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THE EUROPEAN UNIVERSITY INSTITUTE

Department of Economics

Network Competition for European Telecommunications

Oliver Stehmann

May 1993

Thesis submitted for assessment with
a view to obtaining the Degree of Doctor
of the European University Institute.

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List of Abbreviations

ASST: Azienda di Stato per i Servizi Telefonici

BMPT: Bundesministerium für Post und Telekommunikation

BT: British Telecom

CCITT: Consultative Committee on International Telephone and Telegraph

CEPT: Conference of European Postal and Telecommunications Administrations

DBP: Deutsche Bundespost

DIW: Deutsches Institut für Wirtschaftsforschung

EDI: Electronic Data Interchange

EDS: Electronic Data Systems

FCC: Federal Communications Commission

FSS: Fixed Satellite Services

GSM: Global Standard for Mobile Communications

IBN: Integrated Broadband Network

IRI: Istituto per la Ricostruzione Industriale

ISDN: Integrated Services Digital Network

ITC: International Telecommunications Convention

ITU: International Telecommunications Union

LAN: Large Area Networks

LOT: Ley de Ordenación de las Telecomunicaciones

MAN: Metropolitan Area Networks

OFTEL: Office of Telecommunications

PCN: Personal Communication Networks

PSTN: Public Switched Telecommunications Network

PTT: Post, Telegraph and Telecommunications Organisation

SIP: Società Finanziaria Telefonica

TO: Telecommunications Organisation

VANS: Value-Added-Network Services

VSAT: Very Small Aperture Terminals

WAN: Wide Area Networks

WARC: World Administrative Radio Conferences

INTRODUCTION

For the purpose of this investigation, telecommunications may be considered as the two-way exchange of information in the form of voice or data messages between two users at distinct geographic locations.[1] According to this definition broadcasting is not covered by the term telecommunications. Broadly speaking, the latter can be separated in three distinct markets. *Terminals* are equipment which is connected to the telecommunications network (like the telephone, or a Fax machine). *Telecommunications services* are services which are provided on the network. Voice telephony is considered the basic service whilst other services are called value-added. The market for terminals and value-added services has been liberalised during the last decade in the EC. Finally, there is the *telecommunications network* which carries these services. The following research addresses the question whether and to what extent competition can be introduced in EC telecommunications networks and basic voice telephony.

Although in almost all EC member countries the telecommunications industy has faced a process of rapid restructuring, on a policy level, the scope for network competition has not yet been fully explored. Any investigation by regulators has been carried out solely from a national perspective. Moreover, it is generally assumed that network competition automatically implies the duplication of the terrestrial fixed (cable) network. As a result, in continental Europe, the *de jure* monopoly of *Telecommunications Organisations* (TO) has not been challenged. This has to be reassessed in the light of recent technological developments. In this context one may define TOs as public or private bodies to which the state grants special or exclusive rights for the provision of a public telecommunications network and telecommunications services.[2]

In what follows, the question of network competition in the EC is re-examined from the supra-national perspective, taking into consideration the impact of new technological developments. The issue is investigated in four main steps. In part (I) I discuss the specific features of the telecommunications industry. This is the basis for the theoretical discussion in part (II) of arguments in favour of monopoly provision or competition for telecommunications networks. Part (III) then looks at the different national and international policy approaches towards the sector in the EC and the USA. Taking into consideration both the theoretical arguments of part (II) and the empirical findings of part (III), eventually in part (IV) I develop a stragegy towards facility-based competition.[3]

[1] See: Mitchell, B.M. and I. Vogelsang (1991a), p.7.

[2] So defined in the EC directive Com(90e).

CONTENTS

PART I

Specific Characteristics of

Telecommunications Supply and Demand

Introduction

The demand for telecommunications services and the supply of the telecommunications infrastructure and of services have encountered dramatic changes during the last decade. As will be seen technological advance has been the major driving force for this development. The following chapter analyses the main characteristics of telecommunications demand and supply, putting the main emphasis on recent developments. These characteristics - as for instance on the demand side the network externality and on the supply side the increasing overlap between different technological network solutions - play a major role when discussing the costs and benefits of monopoly supply and competition for telecommunications networks.

1. The Demand for Telecommunications Services

The demand for telecommunications networks is closely linked with the demand for telecommunications services. As will be seen, in the past especially the demand for vocal telephone services has determined the telecommunications infrastructure. For that reason in what follows I start with an analysis of the specific characteristics of the demand for voice telephony. The issue of non-vocal ("value added") services will be tackled in chapter 1.2. As will be seen in chapter 3.3. the specific characteristics of telephone demand and the existence of different consumer groups are crucial for the discussion of optimal pricing. They also have a strong impact when developing a strategy towards network competition.

1.1. Telephone Demand

Telephone demand is largely demand for *two-way* conversation. In its service directive[1] the Commission has defined *voice telephony* as the "*commercial provision for the public of (...) speech in real-time between public switched termination points ...*". Three essential features - real time speech, two way conversation and transmission over public switched networks - therefore distinguish telephone service from other telecommunications services (Facsimile, for instance, is an one-way message, voice storage is not real time speech. See chapter 1.2.). The demand for telephone services differs from traditional demand functions in various aspects:

1.) Telephone demand can be split into two parts: The demand for **access** to the telephone system and the demand for **usage**. Both parts are complementary. As will be shown, the demand for access can be derived from the demand for usage.

[1] Com 90/388/EEC of June 28, 1990.

2.) Access demand is partly determined by **optional demand**.

3.) Access as well as usage causes **externalities**. Thus there is a public good aspect in the telephone system.

4.) Consumer demand does not only depend on personal income, access and usage prices but also on time. The latter influences demand in two ways: The usage of a telephone is time consuming in itself. On the other hand, the telephone is a time saving means of communication compared with its substitutes: personal contact, letters etc. Thus, the higher are the opportunity cost of time the higher is the demand for telephone services.

I analyse 1) to 3) in more detail in what follows. Price policy will not be treated here. When references are made to certain pricing schemes the issue is not *why* a certain price is used, but what effects this will have on customer demand.

1.1.1. Access Demand

Access and usage are complementary. There are cross-price effects in both directions: the price for access to the telephone network has an influence on the number of telephone users. If the number increases, usage is likely to rise. On the other hand the change of usage charges brings about a shift in access demand as well. This is due to the fact that the individual decision about access depends on the demand for usage. Only if the utility of using the network is higher than the costs of the phone calls made **and** the price for access, the latter takes place[2]. Moreover, the demand for access depends on the number of subscribers who have already joined the network. Thus, the **demand function for access** is given by:

$$x_A = x_A[p_A, p_U, N(p_A)] \qquad (1.1)$$

x_A = demand for access to the telephone network
p_A = access price
p_U = price for usage
$N(p_A)$ = The number of subscribers, which depends on the price for access. A rise in the total number of subscribers raises the utility for each subscriber (consumer externality).

The previous reasoning leads to the following assumptions:[3]

[2] A detailed analysis can be found in: Squire, L (1973), p. 515.

[3] δ here represents the partial derivative.

$$\frac{\delta X_A}{\delta P_A} < 0, \quad \frac{\delta X_A}{\delta N} > 0, \quad \frac{\delta N}{\delta P_A} < 0$$

Therefore:

$$\frac{dX_A}{dP_A} = \frac{\delta X_A}{\delta P_A} + \frac{\delta X_A}{\delta N} \cdot \frac{\delta N}{\delta P_A} \ll 0 \tag{1.2}$$

and:

$$\frac{\delta X_A}{\delta P_U} < 0 \tag{1.3}$$

(1.2) shows that in the case of the total derivative the negative effect of a price rise for access is stronger than in case of the partial derivative. This is due to the subscriber externality. The price increase has a direct and an indirect effect on access demand. The latter stems from the fact that a smaller network has a lower utility for the customer. This will be discussed in chapter 1.1.4.
(1.3) refers to the considerations made about interdependency of usage price and demand for access.

For the potential subscriber the demand for access can be depicted as a spike (Figure 1.1.). Up to a critical price the acquisition of a telephone set is undertaken. If the access price is above, the customer will stay outside the network.
If S^o is the individual's reservation price for joining the network depending on p_U and $N(p_A)$, the individual demand function becomes:

$$x_A = \begin{cases} 0 \text{ for } p_A > S^o \\ 1 \text{ for } p_A \leq S^o \end{cases}$$

If S^o equals the net consumer surplus from telephone usage, it is the maximum price a customer is willing to pay. Since the surplus varies widely, the critical price S^o is different for each individual. By aggregating individual consumer demand curves the common negative slope is obtained (Figure 1.2)[4]. The depicted demand curve, however, neglects the subscriber externality.

[4] See for instance: Wenders, J (1987), p.53/54.

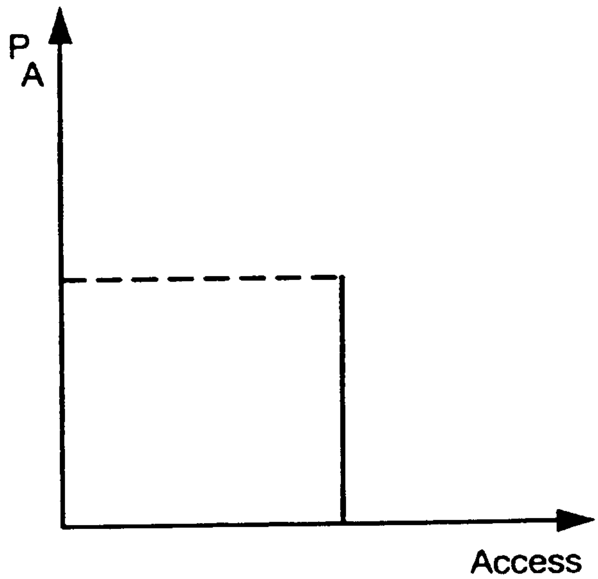

Figure 1.1: *individual access demand*

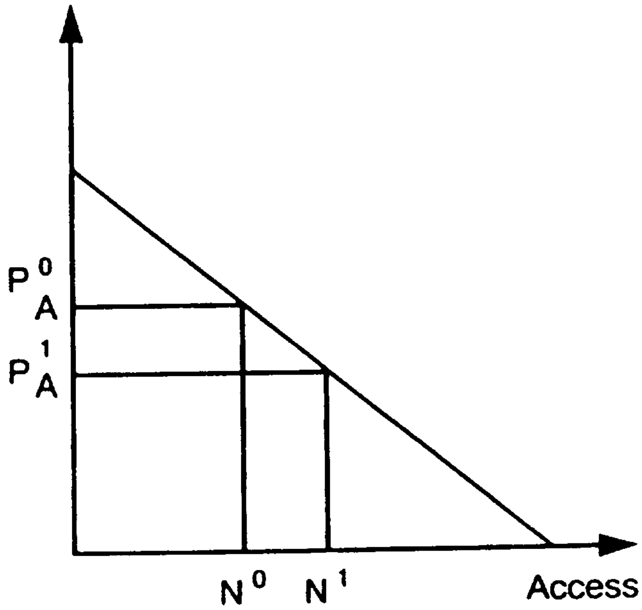

Figure 1.2: aggregated demand for access

Suppose that the access price is lowered from p_A^o to p_A^1: The number of subscribers will increase from N^o to N^1. This, however, will move the whole demand curve outwards according to (1.2.). The correct demand curve for access will be flatter than the one derived from simple aggregation.

Access demand furthermore is increased by "**optional demand**"[5]. The individual will already derive utility by having the option to make or receive phone calls; regardless of whether they are actually made[6]. This refers for example to the ability to make emergency calls. The existence of optional demand thus will increase ceteris paribus the number of subscribers to the network.

Finally, access demand depends also on the business cycle as was confirmed for Spain during the 1980s. This, however, cannot be generalized, as for other countries the relationship is not as clearcut.[7]

Empirical results:

Several studies have shown that the price elasticity for access is low. Estimates of the price elasticity of demand for access to telephone services range between -0.05 and -0.15[8]. For West Germany similar results have been obtained.[9] The income elasticity of access demand

[5] Taylor, L.D. (1980), p.16.

[6] This may be compared to the "menu effect" for restaurants; customers derive a higher utility from having a larger choice of items for dinner, even though, on any one visit to a restaurant, only one main course is ordered.

[7] See chapter 10 and Azzono, R. and F. Morganti (1990).

[8] Taylor, Lester D. (1980), chapter 3; Perl, Lewis J. (1983); and: Perl, L.J. (1986), p. 237.

[9] Heuermann, K.H. (1984), p.297.

is generally higher in absolute terms (around +0.5), but still not very elastic[10]. This might have been expected, since the high access rate (around 90% of households) in industrialized countries indicates that access to the telephone system has become a basic good for almost all income groups. Since strong substitutes are not available, consumers cannot avoid a price change for telephone access by switching to alternative means of communication. Moreover, it was found that the elasticity of access demand varies inversely with the age of the head of the household. Therefore over time one may expect that the elasticity of demand decreases for an aging population and rising income.[11]

1.1.2. The Demand for Usage

Telephone usage consists of making and receiving telephone calls. Only outgoing calls are charged. Thus the measurement of demand refers only to the latter. The receiving of phone calls can be considered as a (in general positive) externality.

While individual consumer's demand appears to be stochastic, on an aggregated level one finds strong daily and weekly patterns.

Mainly due to the pricing schemes applied in the EC, there are three aspects of the demand for telephone usage. One is concerned with **distance**: the observed demand for local calls is different from the demand for long distance calls. The second aspects refers to the **duration** of phone calls: pricing of long distance phone calls, in particular, is generally directly related to the time of the call. Finally, consumers can be separated broadly into two different groups: **private** (residence) and **business** customers[12].

1.1.2.1. Demand for Local Calls

In most urban areas local calls reach their peak in late morning and mid-afternoon. In the USA, the measurement of local demand has been difficult because of *flat rate pricing*[13]. This mechanism has been widely criticized as not being related to costs, and has recently been altered. In European countries local phone calls are charged individually; rates are partly time sensitive[14]. However, so far the demand for local telephone demand has barely been studied in the EC. For four EC member countries I have carried out estimations of the price elasticity of demand. Results are presented in chapter 13. In general I found that the

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10 Wenders, J. (1987), p. 56.

11 Wenders, J. (1987), p. 57.

12 A further aspect could be time of day usage: Normally tariffs for calls during the day are higher than at night. However, Taylor points out that this will not raise any new questions in principle; day and night calls will be substitutes for residence but not business customers. Taylor, L. D. (1980), p. 56-58.

13 The term flat rate pricing refers to a pricing scheme which charges only one (monthly) tariff for both access and local phone calls. Thus the price for an additional local phone call is zero.

14 The "Deutsche Bundespost" for instance charges one unit (= 23 Pfennige) for every 8 minutes.

demand for local phone calls is price inelastic. For instance, for West Germany the price elasticity of local demand was estimated to be -0.08 for the sample period 1970-1989 Similar results were obtained in earlier studies for the USA[15]. Demand for local calls is growing slowly. However, local calls still provide the main bulk of all telephone calls.[16]

1.1.2.2. Demand for Intrastate Long Distance Calls

The assumption that the demand for long distance phone calls is also price inelastic[17], is not justified. For West Germany I found an estimate of -0.18 which clearly exceeds the one obtained for local services. Older investigations obtained even higher estimates for other countries.[18]. According to my estimates in the case of Spain, the direct price elasticity of demand even exceeds one (see chapter 13.6). The income elasticity of demand is generally above one[19] and greater than the price elasticity of demand.

1.1.2.3. Demand for International Long Distance Calls

In almost all countries the demand for international communication has increased more rapidly than the demand for national communication. A development which is especially striking given much higher prices in the international telephone market. This will be seen more clearly in part III and IV. For EC member countries more than 90% of the international traffic is directed to other European countries[20]. The highest price elasticity of demand has been measured for international phone calls. For West Germany I obtained for calls to three EC member countries values between -0.33 and -0.52. For calls to the USA the estimate is -0.61. This generally corresponds to the results for the other three member countries studied here. Similar results derived in prior studies have led several authors to the conclusion that the price elasticity of demand increases with *distance*.[21] However, this conclusion cannot be drawn from the estimations discussed above, given that the tariffs vary for the different services. For linear demand curves, the elasticity increases with the price. Since the price is higher for international calls, the latter also face a higher

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15 According to Littlechild (1970) AT&T assumes the price elasticity for local calls to be -0.1. Similar results can be found in Taylor (1980) for the USA and in Waverman (1974) for Sweden. Quoted from Neumann, K.H. (1984), p.301/302.

16 For instance, in Spain local calls account for 75% of the total. See: FinTech, April 18, 1991.

17 As has been made for instance by Littlechild (1979).

18 see Taylor, L.D. (1980) for the USA: -0.65, Waverman (1974) for Kanada: - 1.2 and Great Britain:-0.63.

19 See chapter 13 and: Taylor, L.D. (1980) for the USA: 1.25; Waverman (1974) for GB 1.11.

20 For instance for West Germany 97% of all international calls are directed to Europe. See: DBP (1980), p.3.

21 Among others, this has been the conclusion in: Neumann, K.H. (1984), p.41; Neumann, K.H., Schweizer, Urs and C.C. von Weizsäcker (1983), p. 80; and Neumann, K.H., Schweizer, Urs and C.C. von Weizsäcker (1982), p. 196; Taylor, L.D. (1980); and: Wenders, J.T. (1987), p.58.

price elasticity of demand. Thus, the higher price elasticities estimated for long distance calls may be entirely due to the different tariff schemes and may not be related to distance. In contrast to national long distance phone calls some authors found that telegram and telex are substitutes for international calls[22]. This result, however, was not confirmed by my estimates.

1.1.2.4. Demand Related to the Duration of Usage

The customer decides about two variables: first whether a phone call should be made at all and second about the duration of the call. Thus, the measurement of demand has to include the number of phone calls as well as the overall time consumed. This applies especially for those parts of services where the tariffs charged are proportional to the time of usage[23]. Empirical studies have shown that the duration of a phone call, on average, increases with distance and that the duration of phone calls made by private households exceeds that of business customers[24].

1.1.3. Demand of Private Households and Business

The demand of households is derived from the maximization of utility. The demand of business instead is concerned with the maximization of profit. For business customers communication is an input for the production of other goods. Business demand for telephone services is therefore *derived* demand. Thus the theory of the firm and not the theory of consumer choice must explain business demand[25]. The parameters of the firm's production function will determine its demand function for telephone calls. The heterogeneity of business makes further disaggregation of business demand necessary. For instance, Hahn and Singer have shown that the quantitative importance of telephone costs varies considerably among different business sectors[26]. Moreover, there is a high concentration on a small number of firms. In 1975 4% of private companies provided 62% of business revenues in the US long distance market[27]. However, data are difficult to acquire for disaggregated business demand functions[28].

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[22] Taylor, L. D. (1980) p.147;, Neumann, K. H. (1984) p.41/42.

[23] Difficulties arise where multi-part-tariffs are used: the tariff for the initial period of a toll call is higher than the one for subsequent periods. Average and marginal price per call period are no longer the same. See: Taylor, L.D. (1980), p.42/43.

[24] Neumann, K.H. (1984), p.43.

[25] See in more detail: Taylor, L.D. (1980) p.59-63.

[26] Hahn/Singer (1979).

[27] A simlar concentration of expenditure for long distance calls can be found for residential customers. See: Hill, J. (1986), p.72.

[28] So far there has not been any investigation in this field. See, for instance: Neumann, K.H. (1984),p.45.

Finally, it has been found that business demand is **less price elastic** (by about one half) than residential demand[29].

1.1.4. Externalities of Telephone Demand

An externality in consumption arises if the consumption of a certain good by an individual i has an impact on the utility of an individual j. The level of consumption chosen by i, however, does not take into account these side effects. Thus in the case of a positive externality the overall level of consumption of the good concerned is less than optimal (from society's point of view)[30].

In the case of the telephone system two kinds of externalities exist:

1.) **call externality**: Only the caller has to pay for the phone call. The utility of the phone call, however, is shared by the caller and by the receiver. This call externality has been modelled by Squire and Rohlfs[31]. In principle a phone call should be made if the utility of both is higher than the marginal costs of the call. Since the caller considers only his own utility, the number of phone calls is less than optimal even if tariffs respond to marginal costs.

Since there are always only two customers involved, in principle it is feasible to internalize the call externality[32].

2.) **network externality**: The second positive externality derives from further access to the network. An additional subscriber increases the utility of the network to all other subscribers who potentially will communicate with him or her. In contrast to the call externality, the network externality concerns a great number of customers. The transaction costs of internalization are much higher than in case 1). In case of marginal cost pricing the size of the network is less than optimal. For certain potential customers the price of access exceeds the personal benefit. Taking into account, however, the additional benefit accrued to other customers, the price of his or her access may very well remain below overall utility. This has been a standard argument in favour of subsidizing access to the network. On the basis of this reasoning in the USA the "*lifeline*" concept was introduced. The corresponding measure in West Germany is the "*Sozialtelefon*". In both cases access of certain social groups defined by criteria like age, income etc is subsidized[33]. The importance of the network externality shrinks if the number of subscribers rises (for a constant population).

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29 Neumann, K.H. (1984), p. 45/306.

30 Artle and Averous have been the first who investigated this public good character for the telephone system. See: Artle, R., Averous, C. (1973).

31 See: Squire, L (1973); Rohlfs, J. (1974).

32 See: Neumann, K.H. (1984) p.48/49. This does not apply for conference calls which involve more than two parties.

33 Neumann, K.H. (1984), p.110/111.

Therefore the externality is considerable when the network is just established. The public good character, however, vanishes if universal service is achieved.

The network externality makes the demand curve for phone calls more elastic, as can be seen from Figure 1.3.[34].

The conceptual demand curve N_1 depicts the relationship of the total number of phone calls made by a constant number of subscribers. Moving along N_1 the number of calls increases if the price of a call drops. However, additionally the price cut will give an incentive for potential subscribers to enter the network. This will further increase the total number of phone calls. Thus, we move from N_1 to N_2. The externality has been responsible for the shift. The conceptual demand curves cannot be observed. Instead only single points (A,B,C) can be detected which correspond to the equilibrium number of calls for the given number of subscribers. A,B, and C then yield the observed demand curve which turns out to be more elastic than the initial one.

Thus a typical **demand function for telephone calls** therefore includes the price for usage (P_U), the personal income (Y) and the number of consumers (N):

$$X_u = X(P_U, Y, N) \text{ with } \frac{\delta X}{\delta P_U} < 0 \quad \frac{\delta X}{\delta Y} > 0 \quad \frac{\delta X}{\delta N} > 0$$

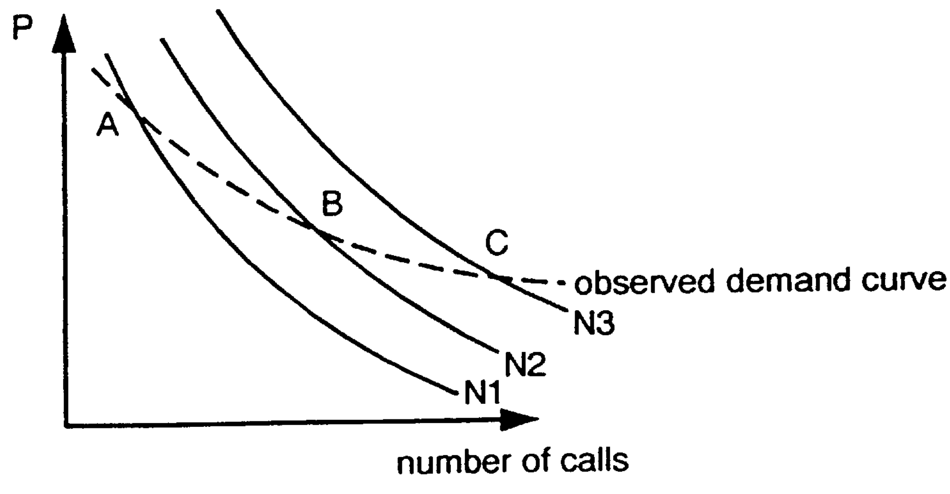

Figure 1.3: *conceptual and observed demand curve*

1.2. Demand for Non-Voice Services

Until the mid 1970's the telephone network was almost exclusively used for the transmission of voice services. Technological advance as discussed in the following chapters now allows for the transmission of many other services. Satellite and fibre optic cables permit high quality transmission of large amounts of data. This created the potential for a new generation of information transmission. While the variety of new services is increasing

[34] A similar description can be found for example in Squire, L (1973), p.517.

fast, regulators have encountered difficulties to distinguish between basic (voice) and non-basic services[35]. In its service directive[36] the Commission has defined *voice telephony* as the "*commercial provision for the public of ... speech in real-time between public switched termination points ...*". According to this definition voice storage, telephone conferencing, picture phones etc do not belong to voice telephony. Instead, they add additional value to the service, hence they are called *value added network services* (VANS). Generally, VANS use the telephone service as a *bearer service* to which further qualities are added. Thus they do not require a separate infrastructure. The underlying transport facilities are usually obtained by leasing lines from the TO. The leased line interconnects the VANS provider own switching and processing node to the switched network. Besides VANS, the transmission of data also becomes feasible (facsimile, electronic mail or electronic data interchange (EDI)). One of the most important functions of VANS is to optimize the communication between different computer systems.[37] The videotext service, for instance, allows personal computer (PC) owners to access certain data bases anywhere, if they have a modem with which to connect their PC to the public telephone network.[38] For 1992 total demand for VANS in the EC is estimated to amount to ECU 5 billion with the highest growth for electronic mail and EDI[39]. The demand for value added services and data transmission is concentrated on business. The finance sector alone had a share of about 50% of total demand for VANS in 1989. It increases by about 25-30% a year[40]. Thus while presently basic services still account for 80-90% of total revenues from telecommunications services, VANS are catching up fast.

[35] See for instance: Neumann, K.H. and H. Schön (1985), p. 479-482.

[36] Com 90/388/EEC of June 28, 1990.

[37] This is well explained in: Weizsäcker, C.C. von, Knieps, G., Unger-Sternberg, T. and B. Wieland (1987), p. 32-34, 38.

[38] Videotext is text and graphics offered to a mass audience on a television screen with a simple hypad converter. See for instance: Branscomb, Anne W. (1988), p. 50/51; and: Steinfield, C.W. and L. Caby (1990).

[39] Scicon Network (1989).

[40] Economist, March 10, 1990, p. 10.

2. The Supply Side: Networks and Services

In the past on the supply side one only had to distinguish between the telephone network and terminals.[1] The provision of the telephone network coincided with the provision of services. The latter were limited to voice telephony. The rising demand for non-voice services and new technological developments led to new solutions on the supply side. One result has been to distinguish between the supply of networks and the supply of services. In the case of VANS the network operator may only provide the infrastructure while private firms then provide a specialized service on the public switched network. As far as networks are concerned one may distinguish two simultaneous developments. On the one hand, the public telephone network has been adapted to the new requirements to carry VANS. Thus, it has become more flexible. On the other hand, the need for specialized solutions has led to the establishment of private networks for closed user groups. The latter become important especially for big enterprises with a considerable amount of in-house communication among different branches. Finally, technological progress led to the rise of independent network solutions, which may be interconnected with the public switched terrestrial network of the TO.

2.1. Public Networks

Public telecommunication networks can be defined as the "*public telecommunications infrastructure which permits the conveyance of signals between defined network termination points by wire, by microwave, by optical means or by other electromagnetic means.*"[2] In contrast to private networks, public networks are principally open to all users who want to be connected to the network. As can be seen from the definition above, the public telecommunications network is not confined to a particular technology. Besides the terrestrial wire, this includes also microwave, mobile and satellite networks.

2.1.1. The Public Switched Terrestrial Network (PSTN)

The PSTN is the cable network traditionally run by the TO. It is by far the most important means to transport point-to-point communication.

2.1.1.1. The Structure of the Network

The telephone network has to connect each pair of customers who wish to communicate. The most expensive method of doing so would be to install a direct cable between all

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[1] In what follows the latter are neglected.

[2] Network termination points are all physical connections which are necessary to access the public network. See: Com (1990e).

subscribers. The number of lines necessary would rise far more than in proportion to the number of customers. If *switches* are introduced the number of lines is considerably reduced. The central office performs the switching function using automatic computerised electronic equipment. Apart from establishing a communication path, the switch reserves the needed capacity for the duration of a call. Switches concentrate calls destined for the same end node and bundle them for bulk transport. This bundling of calls allows for economies of scale. *Circuit switching* implies that for each call a single path is reserved. This contrasts with *packet switching* which is used to interconnect computers.[3] The more switches there are the shorter will be the individual link to the network. The bundling therefore reduces the cost of lines. On the other hand, the **costs of switching** are increased. There is an optimum of substitution of switches for lines which minimises the overall cost of the system. Figure 2.1. depicts a simplified model of a telephone network. Each subscriber is connected to a local switch by an individual line. Phone calls from consumer A to B are considered as local[4].

A **long distance call** takes place if instead A calls C. This call is first sent to the local switch and afterwards it passes through several (here: two) long distance switches. After passing through intermediate switching points, the calls arrive at a terminating switch where they are unbundled. The call is channelled through the local network to which C belongs. The long distance network therefore is star-shaped. Several local networks are put into one junction. The phone call of A to C, however, might be channelled through a direct line as well. A and C happen to use a high density route. For those routes it is cheaper to build a direct line instead of using up the capacity of the long distance switches. They become important especially for big enterprises with a considerable amount of in-house communication among different branches.

Whilst figure 2.1 depicts the basic model of a PSTN, in reality the telephone network is more complicated. For instance, in West Germany there exist 3,500 local networks with 6,200 local exchanges and a long distance network which is hierarchically structured in four network levels. The average geographical area of a local network has a radius of about five km.[5].

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[3] See in detail: Mitchell, B.M. and I. Vogelsang (1991a), pp. 7-9.

[4] In reality a local network consists of more than one switch.

[5] In more detail: Tenzer, G. (1991), p. 37/38.

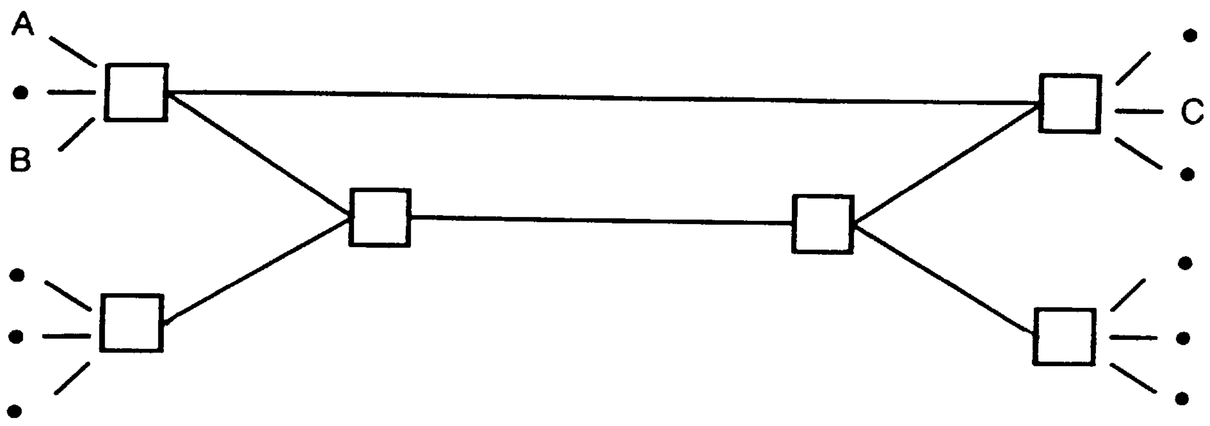

Figure 2.1.: the telephone network

The telephone network therefore consists of the following components:

1) local and long distance switches
2) the cable network
3) transmission technology (amplifiers etc).

The cable network and the transmission technology are often put together. This is reasonable because there is a strong substitutive relationship between the two. Technological progress in transmission technology for instance has helped to reduce the number of cable lines considerably.

2.1.1.2. The Cost Structure of the Network

A rough idea about the breakdown of cost of the old copper cable network can be drawn from an estimate made for the German network for the period 1962-1971[6]: terminal equipment accounted for 7%, switches for 30%, cable lines for 53% and transmission technology for about 10% of total cost. Cable lines therefore entailed the most expensive part of the different components. However, technological advance has reduced the costs of cable significantly. More recent studies therefore imply a lower share for cable (see below). About 75% of the cable lines have to connect individual customer premises with the local switch. Adding the share of terminal equipment a major part of total cost therefore can be attributed towards the access of individual customers.

Another way of breaking down the costs of a telecommunications network refers to usage. In the **short-run** variable costs are very small. Maintenance and energy costs are the result of operating electronic facilities. They barely depend on the actual use of the network.

[6] Heuermann, K.H. (1984), p. 70.

Littlechild analysed the **long run** cost of network services. By doing so four different types of cost are distinguished. Network capacity is regarded as variable in the long run. Littlechild provided rough estimates for the share of total cost[7]:

1) Cost directly **linked** to the **individual subscriber** (access): 36%

2) **Capacity related cost**: These depend on demand and quality of service during peak periods: 45%.

3) Cost directly related to **usage**: These apply for each cable independent from the period (peak or non-peak period): 10%

4) **overhead cost** (common cost): They include for instance R&D and administration cost: 9%

According to this study, usage-sensitive costs account for more than 50%. The main share is borne by the cost of supplying sufficient capacity for peak periods. This has to be borne in mind when discussing optimal pricing policies for telecommunications (see also chapter 2.1.1.7).

Besides the breakdown of costs their development *over time* has an important impact on the evaluation of network competition. In 1973 a meter of fiber cable cost US $ 5, in 1982 the price had decreased to US $ 0.2. By 1990 the price dropped further to one tenth of the one in 1980.[8] As a result, dramatic cost reductions have been realized in the telecommunications networks. For the transatlantic link, for instance, the cost of investment for one minute of use was US $ 2.53 in 1958, 0.22 in 1970 and 0.04 in 1988 in *nominal* dollars.[9]

Thus the technological advance has led to tremendous reductions in network costs. Any static concept of cost functions therefore can hardly be applied to the telecommunications network.

2.1.1.3. Cost of Access

The costs of consumer access arise from the cable which has to be installed to the individual premise from the terminal. The cost of the cable is the main burden of access cost. In order to estimate the marginal cost of access, economies of scale have to be considered. The latter are due to

[7] Littlechild, S.C. (1970), pp.191.

[8] Antonelli, C. (1984), p.333 and: Economist, March 10, 1990.

[9] Source: FCC. Quoted from: Financial Times, April 3, 1990.

1) Fixed cost of a local network: if the number of customers rises, the unit cost of access drops.

2) The costs of access decline if the **density** of customers increases. Neighbours can share the access cable. This is sometimes referred to as **"economies of density"**: the latter are present if the costs of production decrease as points of consumption get closer to each other[10].

The marginal costs of access therefore decrease if either the distance to the local switch is reduced or if the density of customers is increased.

2.1.1.4. Cost of a Local Call

A local call requires that both caller and receiver be connected to the same local switch. The costs of the call depend on duration and the period chosen. The variable costs are very low. Costs rise if the phone call is made during peak time. Then marginal cost rises above variable cost.

2.1.1.5. Cost of a Long Distance Call

A long distance phone call takes place if caller and receiver belong to different local networks. The call consumes capacity of the local as well as of the long distance switches (the number of the latter varies). In general the costs of an individual call depend more on the **general intensity of usage** of a certain route than on the distance bridged by the call. If the general intensity of usage is high there will be a parallel connection (see figure 2.1), which reduces the number of switches used. Therefore the costs of high intensity routes are less than those of low intensity ones[11]. This makes the calculation of marginal cost of long distance calls difficult since they may be directed through different lines.

2.1.1.6. Cost Assignment

The cost structure described above leads to the problem of cost assignment. The knowledge of long term marginal cost is necessary to determine prices for the different services provided. Often fixed costs are said to amount to up to 90% of overall cost[12]. This calculation is based on the assumption that capacity is given. This, however, is only valid for the short run. In the long run even common cost are variable. But even if calculations are made for long run marginal cost, the problem remains that the bulk of costs (capacity and common cost) are **joint costs**. The latter lack a clear-cut criterion for assignment. Joint

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10 Horning, J. and R.W. Wilson (1979). Quoted from Heuermann, K.H. (1984), p.76.

11 Heuermann, K.H. (1984), p. 83.

12 see: Heuermann, K.H. (1984), p.73.

costs are related to the concepts of economies of scope. Without these economies a clear assignment of cost to individual outputs would be feasible. The traditional measure of separation procedures (as for instance applied in the USA and West Germany) was to assign cost to local and long distance services according to the relative share of usage. As will be discussed later in more detail this procedure is not Pareto optimal. Instead of arbitrarily assigning common cost ex ante the Ramsey criterion determines first the individual price (related to marginal cost). Afterwards non-attributable costs will be allocated according to demand elasticities. This maximises overall welfare (subject to a breakeven constraint - see chapter 3.3).

2.1.1.7. The Impact of Technological Progress

As was already pointed out in chapter 1.2., technological progress has significantly changed the structure and the scope of the fixed terrestrial telecommunications network.

In **switching technology** there has been a change from electromechanical to electronic switching.[13] This led to qualitative improvements and greater speed in communications transmission. The new digital switches are themselves computers and function as intelligent nodes in the network. Until quite recently, telephone communications was of the analog form. Sound waves were converted to continuous analog signals which were sent to analog switches. Via amplifiers and repeaters signals were forwarded to their destination. Analog signals are susceptible to noise, attenuation and other electrical problems.[14] While the old electromechanical switches were adequate for voice communication, digitization is necessary for the transmission of data. At the same time it complicated the network operator's position. The traditional system was relatively stationary and network quality hardly depended on the replacement of the installed switches. The rapid changes due to digitization now make it necessary to weigh the quality gains of new technology against the higher cost of earlier replacement. The technical lifetime of equipment no longer determines the period of depreciation.[15] As for switches, the **cable technology** has changed significantly during the last decade. The coaxial cable network has been replaced by fiber optic cables. The former had a much lower capacity and a lower quality. Traditional coaxial cables suffer from considerable power loss and are subject to interference from other circuits within the same cable. This process started in the early 1980s and some TOs hope to finish the replacement by the mid 1990s. Beside the higher quality of transmission, fiber technology allows for the integration of telephone and data transmission as narrow band

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13 Foreman-Peck, J. and J. Müller (1987), p.2.

14 See: Creswell, C.W. et al. (1990), p.1.

15 Compare: Weizsäcker, C.C. von, et al.(1987), p.35.

telecommunications services. For a cable of given dimensions, optical fiber has a capacity more than ten times that of coaxial cable.[16]

In the past, optical fiber was mainly introduced in the long distance network. More recently, further cost reductions make it possible to use optical fiber also for the local loop.[17] Access technology has developed less rapidly. For low volume nodes copper cable remains the cheapest solution. Fiber optic distribution instead becomes attractive for large business customers.

A cost comparison of the coaxial and the fiber optic cable is difficult. Compared to the former the costs of the fiber optic cable are less sensitive towards distance.[18] Optical fiber thus is gaining for long distance high bandwidth applications. However, on thin routes and for the local loop the installation costs often still render it uneconomical. The fixed costs of installation become dominant for an optical fiber system.[19] The new technological development probably has changed the relative cost burden of different services significantly. A recent study estimates that, for a fiber optic network 70 per cent of network costs are access related, 13 per cent distance related and only 16 per cent volume or capacity related.[20]

The Commission of the EC has promoted the Community wide installation of an "*Integrated Services Digital Network*" (ISDN). ISDN is a gateway to access information and to eliminate geographical barriers in information processing. As Lehr and Noll point out, the keyword in ISDN is "*integrated*" and not "*digital*". The process of digitisation is carried out independently of the introduction of ISDN. Especially in the Community ISDN is used as a means to integrate public networks and to provide efficient interconnection for all voice, data and information services.[21] The ISDN is primarily a technical standard which describes how to establish an advanced telecommunications network. As far as ISDN is a move towards digitization it is within the overall trend of technology. However, as is pointed out in chapter 7, the EC concept goes beyond standardization. It fosters an upgrading of the public switched network to higher transmission rates, in order to integrate data communications. However, voice communication and data transmission require different technical performance. Voice communication is tolerant of errors (noise on the line) but intolerant of transmission delays. For switched data transmission the opposite

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[16] Antonelli, C. (1984), p. 333. The trans-Atlantic submarine fiber-optic cable TAT-8 is able to carry 40,000 calls simultaneously, compared to a few hundred calls on a conventional coaxial cable. See: Com (90) 490 p.39.

[17] Shorrock, D. (1989), p.41.

[18] Tenzer, G. (1991), p.49

[19] Compare: Sharrock, D. (1989), p.155-156.

[20] See: Mulgan, G. (1990), p.25.

[21] Here and in the following see: Lehr, W. and R. Noll (1991).

holds. As a result, the adding of data transmission to the telephone network changes the requirements that are placed on switches.[22]
Given common standards in the Community, the ISDN concept is chosen to overcome network fragmentation among the different European operators. The ISDN is able to transmit voice, data, facsimile, telemetry and slow motion video.[23] It can transmit a multitude of signals compared to the copper cable network. Thus the Commission's ISDN concept is based on the three principles of digitization, higher capacity of transmission and integration.
The ISDN has a narrow bandwidth, thus it is incapable of transmitting regular television program services. The next step of integration leads to *Integrated Broadband Networks* (IBN) which are presently tested in pilot projects. This generates an overlap of cable networks, broadcasters and the TOs. IBN are an example for a technology-driven integration of different markets. As will be seen later on, this development becomes a major argument in favour of opening up the market for telecommunications infrastructure.
ISDN is mainly attractive for large businesses. It offers an alternative to private telecommunications systems serving their increasingly complex requirements for internal information services. However, also for small business there may be advantages. Unlike big enterprises the former are less likely to install their own private networks. The ISDN then offers them access to similar services and thereby keeps small businesses competitive.
Residential customers are not likely to benefit greatly from the ISDN upgrade. This raises the question whether the narrow band ISDN and in future the broadband network should be made available ubiquitously throughout the public network. For residential customers certain diseconomies could be expected. They arise due to the additional complexity, higher technical demands, the cancellation of services[24], the incompatibility of analog terminal equipment and the security of transmitted information.
In principle, the ISDN does not imply a certain solution for network ownership. Local access could be provided by several overlapping networks which are interconnected or by one integrated public network. ISDN only requires the compatibility of network and terminal equipment. Whether a single network or several interconnected ones should be preferred also depends on the costs of providing interconnection through gateways.
In practise, ISDN leads to centralisation since it is presumed that all services shall be provided within a single framework of technical standards.[25] As is discussed in chapter 3 this is not optimal. By choosing certain standards, other alternatives which may become

22 In the case of voice transmission, the switch has to set up the call and maintain the connection for a relatively long time. Data packet switching is often of shorter duration and ties up transmission resources only when data are actually sent.

23 Se: Wigand, Rolf T. (1988), p. 30.

24 The ordinary telephone network carries enough power to operate telephone sets. Electricity supply failures hence do not affect the telephone network. Fiber optic transmission eliminates the power supply on the network, thus users will depend on the reliability of the electric utilities' supply.

25 See in more detail: Lehr, W. and R. Noll (1991).

available in the future are foreclosed. Standards produce high short-term benefits due to compatibility whilst bearing the risk of high barriers for superior technical configurations in the future.

Parallel to the installation of fiber optic cables the system of the terrestrial network has been changed. The copper cable network in West Germany was built in the mid 1960s with a planning horizon of 30 years.[26] The very long horizon of investments and the rapid increase in demand made it difficult to forecast the capacity needed. Parallel to the introduction of fiber optic cables a new system has been installed. The fiber optic cables are laid in pipes. In the long distance and all local networks a two pipe system is installed which increases the **flexibility of capacity**. For this purpose always one pipe remains empty. When the capacity limit of the existing fiber optic cable is reached, a new cable is installed in the second pipe while the first one is withdrawn. Thereby it becomes possible to react within less than one year to unforeseen shifts in demand.[27] Given the high unpredictability of future demand for VANS, this higher flexibility of capacity becomes important.

However, also in the light of network competition the two pipe system becomes significant. In general it may increase significantly the entry barriers for new operators in a liberalized market. An unpredicted rise in demand combined with short term inflexible capacity of the main network operator would offer competitors a better opportunity to enter. The two pipe system abolishes this opportunity. Moreover, it allows the incumbent to react quicker to demand fluctuations than a potential competitor can enter. Secondly, the investment in the two pipe system entails high sunk cost which are not related to capacity. These sunk costs comprise, for instance, the investment necessary to lay the pipes and to obtain the right of way etc. As is explained in chapter 3.2. sunk costs are a major entry barrier for telecommunications networks. They require a long investment period. Thus the incumbent will be able to react much quicker to shifts in demand than a potential competitor which first has to install the two-pipe system.

2.1.2. Microwave Public Networks

Microwave radio technology became the first challenge to the fixed terrestrial network in the 1950s. It consists of a network of tower stations among which microwave signals are transmitted. Compared to the wired system, microwave networks have the advantage that they do not require a right of way.

For over 40 years microwave radio relay systems have been used primarily for long distance telephone services in the USA. Compared to alternative means of transmission, microwave radio is the most effective for lower capacity applications.[28] Technological advance,

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[26] Tenzer, G. (1991), p. 36.

[27] This concept is explained in more detail in internal publications of the "Ferntechnische Zentralamt" of the Deutsche Bundespost. See for instance: Hars, H.J. (1986), p. 49.

[28] Sharrock, D. (1989), p.158.

moreover, has made microwave networks applicable for rural areas which are remote from highly populated places. In addition, in these areas the population is spread out over a wide area which renders it expensive to reach all households with the conventional cable network. The microwave radio system is almost insensitive to distance and avoids the cost intensive ground installations of the cable. Experience made in Canada shows that radio systems could provide virtually all services of the cable network with the same quality and reliability.[29] Thus, it is more efficient to use fiber optic for high-capacity backbone transmission and microwave radio in sparsely populated regions. Hence, microwave technology is a complementary means of transportation to the fixed terrestrial network.
However, microwave systems also become substitutive means of transmission. In the UK, for instance, Ionica has developed a radio based technology which may provide a low-cost alternative to British Telecom (BT). This service would be targeted at residential and small-business customers.[30]

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[29] Compare: Morris, M. (1991), p.39.

[30] See: Financial Times, January 30, 1992.

2.1.3. Public Mobile Networks

In contrast to the fixed terrestrial networks, mobile networks do not use a cable link between terminals. Instead communication is transmitted via radiowaves. This allows the moving of terminals. The simplest form may be a **cordless telephone** which allows the moving of a receiver within a small area. Besides the small range of mobility, the cordless telephone completely relies on the terrestrial network. Thus it is a technical improvement of terminal equipment. Only in combination with other systems it offers also an alternative network technology.
Mobile networks exist for a variety of services. Most are limited to a relatively small geographical area. The simpler ones only allow for one-way communication of short messages. This is, for instance, the case for the **paging** system which is limited to the transmission of short non-voice messages. The **Telepoint** service instead offers the possibility to make phone calls using a cordless telephone. Its network consists of local basis stations which are erected at close distances. Telepoint does not allow, however, for the receiving of phone calls. Thus, Telepoint is a low cost mobile service which is almost in competition with public payphones. A combination of the paging and the Telepoint system already would allow a limited two way function. The paging service may inform the Telepoint user that someone would like to talk to him or her. The Telepoint network then can be used to carry out the call. Unlike the British Telepoint system, France plans to launch a two-way Bi-Bop mobile system in Paris in autumn 1992.

A **mobile telephony network** consists of an infrastructure of *Base Stations* and *System Switch and Control Centres* (SSCC). The Base Stations comprise a radio transceiver which enables the communication with the terminals. It also contains a line interface which ensures connection with the SSCC through leased lines from the public switched terrestrial network. The SSCC is the control node of the system and performs the switching between Base Stations.[31] The cellular mobile telephone network of the DBP Telekom, for instance, requires about 5000 Basic Stations and 400 SSCC to cover the West German territory.[32]
In order to get access to the local loop and to link the different Basis Stations with the SSCC, the mobile telephone network has to be interconnected with the fixed network. The mobile network operator has to lease lines from the operator of the terrestrial network to complete a phone call.
The main constraint on mobile telephony is related to the *scarcity of bandwidth*. In particular, the analogue systems have been restricted in their capacity because of cell size limitation and frequency availability. Technological progress, however, has considerably increased the bandwidth which can be used for mobile telecommunications. In the case of the cellular mobile system a certain region is divided into different cells, each getting its

31 For a more detailed explanation of the technicalities of mobile networks: Com(90f), pp. 197-210.

32 BMPT (1988), p. 56/57.

own Basic Station. This ensures that the same frequency can be used in different cells which helps to overcome to some extent the problem of bandwidth scarcity.[33] Having a higher frequency band than the older analogue system, the cellular networks operate with higher capacity and allow for more participants. Nevertheless, the radio spectrum scarcity imposes big constraints on the licensing policy of regulators. The more operators are licensed, the smaller is the individual bandwidth and the smaller is the capacity of the individual network. In the USA and also in the EC for this reason only two or three operators are licensed in order to avoid network fragmentation. As is discussed in more detail in chapter 8.4.1.2. this creates the need for an efficient allocation of frequency property rights. A regulatory body has to control an open and non-discriminatory distribution of scarce frequencies. This may be done by an auction.[34]
Standardization, moreover, ensures that the geographical range for which a mobile system can be used is considerably increased. The GSM standard[35] fixes certain conditions for usage and reserves the 900 MHz frequency band for mobile telephony throughout the Community. Thereby a EC-wide mobile network is created. Previously different standards prevented the use of mobile telephones when crossing borders among member countries.
Presently the fixed costs per customer of the mobile network exceed the ones of the fixed networks. In the UK, an operator invests about ECU 1000 for each customer.[36] Moreover, the lifetime of a mobile radio terminal is estimated between 5 and 10 years.[37] This is considerably less than the estimated 10 to 37 years of lifetime for a new fixed subscriber line. Even though costs are decreasing fast, for the foreseeable future mobile telephony remains more expensive than the fixed network. Thus, the higher mobility has to be paid for by higher access and usage tariffs.

On the local level the cellular technology leads to the development of *Personal Communications Networks* (PCN). Although yet not fully explored, it is expected that PCN will eventually form a second phone system paralleling the wired one. In contrast to the GSM network, the locally operating PCN does not require interconnection into the fixed network. However, this requires enormous up-front investment in antennae. Until related costs shrink, for a transitional period TV companies are exploring the use of their cable networks to carry PCN signals between transmitting antennas.[38] Thus a combination of cable networks and PCN may create local telecommuncations networks which are completely separated from the public switched network operated by the TOs. Another

[33] DIW (1990), p. 47.

[34] See in detail: Kruse, J. (1992).

[35] GSM = Global Standard for Mobile Communication.

[36] DIW (1990), p. 47.

[37] Com(90f), p. 53/54.

[38] Business Week, March 25, 1991, p. 100.

technical solution is presently being explored by Motorola which plan the combination of PCN and satellites (Iridium network).[39] These systems have the great advantage of not requiring investment into underground fiber.

2.1.4. Satellite Communication Networks

Telecommunications satellites have been established mainly to improve international communications. Frequency bands are allocated by the World Administrative Radio Conferences (WARC's) and by Regional Administrative Radio Conferences (RARC's).[40] For the purpose of frequency allocation civil satellite services are divided into fixed, mobile, broadcasting and radio determination services. The fixed services are provided by telecommunications organizations. Due to technological development the distinction between Fixed Satellite Services (FSS) and Broadcast Satellite Services (BSS) becomes blurred. This, however, has not been reflected by an adaption of the regulatory scene. For telecommunications services the FSS are relevant. While the other services are neglected in what follows, some account will be made of the overlap with BSS services.

Generally the satellite network consists of a space segment and an earth segment. The space segment comprises the transmission capacity available for the satellite network. The earth segment is made up of the satellite earth stations using the satellite capacity that is available to the operator of the satellite network.

2.1.4.1. The Earth Segment

The earth segment consists either of receive-only terminals and terminals which can transmit and receive. Receive only telecom terminals can be used for the reception of entertainment broadcasting, and point-to-multipoint data and voice signals (including video transmissions). The second group of terminals is also able to send messages. Therefore it can be used for point-to-point communications. There are strong similarities in the overall function between these two classes of earth stations.[41]

Traditionally the space segment of satellite systems for long distance telephony or television programme exchange were connected to the terrestrial network. Telecommunications organizations owned and operated the large earth stations which were required to transmit the satellite's signal through the public switched network to the customer.

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[39] International Herald Tribune, February 17, 1992.

[40] See in detail: Com(90a), p.11.

[41] Com(90a), p.88.

Rapid technological progress increased the flexibility of satellite earth stations and subsequently the range of services for which they can be used. In the past the use of satellites was hampered by the congestion of frequency bands and the minimum size of earth stations. Technological improvements have increased the power of antennae while at the same time the use of other bandwidths became feasible. These developments make the transmission to and from "*Very Small Aperture Terminals*" (VSAT) possible. These VSAT can be installed directly on the customer's premises. Thereby the satellite network becomes independent from the terrestrial one. Moreover, due to technological progress beside voice telephony and broadcasting, the transmission of VANS (like videoconferencing) has also become feasible.

2.1.4.2. The Space Segment

The capacity of the satellite network is limited by the space segment. In Europe it is growing rapidly since the middle eighties. In 1983 Europe installed its first operational satellite, which subsequently was followed by 12 others until 1989. Currently 170 transponder are available. The Commission predicts an increase to 400 transponders by 1993.[42] The capacity of a space segment can be used either for telecommunications services or for TV channels. An important feature is the distribution of cost of the satellite network among the space segment and the ground segment. As a rough estimate the share of the space segment's cost in total user cost does not exceed ten or fifteen percent.[43]

2.1.4.3. Satellite Networks and Voice Communication

Initially, satellite technology was developed to transmit voice communication over long distances. However, due to the rapid development of the fibre-optic cable voice telephony remaines concentrated on the terrestrial network. The recent technological improvements increased the capacity of the terrestrial network and at the same time reduced the cost of provision of the traditional point-to-point communication. Presently, three quarters of satellite capacity is used for TV distribution. The share of voice telephony carried by satellites to total voice telephony of intra-European international and national long-distance calls accounts for only 2-3%. For trans-Atlantic telephony the share is presently at about 60%.[44] However, after the opening of the TAT8 and PTAT transatlantic cables in

[42] Satellite capacity is measured in "transponder capacity". A single transponder can either carry one television channel or up to 1700 telephone voice channels. See: Com(90a) 490, page 18 footnote 11.

[43] Snow, (1987a), p.98.

[44] Despite the "open-sky" policy adopted by the FCC, in the USA total satellite communications revenues account for no more than 2-3% of total telecom revenues. Com(90a), p.18, 50.

1990, the share of satellites in total transatlantic traffic fell considerably and it is expected to be at around 30-40% by 1995.

However, it is not totally clear whether the rising market share of terrestrial traffic is due to lower cost or due to Intelsat's tariff structure which stimulates bypass (see below).

Cost comparisons between satellites and fiber-optic cable links are difficult to conduct and no satisfactory results have been achieved yet. A study financed by Intelsat showed under conservative assumptions concerning the life time of a satellite that the cost of a telephone circuit on a fully loaded Intelsat space craft is about US $ 504, while the corresponding figure for the TAT 8 cable is US $ 1,596.[45] A more detailed study was carried out by Comsat which showed that the costs of both modes are roughly comparable. The study took account only of the per-circuit capital cost neglecting operation or maintenance costs. The satellite and earth segment scenarios showed marked variation, depending on the type of system. However, Comsat came to the conclusion that for **transatlantic** services satellites appear cost competitive with the cable systems for the majority of configurations.[46]

Despite the lower cost of fibre optic cable in Europe, voice traffic via satellites is expected to rise significantly in the future. This is due to an expected rise in demand if cost reductions are passed over into lower tariffs. Total international and long distance traffic is growing strongly at more than 10% per year which also spurs demand for satellite communication. At the end of 1987 about 1000 satellite voice circuits were in operation for telephony links in Europe. This was expected to rise up to 8500 satellite circuits by the end of 1990.[47]

Moreover, the simple concept of a "*break-even distance*" of satellite technology has been given up. Up to the early 1980s a satellite was regarded as useful only if an operator had to transmit ordinary phone calls for more than a minimum distance. In general for the comparatively small European distances satellite transmission was more expensive than terrestrial transmission. Recent technological developments allow for a diversification of satellite use, thereby emphasising the intrinsic advantages of satellites over terrestrial systems. One advantage is the **widespread geographical coverage**; a second is the advantage of **deploying the network** and services **immediately** over a wide area. The latter made satellites an ideal alternative to the installation of a cable network in peripheral regions. Hence, satellite technology is an appropriate substitute for underdeveloped Eastern European terrestrial networks. For this reason in Germany the use of private satellite installations for the provision of VANS and voice services has been liberalized recently.[48]

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[45] See in more detail: Snow, M.S. (1987 a), p. 104.

[46] Shorrock, D. (1989), pp. 153-155.

[47] Com(90c), Annex VI.

[48] In less than one year more then 38 licenses and approvals were granted. See: Funkschau (10/91).

The ability to transmit either telecommunications services or broadcasting signals became a further strong advantage against the cable. A satellite originally intended for voice services can be reconfigured in orbit to specialize in video or data services. Further, a satellite can be drifted from one ocean region to another, or from one longitudinal location to another in the same region.[49] Thereby the share of fixed costs which are sunk is diminished since capacity can be shifted from one market to another. More technical advantages of satellites relate to the ease of interconnection and their superior performance in terms of continuity of service.[50]

Satellite technology is also used for private networks. The Daimler-Benz AG is setting up a satellite-based pan-European network to link its 20 European subsidiaries and to resell spare capacity to third parties.[51]

Recently Motorola came up with the idea of a global satellite mobile telephony. The *Iridium* network consists of 77 low earth-orbiting satellites which allow worldwide communication using mobile telephone handsets. This system is expected to be ready by 1996.[52] That satellite technology may become a possible alternative means for the PSTN can be inferred from the Conference of European Postal and Telecommunications Administrations' (CEPT) decision. The latter resisted reserving bandwidth for Iridium like systems, being afraid of undermining the TO's fixed network monopolies.[53]

2.1.4.4. Satellite Technology and VANS

As has been noted above, recent technological progress led to a considerable decrease in costs of ground stations which made the satellite transmission of specialised value-added network services economically feasible. It is forecasted that the point-to-multipoint communications services will be a strongly growing market. Terrestrial networks are often unsuited for these services due to technical problems and tariff structures. Already existing examples for such value-added services can be found in Great Britain and in France.[54] The rapid development of VSATs now permits their installation on user premises where they

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[49] See also: Snow, M.S. (1987 a), pp. 35-41.

[50] However, as a disadvantage of satellite technology for voice transmission there is the propagation delay which does not appear if cables are used. See: Snow (1987a), p.103.

[51] Communications Week International, March 4, 1991.

[52] Die Zeit, Januar 24, 1992.

[53] Compare: Economist, March 7, 1992.

[54] PolyCom for instance offers news to radio stations and newspapers, stock market information to brokers and meterorological information. In detail: Com(90a), p.41-43.

can be operated under the direct control of the user. Thereby the provision of wide-area multipoint networks via satellite becomes cost-effective.

2.1.5. Cable Networks

Until today the provision of TV channels and telephone communication was carried out using different cable networks. The former *point-to-multipoint* audio and audiovisual entertainment requires high transmission capacity which could not be provided by the telephone copper wire. The telephone *point-to-point* communication requires less cable capacity.[55] Instead, switching technology became a major part of total costs. The latter is not needed for TV distribution. However, during the last decade convergence of both systems became feasible. At the present state the integration of some telecommunications services in the existing distribution cables is already technically feasible. The contrary does not hold. There are no switches available which permit the large scale switching of broadband services. Nevertheless, technological development is heading towards network integration. The ISDN network already allows the integration of telephone and data networks. The integration of TV distribution becomes feasible with broadband networks which are presently explored. For instance, the German pilot project OPAL permits the integration of telephone calls and up to 30 TV channels in one fiber optic cable.[56]

The effect of broadband technology is the intregration of two formerly distinct markets; cable television and telephone. This requires new regulation and offers principally the possibility of competition between operators in both markets. While telecommunications licences are granted on a national basis, in many countries authorizations for cable TV distribution are granted by local authorities. Television distribution networks operate over a limited geographical area.[57]

In the Netherlands, for instance, parallel to the public switched telephone network, two separate networks exist. Municipalities own the terrestrial broadcasting and cable networks for TV distribution. About 80-90% of households are connected to these point-to-multipoint networks. Having already achieved universal access and a complete terrestrial network, the sunk cost of entry into telecommunications becomes much lower. As was pointed out above, a combination of cable networks and mobile technology like PCN offers the possibility of installing local telecommunications networks which are completely separated from the ones of the TOs (see chapter 2.1.3.). On the other hand, TOs may in the future use their infrastructure to provide TV signals. Optical fiber connections to households allow telephone companies to provide video services, thus also entering the TV

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[55] The bandwidth requirements for the telephone services are 4 kHz, for the television channels, instead, 4-10 MHz. Compare: Lera, E. (1990), p.287.

[56] DBP Telekom, Pressemitteilung, May 31, 1990.

[57] See: Lera, E. (1990), p. 284.

market.[58] For the time being it is less expensive for cable TV operators to convert their networks for two-way transmission than it is for local telecommunications network operators to increase their bandwidth in the PSTN, in order to enter video and TV.[59] However, while increasing the scope for network competition, this development on the contrary may also lead to further concentration. As in the Netherlands, the ISDN proceeding enhances the pressure integrating cable and telecommunications networks in one monopolized super-pipe. Regulators may therefore choose to merge TV and telecommunications operators instead of encouraging market entry and competition.

Principally in the 1990s the regulator has to resolve which alternative should be chosen. Another potential entrant in public telecommunications networks may be European Railways. The *Hermes* network is a pan-European network which has existed for a number of years, providing communication links for the internal use of Railways.[60]. It has been operated separately from the TO networks and links 11 European countries. Presently a consortium has been set up to provide private network traffic for big and middle-sized firms. Technically speaking it would not be difficult to provide interconnection into the terrestrial network of the TOs.

Using the Hermes, an operator could enter who has already installed his own network, who has gained operating experience and, moreover, who provides international links.

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58 See for instance: Noam, Eli M. (1983), p. 388.

59 Compare: Northern Business Information (1991), pp.16/17.

60 The Hermes network has been used for exchanging international freight messages and for linking seat reservation systems. See for instance: Benz, O. (1991).

2.2 Private Networks

The broader scope of telecommunications services available and the increasing need for data transmission has raised significantly the demand for special network solutions. *Private networks* are defined as networks which consist of closed user groups, as for instance different branches of an enterprise.[61] Private networks may be interconnected with the public switched network. They offer big enterprises which have a large amount of internal traffic the opportunity to bypass the public network. Moreover, they take account of very specific needs as can be seen from the various inhouse EDP installations of firms.[62] A private network consists of transmission and switching facilities, and customer premises equipment.

In 1991 Ford has installed the first private international ISDN network which connects six British branches with the two German ones. It comprises 14,000 terminals. These kinds of *Wide Area Networks* (WAN) offer Ford a sharp reduction in costs of internal communication, and offer a higher reliability and speed of transmission and specialized solutions for inhouse data transmission. The network equipment, set-up and the planning was carried out by Siemens, using support from BT and the DBP Telekom.[63] Another example is Electronic Data Systems (EDS), a computer-mangement company owned by General Motors. Besides bringing together more than 100 separate GM networks, consisting of 300 mainframe computers, 300,000 computer terminals and 250,000 telephones, EDS also competes with public network operators for contracts to establish private networks for other enterprises.[64]

Public network operators themselves have started to provide national and international private networks, offering their expertise won from handling the PSTN. Thereby they start competing among themselves and with enterprises like EDS on the private network market. Sprint, the US third largest long-distance operator for instance runs the entire European data network of Unilever, connecting 18 different countries. It won the contract competing against AT&T, BT, and other computer firms.[65]

Alternatively, TOs start to include private networks into their public switched ones. By doing so they hope to limit the loss of business communication for the public network. *Metropolitan Area Networks* (MAN) are fiber optic based high speed networks which comprise the area of a city, or a university campus, used to alleviate traffic bottlenecks.[66]

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61 Other examples where private networks are needed may be business links as between a retailer and its shops, or a car maker and its suppliers.

62 Compare for instance: Weizsäcker, C.C. et al. (1987), p. 36.

63 FAZ, June 10, 1991.

64 Economist, March 10, 1990, Telecom Survey p.33.

65 See also for other examples: Economist, October 19, 1991.

66 Communications International, January 1991, p. 32.

MAN technology is likely to spur the evolution of broadband networks. It leads to an accelerated introduction of optical fiber as an access technology.
Similarly, *Large Area Networks* (LAN) are outside the public network. LAN are communication links that permit the interconnection of computers and other electronic equipment with the ISDN. LAN are facility based data networks that do not use a transmission facility provided by the TO. LAN can be interconnected with each other, thereby expanding geographically into *Wide Area Networks*(WAN).
"*Virtual private networks*" consist of lines of the public switched network which are used only as a closed system. The provision of virtual private networks has become feasible due to new software applications which allow the TO to install a private network within the publicly switched one. Customised software processes each call and routes it over the shared facilities. Being provided by the TO, virtual private networks become cheaper than a separate private network since they allow different customers to share the physical lines. The network operator is able to bundle transmission and switching services and equipment offerings to private network customers, allowing for substantial discounts. Even if the TO retains its monopoly for public voice traffic the customer of a virtual private network nevertheless may use the latter also for telephony.[67] Thus, virtual private networks are a means for TOs to avoid bypass by big enterprises.
On the other hand, having established a separate private network, the private network operator may also try to resell spare capacity to third parties. By doing so he or she could reduce costs similarly to the TO which provides virtual private networks. This, for instance, is planned by Daimler, which is building a satellite based private network for its 20 European subsidiaries. By reselling spare capacity, Daimler could lower the costs of this network significantly.[68] Public switched networks would be put under some competitive pressure.

2.3. Intelligent Networks

As was pointed out above, in the past it was not necessary to distinguish the provision of the infrastructure and services. Having established the network, the TO automatically was able to provide the telephone service. The emergence of VANS instead renders it necessary to separate both functions. VAN-providers may use the TO's network for the provision of a service which competes with similar services provided by the network operator. This concept relies on the presumption that the network only contains the basic functions of switching and transmission. *Intelligent network functions*, however, permit the operator to preempt potential service competitors.

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[67] Economist, October 5, 1991, Telecoms Survey, p. 39.

[68] Communications Week International, March 4, 1991.

The basic idea of intelligent networks is to separate the switching from the service features. Adding new services to a network becomes time consuming and costly if new software releases have to be installed on every switch in the network. In an intelligent network the service features are provided by a separate resource, the "feature node".[69] Thus an intelligent network is a network "*which (...) allows functionality to be distributed at a variety of nodes on and off the network and allows service provisioning via a service control architecture.*"[70] Intelligent networks allow to decouple the software control of the public network from the underlying access and transport technologies.

Adding additional functions to the network, the intelligent network allows also for the provision of new services. The essence of intelligent network *services* is the provision of information as opposed to communication (voice telephony). The precursors of the intelligent network services were the time and weather information services.[71] Nowadays they comprise a large range of services as *universal access number*[72], *time and call routing*[73], *call allocation*[74], *call queuing*, *televoting*[75], *ring back when free*, *mail box*, etc.[76] The new services are expected to face a sharp increase in demand. The DBP Telekom expects that the revenues from intelligent network services will rise by 500% until 1995.[77]

The above mentioned concept of *virtual* private networks is one of the major advantages offered by intelligent networks to the TOs. In contrast to a physical private network, the virtual private network can be dynamically reconfigured and may exist only during business hours. Another option is to increase its capacity in peak hours.[78]

Thus, intelligent networks have two major impacts on telecommunications. First, they offer TOs the opportunity to keep big customers in the public switched network instead of switching to private ones. Second, intelligent networks may have an impact on the competition in VANS markets. This impact may turn out to be blurred.

The separation of "basic" and "value added" services and the overlapping development of hardware and software technology leads to a conflict as to where the "intelligence" shall be placed. The telecommunications network may be regarded only as a bearer service which is

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69 Finnie, G. (1991).

70 AT&T, quoted from: Shorrock, D. (1989), p. 33.

71 Samarajira, R. and R. Mukherjee (1991), p. 152.

72 A single number that identifies a service provider to be advertised nationally.

73 The routing of freephone calls which can be dependend on the time of the day.

74 The routing of incoming calls proportionally to their destination in the case of congestion.

75 Televoting allows for quick opinion polls.

76 These and other examples can be found in: Shorrock, D. (1989), p. 35 and: Handelsblatt, May 21, 1991.

77 Handelsblatt, May 21, 1991.

78 Sharrock, D. (1989), p. 36.

Introduction

National regulators in different countries and at different moments have either promoted network competition or monopoly provision of the telecommunications network. The latter may either relate to public provision or to the regulation of a private monopolist.
It is useful to distinguish the *de jure* concept of legal or administrative monopoly from the *de facto* notion of *natural* monopoly. The legal monopoly is a matter of *raison d'état* and political favour which may or may not coincide with economic conditions of a natural monopoly. The *de facto* view of monopoly is concerned with the objective properties of the cost function rather than a result of legal or political actions.
With the exception of the UK, all EC member countries have granted *de jure* monopoly positions to their public network operators. The following chapters will discuss to what extent this is based on an economic rationale. To this end, issues of distribution and goals of efficiency are discussed. It is scrutinized to what extent there exists a trade-off between both aims for the telecommunications network. Goals of efficiency may be distinguished in three subcategories.[1] *Allocative efficiency* is obtained by optimal prices and quantities for given demand and cost functions. In the simple one-product case this is achieved by setting the price equal to the long-run marginal cost. *Technical efficiency* requires the cost minimizing production of a given output. Technical efficiency refers to economies of scale and scope and X-inefficiency.[2] Finally, *qualitative efficiency* is related to the optimal choice of products provided by a firm. Qualitative efficiency requires that the degree of product differentiation and the amount of different product characteristics matches consumer preferences.[3] When evaluating the extent to which monopoly provision is efficient, all three categories are examined in what follows.
Monopoly provision of the network has been justified by the existence of a natural monopoly and network externalities. Both concepts are normally based on a static approach. Moreover, further impediments to competition have been put forward to justify the granting of exclusive rights. They refer to barriers to entry and exit. It is analysed to what extent these factors provide a rationale for granting a *de jure* monopoly.
In the case of monopoly provision prices are not set by market forces. Monopoly pricing leads to allocative inefficiency because it diverges from first best marginal cost pricing. Hence the regulator has to control the price setting behavior of the network operator. Thus it is necessary to discuss the application of efficient pricing rules for telecommunications. Deviations from optimal pricing rules may lead to losses in allocative and qualitative

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[1] Kruse, J. (1985), p. 223.

[2] The concept of X-efficiency refers to all other sources of deviation from minimum cost. This may occur if the input of factors of production is not minimized, in the case of organisational slack, etc. See Leibenstein, H. (1966).

[3] Kruse, J. (1985), pp. 117.

efficiency. Related results are the basis when in part III I scrutinise the actual pricing policy of European telecommunications organisations.
Chapter 4 thereafter looks at different concepts to introduce **network competition**. It points out that basically two strategies may be distinguished for telecommunications. *Service-based competition* is based on the assumption of a unified network. While the latter provides the infrastructure, different service providers compete by offering VANS on the network. *Facility-based competition* instead fosters competition between different network operators. Principally one may distinguish between the "classical" case of one incumbent who faces one potential entrant and the case of many separate incumbents who may be forced into competition by a regulatory change. Especially in the former case the incumbent has the possibility for strategic behavior to fence off the entrant. If instead there are several incumbents operating in several fragmented markets, the entrant can be used to stir up competition among incumbents.
Finally, part II in chapter 5 concludes with an assessment in which the (dis-)advantages of either monopoly provision or competition are discussed. It is argued that network competition is more likely to fulfil all three goals of efficiency. Distributional aims must not be relinquished in this case. However, they can be pursued in a more efficient manner.

3. Public Monopoly Provision of the Network

3.1. Natural Monopoly

The term "natural monopoly" refers to efficiency in production. It therefore is a characteristic of the supply side of a market. A **natural monopoly** exists for *"an industry whose cost function over some given set of products is such that no combination of several firms can produce an industry output vector as cheaply as it can be provided by a single supplier"* [4].
Historical evidence[5] as well as theoretical considerations have led to the viewpoint that the telephone network is a natural monopoly. This conclusion has to be scrutinized in some detail. It is fundamental for the question whether state regulation or competition should prevail for the provision of telecommunications networks. Natural monopoly elements in the past have often provided the rationale to raise institutional or legal entry barriers.
The following chapter will comprise two parts. First the concept of natural monopoly is discussed on a general level. This leads to the question of *sustainability* of a natural monopoly. Only if a natural monopoly is not sustainable, must a *de jure* monopoly be installed. Second the issue of natural monopoly is addressed for the telephone network. The results of various econometric studies which test subadditivity in telecommunications

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[4] Baumol, W.J., Bailey, E.E. and R.D. Willig (1977), p.350.

[5] As will be seen in chapter 6 the US market provides an example of competition in telecommunications networks. In an early period AT&T was able to oust all serious competitors and to monopolize the market.

are discussed. It is also revealing to look at cost comparisons of different national telecom operators.

The traditional concept of natural monopoly is concerned with an industry which produces one homogeneous good. For the telephone industry the multiproduct case is relevant. However, for the sake of clarity the simple one-product-case is discussed first. Afterwards an extension to the multi-product-case is undertaken.

3.1.1. The Single Product Case

The following description of a single-product natural monopoly is static and strictly neoclassical in the sense that dynamic elements such as technological change are neglected. Technology instead is taken as given and known to everybody.
Essentially there are three concepts to explain a natural monopoly.
Economies of scale:
The most common approach is to refer to economies of scale. They exist if an increase in output leads to a less than proportionate increase in cost. Thus:

$$C(\tau y) < \tau C(y) \quad \text{for } \tau > 1 \text{ and } y > 0 \tag{3.1}$$

Baumol et al show that global economies of scale are **sufficient but not necessary** for subadditivity of cost and therefore natural monopoly[6].

Cost Subadditivity: A cost function C(y) is called **strictly subadditive** at $\grave{Y}$ if for any quantities of output $y_1 \ldots y_k$; $y \neq Y$; $j = 1 \ldots k$; $k > 2$; and $\sum_{j=1}^{k} y_j = Y$

the following condition holds

$$C(Y) < \sum_{j=1}^{k} C(y_j) \tag{3.2}$$

Thus the costs of producing the whole (Y) are less than the sum of the costs of producing the parts of total industry output[7]. Natural monopoly then exists if condition 3.2. holds for the entire range of relevant outputs.
Declining average costs imply subadditivity. The opposite, however, does not hold. Hence, subadditivity is the weakest condition for natural monopoly[8].
Thus, if over the entire range of outputs the cost function is subadditive, the industry is said to be a natural monopoly.

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[6] Baumol, W.J. et al. (1982), p 21-22. See also: Braeutigam, R.R. (1989), pp.1291.

[7] See: Baumol, W.J. et al. (1982), p.17.

[8] A proof as well as an intuitive example for this is given in: Baumol, W.J. et al. (1982), p. 19-21.

This definition of natural monopoly is ambitious in the sense that for an empirical verification of a natural monopoly status the whole cost function must be known. Otherwise subadditivity may exist only at one level of output. In that case a change in market size could transform a market from natural monopoly into a competitive one (or vice versa).
On the other hand, if non-subadditivity can be proved for a local part of the cost function this suffices for a global rejection of subadditivity (and therefore of natural monopoly). If there is no global subadditivity, the monopoly coalition can be broken up into a set of subcoalitions in such a way that each subcoalition can potentially benefit from the split[9].

The existence of a subadditive cost function has been claimed for telecommunications services and the network. In the case of the network one may distinguish economies of density and horizontal economies of scale.[10] *Economies of density* occur if long-run average cost decreases with a rising number of customers in a certain geographical area. In chapter 2.1.1.3. it was pointed out that the costs of access are lower in a highly populated area. Households can share the access cable thus generating economies of density. *Horizontal economies of scale* instead arise if long-run average cost falls with a geographical increase of the network. These different features of economies of scale become important when discussing the optimal network size. If, for example, one finds strong economies of density but no horizontal economies of scale, this may hint that a natural monopoly exists in the local but not in the long-distance network.
In general, the historical trend of processing costs falling faster than transmission costs lessened the economies of scale in the network. The fibre-optic technology may have reversed this effect. Within optical switches and fibre-optic cables marginal cost approaches zero in off-peak periods.[11]
Economies of scale are reckoned to be important for specialized VANS. A universal network allows to supply various new services to the population at large. Whereas for instance it would be too expensive for a residential or small business user to install digital data links, they may be affordable in a universal network where the cost per user drops.

3.1.2. The Multiproduct Case

For a multiproduct industry the definition of natural monopoly based on global subadditivity is still valid. y now has to be treated as an **output vector**. The term "average cost" is replaced by **"ray average cost"** (RAC). RAC refers to a bundle of products (a composite good) and is related to proportional changes in the quantities of the whole

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9 Baumol, W.J. et al. (1977), p. 353. However, this conclusion does not hold for a small market size. The cost function may be subadditive for a small output level but not for a large one. If only the low output level is relevant due to the size of the market demand, Baumol's interpretation does not hold.

10 See: Kruse, J. (1985), p.34.

11 Compare: Mulgan, G. (1990), p.22.

product set. Ray average cost (RAC (y)) of producing the output vector $y \neq 0$ is defined as[12]:

$$RAC = \frac{C(\tau y_o)}{\tau}$$

y_o is used as the unit bundle of a given mixture of output and τ represents the number of units in the bundle ($y = \tau y_o$). Now one can analyse the change of cost $C(\tau y_o)$ in relation to $C(y_o)$ if each component y^i_o of the composite good y_o is changed with the same factor τ. Geometrically in the two product case the development of cost is analysed along a ray. Ray average costs therefore indicates how total cost vary as a function of the number of units produced.

If $C(\tau y_o) < \tau C(y_o)$ for $\tau > 1$ then RAC is decreasing, which corresponds to decreasing AC in the one-product case. As can be shown in contrast to the latter, decreasing RAC is not sufficient for subadditivity[13].

Instead of varying output in fixed proportions one might also change only the quantity of one product while keeping the other(s) constant. Studying this kind of output variation, defines the incremental cost of a product i. For the sake of simplicity this is done for the two product case.

Assume that a firm produces initially only one service, voice telephony V. The costs of production are C(V,0). Subsequently the production of a data service D is undertaken as well. Costs of production are now C(V,D). The **incremental cost** of the data service is the addition to the firm's total cost resulting from the production of D. The **average incremental cost** of the data service is:

$$AIC_D = \frac{C(V,D) - C(V,0)}{D}$$

Product specific economies of scale exist for the data service if a small increase in the output of D leads to a decline in average incremental cost[14].

As was pointed out above, in the single product case economies of scale imply natural monopoly (a sufficient but not necessary condition). In the two (or: multi-) product case product specific economies of scale even for both products are not sufficient for subadditivity[15]. In that case a competitor could specialize successfully in the provision of one good.

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12 Baumol, W.J. et al. (1982), p. 48.

13 See for instance: Windisch, R. (1987), p.48.

14 A more general treatment of incremental cost and product specific economies of scale can be found in: Baumol et al. (1982), p. 67-71.

15 For details: Panzar, J. C. and R.D. Willig (1977), p. 483.

Thus neither decreasing ray average costs nor product specific economies of scale establish a natural monopoly in the multi-product case.

Subadditivity instead requires the existence of economies of scope. **Economies of scope** exist if the overall cost of production for producing V and D separately exceeds the cost of joint production:

$$C(V,0) + C(0,D) > C(V,D)$$

Economies of scope[16] therefore refer to **complementarity** in production. If joint production is more efficient than separate production, the factors of production have a public good character: while factor r_1 is used for the production of V, it is as well available for the production of good D. In the case of the telephone system these economies of scope are said to exist for the local and the long-distance network or for voice and data services.[17] They arise for instance from using the same switched network and the same terminals for different services. If the local network has excess capacity, long-distance phone calls may be fed in without raising costs to the same extent as would have been the case if the long-distance network was completely separated. Similarly, less spare capacity is needed to handle peak demand loads in integrated production than in separate networks.

Economies of scope are a **necessary** condition for a natural monopoly in the multi-product case[18]. Economies of scope and declining average incremental costs for each product are a **sufficient** condition for subadditivity[19]. It is therefore more difficult to establish the case for a natural monopoly in the multi-product case. The information needed about the cost function is more extensive than in the single product case. Economies of scope and diseconomies of scale for one or all products may offset each other. In the case of **trans-ray convexity** the cost savings from economies of scope outweigh the effects of increasing returns to scale if the items are produced individually[20]. In that case economies of scope and decreasing ray average costs are sufficient for strict subadditivity [21].

It is important to bear in mind that the concept of subadditivity assumes a qualitatively and quantitatively well defined output bundle. Regional or temporal changes of the demand or cost function, for instance due to a different density of customers and the availability of

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16 A more formal definition in: Panzar, J.C. and R.D. Willig (1981), p.268.

17 In the telephone network the notion of economies of scope is therefore related to the argument of horizontal economies of scale made above.

18 See: Baumol, W.J. et al. (1982), p. 78 and 174.

19 See: Evans, D.S. and J.J. Heckman (1984), p.616.

20 "Trans-ray convexity" requires that the complementary production cost C(V,D) of a weighted average of an output bundle is smaller than the weighted average of the cost C(V) +C(D) of isolated production (for the two product case). A formal definition and a graphical explanation in: Baumol, W.J. et al. (1982) p.79-82. Spence shows that trans-ray convexity is a very strong restriction: Spence, A.M. (1983), p.985.

21 See: Windisch, R. (1987), p. 51.

substitutive technologies (the fixed terrestrial or the mobile network) are not covered by this concept.[22]

3.1.3. Economies of Scope in Telecommunications Networks

As the previous examples have already shown, economies of scope may exist for the terrestrial telecommunications network. As will be pointed out later, the presumption of strong economies of scope has been a key element of the Commission's policy towards the terrestrial network.

In the following I briefly point at the limitations of this concept.[23]

First, there is a lack of generality if there is a large number of services which can be provided in one or several networks. Suppose that there are two different data networks D_1, D_2 which differ for instance for transmission rates etc, a telephone network V and a network for the transmission of television programs, TV. All networks could be integrated into one broadband network. Alternatively, voice and TV, and the data services could be integrated in two separate networks. Also there would be the option to provide each service separately.

Total network integration would only be efficient if:

$$C\,(V, D_1, D_2, TV) \quad < \quad \left[\begin{array}{l} C(V,TV) + C(D_1,D_2) \\ C(V,TV) + C(D_1) + C(D_2) \\ \\ C(V) + C(TV) + C(D_1,D_2) \\ C(V) + C(TV) + C(D_1) + C(D_2) \end{array}\right. \qquad (3.3.)$$

The existence of economies of scope in the provision of some services does not necessarily justify total network integration. Economies of scope may exist only among the data services. In that case, one may choose to integrate data networks but operate voice and TV separately.

In reality there are many more services and it is far from clear where the strongest economies of scope exist. Total network integration would be efficient only if economies of scope existed between every pair of services. Instead it may be the case that the optimal telecommunications system would consist of several networks, each being optimised for a particular class of uses. Interconnection could be provided through interface devices and gateways. A single network is only superior if the total demand for call services does not exhaust scale economies and if gateways are relatively expensive.

As is pointed out below, the viewpoint of a natural monopoly based on economies of scope is further weakened if dynamic considerations are introduced. The recent rapid growth of

22 See also: Kruse, J. (1985), p. 30/31.

23 For a similar reasoning see for instance: Noam, Eli M. (1986), pp.10; and: Lehr, W. and R. Noll (1991).

private networks contradicts the notion of strong economies of scale and scope in telecommunications networks. It can be interpreted as a sign that technological progress and a rising diversity of services and network configurations dominate cost reductions through network integration.

3.1.4. Empirical Tests of Subadditivity for the Telephone Network

Various empirical investigations have been undertaken to test whether the telephone system indeed is a natural monopoly. Most research has been done for the US and Canadian Bell systems. While the results have been contradictory, there has been a wide consensus that the available data are not sufficient to provide reliable results.[24]
The theoretical considerations have shown that two analytical steps have to be undertaken for an empirical test of subadditivity for a multiproduct network:

1) the analysis has to be disaggregated[25].

2) the whole range of the cost function has to be investigated if global subadditivity is tested.

To test the hypothesis that product specific economies of scale or economies of scope exist, the separate influence of each product variable (y_1,y_2) on the cost function has to be investigated. Time series data, especially if stemming from one big enterprise (which is normally the case for the telecom network), are highly correlated and therefore do not allow for the estimation of separate influences on the cost function[26].
A further problem relates to the specification of the **technological progress**. Most productivity studies do not separate technological change from scale economies. The former, however, does not depend on the number of firms in the market. Technological progress could be realized as well by several independent firms[27].
Evans/Heckman investigated the major econometric studies made for the Bell system. They found that by circumventing these problems most studies either relied on inappropriate statistical techniques or used an invalid aggregate measure of telecommunications output[28]. In order to avoid the problem of extrapolation outside the range of the sample, they propose a local test of subadditivity. If subadditivity can be rejec-

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[24] A good survey can be found in: Wavermann, L (1989), pp. 72. See also: Blankart, C.B. and G. Knieps (1989), p.581/582.

[25] As an illustration why disaggregation is obligatory Evans and Heckman give an example of a two product industry. Both products produced on their own depict constant or decreasing returns to scale. Nevertheless on an aggregated level they exhibit large scale economies: Evans, D. S. and J.J Heckman (1983), p.134/135.

[26] see: Windisch, R. (1987), p. 53.

[27] Evans, D.S. and J.J. Heckman (1983), p. 141.

[28] Evans, D.S. and J.J. Heckman (1983), p. 147.

ted for one region of the Bell cost function, also global subadditivity must be rejected[29]. Using time series data for 1947-77 they reject the hypothesis of subadditivity of the product vectors local and long-distance calls for 1958-1977. Evans and Heckman found *"that the Bell system was not optimally decentralized during our sample period"* This result was confirmed by a more recent study of Waverman, who analysed cross-section, time-series data. He found that neither scale nor scope were significant in the 1947-1977 period for AT&T's size.[30].
For the Deutsche Bundespost Telekom Elixmann estimated several single-product and two-product (static) cost models. From the estimates he concluded that if technical progress is taken into account scale elasticities are around one. Thus the German TO operates with constant returns to scale. Elixmann, moreover, found that the estimates did not confirm cost complementarities between the local and the long-distance services.[31]
Other studies which ascertain the notion of a natural monopoly conclude that over time economies of scale have shrunk. Moreover, estimating different parts of the telephone network, they come to the conclusion that natural monopoly characteristics exist only for the **local network**.[32] Hunt and Lynk carried out time series analysis for the pre-privatization period of British Telecom. They found that the local network was subadditive for the period 1951-1981.[33] Finally, M.S. Snow carried out a simulation exercise examining thirteen separate output decompositions of Intelsat's cost function. In all cases which he tested for local natural monopoly he found that Intelsat could produce by itself more cheaply than any combination of two firms which attempt to produce the same output.[34]
As far as the question of natural monopoly is concerned, empirical investigations have several limitations. Even if the existence of economies of scope is proven for the telecommunications sector this would establish the case for a natural monopoly only for the short run. A dynamic analysis would have to take into consideration the possibility that changes in demand (the volume and structure) as well as in technology can eliminate or even reverse these effects. As has been pointed out already, econometric estimations of cost functions always test only for a local rather than a global natural monopoly. The hypothesis of natural monopoly is rejected globally if it is rejected locally. However, if it is locally accepted, the result cannot be generalized to the entire cost function.
Moreover, the natural monopoly concept is static in nature, and appears to be inadequate for a market which faces rapid technological development. Technological change provides

[29] Evans, D.S. and J.J. Heckman (1984), p. 617.

[30] Evans, D.S. and J.J. Heckman (1984), p. 621; Waverman, L. (1989), p.94.

[31] Elixmann, Dieter H. (1989), p. 685-686.

[32] Compare: Schön, H. and K.H. Neumann (1985), p. 494.

[33] Hunt, L.C. and E.L. Lynk (1990), p.232 and 244-145.

[34] The translog cost function has as arguments two output measures, Atlantic and non-Atlantic circuits, two input price measures for capital and labour, and an index of technological change. Snow constructed sixty-five artificial output disaggregations from 1976 through 1984. See in detail: Snow, M.S. (1987a), pp.34-44; and: Snow, M.S. (1987b), pp. 138-140.

cost savings beyond those furnished by the existence of economies of scale. For instance, over the period 1965 to 1985 the annual price per half-circuit, based on average cost of Intelsat fell from US $ 32,000 to $ 5,000 in nominal dollars.[35] All studies presume that cost subadditivity is exogenous to the market organisation. However, this presumption may not be correct. The cost structure which has been produced under monopoly provision is different from one which would prevail under competition. A subadditive cost function then may not be the reason for monopoly provision but the result of it.

Finally, the estimates were carried out only either for the terrestrial or the spatial network. Thus, it is assumed that the same technology is used by all firms. However, as chapter 2 has shown, recently a range of substitutive networks has emerged. The natural monopoly then has to comprise all of these networks as well. A natural monopoly in the long-distance network, for instance, would only exist if subadditivity prevailed for both the terrestrial and the satellite network and any combination of both systems.

3.1.5. Natural Monopoly in Telecommunications

The previous discussion has shown that little empirical evidence could be found for a natural monopoly in telecommunications networks.

The theoretical considerations, moreover, have pointed out that while for some networks natural monopoly characteristics may exist, they are unlikely to be strong enough to justify complete network integration.

Further evidence can be found by comparing the performance of already existing network operators. The existence of a natural monopoly would imply that ceteris paribus bigger network operators should produce at lower cost than smaller ones. Recently, in the case of the terrestrial telephone network, cost comparisons have been carried out. These comparisons are incomplete and can only be used as a hint. Given that governments impose different obligations on public operators the ceteris paribus assumption cannot be maintained. However, all studies came to similar conclusions. The Cecchini report on the "*cost for non-Europe*" includes productivity comparisons of European TOs. It found significant productivity differences between TOs, as a consequence of different production technology and the degree of x-inefficiency. The smaller TOs of Norway and Denmark were "*definitely more productive*" than the bigger networks of BT, SIP and DBP Telekom.[36] These results were confirmed by a recent OECD study and another investigation carried out for the Commission of the EC. The OECD study compared the efficiency of telephone monopolies in different countries. It did not find any relationship between size (measured in terms of telephone revenues or number of lines) and the cheapness of the telephone service. My own price comparisons carried out in chapter 12 confirm this result. Some of

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[35] Snow, M.S. (1987b), p.134.

[36] Müller, J. (1988), p. 11/12.

the smaller telephone companies have generally lower prices than bigger TOs.[37] The study carried out for the Commission on "*Telecom Administrations Performance*" found that the smaller operators of Denmark, the Netherlands and Luxembourg achieved greater revenue per employee then the bigger ones of Britain, Germany and France.[38]

If the European operators are compared with their North American and Japanese counterparts which operate under competition, it has been found that on average the administrative costs of the European TOs are two to three times higher than the ones of the former.[39] Thus, the extent of X-inefficiency due to size and monopoly provision is significant.

One may therefore conclude that in Europe empirical data do not suggest the existence of a strong natural monopoly for the telecommunications network. Bigger enterprises tend to be less efficient. Higher administrative costs may offset the cost savings due to network integration. Thus, the losses due to x-inefficiency may very well outweigh economies of scale and scope.

The effect of technological advance on the natural monopoly characteristics of telecommunications networks is blurred. On the one hand the optical fibre cable is reckoned to increase economies of scale in the local network. The higher capacity of the fibre-optic network also increases economies of scope for the provision of different services. On the other hand the growing variety of networks weakens the case for monopoly provision. Subadditivity of cost may exist for the terrestrial network. Still *substitutive* competition with other networks may be advantageous. Satellite, terrestrial, cable and mobile networks can be used to provide the same services of a similar quality. Moreover, to the extent that the natural monopoly relies on the high fixed cost of investment, competition should not be excluded if a separate network is already installed. This, for instance, applies for the networks installed by the railways and cable operators. They have already sunk their investment and could enter with low additional cost. Finally, the rapid technological progress itself puts the static concept of natural monopoly into question. While the latter may exist for a certain moment, competition may be considered necessary to promote cost savings over time. This will be discussed in more detail in chapter 5. Given dynamic considerations, the existence of different transmission systems, and the weak evidence for economies of scope, one may conclude that telecommunications networks cannot be considered as a natural monopoly for networks above a minimum size. In the US after liberalisation long-distance carriers competing with AT&T were able to expand rapidly. They have captured important market shares for retail and bulk-rate services. The same applies for NTT competitors in Japan. Where competition has been permitted, incumbents have not been able to oust new entrants.

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[37] See also: Gilhooly, D. (1990), and: Economist, October 13, 1990.

[38] Com(90d), p.2/17.

[39] Com(91b), p. 26.

3.1.6. Network Externality and Critical Mass

While the concept of "natural monopoly" refers to the cost structure of the firm and hence to the supply side, the concept of *network externality* refers to the demand side. The latter was explained in chapter 1.1.4. when referring to demand externalities. The utility each customer can reap by participating in a network rises with the number of customers with whom he or she may communicate. This is the basic rationale for a unified network[40] and universal service. *Universal service* is a very popular term in the debate about liberalisation of telecommunications networks. However, it never has been properly defined. Basically, universal service refers to two distinct goals. One is to provide to all households the same opportunity to join the network, disregarding costs. In that case universal service implies a uniform access price and cross subsidies form high density areas to rural ones. Alternatively, universal service merely implies a high rate of diffusion of telephone terminals. The latter can be achieved even with cost based pricing if special subsidies are targeted to households likely to switch off from the network. This subsidy can be defended by recuring to the network externality. The more complex definition requesting a uniform tariff cannot be defended on purely economic terms. It is linked to political goals such as integrating the society. In what follows I use the term universal service when referring to the second goal.

The concept of "*critical mass*" combines both economies of scale and scope on the supply side and the network externality on the demand side.[41] A prospective subscriber to a network will only join if some minimum number of other subscribers has already joined. This holds even for a low price of the specific network or service. Since the subscriber perceives a greater value of a service the higher is the subscriber pool, the more he or she will be ready to pay. This changes the slope of the demand curve the service (or network) provider encounters. Normally an increase in output leads to a price decrease. In the case of network externalities the service provider encounters rising demand the more customers are already connected to the network. This holds until maturity has been reached.

If this is combined with increasing returns to scale, then any operator faces high losses during the start up, while as soon as a critical point has been reached he or she realizes burgeoning profits. At the beginning the operator has to set very low prices to encourage potential customers to join the network although communication is limited to a small number of participants. While the number of customers rises, the operator may increase price despite decreasing average cost. In the standard analysis of supply and demand the adjustment process leads to a stable equilibrium. In the case of the critical mass the equilibrium may not be stable. Below the critical mass point there is in-built inertia. Once

[40] Note, however, that also several networks which are interconnected reap the same network externality as a unified one. Then a policy of standardization has to ensure compatibility and interoperability.

[41] See in detail for instance: Allen, D. (1988), p. 257-260; Rogers, E.M. (1990), p.5/6.

the critical mass is reached, demand will rise despite rising prices. The relative size of the critical mass group to society as a whole is important. If it is small, the critical mass argument lacks force. If on the other hand, the critical mass group is relatively large then there may be a conflict between competitive pricing and universality. Critical mass is an argument in favour of subsidizing the start up.[42] Introductory prices thereby may fall below marginal cost because of both the additional consumer benefits and because of future cost reduction resulting from an increase in output.[43] If the critical mass group is large, moreover, the need for subsidisation is used to justify state intervention. This has been the case, for instance, for the French videotext system Minitel. The state provided videotext terminals at very low cost to all households. As a result Minitel has been spread throughout France to a much greater extent than similar services in other EC countries.

However, the critical mass argument does not necessarily imply state intervention. If future profits appear secure enough, a private investor would find sufficient financial means on the capital market to finance an initial take-off period in which customers have to be subsidized. This is, for instance, the case for the new mobile telecom operators which have been licensed to build separate GSM networks. However, for many value added network services like Minitel future demand is uncertain. Thus they involve high risk. Private investors may not be ready to face the high start-up losses. However, in that case the state faces similar risks without having more reliable information about the future profitability of the service. Hence, the state should refrain from providing the service if the private market does so. In the absence of social or political goals which justify state intervention (meritorial goods), critical mass does not offer a rationale for public provision if the private sector fails to act.

The critical mass argument, on the other hand, reveals the need to **limit entry** at an initial period. If too many firms enter at the same time no one may be able to reach the point of critical mass and all may fail. This, for instance, has been an argument for limiting the number of licences granted to mobile operators. The higher the number of operators, the smaller is the bandwidth which is available to each one. This reduces the capacity of each network and hence the number of customers which can be served. Too many licences then may discourage operators from carrying out the high start-up investment needed to set up their mobile network.

3.1.7. The Sustainability of a Natural Monopoly

Neglecting dynamic aspects, the discussion has shown that if an industry is a natural monopoly, then it is optimal for one firm to provide the entire output. In the absence of entry barriers, the natural monopoly may be unsustainable; thus **inefficient entry** could occur. Entry is inefficient if its net welfare effect is negative. This is the case if the overall

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[42] Allen, D. (1988), p. 267.

[43] Faulhaber, G.W. and J.W. Boyd (1989).

increase in the cost of production which is due to entry exceeds the increase of consumer welfare due to a greater output. An unsustainable natural monopoly then provides a rationale for establishing institutional entry barriers.
For the one-product case consider the following simple example. It is assumed that the demand function for the homogeneous service x is linear

$$p = a - b(x_1 + x_2) \tag{3.4}$$

There is only one production technology available. The cost function of any firm in the market is assumed to be

$$C_i = c x_i + F; \qquad c > 0, \quad i = 1,2 \tag{3.5}$$

Thus costs of production comprise constant marginal cost (c) and fixed cost (F). Since this cost function is subadditive this is a case of natural monopoly (this is true for any F > 0).
A monopolist would maximise

$$\pi^m = [p(x) - c]x^m - F \tag{3.6}$$

I define[47] $S_C = (a-c)/b$.
As can be seen from figure 3.1. S_C is a measure of market size:

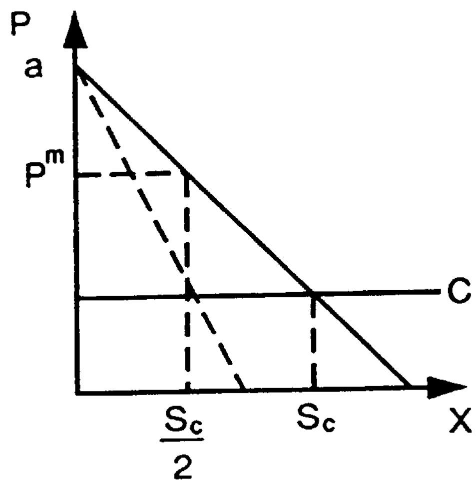

Figure 3.1: *The monopolist's output*

[47] The terminology introduced here is used more extensively in chapter 4. It can be found also in: Martin, S. (1992).

Maximising (3.6) then leads to the monopolist's output

$$x^m = \frac{S_c}{2} \tag{3.7}$$

This generates a profit of

$$\pi^m = \frac{1}{4} b\, S_c^2 - F \tag{3.8}$$

The consumer surplus can be written as

$$B^m = \frac{[a - p(x^m)]}{2} x^m \tag{3.9}$$

For $x^m = S_c/2$ the consumer surplus amounts to $B^m = b/8\ S_c^2$. The total welfare of monopoly provision then is the sum of π^m and B^m.
Assume that a potential competitor can enter using the same technology. If the incumbent has no advantage from having installed his network before, the post-entry output is Cournot. As a result total output rises to[48]

$$x_I + x_e = 2/3\, S_c \tag{3.10}$$

The incumbent and the entrant both realize the Cournot profit

$$\pi^c = 1/9\, b\, S_c^2 - F \tag{3.11}$$

Entry is detrimental if overall welfare is reduced, thus if

$$\pi^m + B^m > 2\pi^c + B^c \tag{3.12}$$

which holds for fixed cost above a minimum level[49]

$$F > \frac{5}{72} b\, S_c^2 \tag{3.13}$$

[48] The subscript "I" represents incumbent, "e" represents entrant and "c" symbolizes Cournot.

[49] Calculations can be found in the appendix.

For fixed cost small enough, entry is beneficial despite the existence of a natural monopoly, because consumers welfare gain from competition exceeds the producers lost profit and higher production cost.

The potential competitor will enter if $\pi^c > 0$. From (3.11) it can be seen that this is fulfilled for $F < 8/72\, b\, S_c^2$. For fixed cost above this level and if the post-entry outcome is assumed to be Cournot, no entry occurs (the natural monopoly is sustainable).

Finally, for fixed cost in the interval

$$\frac{5}{72} b\, S_c^2 < F < \frac{8}{72} b\, S_c^2 \tag{3.14}$$

there is the case of an unsustainable natural monopoly. Society as a whole is better off if entry is prohibited.

In chapter 4 this example is modified to show that the result no longer holds if the incumbent is able to react to the entry threat. The threat forces the incumbent to invest in the reduction of his production cost which allows him to fence off the entrant. With lower production cost the monopolist raises output and overall welfare. This shows why the static approach to natural monopoly is not satisfactory.

In the case of a multiproduct industry the question of sustainability can be regarded from a different angle. Baumol, Bailey and Willig define **sustainability** of a multiproduct monopolist as follows:

"The announced prices of a monopolist p^m are sustainable if the monopoly is financially viable at these prices $\pi_m \geq 0$, and if no potential entrant can find a marketing plan for which the anticipated economic profits $p_e y_e - C(y_e)$ cover the costs of entry $E(y_e)$"[44].

Whereby:

π_m is the profit made by the monopolist

$p_e, y_e, C(y_e)$ are price, quantity and cost, respectively, of the entrant for an individual product.

$E(y_e)$ is the entry cost which varies with the entrant's output vector.

Strict subadditivity is shown to be a necessary but not sufficient condition to guarantee the existence of a sustainable price-output vector for a market without entry barriers.[45] Failure of subadditivity would imply that the monopoly coalition could be split into a set of subcoalitions in such a way that every subcoalition can benefit. Subcoalitions may involve

[44] Baumol, W.J., Bailey, E.E., and R.D. Willig (1977), p. 351. Similiar: Baumol, W.J., Panzar, J.C. and R.D. Willig (1982), p. 9 or 192/193. The marketing plan of a potential entrant is defined as "a subset A of the product N, and vectors of prices and quantities p_e^A and y_e^A for the goods in A." see: Baumol et al. (1977), p.352.

[45] This is shown in: Baumol, W.J. et al. (1977), p.353.

either smaller firms producing the same range of outputs as the monopoly coalition, or a set of specialized firms with each providing only one item of the initial bundle. Scale economies preclude only the first case; they cannot prevent the latter type of "economies of specialization"[46].

For the multiproduct industry consider as an example the previous discussion of different telecommunications networks (see chapter 3.1.3.). $C_s(D)$ are the stand-alone costs of providing the data service D in a separated network. The cost of operating the data service D in an integrated network which also provides voice telephony is $C_I(D)$. Finally, there are incremental costs $C_{IC}(D)$ of adding D to an already existing voice telephony network.

Suppose that $C_s(D) < C_I(D)$. The stand-alone costs are smaller than the cost of operating D in an integrated network. This may be due to technical problems of integration. Integration therefore seems uneconomical. However, total incremental cost might be even smaller than the stand alone costs: $C_{IC}(D) < C_s(D)$. This may result from positive externalities which arise for other services if the data service is included in the integrated network. Then we get

$$C_{IC}(D) < C_s(D) < C_I(D) \qquad (3.15)$$

Integration would be economically efficient but it would not be sustainable.[50] Any service provider establishing a separate network for D could provide this service cheaper than the operator of the integrated network does.

A natural monopoly is likely to become unsustainable in the case of cross-subsidisation. *Cross-subsidisation* refers to the relation of costs and revenues attributed to each good of a multiproduct enterprise. According to the definition of Faulhaber, a **subsidy-free** price structure exists "*if the provision of any commodity by a multicommodity enterprise subject to a profit constraint leads to prices for the other commodities no higher than they would pay by themselves.*"[51] Therefore every product (or group of products) contributes at least as much to overall revenues as its incremental costs in a subsidy free price structure.[52]

A cross subsidy therefore implies that either one or a group of products supplied by the firm does not recover its incremental costs. In order to judge whether cross-subsidisation takes place, Faulhaber proposed the "stand-alone-test"[53]: No product (or group of products) should be charged a higher contribution than would be necessary for a

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46 Baumol, W.J. et al. (1982), p. 173.

50 Panzar and Willig formally provide seven necessary conditions for a natural monopoly to be sustainable. See: Panzar, J.C. and R.D. Willig (1977a), p.7-9.

51 Faulhaber, G.R. (1975), p. 966.

52 This issue is further discussed when addressing the principle of "cost-based-pricing" in chapter 3.3.3.3.

53 Windisch, R. (1987), p.84/85.

specialized competitor to break even. In the absence of entry barriers a competitor would otherwise have the incentive to enter the market.

Thus if some products contribute more than their incremental costs to the general cost, a subset of user groups who have a high share in these products could benefit from leaving the cooperative arrangement (the integrated network). This is often referred to as bypass. *Bypass* of the regulated public switched network occurs if a group of customers supplies the service to itself by using a private network.[54] This kind of *facility bypass* can be provided by metropolitan area microwave or fibre-optic cable networks. The bypass is inefficient if the incremental costs of providing the service to this customer group are lower for the network operator than are the costs of establishing the private network. If the monopolist's prices are within the *core* of subsidy free prices then there is no cross-subsidy. If it takes place, entry is efficient. If competitors find it impossible to undercut the monopolist, the existing economies of scope establish a natural monopoly. However, if all prices are subsidy free a situation may be created in which the network operator does not break even. Given a break-even constraint, welfare maximising prices require Ramsey pricing (see below) which is not necessarily sustainable. This already shows that cross-subsidisation does not necessarily lead to efficiency losses. Only strict marginal cost pricing precludes cross-subsidisation.[55] In that case artificial entry barriers would be needed to maintain the optimal market structure.

In telecommunications there exist two different aspects of cross-subsidisation. The first is related towards cross-subsidies **among products**. This is the concept Faulhaber concentrated on. It may be due either to goals of optimization (Ramsey pricing, profit maximisation) or to predatory pricing.[56] The former may create an unsustainable situation for the incumbent which encourages entry. Predatory pricing, on the other hand, refers to the opposite effect. If the incumbent faces entry by specialized competitors, it may use profits made in the product market which is still monopolized to cross-subsidize the product which is provided by entrants. Thereby the latter is priced below cost. Predatory pricing therefore decreases social welfare by deterring socially desirable entry.[57] The intention is to eliminate competition and to recoup losses encountered in the prior period by raising prices afterwards.

The second type of cross-subsidisation in telecommunications is related to subsidies among different **consumer groups**. Since the demand structures of customers are very different[58],

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[54] Another form of bypass is referred to as "service bypass". The latter occurs if a long-distance operator connects its customer directly to the network without passing through the local switch. By doing so, the local access charge can be avoided. For more detail see chapter 6.

[55] See: Faulhaber, G.R. (1975), p. 973.

[56] Predatory pricing will be discussed in chapter 4.

[57] Brock, W.A. and D.S. Evans (1983), p.50.

[58] See chapter 1.1.3.

the subsidisation of access and local service by the long-distance service entails a redistribution effect from business to households. The former use relatively more national and international long-distance services.[59]
Unsustainable cross subsidies in the telecommunications sector lead to "cream-skimming" if entry is allowed for. *Cream-skimming* occurs if the entrant's ability to undercut some of the incumbent's prices is not due to lower cost of production but due to the price structure of the latter. The prices of the incumbent lead to misinformation. High prices appear where there are high cross subsidies flowing to other services. Entrants can make profits while producing at higher costs.[60] This kind of entry is inefficient because overall costs of production increase. Accordingly, society's welfare shrinks if competitors enter.

The undesirable effect of cream-skimming is only likely to occur if the price structure of the incumbent is not flexible. In the case of flexible prices, the incumbent is able to carry out a credible threat against an non-innovative entrant. Furthermore, as Brock and Evans show, the higher the unrecoverable portion of investments (sunk costs), which the entrant has to undertake, the less likely it is that entry occurs due to cream skimming.[61] The same applies for the possibility that other entrants join, which would reduce the profits available to each entrant. While the inefficient entrant might be able to undercut the inflexible incumbent, he is not protected against more efficient entrants himself.
Therefore cream-skimming is only likely to occur in the case of:

a) **Hit-and-run entry**

This exploits the incumbent's inflexibility. The competitor is able to enter and - if necessary - to exit quicker than the incumbent is able to make a competitive price response.

b) **Protected entrants**

Entrants may succeed despite being inefficient because the regulator prevents price responses from the incumbent and restricts further entry.[62]

In a market like telecommunications networks hit-and-run entry is not a feasible strategy, given high sunk costs. This leads to the next chapter which discusses the importance of entry barriers for facility based competition in telecommunications. Thus, cream skimming may occur only in the case of artificial protection of the entrant. In telecommunications it is the result of regulatory failure and does not stem from specific industry characteristics.

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[59] This kind of cross-subsidisation is common. For Spain, for instance, it is reckoned that a local call of three minutes costs about nine pesetas while Telefónica charges only 3.9 pesetas. See: El País, April 16, 1991.

[60] Brock, W.A. and D.S. Evans (1983), p.63.

[61] Brock, W.A. and D.S. Evans (1983), pp.66/68.

[62] Brock, W.A. and D.S. Evans (1983), p.69.

3.2. Barriers to Entry and Exit

According to Stigler a **barrier to entry** "*may be defined as a cost of producing (at some or every rate of output) which must be borne by a firm which seeks to enter an industry but is not borne by firms already in the industry*"[63].

These extra costs to be borne by the entrant refer only to disadvantages which cannot be avoided after having made the best possible adjustment to a situation. Bain, for instance, did not count the presence of (vertical or horizontal) integration in a market as an entry barrier, because optimal adjustment by the entrant would include the proper level of integration[64].

Barriers to entry are an important feature of the structure of an industry. The competitiveness of an industry depends heavily on the ability of potential competitors to enter a specific market. On the other hand, already established firms are interested in raising entry barriers. At least in the long run the height of entry barriers determines the level by which their profit can exceed the average rate of return in the economy. Rents gained from entry barriers by the incumbent can be seen as the annual equivalent of the discounted present value of the entry costs a potential competitor faces. Entry barriers are a necessary condition for long run profits.

Therefore economists normally assume implicitly that entry barriers distort the competitive process: they lead to a suboptimal entry of resources into an industry[65].

The basic concept of barriers to entry was developed by J. Bain. Starting from his analysis the following brief summary concentrates on barriers to entry which have some impact on the telecommunications industry. Entry barriers occuring in other markets are put aside. Bain analysed the circumstances under which entry barriers are likely to occur:

Economies of scale

Bain argued that the deterrent to entry will increase if the "*minimal optimal scale becomes a larger proportion of total industry output*"[66]. The entrant will basically face two alternatives. One is to enter the industry on a small scale. In that case there will not be a perceptible effect on prices and output of the established firms. But the entrant will produce at a suboptimal level. Alternatively he can enter near the minimum optimal size. By doing so probably he encounters price retaliation from the incumbent. Therefore the entrant will anticipate that costs of production will be higher than the minimum attainable, or prices will be lower. This will work as a deterrent to entry and offer the incumbent the opportunity to raise price. Hence, the established firms in the market are able to reap a supranormal

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63 Stigler, G.J. (1968), p.67.

64 Bain, J. (1956), p.145.

65 Weizsäcker, C.C. von (1980), p. 400.

66 Bain, J. (1956), p.55.

profit without inviting entry. However, in the case of economies of scale, the existence of entry barriers does not necessarily indicate a welfare loss. Von Weizsäcker has shown that if impediments to entry do not exist, the number of firms exceeds the optimal number if economies of scale are present throughout the relevant range of output[67]. On the other hand, however, the fact that the number of firms exceeds the optimal does not mean that society as a whole would be better off with fewer firms, if firms exercise market power.[68] The monopoly / Cournot duopoly example in chapter 3.1.7. has illustrated this point.
If the choice of technology is endogenous this will give an incentive to the incumbent firm to use capital intensive technology. Thus the incumbent employs technology with higher fixed but lower marginal costs. Potential entrants therefore face higher capital requirements. Financial markets are likely to put entrants at a cost disadvantage. Due to incomplete information, they are unable to properly assess the entrants' abilities to succeed. Therefore entrants will have to pay higher risk premiums for financial capital in comparison to incumbent firms. If this keeps competitors out, the decision to use a capital intensive technology offers the opportunity to earn profit over the long run though its adoption and may reduce overall social welfare. As will be argued in chapter 7.3.2. this reasoning applies for the ISDN network.

Product differentiation

If buyers have a transitory or permanent preference for established goods instead of new ones, barriers to entry exist. The disadvantage for the entrant may have the form of a lower price or higher selling costs (or both)[69]. This disadvantage for new firms due to consumer behaviour allows the established enterprise to raise its price above minimum costs, without attracting entry. In this context advertising can be understood as a means to establish barriers to entry by creating a brand name and binding consumers to the firm which provides the specific product. For the sale of the plain telephone service AT&T invests heavily into advertising. By doing so it hopes to develop the image of a high quality operator which justifies prices which exceed the ones of AT&T's long distance competitors.

"Absolute cost advantages"

Bain used this term refering to several advantages an incumbent firm may enjoy. He explicitly mentioned and analysed (also empirically) the importance of the superiority in production technique[70], imperfections in the market for factors of production, strategic factors such as access to natural resources and the capital market[71]. More favourable terms

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[67] Weizsäcker, C.C. von (1980), p.405.

[68] See: Martin, S. (1984), p 628.

[69] Bain, J. (1956), p. 114/116.

[70] Bain explicitly refers to patents, know-how, export management: J. Bain (1956), p. 155.

[71] Bain, J. (1956), p. 144-46.

on the captial market due to a smaller likelihood of bancruptcy for incumbents are presumed to be crucial for the capital intensive telecommunication industry.

Sunk Costs

Sunk costs are a further impediment to entry which is especially relevant for the telecommunication industry. Sunk costs are often refered to as a **barrier to exit**[72]. Costs are sunk if a firm cannot recoup them when leaving the market. The greater are sunk costs, the greater is the risk involved if entry is undertaken. They are connected with plant and equipment specific to the industry. These **irreversible** capital commitments which the incumbent firm has already undertaken make the latter stick to the market. Thus the greater are sunk costs, the stronger is the incentive for the incumbent to use strategic behaviour in order to secure its position.

Investments made in the network (pipes, cables, switches) are likely to have a high degree of sunkenness. The network cannot be directed toward usages other than communication. Moreover, it cannot be shipped to other markets. Therefore if a firm running a telecommunication network wishes to leave the market because it encounters losses, it has to find an investor ready to enter this specific market. This, however, is not likely if, for instance, overcapacity has led the firm to drop out in the first place. These specific assets could be sold, if at all, only with high capital losses[73]. Thus in the case of physical assets only nonspecific assets which have an easily to ascertain quality do not involve sunk costs.[74].

Sunk costs then entail higher risks for the entrant. Entry therefore will only occur if they are matched by higher expected profits.

Other important sunk costs for the telecommunication industry are legal and R&D expenditures. Legal costs - for instance in order to obtain the licence to run a telecom-network - are mainly sunk. They are a necessary investment to enter a specific market. In the case of exit, if the licence cannot be sold, the legal expenditures made cannot be recovered. Sunk costs have a very high share in total costs for telecommunications networks. As was pointed out, high fixed cost oblige the potential entrant to enter with a large capacity. If this leads to industry overcapacity, he has to anticipate losses which become permanent due to exit barriers (sunk costs). In an industry of natural monopoly characteristics, overcapacity is likely to occur due to the high minimum capacity. Then sunk costs establish high entry barriers.[75]

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72 The effects of entry and exit barriers are virtually the same.

73 Investments in buildings or real estate instead can be regarded as fixed costs which are not sunk. Though no investor in the communication business is available at the time, they could be sold for other purpose.

74 Some examples for strategic behaviour given by Bain are related to sunk costs: Expenditures made for product differentiation and marketing are mostly sunk if the brand name cannot be sold. Those additional costs deter a potential entrant and may offer a "pre entry asymmetry advantage" to the incumbent.

75 Kruse, J. (1986), p. 225.

The discussion above has already shown that one may distinguish *natural* entry barriers and *strategic* ones. The former exist due to the specific characteristics of the industry. Strategic entry barriers instead refer to those established by the incumbent. Facing a potential entrant, the incumbent often has a first mover advantage. Since the entrant's conjectured rent depends on the reactions anticipated from the incumbent, the latter has the possibility to influence the entrant's decision.[76] The ISDN is a good example of a technological upgrade which also raises entry barriers due to a strong increase in the incumbent's capacity. As will be seen in chapter 6 the investment in barriers to entry and especially into sunk costs was a major strategy of AT&T in fending off private entry into the market since the beginning of the century.
However, as, for instance, in the case of the ISDN, often it is difficult to distinguish between "natural" and "strategic" entry barriers.

Entry barriers protect a monopolist against competition even if there are high allocative, technical or qualitative inefficiencies. The irreversibility of investment especially creates the scope for related efficiency losses. Thus, even if there were no natural monopoly characteristics in the telecommunications network, competition might not be fierce if networks would be completely liberalized. While on the one hand entry barriers therefore provide a further rationale for state intervention, they may also be used to justify measures of liberalization. A *de jure* monopoly is only necessary if an unsustainable natural monopoly exists. Even if the telecommunications network were a natural monopoly, the existence of high entry barriers makes it unlikely to become unstainable. They are likely to protect the incumbent network operator sufficiently even when operating under a break-even constraint.

[76] Caves, R.E. and M.E. Porter (1977), p.242.

3.3. Optimal Pricing for Telecommunications

Although the previous chapter concluded that neither natural monopoly arguments nor entry barriers justify a *de jure* monopoly for telecommunications operators, in the EC the latter has come about in all EC member countries. Being protected against competitive pressure network operators have some scope for price setting. While the previous chapter was mainly concerned with technical efficiency, in what follows allocative and qualitative efficiency goals are scrutinized. They are related to tariff principles.
Two different concepts for price setting in a public enterprise are analysed. Which approach is considered to be more adequate depends on whether the public good aspect or the aims of allocative efficiency get priority. I describe optimality rules for cost-based and value-based pricing and discuss their implications for the telecommunications sector. One major objective of chapter 3.3.2. is to explore the relevance of the theoretical literature for socially optimal telephone tariffs. Thereafter, I scrutinize the price setting schemes which have prevailed among European TOs. They lead to efficiency losses due to deviations from optimal pricing rules. These price distortions cannot be defended on the grounds of the price setting principles developed before.

3.3.1. Value-Based versus Cost-Based Pricing

The model of perfect competition assumes that the individual firm has no power to set its own price. In the absence of entry barriers, a uniform price for a homogeneous product is derived. The individual producer will adjust its output such that marginal costs equal the market price. No other price is sustainable. This will secure an efficient allocation of resources. As was seen above, the telecommunications industry deviates so much from the underlying assumptions that this model does not seem applicable.
While the firm operating in a competitive market has only one control variable (output), the **monopolist** has two (price and output). It is subject to one constraint; the total demand function. In the basic model the monopolist is thought of as knowing its demand curve. It will maximise profit by setting either price or quantity, taking the other variable as given by the demand curve. The monopolist's profit maximisation leads to a welfare loss (deadweight loss), due to a price which exceeds marginal cost. Goals of redistribution between the producer and consumers and the deadweight loss of monopoly pricing require regulation in the case of monopoly provision.
Taking into account the previous discussion of entry barriers, technological change and natural monopoly aspects, telecommunications pricing schemes have to reflect the following criteria:

1.) **Efficiency in allocation**: This is the traditional (static) approach which aims at the maximisation of consumer welfare. According to the Pareto criterion, an allocation is efficient if no other allocation exists which improves the situation of at least one individual without making somebody else worse off. This criterion is not useful for the decision between different price setting schemes, since normally the alternatives imply that some individuals are made better off and some are made worse off. A more general criterion was developed by Kaldor and Hicks: an alternative is superior to the status-quo if those individuals who have benefited from the change are potentially able to compensate the losers. Thus after compensation the situation could be preferred by everybody. Whether compensation actually takes place is a political question and not a problem of efficiency. If in the following certain situations are described as "efficient" or "inefficient", I mean efficient or inefficient in terms of the Kaldor-Hicks criterion. The static efficiency rule generally leads to marginal cost pricing. Prices then work as indicators which drive scarce resources towards the most efficient sector of employment.

2.) **Innovative efficiency**: A broader concept of efficiency takes dynamic considerations into account. A deviation from prices given by static optimality rules may be necessary in order to ensure the firm's financial ability to invest and innovate. Thus, there may be a trade-off between low prices in the short run and low prices in the long run. Differences arise because marginal cost varies for the short and long run. This aspect of intertemporal efficiency is important for the telecommunications sector because of the high share of fixed cost in total cost and the speed with which technology changes.

3.) **Inefficient market entry**: Market entry is considered to be inefficient if it implies that social welfare decreases as a result. As has been discussed above, inefficient market entry is concerned with the question of sustainability of a natural monopoly.

4.) **Cost recovery**: If economies of scale and scope are present, prices equal to marginal costs will imply that the firm fails to recover all cost of production. In the case of a public enterprise, these deficits could be made up for by state subsidies. If cost recovery is required, a second best pricing scheme has to be set up.

5.) **Cost allocation**: The telecommunications operator provides more than one good. Given the high share of fixed cost in total cost, the allocation of cost becomes crucial. The relative burden each service has to bear, has to be decided. Cost allocation has become a politically sensitive issue given the concentration of consumer demand. Shifting the burden to finance common cost from the long-distance to the local service, for instance, also partly shifts the burden from business to households.

6.) **Public good aspects**: The telecommunications network has some public good aspects which derive from the externalities in consumption. They are the foundation of the universal service goal and may justify the cross-subsidisation of customer access.

7.) **Distributional aims**: In the past European TOs had to apply tariff principles which reflect political goals of redistribution.[77] In West Germany, for instance, the "*Gemeinwirtschaftslehre*" has been influential for the regulation of public enterprises. It rejects the primacy of principles of allocative efficiency for price setting rules.[78]

It is obvious that efficiency and distributional aims may conflict with each other. As far as telecommunications are concerned, von Weizsäcker has pointed out that the different concepts of optimal pricing can be categorized as either value based or cost based[79]. **Value based pricing** is related to Lindhal pricing of public goods.

The issue of public goods is linked to **market failure**. Market failure prevails if there are externalities which cannot be internalized, if consumption cannot be excluded or if consumption of one person does not diminish the supply for others (nonrival consumption)[80]. The Lindahl theory of **burden sharing** refers to the pure public good. A pure public good is characterized by non-rival consumption and very high costs of exclusion[81].

Efficiency in production and consumption of a private good requires the equality of marginal utility and marginal cost (=price) for each individual. In the case of the pure public good, marginal utility will not be equal for all consumers: consumers cannot be excluded from consumption. In this case, the same amount of the good is provided to everybody. Because preferences for the public good diverge, the marginal utility of consumption is different for each consumer. For the public good, efficiency is characterized by the equality of the sum of marginal utility and the marginal cost of provision[82]. If prices are set equal to marginal utility in the case of a private good, each customer will pay the same price while consuming different amounts. In the case of the public good, prices will differ while the amount of consumption is the same[83]. **Lindahl pricing** of the public good requires for the case of constant marginal cost[84] that the contribution of each citizen is generated from the individual's marginal utility times the quantity of which the public good is provided[85]. The greater is the utility derived from a certain service, the greater must be

[77] See chapter 3.1.7. on cross-subsidisation.

[78] See in more detail: Thiemeyer, T. (1964), p. 219; and: Neumann, K.H. (1984), pp.85-89.

[79] see: Weizsäcker, C.C. von (1984), p. 197-207.

[80] Musgrave, R.A. (1984), p.64.

[81] see: Musgrave, R.A. and P.B. Musgrave (1980), p. 56-57. and: Musgrave, R.A., Musgrave P.B. and L. Kullmer (1985), p.62.

[82] see in detail: Musgrave, P.A., Musgrave P.B. and Kullmer (1984), p. 65-68.

[83] A graphical explanation in: Musgrave, P.A., Musgrave, P.B. and L. Kullmer (1984), p. 68.

[84] Therefore marginal cost equals average cost

[85] see: Weizsäcker, C.C. von (1984), p.197.

the consumer's contribution. The value of the good for the individual determines his or her contribution. In the USA this principle was applied for the pricing of rural and urban areas. Since the utility of the network is presumably higher for the latter, the citizens in urban areas were charged more for local calls and for access. This is in direct contradiction to cost based pricing since the costs of access and services are lower in urban areas due to "economies of density".

The problem of Lindahl pricing is that consumers cannot be compelled to reveal their preferences. Moreover, in telecommunications public good and private good aspects exist together.

The public good character of telecommunications services derives from externalities in consumption. The point of nonrivalry in consumption could be made for usage as long as the limit of capacity is not reached. However, the discussion of the cost structure of telecommunications has shown that the cost of capacity has to be regarded as flexible in the long run. Therefore, the network does not have a clear-cut public good character. Furthermore, exclusion is feasible at minimal cost. Finally, the Lindhal solution of providing a fixed amount of output to all consumers is not optimal. Consumption varies considerably among consumers and among services. The main public good aspect of the telecommunications network therefore derives from the network externality. It is the basis for the universal service goal. These externalities, however, vanish once universal service has been achieved. Generally, they are reckoned to be low in those EC member countries which have already installed a mature telecommunications network.[86] Public provision of telephone services therefore is more justified on grounds of market failure on the supply side (economies of scale and scope) than by market failure in consumption. Von Weizsäcker concludes: "*The extent of the economies of scale will determine whether the equivalence principle derived from the Lindahl scheme or the marginal cost principle derived from the competition model is more convincing*"[87].

In the following I discuss optimal pricing rules which are concerned with allocative efficiency. In chapter 3.3.3. I analyse the extent to which these principles can be applied for telecommunications. A comparison is made with the pricing policy which prevailed in the EC. Finally, measures which may reconcile the aims of value-based and cost-based pricing in telecommunications are proposed.

3.3.2. Pricing Rules

The Commission of the EC has asked member states to ensure that prices of telecommunications services under exclusive rights are brought in line with costs. In the UK one of the main objectives of OFTEL is to relate prices of the dominant firm BT to costs of

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[86] Among EC member countries still considerable differences occur. This is discussed in some detail in chapter 14.

[87] Weizsäcker, C.C. von (1984), p. 201/202.

production and of seeking improvements in internal efficiency.[88] However, to establish cost related prices is a rather controversial subject in a multiproduct industry with a high share of common cost. Chapter 3.3.2.1. and 3.3.2.2. concentrate on linear multiproduct tariffs. Thus, the price does not change with the quantity purchased. Chapter 3.3.2.3. then proceeds to non-linear tariffs which vary according to the quantity consumed.

I abstract from all effects that telecommunications prices may have on other sectors of the economy. This partial equilibrium assumption is a strong one given that telecommunications services are an input for the business sector. However, it is in line with most of the literature.

Prices are regarded as instruments to pursue policy objectives. The major objective discussed here refers to the maximisation of society's welfare. A second objective is related to fairness and equity issues. This will be discussed in chapter 3.3.3.1.

3.3.2.1. Marginal Cost Pricing

In competitive markets firms are forced to apply marginal cost pricing. It is quite easy to show that welfare maximisation leads to the same result for a multiproduct **public** enterprise.[89] For each service the price has to equal marginal cost. Ownership does not change the optimality criteria for welfare maximising pricing. Thus marginal cost prices are the benchmark for all public enterprise tariff schemes. Principally a telecommunications network incurs two types of costs. The first one is associated with the interconnection of the customer. This is a non-traffic sensitive cost which varies with the customer's location. On the other hand there exist traffic-sensitive costs which are generated by usage. They vary with the time and duration of usage and to some extent with the distance traversed by the call. Marginal cost pricing would require a lump-sum payment which covers the marginal non-traffic-sensitive costs and a separate tariff for the customer's usage. This leads to a two-part-tariff which is discussed in more detail below.[90]

Marginal cost pricing, however, is difficult to apply for telecommunications. First, the textbook solution depends on the assumption that marginal costs are measurable for each service. For telecommunications networks, however, it is unclear whether the relevant cost is one of connection, of increasing the switch's capacity or some other element of the network.[91] Only network access has clearly defined marginal costs which are related to the laying of the cable, the necessary increase of capacity of the feeder cable and of adjusting

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88 See for instance: Hartley, N and P. Culham (1988), p.3

89 The regulator has to set prices such that total social benefit - the sum of consumer surplus and producer revenue minus cost of production - is maximised. This is formally shown for instance in: Bös, D. (1981); and: Brown, S.J. and D.S. Sibly (1986), p.194

90 See: Kahn, A.E. (1984), p. 140/141.

91 For this reason Mulgan reckons it to be impossible to apply marginal cost pricing in telecommunications. See: Mulgan, G. (1990), p.23.

the frame capacity of a local switch,etc. The marginal cost of a certain service is very high at peak time if capacity is scarce or almost zero when there is spare capacity.[92] This makes it necessary to distinguish between short-run and long-run marginal cost. In the long run capacity is flexible. In the short run instead capacity is irreversible. The marginal cost principle has to take account of all cost components, hence for the price-equal-marginal-cost rule long-run marginal cost has to be taken into accout.[93]

This leads to peak-load-pricing. If capacity is not flexible in the shortrun and if there are certain peaks in demand, then marginal costs diverge for different periods.

For simplicity I assume that there exist only two periods: an off-peak demand period (night time) is followed by a peak-demand period (business hours). The network operator has to provide a certain capacity. If this capacity is chosen to meet peak demand then in the off-peak period some capacity is idle. Intertemporal profit maximisation leads to the same pricing policy as instantaneous profit maximisation. Off-peak marginal revenue should equal peak marginal revenue. In the case of welfare maximisation the problem becomes to find the socially optimal peak and off-peak prices such that capacity is optimal[94]. If the difference between both periods is high then there is a "firm peak" and the optimal price in peak time corresponds to the long-run marginal cost. In the long run capacity is flexible. Thus capacity cost are reflected by the peak-time price. Off-peak prices instead should be related to short-run marginal cost.[95] In the case of a "firm peak" only peak demand determines total capacity. In telecommunications this would lead to very high peak-time prices. Given that the short run marginal costs of a phone call are close to zero, off-peak prices would be very low. This would generate a considerable shift of demand. When in West Germany the DBP introduced a very cheap "moonlight" tariff in the 1970s, the peak demand for long-distance calls shifted to late evening hours. Thus, telephone demand is unlikely to face a "firm peak". In the case of a shifting peak Mitchell and Vogelsang demonstrate that the optimal pricing rule requires setting the price equal to variable cost in off-peak periods and higher prices in peak periods such that demand is equal to capacity and the combined revenues from the peak periods cover long run marginal cost.[96]

Bergstrom and MacKie-Mason have shown that the introduction of peak load pricing can plausibly reduce the price in *both* periods if the company operates with a fixed rate of return on capital. This results from a more efficient use of capacity in both periods.[97] In the case of peak load pricing less capacity is idle off-peak. Thereby total capacity costs are reduced. Peak-load pricing, however, is not sufficient to avoid rationing. Telephone

[92] Compare Renshaw, E.C. (1983), p.515.

[93] Kruse, J. (1985), p. 75.

[94] Compare: Philips, L. (1983), p. 134-137.

[95] Kruse, J. (1985), p. 87.

[96] Mitchell, B.M. and K. Vogelsang (1991a), p.41.

[97] Bergstrom, T. and J.K. MacKie-Mason (1991), p.244.

demand faces absolute peaks in short periods which occur unpredictable and cannot be covered by broadly defined day, evening and weekend tariffs. To meet these absolute peaks would require additional capacity which would remain idle most of the time. Rationing therefore remains in absolute peak moments.[98]

As was pointed out in part (I), the ISDN has driven marginal cost to very low levels while raising the fixed cost of the fibre-optic network. Thus, strict marginal cost pricing will not generate sufficient revenues to recover total cost. This leads to the second problem connected with marginal cost pricing in telecommunications. The marginal cost pricing rule is valid, independent of the type of cost function. The outcome, however, is different. Baumol has shown that in the case of continuously decreasing ray average costs a public enterprise which sets prices equal to marginal cost will run a deficit[99]. Therefore in the static analysis public provision with a permanent deficit is welfare optimal[100]. Marginal cost pricing for a public enterprise with decreasing ray average cost therefore makes permanent subsidies necessary.

There are, however, several objections against public enterprises running permanent deficits[101]. The two main arguments refer to new inefficiencies which may come about as a result from permanent state subsidies:

1) If deficits are automatically covered by state subsidies the incentive to minimize cost is reduced.

2) The taxes needed to finance the deficit lead to distortions. The latter may outweigh losses in efficiency which derive from a departure from marginal cost pricing in the enterprise.

While providing a simple principle, marginal cost pricing hides major conceptual difficulties, measurement problems and potential inefficiencies. The consequences of external subsidies are distortions outside. It is not obvious why external distortions caused by taxes are deemed to be more acceptable than those caused internally by the firm which deviates from marginal cost pricing.[102]

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[98] Call attempts are rejected with a circuit-busy tone. This amounts to a random rationing since calls are not arranged according to willingness-to-pay or urgency. However, redialing increases the probability of a successful call but requires more time. Thus in periods of excess demand call attempts are to some extent ordered according to the individual's priority and opportunity cost of time. See also: Mitchell, B.M. and I. Vogelsang (1991a), p. 42.

[99] see: Baumol, W.J. (1976) and: Bös, D. (1981), p.27.

[100] Alternatively the state may pay a permanent subsidy to the monopolist to cover the deficit in the case of private provision.

[101] in more detail: Neumann, K.H. (1984), p.93.

[102] Compare: Mitchell, B.M. and I. Vogelsang (1991a), p. 34, 39-40.

In order to avoid external efficiency losses, there are strong reasons for a break-even constraint on public enterprises. For this end second-best pricing rules have been developed to maximize social welfare under the constraint that the enterprise breaks even[103]. This requires a deviation from marginal cost pricing. Principally two different approaches may be applied in this respect. In a multiproduct enterprise each product may take a share of the common cost burden. In that case the Ramsey pricing rule will offer a second best pricing scheme.[104] This is discussed in what follows. Alternatively, price discrimination among consumer groups may be applied. The marginal consumer group pays marginal cost prices while those with a higher reservation price pay more. Price discrimination and non-linear tariffs are discussed in chapter 3.3.2.3.

3.3.2.2. Ramsey Pricing in the Telephone Network

The theory of Ramsey prices refers to the problem of covering production costs and minimising the distortions which stem from deviations from marginal cost pricing[105]. As will be seen, Ramsey-pricing belongs to the category of value based pricing.

If total costs of production are covered, the common costs of production have to be allocated to the different services.

For simplicity I assume that the network operator offers only two services. One is the local telephone service x_l, the other one is long-distance service x_d. Accordingly p_l is the price for local and p_d the price for the long-distance service. Demand depends only on the own price, thus cross price elasticities are neglected.[106] Income effects are neglected in what follows as well.

Then the operator's revenues are

$$R = p_l\, x_l(p_l) + p_d\, x_d(p_d) \tag{3.16}$$

If input prices are given, the cost function is

$$C = C[x_l(p_l),\, x_d(p_d)] \tag{3.17}$$

Finally, let U(p) be the consumer's net utility (consumer surplus) in money terms, which is derived from the goods x_l and x_d.

103 see: Baumol, W.J. and D.F. Bradford, (1970), p.265.

104 As Kruse points out, the term "second best" in this context should not be misinterpreted as "less efficient" compared to the first best alternative of marginal cost pricing. In reality the latter is likely to lead to higher inefficiencies which arise from the need to cover the deficit by external subsidies. Compare: Kruse, J. (1985), p. 84/85.

105 They refer to Frank Ramsey who provided a solution to the optimal pricing problem for an industry in which marginal cost pricing does not cover total costs. See: Baumol, W.J. and D.F. Bradford (1970), p.278.

106 Bös discusses the more general case of the cross-price elasticity being above zero. See: Bös, D. (1981), pp.25.

Then the problem of maximising consumer's utility subject to a break-even constraint of the network operator can be formalised as

$$\max_{p} U(p_l,p_d) \tag{3.18}$$
subject to: $R - C \geq R_o$ with: $R_o \geq 0$ and $p_i \geq 0$, $i = l, d$.

R_o represents a minimum profit required. In the case of the break-even constraint R_o is assumed to be zero.

If the constraint is not binding, one obtains the marginal-cost-pricing rule. In the case of decreasing ray average cost the constraint is binding.[107]. Then (3.18) leads to the Ramsey pricing rule.[108]

The Langrangian is

$$L = U(p_l,p_d) + \tau[p_l x_l + p_d x_d - C(x_l,x_d)] \qquad \tau > 0.$$

L is the social objective function as a weighted sum of consumer welfare and enterprise profit. τ is the Lagrange multiplier.

The first order conditions for p_i can be derived by differentiation of L:[109]

$$\frac{\delta L}{\delta p_i} = -x_i + \tau(x_i + p_i\frac{\delta x_i}{\delta p_i} - k_i\frac{\delta x_i}{\delta p_i}) = 0 \tag{3.19}$$

with

$$\frac{\delta U}{\delta p_i} = -x_i(p_i) \quad ; \quad \frac{\delta C}{\delta x_i} = k_i$$

The derivative of the utility function can be derived by classical theorems of price theory.[110] k_i are the marginal cost of service i. (3.19) then can be transformed into

$$\frac{p_i - k_i}{p_i}\epsilon_i = \frac{1-\tau}{\tau} \tag{3.20}$$

with ϵ_i being the price elasticity of demand.[111] If I define the price-cost margin

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107 Bös, D. (1981), p.124/125.

108 For similar treatments see for instance: Bös, D. (1981), p. 124/125; Brock, W.A. (1983c), p.191/192; Weizsäcker, C.C. von (1984), pp.199/200.

109 δ represents the partial derivative.

110 This can be found in: Baumol, J.W. and D.F. Bradford (1970), p.269.

111 The price elasticity of demand is defined as $\epsilon_i = (x_i/p_i)\,(p_i/x_i)$.

$$\frac{p_i - k_i}{p_i} = m_i$$

then $m_1 \epsilon_1 = m_2 \epsilon_2$

since the right hand side of (3.20) is a constant.
This finally leads to the *inverse elasticity rule* of Ramsey pricing:

$$\frac{m_1}{m_2} = \frac{\epsilon_2}{\epsilon_1} \qquad (3.21)$$

The optimal relative deviations of the prices from marginal costs are equal to the reciprocal ratio of the price elasticities of demand. If the firm encounters increasing returns to scale and has a break-even constraint, both prices have to be above marginal costs. In that case the inverse elasticity rule states that the more price inelastic demand is for one product the higher is its optimal price (given the marginal cost of production). It follows that the less price elastic is demand, the higher is the relative burden of common costs the product has to bear. Social welfare therefore will be served most efficiently if the deviations from marginal costs are unequal[112]. The underlying idea is that the more price inelastic demand is, the smaller are distortions stemming from consumer decisions due to "wrong" price signals. In the case of a totally inelastic demand curve the consumer cannot avoid the price rise. The latter therefore will entail only an income effect (redistribution) without any negative effects for allocation. According to the Kaldor-Hicks criterion for this product a price increase does not generate any efficiency loss. The Ramsey price rule therefore is a means of covering total costs of production at minimal welfare distortion. In comparison to the outcome in the case of marginal cost pricing Ramsey-pricing, reduces **proportionally** the quantities demanded of each product. Von Weizsäcker has shown that given linear demand functions the Ramsey pricing rule leads to the same result as the "equivalence principle" of value based pricing. In the Ramsey-Boiteux optimum the ratio of the net benefit U_i and the contribution made to cover non attributable costs $[(p_i - k_i)x_i]$ is the same for all products[113].
Taking into consideration the empirical estimates of price elasticities of demand discussed already in chapter 1.1.2. one may conclude that access and local services should carry a relatively high burden of the common cost. This, however, only holds to the extent that long-distance services are more elastic than local ones.[114] Ramsey prices may be difficult to

112 Baumol, W.J. and D.F. Bradford (1970), p.267.

113 $(p_i - k_i)x_i$ is the contribution made by consumers of service i in excess of the attributable costs (if $p_i > k_i$). See: Weizsäcker, C.C. von (1984), p.201/202.

114 As was pointed out in chapter 1.1.2. despite the empirical estimates it is not necessarily the case that the demand for long-distance services is more elastic than the demand for local calls.

implement politically since they imply a price structure which is quite different from the existing one. Consumers with an inelastic demand would have to pay more than those with an elastic one.

This result is in conflict with the analysis of externalities in consumption. To the extent that network externalities exist, the optimal access charge will be **below** marginal cost. The difference between marginal cost and the optimal access price corresponds to the additional utility created for other subscribers. The deviation of the optimal price from marginal cost of access due to externalities can be considerable[115]. Therefore externalities are an additional factor (apart from scale economies) which render a deficit if first best prices are applied. As has been pointed out above, the relevance of consumer externalities is diminished since the target of universal service has been almost achieved in most member countries.

A more serious problem with Ramsey prices is that they are not necessarily sustainable. A potential competitor may specialize in serving consumers who use those services intensively which have a high deviation of prices from marginal cost. The price discrimination against business customers could lead to a bypass of the public network by an increased use of private networks. The problem arises because entrants supply only a subset of goods offered by the incumbent. If the incumbent applies price discrimination in order to prevent entry, sustainable prices lead to a non-welfare-maximizing pattern of cost recovery. Ramsey prices therefore may make the erection of entry barriers necessary. Competition in telecommunications would be precluded. However, it is not clear whether Ramsey prices in telecommunications would lead to inefficient entry. Often the non-sustainability of Ramsey prices is overemphasized. Entry barriers, moreover, provide some protection to the incumbent who applies Ramsey pricing rules in telecommunications.

3.3.2.3. Non-linear Pricing

Ramsey pricing leads to a set of uniform prices which maximise total surplus subject to a break-even constraint.[116] Prices vary between different markets, depending on the price elasticity of demand. *Non-uniform pricing* goes beyond Ramsey pricing by discriminating between consumers in the same market. The amount a consumer pays does not vary proportionately with the quantity consumed.[117] The network operator may grant quantity discounts to certain consumer groups.[118] Nonlinear tariffs therefore involve price discrimination since different units of a homogeneous product are sold at different prices. As will be seen, non-uniform pricing allows a greater reduction in efficiency losses than

115 Neumann, K.H. (1984), p.109; Willig, R.D. (1979).

116 Ramsey prices are uniform since the amount the consumer pays is proportional to the quantity he or she consumes.

117 Phlips, L. (1983), p.166.

simple Ramsey pricing.[119] Thus, non-linear prices improve on simple Ramsey pricing, while they still allow recovery of the cost of production. It offers heterogeneous consumers a wider variety of tariff packages from which they can choose. Consumers then will buy at quantity levels where marginal prices are closer to marginal cost.[120]

If price discrimination is applied to cover the enterprise's deficit, the allocative efficiency requires a complete separation of consumers. If arbitrage can be prohibited, each consumer could be charged up to his individual reservation price (first-degree price discrimination).[121] By doing so the consumer surplus could be entirely passed over to the enterprise. However, in reality complete price discrimination is not practicable. The producer would have to negotiate with each customer individually which would become too costly. Price discrimination therefore leads to simpler practises as for instance two-part tariffs and block tariffs.

The simplest form of non-uniform pricing is the *two-part-tariff*.

Let's assume that there is only one telephone service which is charged with one unit per call. Thus for simplicity I neglect distance, day time and duration of calls. If q is the quantity of calls made by a customer, A is the access price for the network, and p is the price for one unit, then for $q>0$ the consumer's (monthly) expenses are

$$E(q) = A + pq \tag{3.22}$$

Thus, two-part-tariffs consist of a fixed price (lump-sum fee) which is not related to the quantity consumed and a usage-sensitive price. They are common for telephone services in Europe. The access charge has to be paid without regard to the number of phone calls made. Services then are tariffed corresponding to the length of a call.

Only for $q=0$ can the consumer save the access charge. A uniform price is simply a two-part tariff with $A=0$. The lump-sum fee A then appears as a purchase privilege tax which extracts part of the consumer surplus.[122]

In telecommunications equation (3.22) may also be considered as two prices for two different services. The access price A is the price for participation in the telecommunications network while p is the price for consumption. Since the demand for access is highly inelastic, the Ramsey rule suggests a high access fee and a low usage charge.

119 However, as Brown and Sibley show, the inverse elasticity rule is also valid for non-uniform pricing. For instance, it can be combined with quantity discounts. See in detail: Brown, S.J. and D.S. Sibley (1986), pp.107-112.

120 Non-linear tariffs can only be used under certain conditions. The firm has to have some market power, perfect arbitrage must not be possible and disaggregated demand data have to be available. See: Mitchell, B.M. and I. Vogelsang (1991a), p.74.

121 Assuming that the consumer can be forced to reveal his or her individual preferences for the commodity. See: Phlips, L. (1983), p.158.

122 Phlips, L. (1983), p.161.

In this particular example the Ramsey pricing rule corresponds to the optimal two-part tariff. Coase showed that the two-part-tariff allows complete elimination of the dead weight loss. For this result to materialize, the usage charge p should be set equal to marginal cost, while the access charge has to be such that total costs are recovered. The only difference from the marginal cost pricing rule discussed in 3.3.2.1. is that the sum of access charges are transferred from consumers to the network operator.[123] The fixed fee operates as a non-distortive head tax.[124]

However, the existence of cross-elasticities has to be taken into account (see chapter 1.1.2.). A higher access charge causes some consumers to switch off from the network which also reduces total demand for usage. Since the demand for access is not completely inelastic, non-uniform pricing for telecommunications is not efficient if it leads to marginal cost pricing. One has to take account of the total number of network participants. This leads to the problem of sorting consumers according to their willingness-to-pay for telecommunications services.

In chapter 1.1.3 it was pointed out that customers can be broadly categorised into two groups. Household demand mainly depends on disposable income and on the price. Business demand instead is less price-elastic and varies with the business cycle. It, moreover, varies among different sectors of the economy. Business demand is concentrated on the service sector which relies on telecommunications services as an important input of production.

I assume that there are only two groups of consumers: Households (H) are consumers with low demand, while business (B) have a high demand for the telephone service. Then a two-part-tariff may not be optimal if both consumer groups pay the same access fee A/2. A/2 may exceed the total utility which H can derive from participating in the network. In that case H prefers to disconnect. If the two consumer groups can be identified, prices for each of them are determined separately. They face different access fees. H's access fee would be small enough to induce it to stay in the network. Thus, in the case of heterogeneous consumer groups a discriminatory two-part tariff is applied. The inverse elasticity rule carries over to non-linear pricing. Business customers have a lower elasticity of demand for access than households. A higher access price for B then can be used to subsidise the access of H.[125]

Although so far non-linear pricing has referred to the single product case, the two-part tariff discussed above can be viewed also as a tariff for two services: access and usage. However, multiproduct nonlinear pricing refers to services which do not have a hierarchical

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[123] See for instance: Brown, S.J. and D.S. Sibley (1986), p.67.

[124] Mitchell, B.M. and K. Vogelsang (1991a), p.36.

[125] In this respect the Ramsey pricing rule corresponds to the aims of redistribution.

relationship.[126] In telecommunications it occurs in the form of ***bundling***. Bundling arises when two services are offered in fixed proportions.

A multi-part tariff then can be applied to take account of different consumer preferences. In practice one does not observe smooth non-linear tariffs. Instead, frequently tariffs consist of discrete parts, called ***blocks***. These blocks are discrete intervals within which the same (marginal) price applies. Brown and Sibley define a ***multi-part-tariff*** as "***a nonuniform price schedule with a finite number, n, of rate steps, where n > 2.***"[127] Thus, the multipart tariff can be written

$$\begin{aligned}
p(q_1) &= p_1 \quad \text{for} \quad 0 < q < q_1 \\
p(q_2) &= p_2 \quad \text{for} \quad q_1 < q < q_2 \\
&\vdots \\
p(q_n) &= p_n \quad \text{for} \quad q_{n-1} < q < q_n
\end{aligned}$$

Figure 3.2. illustrates a two part and a four part tariff.

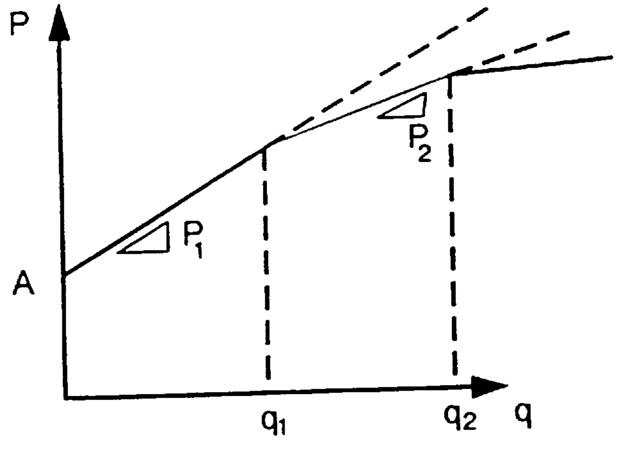

Figure 3.2.: *Two-part and four-part tariffs*

A is the access price. For any unit consumed the customer has to pay p_i which is the slope of the line. If $p_i = p_1$ for all units consumed, a two-part tariff occurs. Alternatively a four-part tariff is depicted if the price (slope) is changed at certain quantities. For all units until q_1 a price p_1 has to be paid. For additional units until q_2 the price falls to p_2, etc. Thus, figure 3.2. depicts a four-part tariff of a declining block type which is common for telecommunications.

If there is a finite number T of discrete consumer types then a block tariff which comprises T parts is optimal. It would render the same result as a smooth tariff. By selecting a certain

126 Access and usage are in a hierarchical relationship since the demand for access is derived from the consumer surplus stemming from usage.

127 Brown, S.J. and D.S. Sibley (1986), p.80.

tariff customers would sort themselves into the group they belong to. However, costs of metering rise with additional blocks as do the cost of optimization and comprehension for customers. Transaction costs then reduce the optimal number of rate steps.[128]

A *pure bundling strategy*[129] is applied if both products are offered together at a given price. The customer cannot buy the individual services separately. This, for instance, was applied in the US before 1984 in the case of *flat-rate pricing*. The latter consists of a fixed monthly price for access and local usage. The effect is that additional local calls have a price of zero, once the flat-rate is paid for.

A *mixed bundling strategy* instead is applied if both products are offered separately and also as a package of both. Thus, the consumer can choose to pay for access and each local call separately or to take a flat-rate. For a consumer with a high demand for local calls the latter becomes attractive. These mixed bundling strategies are increasingly applied in the USA and GB. If economies in the bundling process and complementarity in consumption is excluded, it can be shown that mixed bundling leads to higher sales than either pure bundling or simple monopoly pricing. This may be explained with the following example. A consumer may have a reservation price for access which is below the marginal cost, while the price for calls is below the reservation price for usage. Thus if both services are sold separately the particular consumer does not interconnect. He or she then would make phone calls by using a public telephone box. If the individual's reservation price for usage is above the marginal cost, a flat-rate price could be offered which makes the consumer join the network. Depending on the distribution of the consumers' reservation prices, mixed bundling also can produce the highest profits.[130]

Total revenue and total volume discounts are increasingly applied by telecommunications operators. The heterogeneity of services thereby leads to a preference for total revenue discounts.[131] They require that larger demand be more elastic than smaller demand. Large business customers can install their own private networks thereby bypassing the public switched network. The alternative to switch to substitutive networks makes their demand more elastic.

Hence, price discrimination may increase total welfare. A monopolist can maximise profit and increase consumer welfare by offering a series of optimal multi-part-tariffs. Consumers then can choose their best combination of fixed and variable payments.[132] If there is no break-even constraint a uniform average price equal to marginal cost is optimal. However,

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128 Mitchell, B.M. and I. Vogelsang (1991a), p.104.

129 Here and in the following compare: Phlips, L. (1983), p. 176/177.

130 Mixed bundling becomes the most profitable strategy if some customers have a reservation price below marginal cost for a particular service. Pure bundling instead becomes more profitable when reservation prices are more uniform. See in detail: Phlips, L. (1983), p.180-183.

131 Different *quality* of services makes an aggregation of quantity discounts difficult to apply. See: Mitchell, B.M. and I. Vogelsang (1991a), p.113.

132 This is shown for instance in: Brown, S.J. and D.S. Sibley (1986), p.84.

if a nonnegative profit is required, non-linear prices are better tha uniform ones. The more tariff levels are introduced ceteris paribus, the higher is the welfare gain[133] because customers get a wider variety of tariff packages from which they can select. This shows that quantity discounts do not rest only on cost differences between serving large and small customers. Since the inverse elasticity rule also applies for non-linear pricing quantity, premia and discounts are also justified by differences in demand elasticities.

Technological advance and especially intelligent network services in the future may limit the scope for non-linear pricing. The existence of open access may make it difficult for operators to discriminate between different categories of use and user. Thus ISDN and broad-band technology may lead to simple tariff solutions loading most costs on to access fees.

3.3.3. Optimal Pricing, Universal Service and Equity

Before applying the general principles of optimal pricing for telecommunications I briefly review the present pricing schemes in EC member countries. While a detailed comparison is carried out in chapter 12.2.2. in what follows I outline those features which have prevailed in almost all countries which have granted a *de jure* monopoly to public network operators. The actual pricing policy then will be compared with optimal pricing criteria as derived from the previous discussion.

Some general conclusions have already been made for usage-sensitive and non-sensitive charges. In what follows the considerations of optimal price setting are applied to access charges and usage-sensitive tariffs in a more specific manner. The kinds of price discrimination among user groups, which could increase overall welfare, are of special interest.

3.3.3.1. General Features of Actual Tariff Schemes in the EC

Universal service at a uniform price:

This terminology has been popular to characterise the policy of public provision of telephone services. The intention is to emphasize the public firm's obligation to consider social aims and goals of integration.

The concept of **universal service** at a uniform price is aimed at providing a means of integration of society by offering every household the same opportunity to join the telephone network (without regard to individual cost differences). In the European context the notion of a public service is rooted in the idea that all citizens in a country have the

133 This holds only if it is assumed that there are no other costs involved with raising the number of tariffs. If, for instance, a more detailed tariff package requires customers to devote considerable time to figure out the individually optimal solution, the opportunity costs of time will establish an upper limit for the number of rate steps.

right to certain basic services on equal terms.[134] As was pointed out in chapter 3.1.6. this more complex concept cannot be defended by the network externality alone. It is a demand-related concept of "fairness"[135] which implies a right of access to the telephone network for everybody. It implicitly leads to a weighting of customer classes according to distributional aims. Distributional pricing uses the correlation between income and the demand for specific services. Services consumed relatively more by poor customers would receive greater weights in the welfare maximisation problem.[136] However, the target of universal service has been almost achieved in industrialized countries, where about 90% of households have access to the telephone system.

Given the break-even constraint, the principle of universal service implies that a large portion of access cost is recovered in charges for usage. Given the demand elasticities, this leads to a cross-subsidisation which directly contradicts Ramsey pricing rules.

Uniformity of the price implies that disregarding his or her location, each consumer has to pay the same amount for the same service. Local calls are priced the same everywhere. Long-distance calls are only priced according to the distance traversed, the duration and the day time of the call. The cost considerations made in chapter 2.1.1.5 instead imply that prices should vary according to the density of the route, not the distance. For both services, the averaging over a large number of subscribers implies a subsidy from high density to low density areas.

Redistribution among customers:

In contrast to the aim of integration, which led to cross subsidies among different regions as described above, the tariff system also implies a cross subsidy among groups of customers. In all EC member countries and the USA before divestiture, long-distance charges far exceed costs. Additional revenues are used to subsidise the local service and access. Again the estimates of price elasticity of demand suggest that this is in direct contradiction of the inverse elasticity rule derived in chapter 3.3.2.2. Cross-subsidisation from long-distance services to local service cannot be justified on the grounds of externalities or value based pricing. It has developed partly accidentally. Technological advance reduced the cost of long-distance calls over time, while the cost of the local network and access remained constant. Keeping nominal prices constant implied that over time the augmenting profits from long-distance services made up for increasing losses in the local network. The increasing profits in the long-distance market were easy to hide given that they relied on cost reductions and not on price increases. While the increasing

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134 The universal service goal was explicitly defined in the wording of the 1934 Communications Act in the USA. It asks "*to make available, so far as possible, to all people of the United States, a rapid, efficient, nationwide and worldwide wire and radio communications service with adequate facilities at reasonable charges.*" Compare: 1934 Communications Act, 47 USC 214.

135 In contrast to a supply related concept which asks for a "fair" allocation of costs. See in more detail chapter 3.3.3.4.

136 See in more detail: Bös, D. (1985).

cross-subsidisation was only a matter of book-keeping for the telephone company, it became politically popular because of a redistribution mainly from business to residential customers[137]. The high concentration of the bulk of long-distance calls on a small number of customers ensured that the *median* customer was better off although the *mean* customer was worse off compared to a subsidy-free tariff scheme. While it serves the politician's interest, the cross-subsidisation did not require a deliberate tariff policy but could be achieved by the regulator's passiveness. The technological progress allowed politicians to avoid politically sensitive price changes. However, as was pointed out, the evolving cross-subsidy directly contradicts principles of optimal pricing and hence creates an increasing efficiency loss. It cannot be defended by demand externalities or Ramsey pricing.

It can be shown that related objectives of redistribution can be reached in a more efficient manner[138]. Moreover, even the redistributive effect is less clear cut than is normally claimed. Business and rich customers also use the subsidised local service and profit from the low access rate. The long-distance charge has to be paid for by all customers disregarding their income. Since businesses normally pass on their costs in their prices, residential customers are subsidised by a **sales tax** on products which involve high telephone service. The redistribution effect becomes blurred since it cannot be evaluated which customers consume those services more intensively.

The inefficiencies which occur from telephone tariffs being used as a means of income redistribution therefore are threefold. They create high efficiency losses since the tariff scheme directly contradicts optimal pricing rules. The redistributive effect is small since the subsidy is spread among a large number of customers disregarding individual income. And finally the extra "tax" burden is spread among consumers of services with high telecommunications inputs, disregarding their personal income.

More recent studies for the USA, moreover, raise some doubts whether the cross-subsidisation has any redistributive income effects at all. Crandall, for instance, has shown that low income subscribers in the mid 1980s spent about US$ 7 to US$ 25 a month for local service and between US$ 17 to US$ 21 a month on long-distance services. Thus, even for low income subscribers it may be the case that an abolition of the cross-subsidisation does not have negative effects on income. The increase in local charges may be greatly offset by lower long-distance rates.[139]

An analysis of Southwestern Bell's regional traffic showed that the long-distance usage of lower income users increased much more than for the average residential subscriber as a response to the rebalancing of tariffs after AT&T's divestiture. The average customer of

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137 see for instance: Kahn, A.E. (1984), p. 144,

138 see for instance: Bös, D. (1983), pp.171, and: Heuermann, K.H. (1984), pp. 137-145.

139 Compare: Crandall, R. W. (1991), p. 108/109.

the US *"Lifeline"* concept[140] spent approximately the same share of the total telephone bill on long-distance services as the average residential customer.[141]

3.3.3.2. Optimal Telephone Tariffs

Applying the principles of optimal pricing as developed before may lead to a conflict with the universal service goal. However, even if the latter is given priority the previous discussion has shown that it cannot justify the present subsidy scheme. The latter mainly gives subsidies to the inframarginal consumer who effectively becomes a free rider with respect to the goal of universal access. Instead subsidies should be targeted at the *marginal* consumer. This fosters the goal of universal access and the goal of income redistribution. More efficient subsidy programs have been developed in the US. They are in chapter 6. The discussion of efficient pricing rules leads to the conclusion that the cross-subsidy to poor customers would be best regarded as an additional fixed cost which has to be covered by other consumers. According to the theory of non-uniform pricing, better designed tariffs allow the subsidy while making other consumers better off.
If cost based prices for access are deemed too high for some customers, they should either be reimbursed by the government or receive a tax deduction for the service.[142]

Optimal Access Charges

The Ramsey pricing rule and the Coase result for a two-part-tariff both lead to the result that access should bear a relatively high burden of common costs. The very low price elasticity of demand makes it unlikely that customers switch off if the access price is increased. The access charge, moreover, does not generate an efficiency loss since it is usage-insensitive.
Quite to the contrary, in all EC member states access is priced much below marginal cost. This clearly contradicts the pricing rules derived above. It is justified by the network externality. In chapter 3.3.3.1., however, it was pointed out that the latter diminishes once universal coverage has been achieved. Moreover, even if the latter justified a subsidisation of access, the Ramsey pricing rule has demonstrated that the present regime of subsidizing access by highly elastic long-distance services is especially inefficient. In the following I discuss alternative means to achieve the universal service goal.
If both the cost structure and demand elasticities are taken into account the following criteria for optimal access charges can be derived:

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140 Lifeline programs subsidise low income household's telephone services. In detail see chapter 6.

141 Compare: Larson, A., T. Makarewicz, and C. Monson (1988); and Makarewicz, T. (1990).

142 Faulhaber, G.R. (1983), p.23.

1) **Price differentiation according to costs of access**: The costs of access vary with the distance of the individual subscriber from the local switch and the density of subscribers in the local network. The further away the individual subscriber is and the lower the density, the higher are access costs. Thus in principle individual tariffs should be charged. If the cost of extortion of individual fees or other reasons make unified charges for a local network necessary, the access charge should be lower for high density areas in general.

2) **Price differentiation among user groups**: Part (III) discusses empirical evidence that demand for access is *income* elastic. The higher the customer's income, the higher one may estimate is his or her reservation price. Higher prices for inframarginal customers do not lead to a disconnection from the network. Thus a uniform access price is an inefficient means to promote universal service. Instead price discrimination among customers would allow then to recover the cost of access without threatening the universal service goal.

Price discrimination among customers may not only refer to income. Price elasticities of demand for access are considerably lower for business customers than for households. Thus, some of the business' surplus can be transferred to the operator without changing marginal decisions. Higher access prices for business therefore would satisfy both, the criteria of network externality and the Ramsey price rule. In the US typically the monthly business access rate exceeds the residential one by a factor greater than 2.
Chapter 3.3.2.3. provided some hints as to how an unbundling of access charges could be feasible without knowing individual's reservation prices. The network operator has to design a package of optional tariffs which forces customers to reveal their preferences. Demand for access being mainly derived demand from usage, the individual's reservation price mainly depends on the surplus she derives from usage. Low users therefore may pay a lower access charge than high users. Figure 3.3. demonstrates how the self selection procedure could work in the case of a two-part tariff for access and usage.[143]

143 For simplicity, here I neglect the existence of several services.

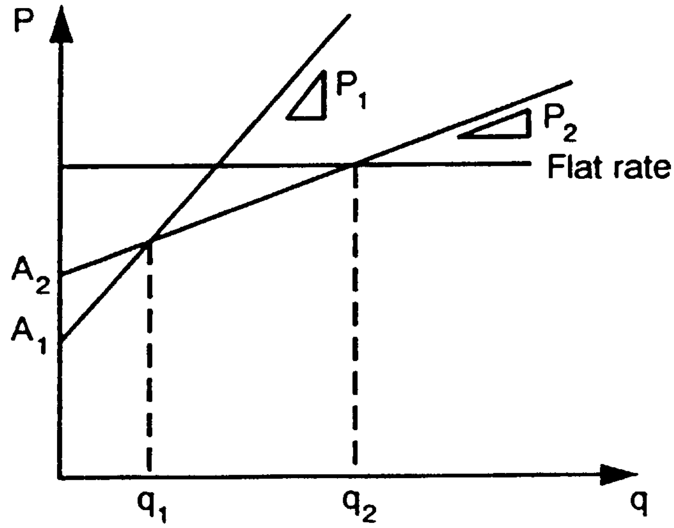

Figure 3.3.: *optional tariffs*

A low user consuming less than q_1 calls in a month would prefer a low access charge A_1 and a relatively high usage price p_1. A customer making calls between q_1 and q_2 would prefer a higher access charge but a lower usage price. High users, finally prefer the flat rate. These kinds of *optional tariffs* were first tested by AT&T in 1983. Despite the additional transaction costs they are increasingly used in the US.[144] AT&T's competitors have subsequently introduced their own *optional calling plans* (OCP). These plans have become more and more sophisticated.[145] Their effect is a marked increase in the number of calls made. During the first year after adopting an optional calling plan AT&T increased the mean minutes subscribers calls at cheap rates by 42%. The overall price elasticity of demand of OCP subscribers significantly exceeds the one of all residential subscribers.[146] Recently, the FCC guidelines for OCP have relaxed considerably the tariff supervision of regulated carriers.

Cost orientation of access charges would require a major shift towards non-tariff-sensitive pricing. Presently in the EC only 15% of the TOs' revenues stem from access and rental charges. However, as was pointed out in part (I), in an ISDN environment about 70% of network costs are access related.[147]

[144] It can be shown that suitably designed optional two-part tariffs are equivalent to nonlinear tariffs when consumers and suppliers have full information and no transaction cost exist for switching from one tariff to another. In more detail: Mitchell, B.M. and I. Vogelsang (1991a), chapter 5 and (1991b) chapter 8.

[145] For instance, in 1990 AT&T adopted an optional calling plan which enables subscribers to obtain reduced tariffs only for calls made to one specific area.

[146] Mitchell, B.M. and I. Vogelsang (1991b), p.52.

[147] Mulgan, G. (1990), p. 25.

Optimal Local Charges

Considerations based on cost-based and value-based pricing lead in the same directions. Cost-based pricing requires a change in the tariff structure because technological change reduces the cost of long-distance calls considerably, while the cost of local usage has been rising[148]. Ramsey pricing requires that local services should bear a comparatively higher share of non-attributable cost in relation to long-distance service.

Further price discrimination which reflects the different costs of provision is necessary:

1) **Price differentiation among local and urban areas**: similar to the considerations made for access, the higher frequency of calls made in high density areas reduces usage-sensitive costs. Therefore tariffs for rural areas have to be higher.

2) **Price discrimination among consumer groups**: as in the case of access, the different elasticity of demand for business calls and households calls should lead to different residence and business rates. In the US, for instance, businesses pay substantially higher rates.[149] This price discrimination, however, is generally not applied in Europe.

3) **Prices according to duration of the phone call**: for the local network, the costs directly linked with the duration of a phone call (capacity cost) have increased relative to the fixed costs of a phone call (set-up). Nevertheless, since every call causes set-up costs, the total cost of a local phone call is not proportional to the duration of a phone call. Neumann concludes that after taking into account the cost of measurement as well, a local tariff, consisting of a fixed surcharge and a tariff proportional to duration, is most efficient.

4) **Peak-load pricing**: It was pointed out before that marginal cost varies considerably between peak and off-peak periods. Especially local networks are engineered for peak usage. Peak-load pricing, however, is rarely applied for local services. Among the four EC member countries studied in some detail in part (III) only Italy charges different prices for a local call depending on time of day. Peak load pricing for local calls would offer efficiency gains and also meet distributional aims. Peak usage usually occurs during office hours as a result of business use, rather than a residential one. Peak-load pricing therefore would raise the relative share of business customers and presumably reduce the burden for households.

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[148] Neumann, K.H. (1984), p. 133.

[149] See: Mitchell, B.M. and I. Vogelsang (1991b), p.11.

Optimal Long-distance Tariffs

The rules of price discrimination which apply for local calls carry over to long-distance calls. Due to technological progress, **distance** has lost most of its impact on long-distance costs. This trend will be fostered by new transmission technologies (satellites, fibre-optic). In addition the costs of measurement for distance sensitive pricing are high. Therefore, tariffs disregarding distance might be optimal. Peak-load pricing should be an important feature for long-distance tariffs.

Price discrimination according to capacity utilization leads to different prices depending on the time of the phone call and the route chosen. The time of the call is considered by different prices at the weekend and during the week as well as for day and night calls. The route effect can be explained by referring to the network model of figure 2.1. It was pointed out that the phone call of A and C could be directed through a direct line. The latter are installed for high density routes. The cost of the call using these routes is lower than the cost of a long-distance call which passes through long-distance switches. This leads to different prices for essentially the same service. When introduced in the UK by BT, this created some resistance among customers.[150] While in the EC generally three pricing periods are applied, AT&T in 1990 filed an optional calling-plan rate structure which provides for 8 separate time-of-day/day of week pricing periods.[151] As far as duration is concerned the considerations made for the local service also hold for long-distance.

Duration is an important feature for cost of a long-distance phone call. Therefore a tariff related to duration is necessary. Price discrimination among user groups (business and residence) can be recommended due to the different price elasticities of demand. Business demand is concentrated almost entirely on regular weekday working hours. Different prices for day and evening calls hence allows one to discriminate among customer groups. In this respect two contradictory effects have to be observed. On the one hand business demand is reckoned to be less elastic than residential demand. This, however, only held as long as business customers did not have substitutive networks to which they can switch. The bypass possibilities of private networks raise the elasticity of big users considerably and makes it optimal to offer volume discounts. In the US, for instance, long-distance operators offer switched service at bulk rates for WATS tariffs.[152]

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150 Lewin, D., D. Rogerson and T. Johnson (1989), p.117.

151 See: Mitchell, B.M. and I. Vogelsang (1991b), p.19

152 Recently AT&T has replaced a set of optional two-part long-distance tariffs with a single nonlinear WATS tariff that offers increasing discounts at higher volume levels. The WATS market is highly competitive with AT&T's market share down to 44%.

3.3.3.3. Cost-based Pricing for Network Services

Cost-based pricing has recently become a popular term among telecommunications regulators. The previous discussion of optimal pricing rules took costs as one major factor, beside the characteristics of the demand side. Cost-based pricing instead stresses the principle that tariffs should cover some notion of cost. Even if one agreed upon the principle, the previous discussion has shown that it is far from clear what cost-based tariffs should look like. It mainly refers to marginal-cost pricing and the ending of cross-subsidisation. Prices which are related to costs are often regarded as being "fair" in the sense that the customer's expenses should not exceed the costs which arise if he or she is served. However, the main rationale for cost-based pricing stems from the aim to open up the telecommunications network for competition. Whether facility based or service based competition[153] is introduced, in order to avoid unfair practises by the incumbent or in order to avoid inefficient entry, the network operator's tariffs have to correspond to underlying costs.

Finally, in the actual discussion in the EC there is a third motivation for cost-based prices. This is related to the inefficiencies which have come about due to the specific pricing patterns characterized in chapter 3.3.3.1. The discussion of optimal tariffing led to the conclusion that value-based pricing as a second best strategy would generate higher static efficiency gains than cost-based pricing. This, however, only holds for optimally applied value-based pricing. In all EC member states and the US before divestiture monopoly prices were substantially distorted by political pressure. The comparison of actual features of telephone pricing as they have prevailed under monopoly provision in all industrialized countries and optimal tariffs has shown that a move towards cost-based pricing actually corresponds also to value-based pricing goals. Even if the extent of rebalancing is disputed, it is generally agreed upon that cost-based pricing requires lower long-distance and higher local charges. This corresponds to the Ramsey-pricing rule. A conflict may arise only for access charges. The optimal non-uniform tariff would raise access charges substantially; even beyond marginal costs. This conflicts with the goal of universal service. However, several reasons were put forward why the universal service goal can be achieved with cost-based pricing.

The main problem with value-based Ramsey prices is that in certain circumstances they are not subsidy-free.[154] If they are not, the monopolist may require legal entry barriers to be

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[153] See in more detail chapter 4.

[154] In detail: Faulhaber, G. (1983), p. 17.

sustainable. *Sustainable* prices p* are defined by two properties:[155]

a) $$p^* q(p^*) - C[q(p^*)] \geq 0 \tag{3.23}$$

b) no quantities and prices p^e, q^e exist, such that $p^e q^e - C(q^e) \geq 0$ and $p_i^e < p_i^*$ for some i and $q^e \leq D^e(p^*, p^e)$. (3.24)

However, it is not obvious that Ramsey prices in the telecommunications network are unsustainable. In effect optimal value-based prices may very well be sustainable.[156] In this context it is important to distinguish whether the incumbent is unsustainable due to the tariff structure chosen or due to technology and the underlying cost function. When it is claimed that European TOs are not sustainable then normally reference is made to the tariff structure. However, the nonsustainability of the present tariff scheme in EC member countries is not caused by a price policy following the principles of static efficiency. It is reckoned to come about rather because TOs have failed to adapt their prices to the technology driven changes of underlying costs. It was pointed out that (political) inertia rather than distributional aims are the origin for the present tariff structure. The present price regime in EC member countries therefore cannot be justified by either static or dynamic efficiency goals. It contradicts value-based and cost-based pricing principles. It is likely to create severe efficiency losses by attracting too many resources to underpriced and too few to overpriced services. The empirical estimates which I have carried out for four member countries indicate that no close substitutes exist for telephone service. This has protected the network monopolies from substitutive competition in spite of their tariff policy. Moreover, regulators traditionally have foreclosed entry and exit in the industry. This has ensured that interest groups have captured the price-setting procedure. Since the main aim of cost-based pricing is to generate the environment for competition, previously discussed concepts of stand-alone and incremental costs become relevant. Stand-alone cost is the average cost of providing a particular service. It represents a maximum price in a truly competitive market. Incremental cost is the average additional cost per unit of providing the service. Incremental cost is lower than stand-alone cost if cost savings are possible from joint provision of services. It represents a lower bound on a price.

Prices are a signal to consumers and potential competitors as to how much to consume and to produce of a certain good. They are signals for investors too. Cost-based pricing then

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155 Compare Mitchell, B.M. and I. Vogelsang (1991a), p.124.

156 Baumol, Bailey and Willig have argued that a monopolist actually may be forced to implement Ramsey prices to protect itself against inefficient entry. They argue that Ramsey prices are the only sustainable ones when the monopolist has got only local information on costs and demand. See: Baumol, J. E.E. Bailey and R.D. Willig (1977). On the other hand Einhorn has shown that cost-based prices are not necessarily sustainable. If large customers have the option to leave the network for an intermodal supplier (bypass), an optimal non-uniform price schedule may include prices below marginal cost for these customers. In detail: Einhorn, M. (1987), pp.550-563.

ensures that society's scarce resources are used in the most efficient fashion.[157] Cost orientation of prices may be preferred to value-based pricing if the efficiency gains from competition are higher than the static efficiency losses due to prices deviating from the Ramsey rule.

Competitive pressure, moreover, precludes tariff distortions which have prevailed throughout the Community. While cost-based prices are a precondition for the opening of the market, on the other hand entry itself forces incumbents to apply more efficient pricing schemes. Empirical evidence from the UK and the US has shown that competition motivated the incumbents BT and AT&T to introduce a large variety of tariff packages. This is discussed in more detail in chapter 11. In the Uk the rebalancing from 1984-88 led to fourteen different tariff packages. Since then this number has risen further.

The "critical mass" argument could be used against the cost-based principle for tariffs. Critical mass issues favour *strategic* pricing. The network operator may wish to encourage the use of the network, or of certain services in order to reach the critical-mass point. This may require pricing below cost for a limited period of time. If obliged to stick to mechanical cost principles, prices may not be optimal. The critical-mass argument therefore is often used to justify public provision and strategic subsidies (see the Minitel case). In effect it may rather be taken to justify competition and privatisation. New services and strategic pricing involve *high risk*. The latter are more likely to be taken into account if decision makers face the risk of failure. Regulators can force TOs to apply cost-based pricing. However, they normally are not able to decide when strategic pricing is justified. Competition would force TOs to apply cost-based pricing without a bureaucratic requirement. With regard to a regulated monopolist, in the case of competitive pressure no restriction on strategic pricing would be necessary (see chapter 4).

Cost-based pricing requires substantial rebalancing of tariffs in EC member countries. This was seen after 1984 in the UK and the USA (see part (III)). Several authors have estimated the probable welfare effects of a rebalancing of telephone tariffs. Obviously the results vary considerably depending on the underlying assumptions. However, in general the overall welfare effects are reckoned to be substantial. Crandall estimated the annual welfare gains from repricing through 1988 to range from US$ 664 million to US$ 1.4 billion in the USA.[158]

He also estimated the impact of tariff rebalancing on income distribution after the divestiture of AT&T.

Crandall comes to the conclusion that telephone rates as a means of redistribution are very costly, *"reducing social output by more than two dollars for every dollar transferred from upper-*

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[157] Compare: Faulhaber, G. (1983), p. 13.

[158] Crandall, R.W. (1991) p. 164. See also: Griffin, J.M. (1982), p. 59, 64 and 66. Wenders, J.T. (1987), p. 82-89. For West Germany: Neumann, K.H., Schweizer, U and C.C. von Weizsäcker (1983), p.84.

income to lower-income households. It is far better to target subsidies to very low-income households through Universal service funds."[159]

3.3.3.4. Cost Distribution: Station-to-Station versus Board-to-Board Calculation

As was pointed out before, the main problem of cost-based pricing the allocation of joint cost.

From the very beginning, the proper allocation of costs between different services has been disputed. As is pointed out in chapter 2.1.1.6., the assignment of cost of the telephone network is especially difficult because of the high share of joint costs. It has been estimated that 70% to 90% of the cost of the local loop are common cost to local and long-distance services.[160] Due to this problem, essentially two approaches appeared, which differ in the proper definition of a long-distance call.

Going back to the simple model of the telephone network (figure 2.1.), the problem occurs whether the phone call made from A to D is totally "long-distance" or, whether the part from A to the local board and again the channeling through the local board of D are considered local. In the latter case only the part of the phone call which actually connects the two local switches is considered to be "long-distance".

The discussion of separation of cost has a long tradition in the USA[161]. The first concept is called "**station-to-station**": the entire call is considered to be long-distance. The consequence is that the long-distance service has to contribute to the cost of the local network. This corresponds to the concept of "*fully distributed costs*" according to which the long-distance service should bear some part of the non-traffic-sensitive costs of subscriber access[162]. The station-to-station approach would lead to a burden sharing of long-distance and local services according to the relative usage of the network. The technical drawback of this mechanism is that the actual calculation of the adequate contribution of long-distance is difficult to assess.

The second approach is called "**board-to-board**": the local service has to recover all costs of the local network. The board-to-board concept is easier to administer by having separate accounts for local and long-distance networks. The board-to-board principle apportions all the costs of the local loop to local services. A long-distance call would be charged for two local calls and the cost of the inter-exchange between them. The board-to-board principle was applied in the USA following the Minnesota Rate Case of 1913.[163]

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159 Crandall, R.W. (1991), p. 164.

160 Huber, P (1987).

161 see in detail: Temin, P. and Galambos, L (1987), p.19-27.

162 Kahn, A.E. (1984), p. 142.

163 Mulgan, G. (1990), p. 22.

Recalling the cost breakdown made in chapter 2.1.1.2., it is obvious that the board-to-board system assigns the main part of overall cost to the local network and access. In the USA the controversy about the appropriate accounting system was brought to the Supreme Court. In **Smith vs.Illinois Bell** (1930) the Court concluded that since the exchange properties were used for both services the board-to-board system was inadequate[164]. Intrastate (and later inter-state) rates therefore had to be calculated on a station-to-station basis[165]. In Europe as well fully-distributed-cost pricing has been judged to be "fair" by regulators. Every consumer pays his or her attributable cost and a certain part of the unattributable costs. The rationale for this procedure is that local and long-distance services are complementary in demand. Parts of the local network cost should be allocated to usage and then divided among local and long-distance services according to their relative share of usage.

The counter argument is that complementarity of services does not exist on the supply side. The production of one product (service) does not automatically yield a given amount of the other one. Therefore the long-distance tariff should only reflect the **additional** costs which are inflicted by long-distance calls. This reflects the incremental costs of providing a long-distance service. The station-to-station principle thus implies a cross-subsidy from long-distance service to local service inasmuch as the contributions of the former exceed incremental costs. While having been quite viable in the case of public provision, fully-distributed-cost pricing is challenged in a liberalised environment. It puts the incumbent at a disadvantage and may lead to an inefficient bypass.[166] It is mainly based on accounting principles rather than on economic principles. "*The accounting approach subordinates the outcome to the process, and in doing so may neglect efficiency.*"[167]

The emergence of VANS has made cost allocation even more difficult. The proliferation of a multitude of services all using the same integrated digital capacity switches undermines mechanical cost formulas.

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164 see: Horwitz, R. B. (1989), p.104.

165 Temin, P. and L Galambagos (1987), p. 22.

166 Braeutigam has shown that fully-distributed-cost pricing is not optimal for public enterprises either. Compared to Ramsey pricing it leads to efficiency losses. See: Braeutigam, R.R. (1980).

167 Mitchell, B.M. and I. Vogelsang (1991a), p.144.

3.4. Public Provision versus the Regulation of a Private Monopolist

State intervention can be justified on the basis of welfare economics or it may be based on aims of income redistribution. As was argued already in chapter 3.3.3.3. the use of an industry sector for distributional aims is highly inefficient. A given redistributional effect can be obtained more efficiently by tax policies than by telecommunications tariff schemes.[168] For this reason I concentrated in the previous chapters on the *normative theory* of regulation which explains state intervention by *market failure*. The discussion of the sustainability of a natural monopoly, however, has shown that the level of state intervention may vary considerably with the degree of market failure. If a natural monopoly exists which is sustainable, entry can be fully allowed for. The threat of potential entry already imposes some discipline on the incumbent. The level of entry barriers and the incumbent's cost advantages determine the degree of the entry threat. If the natural monopoly is not sustainable, there will be a trade-off of static efficiency losses in case of entry and dynamic efficiency gains due to competitive pressure. If the latter is estimated to be higher, one may take off all non-sustainable obligations from the incumbent's tariff structure and pay for the extra burden (infrastructural tasks) by government subsidies or by a special surcharge imposed on competitors. Finally, of course, the trade-off may favour the exclusion of competitors. Then institutional entry barriers may bar competition altogether. This has been the outcome in Europe in the past.

Natural monopoly characteristics, public good aspects and high entry barriers for telecommunications networks led regulators to the conclusion that a market solution would not be optimal for society as a whole. Instead a state monopoly was created for telecommunications networks. The concept of state monopoly deviates considerably from the economic interpretation of monopoly. It implies a regulatory action of the state. The latter grants exclusive or special rights to an enterprise to provide a certain service.[169] The state monopoly does not necessarily imply public ownership. Exclusive or special rights can also be granted to a private enterprise.[170] Public ownership and regulated private ownership then appear to be the two alternative methods of pursuing public policy goals. In the EC the "PTT-model" has been dominant. The Ministry for Post and Telecommunications runs the telecommunications network. Being the owner of the enterprise, the state is responsible for the firm's business strategy and the regulation of market access. In the US, in contrast, AT&T has always been a private entity which is

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168 This is also explained in: Faulhaber, G.R. (1983), pp.14-15.

169 An exclusive right constitutes a monopoly. Special rights already allow for some competition. The latter is, for instance, the case in the UK where in 1984 competition was limited between BT and Mercury. A state monopoly does not exist if the state only establishes a set of non-discriminatory licensing criteria which all network operators have to fulfil. See in more detail part (III).

170 In Spain, for instance, the majority of Telefonica's shares are held privately.

regulated by the FCC. Both approaches were justified by market failure which arguably did not allow the liberalisation of telecommunications networks.

However, during the last decade the discussion shifted to *regulatory failure*. It became obvious that market failure does not automatically imply that regulation is a superior solution.[171] Market failure is only a necessary condition for government regulation. However, one has also to demonstrate that regulation can offer a remedy.[172] The *positive theory* of regulation as developed for instance by Stigler argues that state intervention cannot be expected to follow a welfare maximising approach. Instead politicians pursue their own interests by maximising votes in future elections. They may be captured by powerful interest groups.[173] According to the *public choice* theory this *rent-seeking* behaviour of civil servants and politicians leads to efficiency losses which exceed the dead-weight loss related to monopoly provision.[174] More recent research has led to the conclusion that most of the monopoly rent can become a loss to the economy due to the resources spent by rent-seeking activities.[175] Ample evidence was found that the "PTT-model" created significant inefficiencies on its own. The most obvious one was already discussed when describing the deviations of the actual tariff structure from the optimal one. Beside the political pressure for tariff averaging, most of the time monopoly operators do not have an analytical accountancy system and do not exactly know their cost structure. More sophisticated tariff principles are therefore not applicable. Inefficiencies arise also internally. They are related to the absence of sufficient means to control firm's performance. These X-inefficiencies and additional rents offered to employees may increase the firm's cost significantly.[176] Additionally technical inefficiencies arise due to inappropriate investment decisions caused by a management pursuing its own interests. According to the *principal-agent* theory efficiency losses arise since the owner (principal) cannot completely control the firm's management (agent), or control itself becomes too costly. Tax payers as the owners of the public enterprise have less supervisory control than shareholders in the case of a private company. Thus, informational problems of the principal are estimated to be higher for a public enterprise. Often it is claimed that public firms maximise turnover instead of overall welfare or profits. This leads to a firm size which is too big. Public enterprises are also notorious for not satisfying qualitative efficiency.[177]

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171 See for instance: Müller, J. (1982), p.182; Braeutigam, R.R. (1989), pp. 1299; and: Joskow, P.L. and N.L. Rose (1989).

172 Noll, R.G. (1989), p. 1258.

173 Compare: Stigler, G. (1971); and: Knieps, G. (1988), pp.55-59.

174 See in more detail: Noll, R.G. (1989), pp. 1262-1277.

175 An example for this is modelled in chapter 4.3.2.2. See also Tirole, J. (1989), pp. 76-77; and: Blankart, C.B. (1983), pp.152-155.

176 See: Kruse, J. and G. Yarrow (1985), p.15.

The supply is limited to standardised products. The introduction of product differentiation is resisted since it complicates monitoring, raises the risk of failure and does not offer sufficient rewards to the management. Deregulation then becomes a response to regulatory failure. It should occur if the cost of regulation exceed the transaction costs of a change plus the costs of market failure.[178] To what extent these theoretical arguments apply to the European PTTs is discussed in part (III).

As will be seen, regulatory failure and changing markets require an institutional reform in Europe. Basically three different concepts appear available. First, one may switch from public provision to the regulation of a private monopolist. The transfer of BT's ownership in the UK follows this road. After describing the past history of public control of BT as a major policy failure, Vickers and Yarrow concluded that the privatisation programme of BT "*can be regarded as a policy response to an intractable institutional weakness.*"

The second alternative is to introduce competition while not changing ownership. As will be seen in chapter 7 this is the Commission's approach. Deregulation in the sense of an abolition of exclusive or special rights must not be linked to privatisation.[179]

Finally, both steps can be combined. This was the approach eventually chosen in the UK.

At first sight the transfer of ownership may have certain advantages. Often public corporations lack clearly defined objectives. The business strategy varies more with a change in government than with market developments. Clearer objectives and an institutional structure that reduces state involvement then may be expected from privatisation. Hence, the biggest advantage of privatisation may be to raise obstacles to intervention. It is a form of political self-control.[180] Littlechild concludes that private firms are more likely to apply optimal pricing rules.[181]

However, many of the shortcomings of European PTTs also arise in case of a regulated private firm. First, regulators can be captured by political interest groups as much as politicians. The tariff structure in the USA before divestiture of AT&T corresponded to the features described for European PTTs. Political pressure ensured an efficiency distorting

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177 In public enterprises qualitative efficiency may be distorted in both directions. Besides offering a low quality level, it has been argued that sometimes a quality standard is obtained which is more than optimal. Facing the alternative either to reinvest into the network or to subsidise external budgets, a PTT management may have an incentive to overinvest. Compare: Kruse, J. (1985), pp.251-252.

178 Noll, R.G. (1989), p.1260.

179 Since increased competition often leads to more regulation in what follows I use the term "liberalisation" instead of "deregulation".

180 Another advantage which is related to higher internal efficiency due to takeover threats which exist for private enterprises, is not likely to apply for big network operators. Compare: Vickers, J. and G. Yarrow (1985), p.15.

181 Littlechild, S.C. (1983), pp.369,375.

toll-to-local subsidy. AT&T obtained a regulation which guaranteed its profits and offered protection against competition and antitrust.[182]

Second, regulation itself may create new incentives to deviate from aims of efficiency. Besides price and output, other variables exist under the management's control (R&D, quality of services, managerial effort). Thus, while the regulator's control is concentrated on prices and output, the management may pursue its own interests among the others. While regulation is directed towards allocative efficiency, technical and qualitative efficiency are likely to be neglected since they are more difficult to quantify. The Averch-Johnson effect shows how price control leads to distortions of capital expenditure decisions in case of rate-of-return regulation. Under rate-of-return regulation prices are set to allow the company to recover its expenses, capital (deprecation charges) and to earn a "fair" return on capital.[183] In theory, rate-of-return regulation does not give incentives to the firm to reduce costs. It will overutilize capital relative to labour since capital investment raises the rate base. This is in the management's interest if expected profits exceed the allowed return on capital. Rate-of-return regulation cannot be optimal since no objective function is maximised.

Third, the regulator faces a lack of information. Since no other firms exist in the market, the regulator depends exclusively on information which is provided by the firm. The enterprise's management then can influence regulation by withholding or releasing certain information. Thus, information is imperfect and unequally distributed between the regulator and the firm.

Fourth, the firm's investment decision depends on expected regulatory decisions since the latter influences its profitability to a considerable extent. The investment in specific and durable assets depends, for instance, upon expectations about allowable prices. Investors then may shrink from investment in sunk-cost technology since regulators *ex post* are able to reduce prices without risking supply failures.[184]

Hence one may conclude that the transfer of ownership alone does not solve the regulator's problem. In both frameworks of state intervention the objectives remain the same while only some constraints change.

However, this perception may change if a policy of liberalisation is also envisaged. Several reasons then may favour a transfer of ownership and indirect regulatory supervision to public control. A privately owned firm is more likely to respond to competitive pressure. Employees of European PTTs are civil servants who cannot be layed off. In the past the

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182 See in more detail chapter 6 and: Wenders, J.T. (1988), pp.16-19.

183 Noll, R.G. (1991), p.43.

184 See: Helm, D. and G. Yarrow (1988), p.5.

PTTs were often used as a means for countercyclical employment programs, thus employees were hired in times of recession disregarding the firm's own needs. As a result they are often overstaffed. In some cases governments force PTTs to make high side payments to the federal budget which exceed those which were necessary if the PTT was liable to taxes. Internal inflexibility, government's responsiveness to sensitive political issues[185] and their interest to divert the firm's profits towards external purposes then put public enterprises at a disadvantage in a competitive environment. Public enterprises, moreover, can be expected to be more difficult to control than private ones in a competitive environment. In chapter 4.3.1.3. it is argued that *predatory pricing* as a strategic behaviour is not very likely to occur for profit maximising firms. This, however, changes if the public firm's management becomes an output maximiser.

When privatised, state intervention can be expected to diminish, as was seen in the case of BT. The firm's flexibility to react to competitive pressure has to be increased significantly. A privatised firm, moreover, has the advantage of being given clearly defined objectives and observable measures of performance (the share price).[186] This is crucial if inefficient entry shall be fenced off. On the other hand, the privatised incumbent enjoys considerable market power even if entry is liberalised. In order to avoid strategic behaviour regulatory supervision has to continue.[187]

For this purpose, some regulatory changes have been introduced. In recent years regulators have switched from rate-of-return regulation to price-cap regulation. *Price-cap regulation* sets a certain price ceiling for a bundle of services which cannot be exceeded by the firm.[188] Within the ceiling the regulated firm is free to choose its own prices.

Thus price-cap regulation has four properties:[189]

1) The regulator directly sets a ceiling for prices charged by the firm

2) These ceilings are defined for baskets of services.

3) The price indexes of services are adjusted periodically by a factor which is exogenous to the firm.

4) In longer intervals the adjustment factors and baskets are reviewed.

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185 Like the rebalancing of tariffs.

186 Vickers, J. and G. Yarrow (1985), p.13.

187 As can be seen in chapter 6, however, the US experience in the long distance market has shown that as competition develops, the regulatory supervision is relaxed.

188 For instance, AT&T's services were divided into four baskets with different price-caps. It is permitted to restructure the rates within one basket, but not across baskets. See: Rohlfs, J.H. (1990), p.9.

189 See: Acton, J.P. and I. Vogelsang (1989), pp.369-372.

Most price-cap regulation permits rates to be raised by a certain percentage per year. The percentage depends on general economic conditions (for instance inflation) and does not depend on the firm's performance. However, the performance will influence the renegotiation at the end of the term. The regulatory lag offers some incentives to the firm to reduce costs and thereby raise profits.[190]

Compared to rate-of-return regulation the flexibility of tariffing is increased and competitive responses to entry can be made.[191] Rate-of-return regulation lets regulators set individual rates. Rate changes thus become a tedious and time consuming effort. As is discussed in more detail in chapter 11, price-cap regulation, however, may create new problems. It may give the incentive to reduce costs by reducing quality and it creates the risk of *capture* of the regulator since the firm invests strategically into cost reductions. Since the investor will look at costs when revision starts, the firm has an incentive to raise costs in the period before. Finally, price-cap regulation may allow the regulated firm to apply predatory pricing.[192]

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190 In more detail: Helm, D. and G. Yarrow (1988), pp.12-28.

191 See: Rohlfs, J.H. (1990), p.5.

192 See chapter 4.3.1.3.

4. Concepts for Competition in Telecommunications

4.1. Competition and Innovation

In the previous chapter it was argued that the absence of competition leads to higher production costs and a more restrictive choice for the customers of the monopolized service. The underlying assumption of the natural monopoly concept is that the owner, managers and employees behave as if the company were operating in a competitive market. This assumption, however, is unrealistic and it was suggested that public organizations tend to pursue objectives other than merely the minimizing of costs of production.

However, even if public firms only mimicked a competitive market situation they would only achieve allocactive efficiency. No incentives exist to achieve technical and qualitative efficiency.

As part (I) showed, the telecommunications industry, however, is characterized by rapid innovation in the service and the transmission market. The legally protected public or private monopolist does not have the same incentive to foster innovation that would exist in a competitive environment. Thus, state intervention based on the natural monopoly argument neglects dynamic aspects. These, however, can be expected to be strong in telecommunications.

However, there are further aspects of telecommunications networks which favour the introduction of competition. One is concerned with the form of entry. Generally speaking, one may distinguish imitative entry from innovative entry. *Imitative entry* may be defined as the replication of the incumbent's services by using the same technology of production. If imitative entry is likely to occur, the incumbent has little incentive to invest into innovation. The possible return quickly evaporates due to competitors who are able to save the costs of R&D by copying the incumbent's solution. Imitative entry is likely to occur in industries which do not face entry barriers due to sunk cost.

Where entry barriers exist, incumbents have an incentive to invest in *innovative* activities to safeguard present and future profits. Transitional monopoly positions offer the opportunity to reap profits above average and hence they encourage innovation to maintain this position.[1] However, this incentive also depends on the intensity of rivalry between the incumbent and the potential competitor. This influences the speed with which process and product innovation is introduced. Sunk costs may deter entry by imitation but they cannot deter *entry by innovation*. Innovative entry appears if the entrant either uses a new production technique or provides new services (or both). Competition by innovation

[1] This corresponds to Schumpeter's classical notion of a dynamic and innovative entrepreneur. See: Kruse, J. (1985). p.8.

becomes the disciplinatory force of the market.[2] As is discussed in more detail in chapter 6, in the USA AT&T always has been under the threat of innovative entry. This pressure encouraged it to invest heavily in R&D through its Bell Laboratories which are the biggest private research institute in the world. The *de jure* monopoly position granted in Europe eliminated this pressure on the PTTs. This may be regarded as one major reason for their relative backwardness when compared to the US operators.

The concept of natural monopoly, however, is normally applied only to imitative entry. Process innovation as described in part (I) has eliminated the natural monopoly position of major parts of the telecommunications industry.[3] In order to reap the benefits from technological progress, in the 1980s competition has been introduced in the telecommunications sector. Broadly speaking two different concepts were developed. In the EC the public switched network is left under the exclusive control of national TOs. Like motorways, it is regarded as an element of infrastructure which has to be publicly available to foster competition among service providers. This approach may be called *service-based* competition. It is fundamentally different to the Anglo-saxon approach of *facility-based* competition which envisages competition among network operators. Thus, in the case of facility-based competition operators provide their services on the basis of own facilities while service providers hire leased lines from the public switched network. In what follows I concentrate on the latter. The different features of service-based competition are briefly characterized. It is pointed out where the limits of this approach can be expected. It is discussed in more detail in chapter 7.

4.2. Service-Based Competition

4.2.1. Competition for Basic Services

If network competition is not allowed for, competition for basic services only becomes feasible in the form of resale. *Resale* may be defined as the leasing of a circuit from the public switched network operator and the reselling of the capacity to other customers. By doing so the reseller can make arbitrage gains when undercutting the operator's tariffs in certain markets. The amount of these gains depend on the relationship between leased line tariffs and local and long distance charges in the public switched network. In contrast to the *switched* network connections, leased lines offer communication over a *fixed* connection. The latter is cheaper in the case of heavy traffic. It can be interconnected into the switched network on one or both sides. In the USA resellers are allowed to purchase switched services in volume under high-volume tariffs like Megacom, add billing features and resell them. Similarly *aggregators* combine the monthly traffic of small users and thereby apply for

2 Compare: Gentzoglanis, A. (1990), p.5.

3 Noll, R.G. (1991), p.9.

the discounts granted to big users.[4] To make resale a feasible option, the TO has to be required to offer leased circuits on a cost-based flat-rate basis. Interconnection with the public network is necessary and related interconnection charges have to be cost-based and nondiscriminatory. They should compensate the TO for the actual cost of interconnection. Resale is often regarded as beneficial because it forces the network operator to rebalance his tariffs and eliminate cross subsidization. When in 1990 the US and Canada liberalised resale and shared use of private-line services among both countries, accounting rates[5] of all voice traffic decreased immediately by nearly 50%.[6] The digitization, increased flexibility and intelligence of the new switching systems increase the opportunity for arbitrage since they allow large users to *reroute* their traffic to circumvent excessively high prices.

However, from the perspective of optimal pricing resale is not optimal. It limits the scope for price discrimination to the additional costs of resale. If the latter were costless, its effect would be to introduce a uniform price equal to average cost.[7] Thus, without transaction costs, resale leads back to linear pricing which is inferior to non-linear pricing. Moreover, it does not put any pressure on the network operator to reduce the cost of provision. Hence competition for basic services is of very limited scope as long as a network monopoly persists. It may be beneficial only if thereby internal cross subsidisation is reduced.

4.2.2. Competition for VANS

If competition for VANS is permitted, the TO still keeps the transmission monopoly. Thus it controls the "backbone" network. The service provider has to lease transmission facilities from the network operator and by using her own switching facilities she adds features to the basic service (often called "bearer" service). The VANS provider is explicitly prohibited from providing real-time voice telephony.[8] The network operator's monopoly is reduced to a transmission monopoly thus service providers are entitled to use their own switching facilities if needed to provide the particular service.[9] In EC member states the network operator is also entitled to provide VANS in competition with other service providers. Economies of scope between the provision of basic services and VANS are regarded as strong. This, however, offers the TO two possibilities for unfair practices. One is to provide preferential access to its own service provider. Superior network access may arise in terms

[4] Mitchell, B.M. and I. Vogelsang (1991b), p.61-62.

[5] See in detail chapter 12.

[6] Gilhooly, D. (1991), p. C.10.

[7] Brown, S.J. and D.S. Sibley (1986), p.192.

[8] International Chamber of Commerce (1991), pp. 31-32.

[9] Neumann, K.H. (1987), p.2.

of features, functionality, transmission quality, reliability and prompt installation, maintenance and repair services. The second unfair practice is created by cross-subsidisation. The network operator is able to use profits made in the regulated markets (basic services) to subsidise his activities in the unregulated ones. The TO can overallocate operational costs or improperly assigning investment risk, thereby assigning a disproportionate part to the section operating under special or exclusive rights. Thus service-based competition requires strong regulatory safeguards to supervise the network operator's activities. *Structural* regulatory safeguards separate the sector which operates under exclusive or special rights from the one under competition. Both enterprises then operate on an "arm's length basis" and are treated as separate entities. This is easier to monitor and diminishes the scope for cross subsidisation by reducing joint and common cost. On the other hand structural safeguards lead to a loss of economies of scope. *Non-structural safeguards* instead do not impose a separation of entities. They establish accounting rules according to which costs are assigned as if monopoly and competitive services are offered by unaffiliated entities. It has to be ensured that the capital investment risk is not borne by the monopoly rate-payer.

The main regulatory task is to establish access charges for VANS providers. These have to be fixed by the regulator since otherwise they can be used by the TO to preclude access. The fixing of access charges requires a good insight into the cost structure of the TO. As far as the regulatory experience of the FCC and AT&T before divestiture can be taken as a yardstick, the lack of information on the regulator's side offers considerable scope for anti-competitive behaviour.[10] Moreover, problems arise in the practical application of tariffs (sharing of fixed cost, peak-load pricing, etc), the specification of entry terms and the provision of supporting back-up supplies.[11]

To the extent that economies of scope exist, supervision by the regulator becomes even more difficult because a clear cost allocation is prevented. In order to foster competition the regulator has to determine objective criteria for effective access which have to be *transparent* and *non-discriminatory*. They should be predetermined, thereby excluding discretionary power of the state.[12]

However, in the absence of network competition one may expect that service-based competition is also unlikely to gain force. Since the network operator is not encouraged to reduce network costs, service providers are handicapped since via access charges they have to bear their share of network costs. Moreover, the network operator is not forced to develop and install sophisticated technology which may be needed to transmit new services.

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10 Compare chapter 6.1.

11 See also: Helm, D. and G. Yarrow (1988), p.23.

12 See in more detail chapter 7.2.3.1.

4.3. Facility-Based Competition

The following chapters explore the scope to introduce network competition in the EC. Principally two types of competition may be distinguished: the "national" and the "European" perspective. The traditional viewpoint assumes the presence of one network operator which in the past has enjoyed a *de facto* or *de jure* monopoly position and then faces an entry threat. This may be described as the *national* perspective. Besides the UK, member states of the EC have granted exclusive rights to their network operators. Thus, it is assumed that one incumbent is already installed. In that case a regulator who fosters competition has available three alternative approaches. If the cost function is subadditive he may substitute competition within the market with competition for the market. Alternatively the theory of *contestable markets* proposes that *potential* competition can replace *actual* competition. Both concepts are discussed for their relevance for telecommunications. Finally, if the market is not considered to be a natural monopoly, a second (or more) operator may be licensed. This was the policy chosen in the UK. In this case the incumbent's scope for strategic behaviour is of special interest. This is discussed in chapter 4.3.1.3.

In the *European* context there is also a reasonable second approach to investigate the scope for facility-based competition. One may study a situation where many incumbents operate in markets which are separated due to technology. Regulation and the cable network so far have prevented, for instance, France Telecom and the Deutsche Bundespost Telekom from competing in the provision of basic services. A regulatory change could lead to indirect competition by comparing the performance of national TOs (yardstick competition). Alternatively competition among these operators could be introduced by licensing one entrant who may choose one of the national markets. Incumbents start competing against each other trying to push the entrant to the other's market. This is modelled as a *rat-race*.

4.3.1. Competition with One Incumbent

The first two approaches discuss the substitution of "*competition for the market*" for the traditional concept of "*competition within the market*". Competition for the market may become a substitute if entry barriers or subadditivity aspects make competition within unfeasible or uneconomical. Both, the concept of franchising and the contestable market theory will be discussed as far as their relevance for telecommunications is concerned.

4.3.1.1. Franchising

Demsetz has pointed out that natural monopoly does not imply the need for state controlled provision (either by public provision or regulation). Instead he proposed that rival sellers could compete for contracts with buyers. *Bidding competition* for the market could essentially replace competition within the market. The franchise would be granted to the firm promising the lowest price for the provided service.[13] Alternatively, the service price could be fixed in advance and the firm making the highest bid could be licensed. In that case the allocation is done through an auction and the government receives the proceeds.[14] If all bidders are symmetric, the highest bid corresponds to the monopoly rent which can be reaped thereafter.[15] The monopolist still exploits his market power and consumers pay the monopoly price. However, the monopolist makes a side payment which is equal to the present discounted value of monopoly profit over all future time to the government. Thus bidding competition leads to a redistribution of the monopoly rent to the government. Given perfect foresight and the existence of several bidders which do not collude, the bidders could only achieve an average return on their investment. The enterprise has strong incentives for X-efficient production during the franchise period since all cost reductions render higher profits. Franchising then leads to technical efficiency.[16] It appears to be an attractive approach towards natural monopoly since it combines the advantage of single firm cost-efficiency with the advantages of competition.

The assumptions under which franchising would reap the desired results, however, are rather strong. Various reasons render it rather unlikely that it becomes feasible for the public switched telecommunications network. First of all the amount of capital needed to buy a telecommunications franchise is considerably high. This and the need for experience reduces the number of potential bidders.[17] A serious threat of collusion between these bidders exists. Second, the telephone network is a multiproduct industry. Comparisons of different bids would have to rely on certain criteria to evaluate different sets of prices. Moreover, besides the price some measure of quality has also to be introduced since normally a trade-off between quality and price exists. When deciding on objective criteria the franchising body has to have information on consumers' preferences. Most important,

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13 Demsetz (H. (1968), p.56/57. The distinction between "competition for the field" and "competition in the field" had first been made by E. Chadwick (1859), p.381.

14 An auction was the underlying principle for the sale of the Compañía de Teléfonos de Chile (CTE), where Telefónica bought for US $ 388 million the majority of shares. See: FinTech, February 21, 1991, and Sharma, P. (1991), pp.36-38.

15 Tirole, J. (1989), p.77.

16 Compare: Kruse, J. (1986), p.234.

17 One of Demsetz' assumptions has been that all inputs are available to potential bidders. This, however, is unlikely to be fulfilled for a trained and experienced working force. Instead it is more likely that the incumbent operator has a considerable advantage by controlling production specific input factors. See: Demsetz, H. (1968), p.58.

however, is the question of the time horizon of the franchise. Short franchise periods have to be preferred since then the regulator is able to react to shifts in demand and changes in production technology. On the other hand most of the investments made into the telecommunications network are durable and irreversible. In the case of short franchising periods these investments pass from one franchisee to another. This offers a wide range of strategic actions for the incumbent.[18] Moreover, the danger exists that the wrong technology will be chosen since the franchisee is more concerned with winning the next franchise than minimizing long run costs if the latter cannot be reaped by himself. If the incumbent is likely to lose the forthcoming bidding it is difficult to ensure that long-term investments are undertaken adequately. The combination of irreversible long run investments and quick changes in technology and demand then makes franchising rather inefficient. A conflict of aims arises between allocative efficiency which requires long term franchises and technical and qualitative efficiency which require shorter franchise periods. Rapidly changing market conditions, moreover, make the assumption of perfect foresight and complete information for all bidders unrealistic, rather they offer the incumbent firm considerable advantages. Having been the previous supplier the latter is better informed about likely market changes. This will either allow the incumbent to reap extra rents or it leads to the *winner's curse*. By the fact that another bidder has won the contract against the better informed incumbent the former already knows that she has offered too much.

Vickers and Yarrow therefore conclude that the Chadwick-Demsetz proposal is useful only in cases of simple contracts.[19] In the case of the public switched telecommunications network, contract specification and administration would raise immense problems. However, franchising has become a feasible concept for *mobile* networks where the scarcity of bandwidth limits the number of operators. This is discussed in more detail in part III.

[18] Strategic actions may comprise "strategic accounting" (the choice of depreciation periods), the moment of investment, and the choice of technology. See in detail: Kruse, J. (1985), pp.344-365.

[19] Vickers, J. and G. Yarrow (1985), p.30.

4.3.1.2. The Potential Entry Threat

Franchising was described as a market solution for a natural monopoly. It substitutes competition for the market for competition within the market. Competition for the market can also arise between an incumbent and a potential entrant. Although no actual entry occurs, the incumbent is forced to take measures against the entry threat. These measures aim at driving the entrant's post-entry profits below the average return she could reap in other markets. As a result the entrant decides to stay out. Defensive measures of the incumbent may either increase society's welfare or lead to a waste of resources. If the incumbent reduces cost of production and raises output as a reaction to the entry threat overall welfare is increased. Potential competition has served as a substitute to actual competition within the market. This is discussed in the present chapter. The contestable market theory describes an extreme case where potential competition renders the same outcome as "perfect" competition. Thereafter I extend the example of chapter 3.1.7. which described the case of a unsustainable monopoly. The extension shows that if the incumbent can react to the entry threat, regulatory entry barriers may become unnecessary and the potential entry threat raises overall welfare.

Contestable market theory shows that under certain strong conditions *potential entry* can force an incumbent to behave as if put under actual competition. Therefore the dismantling of entry and exit barriers has been proposed as a policy alternative to regulation or nationalisation when addressing a natural monopoly. This goes beyond Demsetz's proposal in that the bidding process is relinquished. The latter still can be seen as an interventionist means. The regulatory authority which organises the auction has considerable power to influence the outcome. For Demsetz the auction is necessary to prevent the winner of the bidding from reaping all the benefits of a temporary monopoly position. Contestable market theory denies that these benefits materialise. It relies on the vigilance of entrepreneurs outside the market. They will enter as soon as the monopolist's profits exceed the average rate of return in other markets. In that case the bidding process is no longer necessary. The theory of contestable markets has thus become a cornerstone in the present discussion concerning deregulation in the telecommunications industry. Before discussing its relevance for the industry, I present a short description of this approach. Since the presumption of the absence of any entry and exit barriers is crucial, I begin with this issue.

A **contestable market** is defined as a market "*into which entry is absolutely free, and exit is absolutely costless*" [20].

Furthermore it is assumed that[21]:

[20] Baumol, W. J. (1982), p. 3.

[21] Here I will concentrate on the assumptions especially relevant for the telecom-sector. See: Baumol, W.J. et al (1982), p. 200 and Windrich , R. (1987), p. 67.

1.) The productive techniques are known and generally available. This excludes any advantages for the incumbent like market experience or a lead in innovation.

2.) While fixed costs may exist, sunk costs are excluded. This assumption implies that all suppliers have the same rights. This excludes for instance conditions imposed on licensed carriers, which impede market exit and thereby increase the opportunity cost of entry.

3.) The potential entrant has **Bertrand-Nash expectations**: The potential entrant assumes that the pre-entry price set by the incumbent will prevail after entry. In this case an unsustainable price vector will induce entry. The potential competitor therefore neglects the possibility of strategic behaviour and a price war.

4.) **Consumers** instead react immediately if a slight price difference occurs. Their decision depends only on the price; other parameters for consumer choice are ruled out (like quality, product label, etc).

Given these conditions, contestable market theory explores the requirements which have to be fulfilled to render a monopoly configuration sustainable.
Strict subadditivity is shown to be a necessary but not a sufficient condition to guarantee the existence of a sustainable price-output vector for a market without entry barriers[22].
Failure of subadditivity would imply that the monopoly coalition could be split into a set of subcoalitions in such a way that every subcoalition can benefit. Subcoalitions may involve either smaller firms producing the same range of outputs as the monopoly coalition, or a set of specialized firms with each providing only one item of the initial bundle. Scale economies preclude only the first case; they cannot prevent the latter type of "economies of specialization"[23].
Panzar and Willig have shown that the firm which breaks even in a contestable market will behave optimally from society's point of view[24].
The monopoly is not sustainable if it does not produce at the lowest possible cost, if it sets prices above the marginal cost, and if it applies cross subsidisation or predatory pricing. Thus, in a contestable market a monopolist is only sustainable if he does not abuse his market position. Potential competition forces him to behave as under perfect competition. In particular, **hit-and-run-entry**[25] makes the monopolist vulnerable: any departure from

22 A proof can be found in: Baumol, W.J. et al. (1977), p.353.

23 Baumol, W.J. et al. (1982), p. 173.

24 Panzar, J.C., and R.D. Willig (1977), p.7.

25 Hit-and-run entry signifies that the entrant is able to undercut the incumbent's price vector slightly and sell as much as she wants (up to the output level formerly held by the incumbent). Before the incumbent is able to respond the entrant can make her exit.

optimal pricing, cross subsidisation or the failure to produce at minimum cost offers the potential entrant an incentive to enter, make a profit and depart before the monopolist can react. Exit is assumed to be completely costless. The "*weak invisible hand*" is therefore able to control monopolistic markets[26]. Society in that case gets both efficiency in production, which requires only one enterprise in the market, and efficiency in distribution, which requires that the single firm mimics the behaviour of a competitive market. Therefore the authors claim that the theory of contestable markets is a substantial generalization of the classical theory of perfect competition[27].

Besides offering new theoretical insights contestable market theory promised to rewrite the rules for antitrust policy. The authors claim that their theory can readily be applied.[28] As Baumol put it: "*It tells us that a history of absence of entry in an industry and a high concentration index may be signs of virtue, not a vice.*"[29] According to him the analysis has shown that markets which are far from meeting conditions required from perfect competition nevertheless perform well. Public intervention therefore should be restricted.[30] Traditional means of antitrust policy like indicators of poor market performance (concentration indexes, price discrimination, vertical integration etc), have to give way to contestability as a benchmark, which Baumol sees as "*appropriate and applicable to virtually all industry structures*".[31]

The main message of the contestable market theory is therefore to direct antitrust policy aims away from securing a certain level of competition inside a market toward lowering entry barriers. This would meet regulators interest in that most of the day-to-day supervision of private dominant firms could be relinquished.[32] In Europe, TOs could be privatised and left on their own since the entry threat would impose a sufficient safeguard against an abuse of market power. Thus, applying the contestable market theory to telecommunications would have far reaching consequences. As Bailey argued: "*Under the contestability framework, entry and price regulation is deemed inappropriate in industries which do not have system - wide natural monopoly characteristics. On this criterion brokerage, airline, trucking,* **long distance telephone** *and terminal equipment should not be regulated.*[33]

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[26] Baumol, W.J. et al. (1977), p. 351.

[27] Baumol, W.J. et al. (1982), p. 15.

[28] Bailey, E.E. (1981), p. 179.

[29] Baumol, W.J. (1982), p.4.

[30] Baumol, W.J. (1982), p. 14.

[31] Baumol, W.J. (1982), p.479.

[32] As Baily put it: "*...while the weaknesses of the contestability doctrine may have been evident to some early on, the doctrine remains very influential in Washington.*" Compare: Baily, M.M. (1987), p. 38.

[33] Bailey, E.E. (1986), p.1 (emphasis added by the author).

There is little doubt that the contestable market theory was a leading force for the divestiture of AT&T in 1984. While telecommunications networks may not fulfil its underlying assumptions, the authors postulated that the extension of their policy recommendations to *"nearly contestable markets"* would be adequate.[34] In order to shape regulatory policy according to their findings the authors suggested *"rules of thumb that can be used to guide policy design"*.[35] By doing so, the application of contestable market theory to real markets was suggested without stressing the importance of the underlying conditions.[36] However, the contestable market approach appears to be applicable only to the extent that the conditions summarised before are fulfilled. The theory is related to markets which have attributes of natural monopoly as well as free and easy entry and exit. The assumption of free entry is substituted for the price-taking behaviour in cases of internal competition. At first sight the telecommunications industry fits as an example since internal competition either has never existed (Europe) or was almost extinguished during an early period of competition (USA). Entry barriers are present but partly due to regulatory measures. Thus the dismantling of entry barriers could make the market more contestable. However, the contestable market approach relies on an extreme case by assuming **"ultra-free-entry"**.[37] As Shepherd points out, this is based on three rather strong assumptions. First, it implies **"entry without limit"**: the entrant can immediately duplicate and replace any existing firm. Thus entry is total and does not encounter any lags. Second, it assumes **"absolute entry"**: this excludes any price response by the Bertrand-Nash expectation. Moreover, even a tiny price difference will be sufficient for the entrant to prevail and sell his output up to the previous level provided by the incumbent. Lastly **"complete reversibility"** is implied: sunk costs are zero, therefore exit does not involve any costs.

First of all, these conditions are inconsistent. The assumption of an inactive incumbent is only valid for trivial entry (entry on a small scale). *"Total entry, which would entirely duplicate and replace even a monopolist, would be particularly absurd in a Bertrand-Nash model"*.[38] While entry on a small scale is consistent with price taking behaviour, it is excluded for markets where technology requires a large market share to produce efficiently. Furthermore, entry on a small scale very much resembles the ordinary model of perfect competition which also assumes that price taking firms will enter a market as soon as its profitability is presumed to be above average rate of return.

While large scale entry is precluded by the Bertrand-Nash assumption, it is crucial to exert the disciplinary power over the monopolist. This discipline forced upon the monopolist

[34] Baumol, W.J. et al. (1982), p.14.

[35] Bailey, E.E. (1981), p.181.

[36] This can be seen for instance when comparing Baumol, W.J. et al. (1982), pp.476-483.

[37] A term coined by W. Shepherd: Shepherd, W.G. (1984), p.573.

[38] Shepherd. W.G. (1984), p.576.

from outside, is the major argument in favour of replacing regulatory measures by the pressure of potential entry.[39] This was the basis for the authors' claim to have generalised economic theory by giving the "invisible hand" additional power over monopolistic markets. Furthermore, even for contestable markets it is not clear whether a monopolist will indeed choose to set prices equal to marginal cost. If entry and exit are completely costless, the monopolist himself might opt for maximising short term profit and to leave the market as soon as entry occurs. Hit-and-run entry is very unlikely to occur even in the absence of sunk costs. For instance, financial markets are likely to place potential entrants at a disadvantage with respect to incumbents. This offers the latter the opportunity to engage in strategic behaviour.[40] As far as telecommunications networks are concerned all three conditions of "ultra-free-entry" are clearly violated. Building up a second network is time consuming. Entrants like Mercury, MCI or US Sprint were able to enter only on a small scale. Only over time are they able to build up their networks. Second, the incumbent's price responses have been quick and considerable which contradicts the Bertrand-Nash expectation. Third, high sunk costs preclude hit-and-run entry. Exit is costly in telecommunications markets where most of the network entails specific investment.

Baumol himself acknowledges that most markets are not perfectly contestable, but "*may be approximately so.*"[41] He supposes that nearly contestable markets perform in nearly the same manner as perfectly contestable markets do. Schwartz and Reynolds have pointed out a deficiency of contestability theory which precludes this supposition. It is **not robust**. Any slight deviation from the strict assumptions made, may result in a very different outcome.[42] What kind of outcome this would be cannot be analysed by applying the concept of contestability. This derives from its static approach. The static analysis prevents the modelling of a game which makes those strategies explicit which might be adopted by the monopolist or entrants.

Predictions about strategic behaviour, moreover, are more realistic if they take quantity as given instead of price. Quantity sustainability assumes that the monopolists' quantities remain fixed. Thus firms vary their price in order to maintain a certain market share. This applies for standardised products. In the case of differentiated products price setting behaviour becomes more relevant, because a slight price difference does not generate a complete loss of sales. For telecommunications services the product may be regarded as standardised (though there may be differences in the quality of transmission). Dominant firms often are more profitable because they exert market control due to a high market share.[43] This is relevant in particular for the telecommunications industry, with a large

[39] The assumption that fixed costs do not amount to entry barriers as well presupposes total entry. Entry on the fringe instead implies that fixed cost per unit are higher for the entrant, who therefore faces an entry barrier.

[40] Martin, S. (1989), p.1102.

[41] Baumol, W.J. et al (1982), p.14.

[42] Schwartz, M. and R.J. Reynolds (1983), p.488/9 and: Agliardi, E. (1990).

[43] Brock, W.A. and D.S. Evans (1983), p. 79.

share of sunk cost and small variable cost. In that case it is in the incumbent's self interest to maintain output level after entry.[44] Brock and Scheinkman have shown that quantity sustainability is a weaker concept than price sustainability. Price maintenance instead is the most favourable response the incumbent can offer to an entrant. If the monopolist's output configuration is sustainable, entrants anticipate negative profits even without taking into consideration the depressing effect of their output on price; the monopolist is secure indeed. The incumbent's configuration might, however, be quantity sustainable without being price sustainable. Therefore keeping market share is more unfavourable towards the entrant. It enhances the monopolist's chance of fencing off competitors. Brock and Evans therefore argue that the assumption made by Baumol et al. implies **irrational behaviour** on the part of the monopolist. He charges a price which encourages entry which virtually annihilates his position. Thereafter the incumbent does nothing to counter the entrant's challenge.[45]

The concept of quantity sustainability is based on Cournot's quantity equilibrium. Its considerations lead to the traditional concepts of oligopoly theory. In contrast to Baumol et al. quantity sustainability stresses the importance of the traditional concept of market share. It therefore furthermore weakens the claim that measures based on the contestable market theory could replace regulatory policy towards natural monopolies.

Summing up, the theory of contestable markets provides a solution for an ideal market situation which is very unlikely to materialise. Its conclusions cannot be applied to market configurations which are not perfectly contestable. Therefore the claim that the theory is more general than the concept of perfect competition has been rejected. Instead Shepherd argues that simply an "*odd special case*" has been added to economic theory.[46] It has worked as a reminder of the importance of potential competition which hardly is a new idea.[47] As Vickers and Yarrow conclude: "*Entry should be made as free as is practicable, but it would be foolhardy to restrict policy to the easing of entry.*"[48]

The following example shows how potential competition can increase overall welfare in a natural monopoly. Moreover, extending the previous model of chapter 3.1.7. it is seen that if technology is not fixed, an unsustainable natural monopoly may become sustainable. This result is related to chapter 4.1. which argued that entry pressure may lead to innovation and higher productivity. The following example shows a case in which due to natural monopoly

[44] Brock, W.A. and J.A. Scheinkman (1983), pp.222/223.

[45] Brock, W.A. and D.S. Evans (1983), p. 76

[46] Shepherd, W.G. (1984), p. 577.

[47] "*It is hardly necessary to point out that competition (...) acts not only when is being but also when it is merely an ever-present threat (...). The businessman feels himself to be in a competitive situation even if he is alone in his field (...).*" Schumpeter, J.A. (1950), p.85.

[48] Vickers, J. and G. Yarrow (1985), p.19.

characteristics society as a whole is better off if no entry occurs. However, also the incumbent has an incentive to prevent entry and maintain his monopoly position. Unlike the case described in chapter 3.1.7. now the incumbent can invest in the reduction of his marginal cost. It is seen that in this case society is better off to "liberalise" the market and to allow the entrant to come in. The incumbent is forced to invest more than he would have done as a monopolist. As a result, the entrant is kept out. The entry threat, however, has reduced the incumbent's cost of production and it has raised output and overall welfare.
For convenience I repeat the features of chapter 3.1.7.

The model

A market for one homogeneous good is considered. There are two firms only. Incumbent "I" has already installed his network in the market. In period 1 he can invest in an upgrade of his production technology. This reduces his marginal cost of production while raising fixed cost. All fixed costs are assumed to be *sunk*. At the beginning of period 2 the entrant "e" makes her entry decision. If she enters thereafter both firms play Cournot with different marginal costs. If not, firm "I" remains a monopolist.
Both firms have *perfect information*. Thus, when making her entry decision, the entrant knows the incumbent's investment in period 1. Both firms also have *complete information*, thus they are informed about the cost function of their rival.

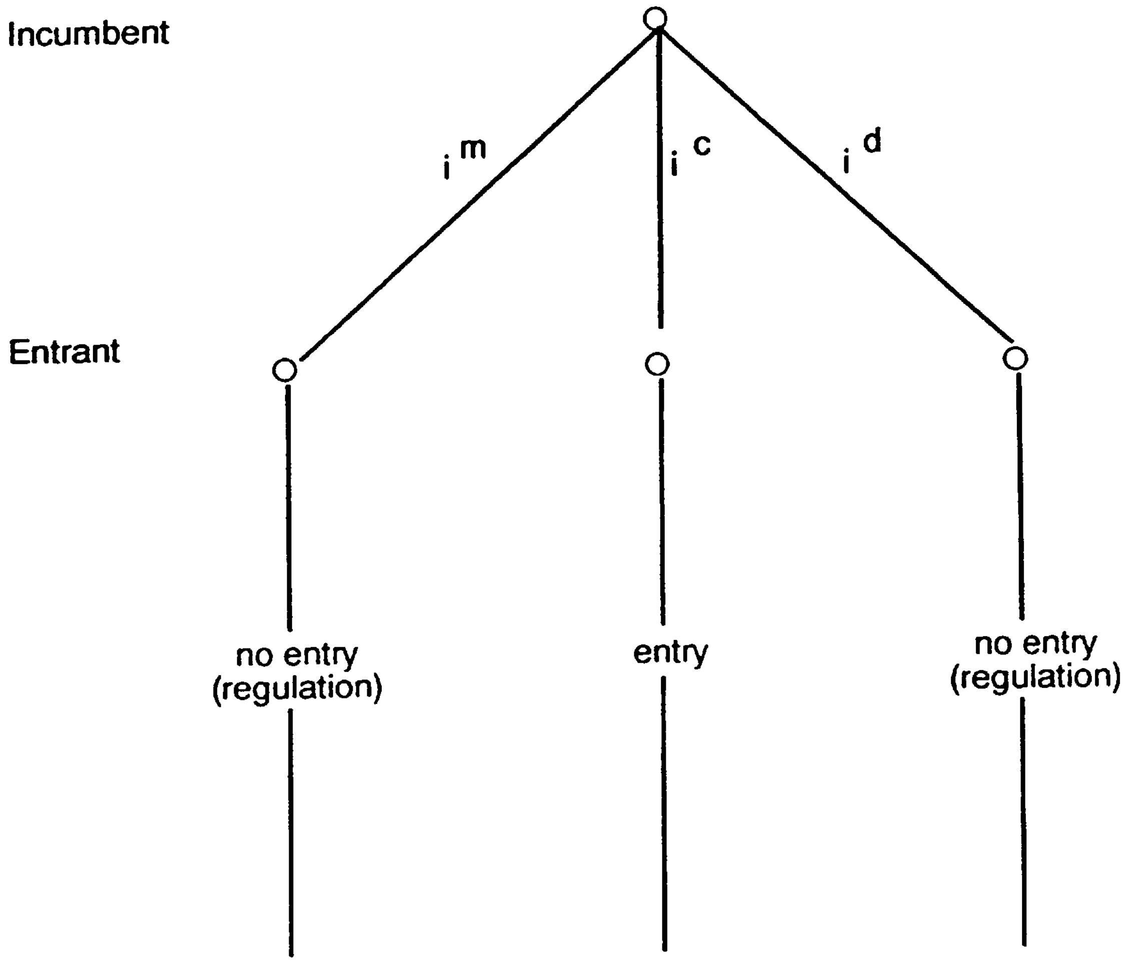
The demand function is assumed to be linear:

$$p = a - b\,(x_I + x_e) \tag{3.4}$$

The incumbent's cost function is given by

$$C_I = (c - i)x_I + (z/b)\,i^2 + F \qquad (z/b) > 0 \tag{4.1}$$

Thus, in period 1 the incumbent can invest i in the reduction of his marginal cost. This raises fixed cost by $(z/b)\ i^2$ (investment costs). It is easy to verify that for $i = 0$ (4.1) reduces to the previous example (3.5).
(z/b) is a constant. The denominator b is only a normalisation. In order to keep the algebra interpretable in the following example I have chosen $z = 1.5$. Similar results would be obtained for a large range of z.
The entrant produces according to (3.5).



$$
\begin{bmatrix}
\pi_I^{mi} = \frac{3}{10}\, b\, S_c^2 - F \\
\pi_e^e = 0 \\
B^{mi} \quad \frac{9}{50}\, b\, S_c^2 \\
W^m = \frac{12}{25}\, b\, S_c^2 - F
\end{bmatrix}
\quad
\begin{bmatrix}
\pi_I^{ci} = \frac{3}{19}\, b\, S_c^2 - F \\
\pi_I^{mi} = \frac{25}{361}\, b\, S_c^2 - F \\
B^{ci} = \frac{98}{361}\, b\, S_c^2 \\
W^c = \frac{180}{361}\, bS_c^2 - 2F
\end{bmatrix}
\quad
\begin{bmatrix}
\pi_I^{ci} \\
\pi_e^d \\
B^d \\
W^d
\end{bmatrix}
$$

Figure 4.1.: *The potential entry game*

There are three possibilities. First, society may prevent entry by regulation. An absolute entry barrier is installed by granting exclusive rights to the TO. In that case the incumbent realises the unconstrained monopolist profit. Second, entry is allowed and the incumbent chooses to accommodate the entrant. In that case in period 2 both play Cournot. Third, entry is permitted by regulation but the incumbent deters.

The Monopolist's Output

If there is no entry threat, the monpolist maximises

$$\pi_I^{mi} = [p(x^m) - (c - i)]\, x^m - 1.5/b\, i^2 - F \tag{4.2}$$

Maximising (4.2) with respect to x^m and i leads to the monopolist's investment and output

$$i = \frac{1}{5} b\, S_c \qquad x^m = \frac{3}{5} b\, S_c \tag{4.3}$$

Thus, even without an entry threat the monopolist will invest into the reduction of his marginal cost. Compared to (3.7) he increases his output.

Finally the monopolist's profit will be

$$\pi_I^{mi} = \frac{3}{10} b\, S_c^2 - F \tag{4.4}$$

which also exceeds (3.8).

The Cournot outcome

In the case where entry takes place in period 2 both firms play Cournot. However, in period 1 the incumbent has some power to influence the outcome to his advantage. He maximises

$$\pi_I^{ci} = [p(x_I + x_e) - c + i]\, x_I - (1.5/b)\, i^2 - F \tag{4.5}$$

Maximising (4.5) with respect to x_I gives the incumbent's first order condition for his output, given his prior investment.

$$x_I = \frac{S_c}{2} - \frac{x_e}{2} + \frac{i}{2b} \tag{4.6}$$

Instead, the entrant's reaction function becomes

$$x_e = \frac{S_c}{2} - \frac{x_I}{2} \tag{4.7}$$

Using (4.6) and (4.7) one can determine the outputs chosen by the firms, which depend on the incumbent's previous investment.[49]

[49] Note that for i = 0, (4.8) represents the quantities both firms realise in the simple Cournot case.

$$x_I = \frac{S_c}{3} + \frac{2i}{3b} \qquad x_e = \frac{S_c}{3} - \frac{i}{3b} \tag{4.8}$$

(4.8) shows that the Cournot quantities in period 2 are different if both firms produce with different marginal cost. The incumbent's output exceeds that of the entrant.

Now it is assumed that in period 1 the incumbent has a first-mover advantage by deciding i. According to (4.8) the more he invests, the higher will be his post-entry output and the lower will be the entrant's output.

Substituting (4.8) into (4.5) gives the condensed profit function of the incumbent. Maximising the condensed profit function with respect to i then leads to the incumbent's optimal investment if he expects entry in period 2

$$i = \frac{4}{19} b S_c \tag{4.9}$$

(4.9) exceeds (4.3). Thus, anticipating entry, the incumbent will invest more than if he is sheltered from the entry threat by regulation. Finally, in period 2 both firms realise the following quantities and profits

$$\begin{aligned} x_I^{ci} &= \frac{9}{19} S_c \qquad & x_e^{ci} &= \frac{5}{19} S_c \\ \pi_I^{ci} &= \frac{3}{19} b S_c^2 - F \qquad & \pi_e^{ci} &= \frac{25}{361} b S_c^2 - F \end{aligned} \tag{4.10}$$

The result is illustrated in figure 4.2 which depicts the reaction curves of both firms.

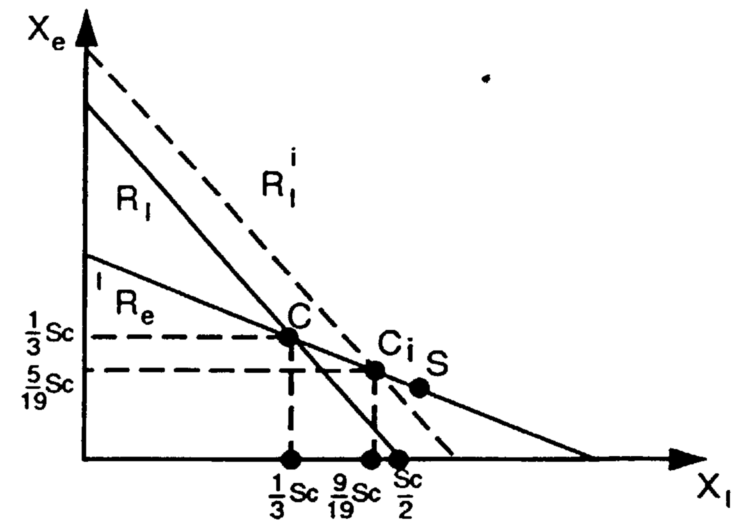


Figure 4.2: *reaction curves of incumbent and entrant*

If both firms operate with the same cost function, C will be the *non-cooperative Nash equilibrium*.[50] Both firms in period 2 produce the same output and realise the same profit (see chapter 3.1.7). S is the Stackelberg equilibrium with $x_I = S_C/2$, $x_e = S_C/4$. If the incumbent is able to make his investment decision before entry takes place (and if this investment is recognised by the entrant), his reaction function is shifted outwards from R_I to R_I^i. The new equilibrium is C_i. In the particular example I have chosen, the incumbent produces less than in the case of Stackelberg leadership (with equal costs). However, for i > 0 he produces more (the entrant less) than in the symmetric game. Thus, being able to make his investment decision prior to the competitor's entry decision offers the incumbent a *limited* leadership position.

Natural Monopoly

Similar to chapter 3.1.7 one may determine the level of fixed cost which is necessary for a natural monopoly. Entry reduces overall welfare if

$$\pi_I^{mi} + B^{mi} \quad > \quad \pi_I^{ci} + \pi_e^{ci} + B^{ci} \tag{4.11}$$

The right hand side (left hand side) represents total welfare in the case of monopoly (Cournot). If consumer welfare is determined according to (3.9), entry is detrimental for

$$F \; > \; 0.019\, b\, S_c^2 \tag{4.12}$$

Entry Deterrence

In order to deter the entrant, the incumbent has to choose i such that $\pi_e^{ci} \leq 0$. Using (4.8), one can determine the critical level of i (see appendix). If in period 1 the incumbent chooses

$$i^d \geq b\, S_C - 3\sqrt{b}\sqrt{F} \tag{4.13}$$

then the entrant prefers to stay out.

The incumbent chooses i^d if his monopoly profit at this investment level exceeds the Cournot profit in the case of accommodation.

Given (4.13), one can determine the incumbent's monopoly profit in the case of entry deterrence π_I^{md}. If $\pi_I^{md} \; > \; \pi_I^{ci,}$ the incumbent chooses to deter the entrant. This is the case for fixed cost between

$$0.004\, b\, S_c^2 \; < \; F \; < \; 0.22\, b\, S_c^2 \tag{4.14}$$

---

50 In a Nash equilibrium the price and the quantities sold are such that no competitor has an individual interest to deviate from these prices and quantities. Each competitor maximises its profits, given that others do the same. A Nash equilibrium is non-cooperative if collusion between both firms is ruled out. Compare: Phlips, L. (1987), p.28.

Given condition (4.12) then for

$$0.019\, b\, S_c^2 \;<\; F \;<\; 0.22\, b\, S_c^2 \tag{4.15}$$

entry is detrimental for society, but the incumbent will deter the entrant, if entry is permitted. In the case of entry the entrant realises the Cournot profit $\pi_c^{ci} = 25/361\, b\, S_c^2 - F$. One can easily verify that if $F > 0.069\, b\, S_c^2$ the entrant does not enter. For fixed costs of this level entry is *blockaded*. Since it is lower than the right hand side of (4.15), one can conclude that for the example chosen here, the incumbent will always deter if entry is detrimental for society.

Regulation versus Competition

Although the incumbent is able to protect himself, this does not establish by itself that regulatory entry barriers are unnecessary. Since investment is costly, the entry threat may encourage the incumbent to overinvest. Lower marginal cost increase the monopolist's output and hence makes consumers better off. On the other hand, it requires additional resources which in the present model are represented by higher fixed cost.

Society as a whole is better off, liberalising entry if

$$\pi_I^{mi} \;+\; B_I^{mi} \;<\; B_I^{md} \;+\; \pi_I^{md} \tag{4.16}$$

The left hand side (right hand side) represents overall welfare if regulation (deterrence) prevents entry. (4.16) eventually leads to a last condition for fixed cost

$$0.032\, b\, S_c^2 \;<\; F \;<\; 0.071\, b\, S_c^2 \tag{4.17}$$

Given the previous remark for blockaded entry, one finally finds that for $F > 0.032\, b\, S_c^2$ entry is detrimental, the incumbent chooses to deter and society is better off to liberalise.

Although entry is not in society's interest, **potential** entry is beneficial since it forces the incumbent to reduce cost of production and to raise output.

In the case chosen here, the disciplinary force of potential entry is much weaker than it was assumed to be by the contestable market theory. However, it shows the shortcoming of a regulation based on the presumption of an unsustainable natural monopoly. At an investment and output level chosen according to (4.3), the incumbent's position is unsustainable for a certain range of fixed cost. Regulatory entry barriers would cement this position. However, when facing the entry threat the incumbent will not stick to (4.3) but carry out an investment which makes him sustainable, thereby reducing variable cost of production. This raises overall welfare. Hence it is not optimal for society to grant a *de jure* monopoly to the incumbent.

4.3.1.3. The Scope for Strategic Behaviour

The previous chapter showed that a potential entrant can exert some competitive pressure on the incumbent even if entry does not occur. The following chapter discusses in more detail the possibility that incumbents take defensive actions to deter the entrant. Strategic behavior to deter entry becomes relevant in markets with high sunk costs. Entry is likely to considerably reduce the incumbent's profitability especially if it leads to excess capacity in the market. High exit barriers then prevent the incumbent from switching to other markets. On the other hand, irreversible investments also increase the scope for entry deterrence.[51] The previous model described a situation in which this behavior actually can be beneficial for society as a whole. However, it is more likely that the profit maximising behavior of the incumbent conflicts with aims of welfare maximisation. He may try to foreclose the market, or apply predatory pricing. Another alternative is to install excess capacity and to threaten that the market will be flooded in the case of entry. While by so doing the incumbent relinquishes some of the present profits, he expects greater ones in the future by maintaining his monopoly position. This strategic behavior is detrimental for two reasons. First it prevents competition and reinforces the incumbent's dominant position. Second, it leads to wasteful investment (like having excess capacity which is actually never used).

Market foreclosure has been practised in the USA, where AT&T imposed high legal expenses on entrants like MCI trying to receive a regulatory approval.[52] Legal expenditures are normally non-recoverable and thereby become an effective means to raise entry costs.

In Europe market foreclosure becomes relevant for TOs abusing their monopoly position for the public switched network. Mobile network operators and service providers have to interconnect their facilities with the public switched network to achieve access to the residential subscriber. TOs then have an interest in denying or delaying physical access to the local exchanges, or to demand exorbitant access charges. Higher access charges may not only generate higher revenues but also increase the input costs of their competition. The network operator therefore has to find the right trade-off between the lower revenues collected as the wholesaler of network capacity with the higher revenue he expects as a retailer of VANS. The higher are the wholesaler revenues the smaller is the TO's incentive to foreclose. Another limitation arises through the possibility of bypass. High access charges encourage large business subscribers to install their own networks. In that case wholesaler and retail revenues are foregone. However, recent battles over access charges in the UK and Germany have shown that TO's are ready to use their bottleneck facilities for market foreclosure (see part III).

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[51] Compare: Kruse, J. (1985), p. 327.

[52] See: Brock, W.A. and D.S. Evans (1983), and Globerman, S. (1985), p. 321.

While the rationale for market foreclosure is relatively clear and ample evidence exists that it is applied by network operators, predatory pricing is more difficult to establish.

Predatory pricing requires that price be set below the one necessary for cost recovery **and** below the short-run profit maximising price. It has to be distinguished from "limit pricing" which leads to a price permanently set above average cost but below the monopolist's profit maximising price. Limit pricing can be used against potential entrants with higher average costs.

Predatory pricing instead occurs if in a non-cooperative Nash equilibrium the entry value is positive and the incumbent's pricing policy makes it negative so that sunk cost are no longer compensated by the present value of future profits.[53]

Predatory pricing is expected to emerge only in rare cases. If quick entry and exit is possible the predator does not succeed in inflicting losses on rivals through below-cost pricing. Moreover, these losses cannot be recouped by raising prices in the future. In such a case competitors would reenter the market. Finally as McGee pointed out, acquision or merger offers a higher present value than a price war. The latter can be expected to be considerable since by cutting the price the incumbent has to sell more at a price which does not cover costs. When purchasing is cheaper than price cutting, competitors stick it out. Under complete and perfect information predation is impossible because the entrant will not give up.[54] The *chain-store paradox* has shown that predation is impossible in a non-cooperative game which comprises identical markets and a finite time horizon.[55] However, this result does not hold if imperfect information exits. In this case predation can become an equilibrium strategy. One may assume that past behavior is relevant for future periods. The possibility exists that the incumbent is a "fanatic predator". Moreover, entrants may not know the costs of predation. Hence predation must occur. The incumbent has an incentive to preserve a reputation of aggressiveness.[56] If future entry (or entry in other markets of the incumbent) depends on the perfomance of a present entrant, predation becomes possible if the lost profits in this period are smaller than the gains made by keeping further entrants out.

Predation then becomes an equilibrium strategy if five conditions are fulfilled.[57] The aggressor must be a multimarket (or multiproduct) firm; the attack is carried out after entry has occured; the attack brings the price below the non-cooperative Nash equilibrium

[53] Phlips, L. (1988), pp 233-234.

[54] Mc Gee, J.S. (1980), p. 140 and Phlips, L. (1988), p. 199-201.

[55] By backward induction it can be shown that in each period it is better for the entrant to enter. The incumbent is not able to build up a reputation as being "aggressive". Compare: Selten, R. (1978).

[56] See for details: Phlips, L. (1988), pp. 207-211.

[57] See: Phlips, L. (1988), p. 218.

level at which the entry value is positive; the price cut makes the entry value negative and finally the entrant is not sure whether the price cut is predatory. The last condition is required because otherwise the entrant will not enter beforehand and predation would not be observed. This condition, however, also implies that predation is difficult to identify in practice. For predation to occur it is not necessary that the incumbent sets a price below its marginal cost. Rules to determine when predatory pricing occurs can hardly be established.[58] A comparison of marginal and average cost with the price set by the incumbent is not sufficient. Instead it has to be shown that under "normal competition" the present value of future profits exceeds the entrant's sunk cost and that the incumbent's price cut has driven the present value below this level. The difficulty is to show that the observed price cut is not the result of normal competititon.

Telecommunications networks may fulfil the requirements for predatory behavior. High sunk costs increase the incumbent's incentive and the entrant's vulnerability. It is a multiproduct industry and newcomers will only enter some markets. The regulatory separation of competitive and monopoly markets raises the incumbent's scope for predation. Cross-subsidisation from monopolised (basic) services towards liberalised ones (VANS) is feasible.[59] Consequently, the incumbent does not have to recoup all the cost of predatory behaviour in the competitive market segment. Setting prices above marginal cost in the regulated market gives the incumbent resources which could be invested in predation. The regulated market guarantees that the incumbent has sufficient financial means to sustain a price war.

To deter the entrant this cross-subsidization need not exist permanently, so it is often sufficient to announce credibly that it will be applied in the case of entry. However, as Mc Gee points out, the "long purse" argument alone is not sufficient.[60] The incumbent must have an incentive to spend his reserves on predation instead of seeking an alternative return by financial (or physical) investments. This incentive, however, may be given by regulation or public ownership. In the case of rate-of-return regulation the incumbent can cross-subsidise by paying higher prices internally. This may happen in a vertically integrated firm like AT&T where the network operator buys equipment from its own affiliate. The regulated part then incorporates the higher price in its rate base. In that case the telephone subscriber eventually pays the inflated equipment costs of the network operator.[61] In chapter 3.4. it was pointed out that in the case of public enterprises management may substitute the aim of maximising sales for maximising profitability. In such an event cross-

[58] In detail: Phlips, L. (1987), pp. 67-70.

[59] One has to distinguish carefully this kind of cross-subsidization from the one discussed in chapter 3.1.7. The latter is based on political aims of redistribution among customers and may render the monopolist unsustainable. Thus, it rather has the opposite effect to cross-subsidisation, which aims at predation.

[60] Mc Gee, J.S. (1980), pp. 297-300.

[61] Compare chapter 3.4. and: Globerman, S. (1985), p. 323.

subsidies to the unregulated activities of a TO become more likely in order to spur output growth.

Finally it is interesting to note that a private regulated firm may use rules of optimal pricing to hide cross-subsidies. By claiming that the long distance market has become more price elastic since entry has been allowed for, BT tried to convince the regulator that according to the Ramsey rule more of its common cost should be shifted from long distance to the (monopolised) local networks. However, this also fitted its interest when competing against Mercury in the long distance market.

4.3.2. Competition with many Incumbents

In what follows I investigate the case where there are several markets where incumbents produce the same service with the same technology (cable network). As an example, one may consider the intra-EC long-distance market for telecommunications. Competition is precluded in this market by regulation and more importantly by technology. The cable network cannot be transfered from one country to another for the sake of entering the market. Nevertheless, competition can be introduced as is discussed in two different approaches. In the case of yardstick competition the performance of different monopolists is compared. This can be done among TOs operating in different countries. Yardstick competition, however, could also be applied if different firms run local monopolies within one country. The rat-race competition model instead assumes that one additional entrant is licensed which also uses the cable technology. While leaving the decision which market to enter to the entrant, the incumbents are forced into an investment race.

4.3.2.1. Yardstick Competition

If TOs operate under similar circumstances the performance of fellow network operators could be taken as a yardstick to measure the efficiency of management and employees. This "tournament idea" allows to introduce incentives to increase x-efficiency. By using yardsticks, regulation can mimic the incentive properties of a competitive product market despite the fact that the actual market is monopolized.[62] To some extent it allows the regulator to tell whether lower profits are due to managerial slack or demand and costs shifts (which then must be assumed to hit all firms similarly).[63] Granting licences to different operators, each keeping a local network monopoly, yardstick competition could also be introduced within one country. It would still allow the exploitation of economies of density while on the other hand the disaggregated structure provides separate cost and profit centres.

Even if markets are to some extent idiosyncratic, yardstick competition is likely to raise efficiency because it still reveals some information to the regulator, who faces the problem of asymmetric informations regarding the monopolist.[64] Helm and Yarrow propose the following example for price regulated firms.[65] $\blacktriangle$ p (a) is the real allowable price change for an individual firm. It depends on what is anticipated to be a fair rate of return on its *own*

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[62] Yarrow, G.K. (1985)

[63] See: Tirole, J. (1988), pp. 41-42.

[64] Compare chapter 3.4. and: Helm, D. and G. Yerrow (1988), pp. 18-19.

[65] Compare: Helm, D. and G. Yarrow (1988), p. 20.

assets. $\blacktriangle$ p (b) is considered to be a fair rate of return on their assets. Then the following rule may apply

$$\blacktriangle p = \tau \ \blacktriangle p(a) + (1 - \tau) \blacktriangle p(b)$$

where $0 \leq \tau \leq 1$. If $\tau = 1$ there is no yardstick effect. τ close to unity is chosen for idiosyncratic cost and demand conditions. It will be closer to zero if there is a high degree of correlation of costs and demand among the regional monopolists.

However, it is apparent that different conditions limit the use of yardstick competition. Differences, for instance, exist in topography and population density, in input costs and through varying historic costs. The regulator may find it difficult to determine τ when accounting idiosyncrasies and measurement errors exist. Finally, perfomance may depend significantly on the inherited assets which make comparisons more difficult.[66]

[66] Tirole, J. (1988), p. 42.

4.3.2.2. Rat-race Competition

Consider the case that there are several incumbents, each being a monopolist in his submarket. Taking each submarket on its own, natural monopoly considerations may render entry uneconomic. The existence of many incumbents then would offer the possibility of yardstick competition as described above. Alternatively the regulator may license a number of entrants which is smaller than the number of incumbents. Since due to the cable technology an entrant can only enter one market, some incumbents will be able to preserve their monopoly position. Each of them then has an interest in making its own market less attractive for entry than the others are. As a result, incumbents start an investment race. If this race leads to a higher output and lower prices also in the markets which eventually remain monopolized, consumers are made better off. This is modelled in what follows. The investment race thereby may be regarded as an intermediate stage between monopoly provision and full competition. In some markets entry takes place, in others the more efficient incumbents remain monopolists. As far as incumbents enter the race, some competition among them is achieved.

I build on the model presented in chapter 4.3.1.2. Thus incumbents have the possibility to invest in their network before the entrant makes her entry decision. The more an incumbent invests, the lower is his marginal costs in period 2, the higher will be his output in the duopoly, and the lower is the entrant's profit. This may be taken as a rough description of the previously discussed installation of an ISDN network in Europe. As has been pointed out, ISDN investments raise fixed cost considerably while marginal costs of production are lowered substantially. Since the incumbent TOs can carry out this investment before potential competitors are permitted to enter, the former enjoy a first mover advantage which allows them to gain a higher market share in a liberalised market.

The following model shows that prior investment becomes optimal even if entry is certain. However, as will be seen, the investment race is likely to lead to an "overshooting" from society's point of view.

The model distinguishes two cases. First I analyse the discrete case of investment, where the incumbent may either invest a certain fixed amount or he may not: either a complete ISDN network is installed or it is not. In that case incumbents may find themselves in a prisoner's dilemma situation in which the entry threat forces them to carry out the investment. As a result society as a whole is better off.

Secondly I discuss the case of a continuous investment function. This was applied already in chapter 4.3.1.2. In that case each incumbent aims at investing just enough to remain monopolist. The resulting mixed-strategy equilibrium shows that incumbents are likely to overinvest. As a result, society may be worse off compared to a *de jure* monopoly granted to the TOs.

The model

There are two incumbents which face the same demand and cost functions and which both produce the same product. In period 1 both incumbents can invest into the reduction of their marginal cost. The cable entrant is licensed to install one cable network at the beginning of period 2. Due to technology she can only enter one market. For simplicity it is assumed that she cannot choose between different levels of marginal and fixed cost. The profit maximising entrant chooses the market where the incumbent operates with higher marginal cost. If both have invested, the entrant is indifferent and randomises. The post-entry outcome is Cournot in one market and monopoly in the other.

All firms are assumed to be risk neutral and profit maximising firms. For convenience I repeat the features of the chapters 3.1.7. and 4.3.1.2. The only difference is that I neglect fixed cost F which are not related to the investment i. Including F would render the algebra more complicated without leading to new results.

The demand function is assumed to be linear:

$$p = a - b(x_1 + x_2) \qquad (3.3)$$

The cost function of the incumbents is given by[67]

$$C_I(x) = [c-i]x + (z/b)\, i^2 \qquad I = 1,2 \qquad (4.1)$$

The entrant instead is assumed to produce according to

$$C_e(x) = cx_e \qquad c > 0 \qquad (3.4)$$

Joint Entry Deterrence

In this model the emphasis is put on the outcome if entry actually occurs. For the sake of completeness, however, I briefly discuss the case when both incumbents prefer to deter jointly the entrant. This is the case if both incumbents invest i_{threat}, so that the entrant neither enters market 1 nor market 2. The way this example is modelled makes entry deterrence rather unlikely to occur.

Entry will be deterred only if for both markets $\pi_e < 0$.

The profit of the entrant is given by

$$\pi_e = [p(x_s + x_I) - c]x_s \qquad (4.18)$$

[67] The subscript "I" represents incumbent, and "e" represents entrant. As before for the calculations I assume that z = 1.5. For details see chapter 4.3.1.2.

For $\pi_e = 0$ we eventually get the entry deterring investment level [68]

$$i_{threat} = bS_c = (a - c) \tag{4.19}$$

If both incumbents invest more than (4.19) in period 1, their output choice in period 2 will be such that the entrant makes negative profits. Observing the incumbents' investment, the entrant therefore will not enter in period 2.

A graphical illustration shows that this case is unlikely to materialise. The most plausible case is that $(a\text{-}c) > c$, so that $(c\text{-}i_{threat}) < 0$, which is impossible (the incumbent would produce with negative marginal cost). As will be seen below, indeed incumbents co not choose to deter jointly the entrant.

The Entry Threat

If either incumbent invests less than (4.19) then there will be entry in one market at the end of period 1. The entrant will choose the market where the incumbent operates with higher marginal cost (or: where i is lower). The extensive form of the game is depicted in figure 4.8). The payoffs of firms depend on the investment i. [69]

If $i = 0$ then the incumbent realizes π_0^m in the case of no entry or he realizes π_0^c in the case of entry, while the entrant realizes π_e^{co}. Alternatively the incumbent has invested i^a and subsequently his profit in the case of monopoly (entry) is π_i^m (π_i^c, π_e^{ci}).

Thus I define:

π_0^m = monopoly profit without investment.

π_i^m = monopoly profit if i^a is invested.

π_0^c = Cournot profit without investment.

π_i^c = Cournot profit with investment.

The extensive form of the game is depicted in figure 4.3.

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[68] Calculations can be found in the appendix.

[69] The superscript "m" represents monopoly and "c" Cournot.

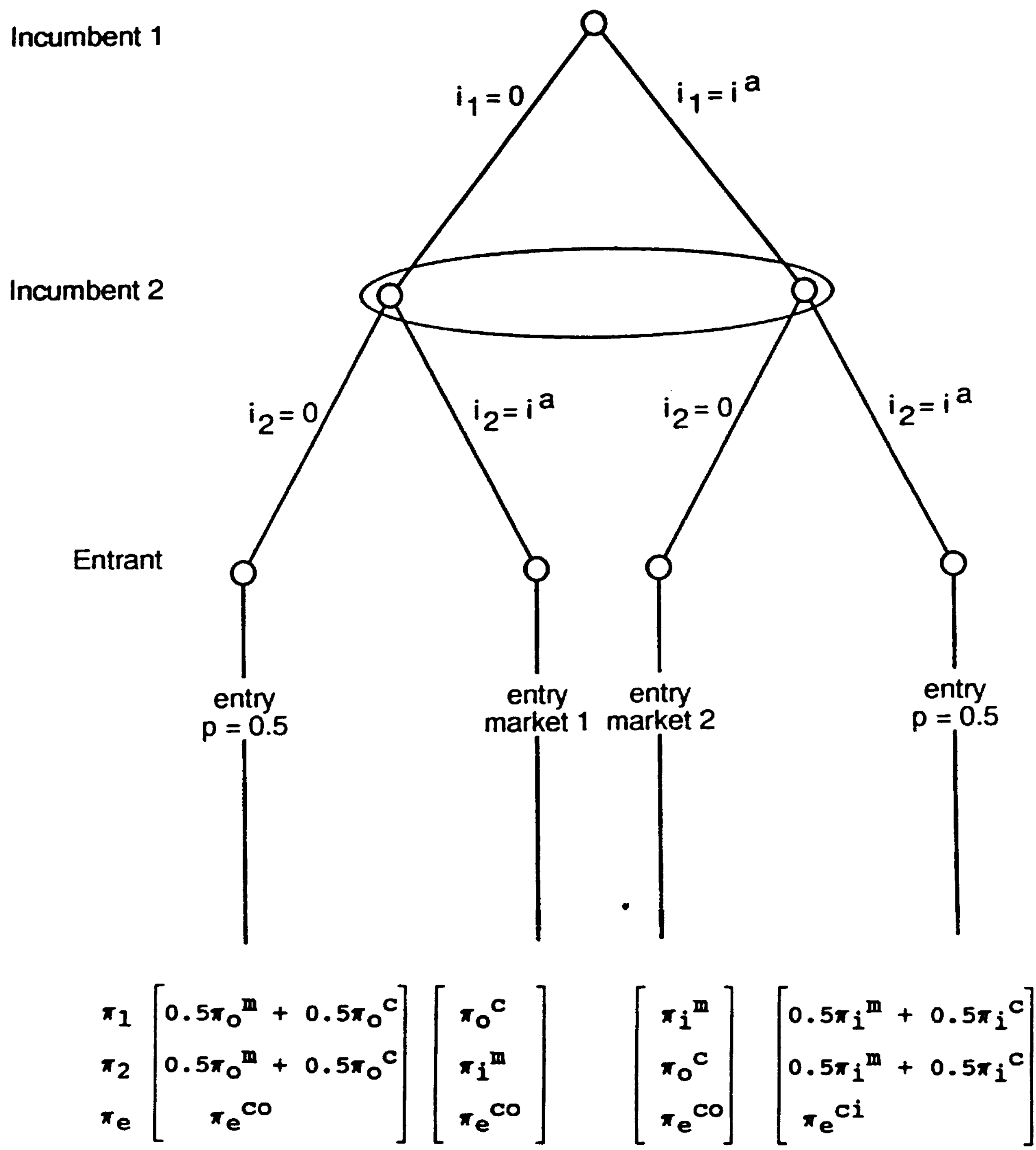

Figure 4.3: *the game tree*

Payoffs:

$$\pi_o^m = \frac{1}{4} bS_c^2$$

$$\pi_i^m = \frac{b}{4}\left[S_c + \frac{i}{b}\right]^2 - \frac{1.5}{b} i^2$$

$$\pi_o^c = \frac{1}{9} bSc^2$$

$$\pi_i^c = \frac{b}{9}\left[S_c + \frac{2i}{b}\right]^2 - \frac{1.5}{b} i^2$$

$$\pi_e^{ci} = \frac{b}{9}\left[S_c - \frac{i}{b}\right]^2$$

$$\pi_e^{co} = \frac{b}{9} S_c^2$$

The payoff matrix for the incumbents is depicted in figure 4.4:

	Incumbent 2: $i_2 = i^a$	Incumbent 2: $i_2 = 0$
Incumbent 1: $i_1 = i_a$	$\pi_1 = 0.5\ \pi_i^m + 0.5\ \pi_i^c$ $\pi_2 = 0.5\ \pi_i^m + 0.5\ \pi_i^c$	$\pi_1 = \pi_i^m$ $\pi_2 = \pi_o^c$
Incumbent 1: $i_1 = 0$	$\pi_1 = \pi_o^c$ $\pi_2 = \pi_i^m$	$\pi_1 = 0.5\ \pi_o^m + 0.5\ \pi_o^c$ $\pi_2 = 0.5\ \pi_o^m + 0.5\ \pi_o^c$

Figure 4.4: *the payoff matrix for both incumbents*

Depending on i four outcomes in pure strategies are possible: Either no incumbent invests (0,0), or one of them (1,0), (0,1), or both (1,1).

Whenever both incumbents have made the same decision about i in period 1, the entrant is indifferent and randomises. For (1,1) to materialize we have to assume that entry deterrence will not be a feasible strategy for incumbents. As will be seen below for the cost function specified in (4.1) indeed entry deterrence will not be chosen by incumbents.

For consumers the best outcome is the equilibrium (1,1), since subsequently prices would decrease most in both markets. Therefore in the following I concentrate on the conditions which have to be fulfilled to reach an equilibrium where both incumbents invest (1,1). Subsequently this will be compared with the case where both incumbents do not invest (0,0).

To make the analysis interesting it is assumed that

$$\pi_o^m > \pi_i^m \tag{4.20}$$

(4.20) implies that the costs of investment are such that without an entry threat neither incumbents would invest.

Since $\pi_o^m = [p(x_m) - c]\, x_m$ using (3.3) to (4.1) we get

$$\pi_o^m = \frac{1}{4} bSc^2 \tag{4.21}$$

Accordingly we get for π_i^m

$$\pi_i^m = \frac{b}{4}\left[S_c + \frac{i}{b}\right]^2 - \frac{1.5}{b} i^2 \tag{4.22}$$

Then (4.20) leads to a first condition for i:

$$i^a > 0.4\, bS_c \tag{4.23}$$

Thus condition (4.20) is only fulfilled if i^a has a minimum level. Otherwise incumbents would invest in the reduction of their marginal cost even if there was no entry threat.

Secondly it is assumed that

$$\pi_i^m > \pi_o^c \tag{4.24}$$

Thus each incumbent would prefer to invest i^a and remain monopolist rather than not to invest and play Cournot with certainty. Similarly from the procedure above we get for π_o^C and i:

$$\pi_o^c = \frac{1}{9} bSc^2 \tag{4.25}$$

$$i^a < 0.59\, bS_C \tag{4.26}$$

Only if i^a is small enough the incumbent will prefer to invest in the reduction of his marginal cost. For high i^a the loss envisaged by entry is less than the costs of investment. Accordingly the incumbent prefers to accommodate.
Eventually it is assumed that

$$\pi_o^c > \pi_i^c \tag{4.27}$$

which corresponds to (4.20). If entry occurs each incumbent would prefer not to have invested into i^a.
Since

$$\pi_i^c = \frac{b}{9}\left[S_C + \frac{2i}{b}\right]^2 - \frac{1.5}{b} i^2 \tag{4.28}$$

finally (4.27) leads to a third condition for i^a

$$i^a > 0.42\, bS_C \tag{4.29}$$

(4.29) includes (4.23) which intuitively makes sense because if entry takes place with certainty the incumbent has a stronger incentive to invest in his marginal cost than if he were to remain a monopolist. Consequently if i is high enough to make the investment unprofitable in the event of entry, it always will be unprofitable in the case of monopoly.
With the assumptions (4.20), (4.24), (4.27) I have established a situation in which all firms prefer (0,0) to (1,1)[70]. Finally we have to investigate when (1,1) will be better for society than (0,0). This will be the case if:

$$B_i^m + B_i^c + \pi_i^m + \pi_i^c + \pi_e^{ci} > B_o^m + B_o^c + \pi_o^m + \pi_o^c + \pi e^c$$

with
B_i^m = the consumer surplus in the case of investment and monopoly.
B_i^c = the consumer surplus in the case of investment and entry.
B_o^c = the consumer surplus in the case of no investment and entry.

The left hand side represents the level of welfare when investment is employed. On the right hand side there is total welfare without investment. If we define

[70] from the payoffs above we immediately see that the entrant will always prefer no investment.

$$B = \frac{[a - p(x_I + x_s)]}{2} (x_I + x_s) \tag{4.30}$$

then we find that investment will improve total welfare if

$$i^a < 0.593\, bS_C \tag{4.31}$$

Since (4.31) is included in (4.26) it can be neglected in what follows. Thus, society as a whole is always better off with investment.

A Prisoner's Dilemma Situation

In the present example, society as a whole would be better off if incumbents invested into the reduction of their marginal cost. The latter, however, have contrary interests. They prefer no investment.

Given (4.20), (4.24), and (4.27) we find that there are two conditions to be fulfilled for (1,1) to be the only pure-strategy equilibrium. Each incumbent must be better off with investment in the event that the other does not invest as well as in the event that the other invests. In that case both incumbents will invest in period 1.

$$\pi_i^m > 0.5\, \pi_o^m + 0.5\, \pi_o^c \tag{4.32}$$

If the other incumbent does not invest then a risk neutral incumbent will invest if the monopoly profit after investment exceeds the expected profit of no investment. The latter is given by an equal probability of remaining monopolist and facing entry.

$$\pi_o^c < 0.5\, \pi_i^m + 0.5\, \pi_i^c \tag{4.33}$$

Alternatively firm 2 is assumed to invest. Then incumbent 2 will invest as well if the expected profit of investment exceeds the Cournot profit if there is no investment.

If (4.32) and (4.33) are fulfilled both incumbents will choose to invest in i and (1,1) is the Nash equilibrium. Similarly to the discussion above (4.32) and (4.33) lead to two further conditions for i^a:

(4.32) is fulfilled if $\quad i^a < 0.51\, bS_C \quad$ (4.34)

(4.33) is fulfilled if $\quad i^a < 0.52\, bS_C \quad$ (4.35)

Since (4.34) includes (4.35) we can neglect the second condition for (1,1).

Comparing (4.34) and (4.19) we find for the case discussed here that entry deterrence will not be a feasible strategy. The investment which has to be carried out by both incumbents in order to deter would reduce their profits by more than if they decide to play Cournot.

Then as a first result for a certain range of i^a we see that both incumbents are trapped in a *prisoner's dilemma* situation.

If

$$0.5\,\pi_0^m + 0.5\,\pi_0^c > 0.5\,\pi_i^m + 0.5\,\pi_i^c \tag{4.36}$$

then both firms prefer (0,0) to (1,1). Thus both would be better off if there were a binding agreement not to invest.
(4.36) leads to

$$i^a > 0.41\,bS_c \tag{4.37}$$

(4.34) and (4.37) then lead to

$$0.41 < i^a < 0.51 \tag{4.38}$$

If i^a is in the range defined by (4.38) then both incumbents in period 1 find themselves in a *prisoner's dilemma*. Both prefer the situation where no one invests to the one of investment by both firms. However, they are both better off to invest if the other one does not. Moreover, if the other incumbent invests, as well, according to (4.33) and (4.35), they are better off investing. Thus both incumbents will invest and the equilibrium will be (1,1), if no binding agreement is possible.[71]

This simple model has shown that, in a fragmented market, competition among incumbents is introduced. Thereby overall welfare can be increased. This results holds even if the entrant is not able to enter more than one market and if entry is limited to only one firm. The regulator has to announce the licensing of one entrant for the next period. Incumbents then will invest in the reduction of costs of production. This leads to an investment race in which both incumbents compete against each other.
Consumers in *both* markets are better off because lower costs of production ceteris paribus increase the firms' outputs.

71 In the prisoner's dilemma we may even include the entrant who, as well, would prefer (0,0) to (1,1).

Limiting Entry as a First Best Solution

As far as private telecommunications operators have been permitted to enter at all, regulators have refrained from complete liberalization. Instead the number of competitors has been kept small.[72] This artificial restriction is sometimes justified by high fixed costs. However, in chapter 3.1.7. it was shown that the level of fixed costs alone cannot justify the restriction of entry by regulation. Instead, if a sustainable (natural) monopoly existed, a potential entry threat could be beneficial because it forces the incumbent to choose a price below the monopoly price. In the following I try to point out a case where limiting entry might indeed be beneficial for society.
The case that society is better off if entry is restricted to only one entrant arises if condition (4.27) is fulfilled and if in the previous game (1,1) is a Nash equilibrium. If two entrants are allowed for then each incumbent believes that entry is will take place and if (4.27) holds he will not invest.

Using (3.3) and the quantities which were calculated for the profit functions above, I obtain

$$B_i^m = \frac{b}{8}\left[S_c + \frac{i}{b}\right]^2 \tag{4.39}$$

$$B_i^c = \frac{b}{18}\left[2S_c + \frac{i}{b}\right]^2 \tag{4.40}$$

$$B_o^c = \frac{2}{9}\, bSc^2 \tag{4.41}$$

Accordingly for the entrant's profit we can write.

$$\pi_e^{ci} = \frac{b}{9}\left[S_c - \frac{i}{b}\right]^2 \tag{4.42}$$

which is the entrant's profit if the incumbent has invested, and

$$\pi_e^{co} = \frac{b}{9}\, S_c^2 \tag{4.43}$$

for the entrant's profit if the incumbent has not invested.

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72 See for instance the duopoly of BT and Mercury in the UK or the duopoly of DBP and Mannesmann for mobile telephony in Germany.

Then society as a whole is better off having only one entrant instead of two if

$$B_i^m + B_i^c + \pi_i^m + \pi_i^c + \pi_e^{ci} > B_0^c + B_0^c + \pi_0^c + \pi_0^c + \pi_e^{co} + \pi_e^{co} \tag{4.44}$$

On the left hand side of (4.44) we have total welfare in the event of entry by one entrant and both incumbents investing into i^a. On the right hand side there is total welfare if there are two entrants and both incumbents do not invest (due to (4.27)). Each entrant will enter one market. In there are two entrants, there is an additional fixed cost F on the right hand side of (4.44). Thus, a certain level of fixed cost would ensure that (4.44) holds since the additional F reduces overall welfare. However, even if fixed cost are neglected, one finds that (4.44) may be fulfilled.

Some algebra leads to the condition for (4.44) to be fulfilled:

$$0.07bS_C < i^a < 0.53bS_C \tag{4.45}$$

(4.75) may be interpreted as follows:
For very low i the price effect of investment in the case of monopoly will be small. Consumer surplus therefore would be much higher if entry occurred. The potential consumer's gain from more competition outweighs the higher profit of both incumbents due to the low cost of investment and one incumbent remaining a monopolist. Therefore having more competition (right hand side) outweighs the benefits of investment (left hand side). For very high i^a the fixed cost of investment (which reduce society's welfare) outweigh the positive price effects (for consumers). Again no investment and competition is to be preferred to some competition and investment. For i^a in between we find that restricting competition to one entrant makes society better off.

Bringing all conditions together we find that for

$$0.42 < i^a < 0.51 \tag{4.46}$$

both incumbents will choose to invest in the case of one entrant while not investing in the event of 2. For this range of i^a as well we find that (4.44) is satisfied. Thus, for i within these limits, society as a whole would be better off restricting entry.

Conclusions

The rat-race model has shown that in the European telecommunications market competition could be launched despite market fragmentation. While it was argued previously that the ISDN investment ceteris paribus diminishes the scope for network competition, it actually could be used to stir up competition among incumbents. Thereby an entrant could have a competitive impact not only on the market segment which she actually enters. Instead, by not deciding previously where entry will occur, the potential entrant will have an impact on the incumbent who remains a monopolist. It was argued that the first mover "advantage" puts incumbents into a prisoner's dilemma situation which can be exploited by the regulator to raise general welfare. The main impact of the entrant is to encourage an investment race among incumbents. For this reason society as a whole may be better off if entry is restricted.

A Mixed Strategy Equilibrium

It is interesting to analyse to what extent results change if I assume that incumbents are able to raise i continuously. As will be seen, in this case there will be an equilibrium only in mixed strategies.

The assumptions (3.3), (3.4) and (4.1) concerning linear demand and cost functions are not altered. As well I stick to the case of two incumbents and one entrant. However, now incumbents are able to reduce their marginal cost continuously by investing a bit more (or less). As a result, many different levels of investment become feasible. Thus the assumption that $i = 0$ or $i = i^a$ is given up. This is elaborated in the following.[73]

It is assumed that each incumbent takes the investment strategy of the other as given. Moreover, only a symmetric equilibrium is discussed. The level of i chosen by an incumbent has an impact on his profit in the event of monopoly or entry and on the probability that one of both possibilities will materialize in period 2.

The impact of i on the profit of each incumbent is depicted in figure 4.5.

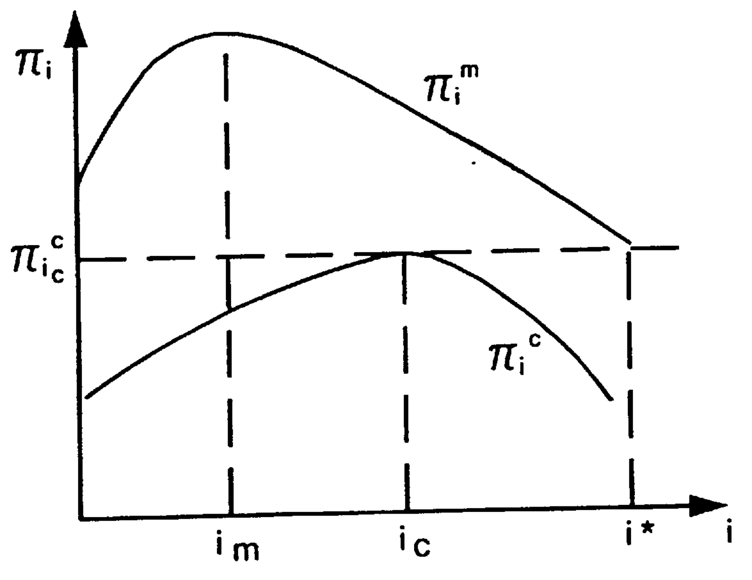

Figure 4.5: *the impact of i on π_i^c and π_i^m*

If firm 1 remains a mnopolist in period 2 then the monopolist's profit would be highest for i_m. If instead entry occurs the profit of firm 1 is the highest for i_c.

Incumbent 1 succeeds in remaining a monopolist if he invests $i_1 > i_2$. In that case he will realize the monopoly profit π_i^m. If instead $i_2 > i_1$ he faces entry despite his investment. In that case he realises a profit which is lower than the one if he had chosen to play Cournot from the beginning: $\pi_{i1}^c < \pi_{ic}^c$ for $i_1 \neq i_c$.

[73] I mainly follow an approach chosen by Varian analysing a mixed strategy equilibrium for a model of sales. See: Varian, Hal, R. (1980), pp. 651-659.

If both incumbents randomise then for each incumbent exists a cumulative distribution function F(i) which indicates the probability of investing at least i.

Analysis

If entry took place for certain then each incumbent would choose i_c. Then the post-entry Cournot profit of the incumbent will be π_{ic}^{c}. $\pi_{i^*}^{m}$ instead is the monopolist's profit if he has invested i^*. Let i^* be such that $\pi_{ic}^{c} = \pi_{i^*}^{m}$. This is depicted in figure 4.5.

Proposition 1: $F(i) = 0$ for $i \geq i^*$

Proof:
i^* will not be chosen by incumbent 1 since if incumbent 2 invests less then firm 1 will realize $\pi_{i^*}^{m} = \pi_{ic}^{c}$ which is the minimum profit he can realise by investing i_c in period 1. If, however, the other incumbent also invests i^* then with probability 0.5 incumbent 1 will make a lower profit then π_{ic}^{c}.

Thus in figure 4.5 i^* is the maximum level of i which might be chosen by any incumbent.

Proposition 2:

There are no pure strategy equilibria where both incumbents invest the same i.

Proof:
If both incumbents invested the same i with $i_m < i < i^*$ then a slight increase in i by one incumbent would secure the monopoly position for him and thus make a positive profit.

Proposition 3:

There are no point masses in the equilibrium investment strategies.

Proof:
i is a point mass of a probability density function f if there is a positive probability concentrated at i.
If incumbent 2 invested i_2 with positive probability then for a slightly higher $i_1 = i_2 + \epsilon$ which is invested with the same probability, incumbent 1 would remain monopolist if i_2 is

realized. For small ϵ the profit of remaining monopolist is higher then the expected profit for $i_1 = i_2$ which includes a 50% chance of entry. Thus for small ϵ the profit is positive which contradicts the assumption of an equilibrium.

Since there are no point masses in the equilibrium density f(i), the cumulative distribution function F(i) for f(i) will be a continuous function on i.

Proposition 4: $F(i) = 0$ for $i \leq i_c$

Proof:

$\underline{i}$ is defined such that for all $i \leq \underline{i}$ $f(i) = 0$.
Thus the probability that entry occurs is 1 if $\underline{i}$ is chosen.
Then for $\underline{i} < i_c$ it follows that $\pi_{\underline{i}} < \pi_{ic}^c$. Thus, any $\underline{i} < i_c$ cannot be part of the equilibrium strategy and i_c is the minimum level of investment.

Given the propositions 1) to 4) the cumulative distribution function can be depicted as in figure 4.6:

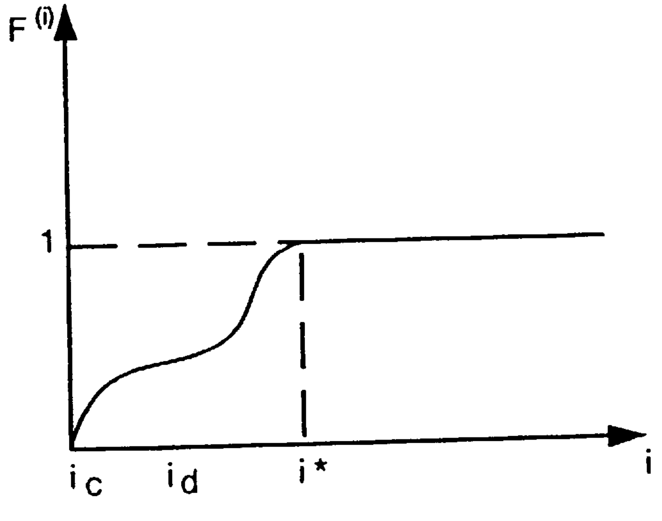

Figure 4.6: *cumulative distribution function F(i)*

For any $i = i_d$ two events may appear. If incumbent 2 invests more, then firm 1 realizes π_{id}^c. This happens with probability $1 - F(i_d)$. If however, $i_1 > i_2$ then incumbent 1 remains a monopolist. Thus with probability $F(i_d)$ he realises π_{id}^m.

The expected profit function for incumbent 1 then can be established as follows

$$E(\pi_1) = \int_{i_c}^{i^*} [F(i_d)\pi_{id}^m + (1-F(i_d))\pi_{id}^c]\, f(i)di \qquad (4.47)$$

All i which are chosen with a positive probability must yield the same expected profit. If not, some i would yield a higher expected profit than others, thus the latter would be dominated and excluded from the equilibrium strategy.

Since π_{ic}^c is the minimum profit incumbent 1 could achieve if he decides to invest i_c, I can write

$$F(i_d)\pi_{id}^m + (1-F(i_d))\pi_{id}^c = \pi_{ic}^c \qquad (4.48)$$

And for the equilibrium cumulative distribution function

$$F(i_d) = \frac{\pi_{ic}^c - \pi_{id}^c}{\pi_{id}^m - \pi_{id}^c} \qquad (4.49)$$

Finally I have to establish those i for which a positive density exists. For the lower limit of i f(i) is characterised as

Proposition 5 : $F(i_d) > 0$ for any $i_d > i_c$.

Proof:

Suppose not, then $i = i_d > i_c$ is the lowest level of i and $F(i_d) = 0$. When i_d is invested incumbent 1 will face entry since with probability 1 firm 2 has invested more. However, $\pi_{id}^c < \pi_{ic}^c$ for $i_d > i_c$. Then π_{id}^c is dominated by π_{ic}^c and it is not part of the equilibrium strategy.[74]

For the upper limit

Proposition 6: $F(i^* - i_d) < 1$ for any $i_d > i_c$.

[74] Proposition 5 also follows immediately from (4.49).

Proof:
If not, incumbent 2 could invest $i_2 = (i^* - i_d/2)$ and remain a monopolist with certainty. Then he would make a higher profit than $\pi_{ic}{}^c$.

Thus investments near i_c and i^* are carried out with positive density.

Proposition 7: There is no interval (i^a, i^b) for $i_c \leq i^a < i^b \leq i^*$ with which $f(i) = 0$.

Proof:
If not, let $i^a < i^y < i^b$. Then if firm 2 invests $i_2 < i^a$, i^y and i^b succeed in guaranteeing the monopoly position for firm 1. But the monopolist profit for i^y is higher then i^b. If instead firm 2 invests $i_2 > i^b$, i^y and i^b will both lead to entry. But again the Cournot profit for i^y is higher than for i^b. Thus in each circumstance since $i^y < i^b$, i^y makes a higher profit and i^b cannot be part of the equilibrium strategy.

Example 1)

As has been argued before, the reason to invest in i for an incumbent is twofold. First, the level of i determines the likelihood of entry in the market. Secondly, even if there is certainty that (no) entry occurs both incumbents would invest (but less). It has been seen that in any case both incumbents would invest at least i_m.
The exercise of this chapter is to analyse the investment behaviour of the two incumbents as a response to the entry threat. Therefore it might be interesting to separate the motives of investment of our model and to look first at a simpler case.
Suppose as before that the investment of i determines whether entry occurs. However, it does not change the marginal cost of the incumbent (instead it may influence the quality of the service and the entrant ceteris paribus prefers the market where the incumbent operates at a lower quality level). Leaving everything else as specified above the profit function then changes to

$$\pi_I = [p(x_I + x_e) - c]x_I - \frac{1.5}{b} i^2$$

If entry occurs with certainty then both incumbents invest $i_m = i_c = 0$.

Then as in the previous chapter we obtain:

$$\pi_o{}^c = \frac{b}{9} S_c{}^2$$

$$\pi_{id}{}^{c} = \frac{b}{9} S_c^2 - \frac{1.5}{b} i_d^2$$

$$\pi_{id}{}^{m} = \frac{b}{4} S_c^2 - \frac{1.5}{b} i_d^2$$

If we insert this into (4.49) we get

$$F(i_d) = \frac{(1.5/b)\, i_d^2}{(5/36)bS_c^2 + (1.5/b)i_d^2} \tag{4.50}$$

Since f(i) = F'(i) we obtain for the density function

$$f(i_d) = \frac{(5/12)i_d S_c^2}{(25/36^2)bS_c^4 + (5/12)i_d^2 S_c^2 + 3\,(i_d^4/b^2)}$$

This density is depicted in figure 4.7

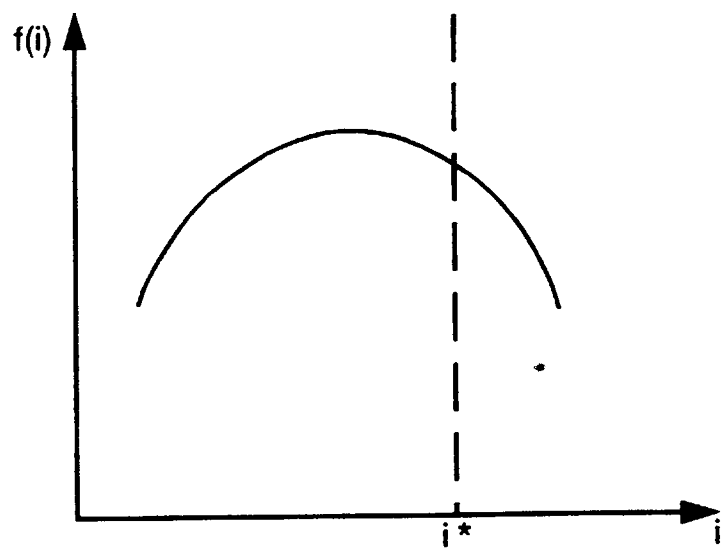

Figure 4.7: *the density of example 1)*

Incumbents tend to invest in intermediate i with higher probability than extreme i. This seems intuitively plausible since for very high i the increase in profit compared to the profit which could be made without investment is low. On the other hand the potential loss which arises if the other incumbent has invested more, rises with i. Similarly for very low i the likelihood of remaining a monopolist is low. The potential loss of choosing a higher i is relatively small compared to the potential gain. Therefore incumbents have an incentive to choose intermediate i instead of extreme ones.

Example 2)

The second example is calculated for the initial profit function where the investment will lead to a reduction of marginal cost. As has been stated above there are two overlapping effects of an investment in i. As a result the density function f(i) has shifted to the right. The steeper part of the function is now in the range of (i_c, i^*).
As in the first example, the density function is calculated as the first derivative of (4.49) in which (4.22) and (4.28) are inserted. Calculations can be found in the appendix.

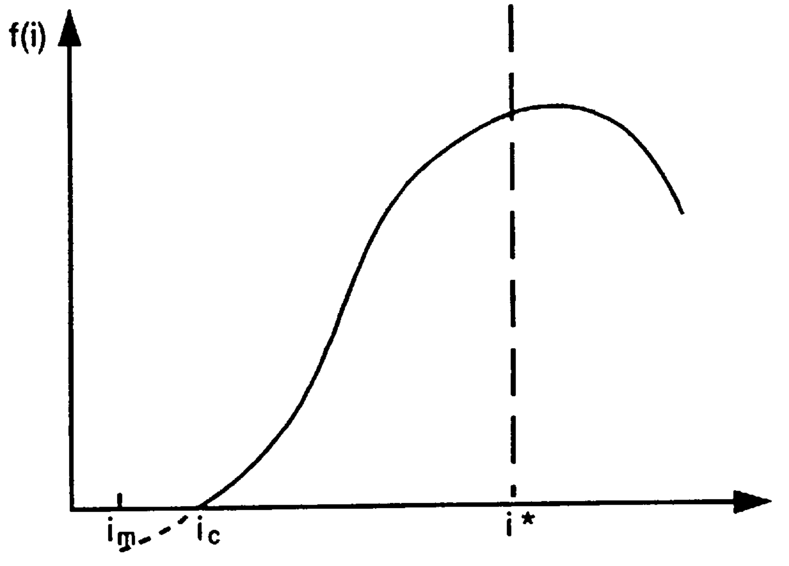

Figure 4.8: *the density function of example 2)*

For $i < i_c$ the calculated values for f(i) are smaller than zero. Thus, corresponding to proposition (4) incumbents will not choose an investment level which is smaller than the investment which they would carry out if entry took place with certainty. More importantly, in the relevant range $i_c < i_\epsilon < i^*$ f(i) increases continuously, thus for i approaching i^* the probability og investment is higher than for smaller i. This shift to the right results from the fact that in example 2) the higher fixed cost of investment are partly offset by lower marginal cost of production. Thus raising i beyond i_c is less costly in example 2) compared to example 1). The trade-off of (lower) marginal costs and (higher) fixed costs with rising i then determines how much the density function of example 1 is shifted to the right.

Overinvestment due to the "Rat-Race" Effect

In what follows I compare three different scenarios. The first one is monopoly provision. The second one discusses the duopoly outcome if in each market a cable entrant enters. The last one refers to the rat-race. Profits, consumer surplus and overall welfare are compared for all three cases. They are summarised in table 4.1. As far as the rat-race is concerned, one cannot predict investment levels of incumbents with certainty. However, I can calculate the *expected values* of investments and profits.

The rat-race model discusses a case where an individual incumbent tries to deter entry. The alternative is to accommodate the entrant. Whereas in the entry-deterrence model the incumbent's behaviour is dictated by the entrant's profit[75], in the accommodation game it is dictated by the incumbent's profit in period 2.

The incentive to invest in the accommodation game is given by

$$\pi_I = [i, x_i(i), x_e(i)]$$

which is maximised with respect to i.

Then also in the accommodation game the effect of the incumbent's investment on π_I can be decomposed into a *direct* and a *strategic* effect.

$$\frac{d\pi_I}{di} = \underbrace{\frac{\delta\pi_I}{\delta i}}_{\text{direct effect}} + \underbrace{\frac{\delta\pi_I}{\delta x_e} \cdot \frac{dx_e}{di}}_{\text{strategic effect}}$$

The direct effect is a cost-minimising effect. Even if the entrant cannot observe the investment in period 1, it has some influence on the incumbent's output of period 2. The strategic effect instead results from the influence of period 1 investment on the entrant's period 2 output. In the quantity game a higher i leads to a higher output of the incumbent and a lower output of the entrant.[76]

Even if there is no entry threat, with the given cost function the incumbent invests in reduction of his marginal cost. The monopolist maximises (4.22) and invests

$$i_m = 0.2\, bS_c \tag{4.51}$$

In the case of entry and accommodation i_c is invested. Due to the strategic effect explained before i_c exceeds i_m

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[75] In the rat-race model π_e has to be driven below the entrant's profit in the other market in order to deter the entrant.

[76] The incumbent behaves as a *"top dog"* and overinvests. See: Tirole, J. (1989), pp.326-327.

$$i_c = 0.211\, bS_c \tag{4.52}$$

(4.51) and (4.52) may be compared with the expected investment from rat-race competition.

$$E(i) = \int_{i_c}^{i^*} i\, f(i)\, di \tag{4.53}$$

Integration by parts yields

$$\int_{i_c}^{i^*} i\, f(i)\, di = F(i)\, i \Big|_{i_c}^{i^*} - \int_{i_c}^{i^*} F(i)\, di \tag{4.54}$$

(4.54) eventually leads to

$$E(i) = 0.436 \tag{4.55}$$

Comparing (4.52) and (4.55) we find that the possibility to fence off the entrant encourages incumbents to increase their investment considerably. However, in this model it can be seen that incumbents are likely to overshoot. The rat-race is likely to lead to overinvestment from society's point of view. This can be seen when comparing overall welfare.

The incumbents' expected profit can be written as

$$E(\pi_I) = \int_{i_c}^{i^*} \pi_i^c\, f(i)\, di = 0.16\, b\, S_c^2 \tag{4.56}$$

which slightly exceeds the profit after accommodation and if the incumbent invests i_c ($\pi_{ic}^c = 0.158\, b\, S_c^2$). Thus although one incumbent actually remains monopolist, their expected profit will not exceed substantially the profit they would make individually if they played Cournot from the beginning. The rat-race withdraws most of the incumbents' advantage of having only one entrant instead of two.

This corresponds to Posner's assertion on rent seeking behaviour. In an extreme case of a contest between firms to become a monopolist the total expenditure by the rent seeking firms is equal to the rent itself (*rent dissipation*).[77] Also the entrant's profit is diminished by the incumbents' investment race. If both incumbents have invested according to (4.55) then the expected profit of the entrant will be

$$E(\pi_e^{ci}) = 0.0353\, b\, S_c^2 \tag{4.57}$$

In the case of accommodation and investment i_c the entrant's profit would have been almost twice as great ($\pi_e^{ic} = 0.069\, b\, S_C^2$).

Finally, using (4.55), (4.56) and (4.57) one may calculate the expected total social welfare due to the rat-race:

$$E(W) = 0.88\, b\, S_c^2 \tag{4.58}$$

Table 4.1 summarises all results. As is seen, the expected welfare of the rat-race is below the total welfare with monopoly supply. Thus, we find that the contest between rent-seeking firms may lead to a *socially wasteful dissipation* of rents. Rat-race competition does not make society as a whole better off. However, in contrast to a patent race, the investment race raises consumer welfare. Hence, to some extent it leads to a redistribution of income from the incumbents to the customer. Finally, a comparison with duopoly in both markets depends on the level of fixed cost. For high fixed costs the duopoly generates lower welfare than monopoly provision or even the rat-race.

Conclusions

The model has picked up three features of the European telecommunications market. First, it has given an economic rationale why under certain conditions it might be optimal to restrict entry by regulation. This may come about if the welfare raising effects due to entry and competition in one market are substituted through welfare gains arising from competition among incumbents operating in different markets.
Secondly, the *prisoner's dilemma* situation of the discrete case as well as the *rat-race* situation of the continuous case of investment have shown that competition among

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[77] Compare: Tirole, J. (1989), p.76; and: Posner, R. (1975).

incumbents may be induced through an announcement of future liberalisation. By making this announcement the regulator grants a first-mover advantage to the incumbents. Before the entrant makes her output decision they can invest in their marginal cost. Thereby they are able to influence the post-entry outcome to their advantage. Similar to the argument of entry restriction, the entrant is put at a disadvantage due to regulation. On the other hand, the regulator can use the entry threat to force incumbents to compete against each other. The investment race leads to lower costs of production and an increase in output which makes consumers better off.

The incumbents are driven by the motivation to deter the entrant. However, from the individual incumbent's point of view entry deterrence becomes feasible without driving the entrant's profit to zero. The entrant is not deterred altogether but instead she is pushed towards the other market. As a result in this model strategic investment becomes more likely to occur. However, while entry cannot be deterred by both incumbents the rat-race is likely to result in overinvestment. The model has shown that the rent-seeking race almost completely dissipates the monopolist's rent. It is partly redistributed to consumers who enjoy a higher output and lower prices. However, from the viewpoint of society the investment race is detrimental. The incumbents' overinvestment leads to socially wasteful rent dissipation.

The results of the model may partly explain the current investment race among national telecom operators in the EC. This is related to the rapid installation of the ISDN in Europe (see part III). In an earlier chapter it was pointed out that since the middle 80s on average, network operators have increased their investments by 30% annually. This coincided with the change of the regulatory environment in the USA and the UK where entry by private operators has been permitted. Though facility based competition has not yet been installed on a European level, in the quickly changing regulatory environment operators perceive future liberalisation as likely. As far as mobile telephony is concerned, network competition has already started in some member countries. According to latest developments full liberalisation may be in place by the end of the decade. A typical public relations justification for the ISDN investments for instance of the DBP Telekom is to "*get fit for competition*". The rat-race model has pointed at the possibility that this dynamism actually may lead to overshooting and to a wasteful use of scarce resources.

	Investment	Output		Profits		Consumer Surplus	Total Welfare
		Incumbent	Entrant	Incumbent	Entrant		
Monopolist	$i_m = 0.2\ b\ S_c$	$x^m = 0.6\ S_c$		$\pi_m = 0.3\ bS_c^2\text{-}F$		$0.36\ b\ S_c^2$	$0.96\ b\ S_c^2 - 2\ F$
rat-race	$i_r = 0.44\ b\ S_c$	$x^I = 0.62\ S_c$	$x_e = 0.19\ S_c$	$\pi_I = 0.16\ bS_c^2\text{-}F$	$\pi_e = 0.035\ b\ S_c^2\text{-}F$	$0.53\ bS_c^2$	$0.88\ b\ S_c^2 - 3\ F$
cable entrant	$i_c = 0.21\ b\ S_c$	$x^I = 0.47\ S_c$	$x_e = 0.26\ S_c$	$\pi_I = 0.158\ bS_c^2\text{-}F$	$\pi_e = 0.069\ b\ S_c^2\text{-}F$	$0.54\ bS_c^2$	$0.99\ b\ S_c^2 - 4\ F$

Table 4.1.: results of monopoly provision, the rat-race and duopoly in both markets [1]

1 For colums 1 - 5 the results for one market are reported. In case of consumer surplus and total welfare instead the figures have been accounted for both markets.

5. An Assessment: Monopoly Provision Versus Competition

The following assessment comprises three steps. First, I weigh the arguments for competition and monopoly provision. Thereafter the scope for competition and problems of a "mixed regime" are discussed. Finally, based on the findings of part (II), I point out the features on which a strategy of liberalisation should be based.

The supply of telecommunications networks faces three fundamental characteristics. There are high sunk costs of establishing the network, economies of scale and scope in operation, and rapid technological progress. On the demand side customers' needs are quickly changing due to demand diversification. The decision for monopoly provision or competition therefore depends on the evaluation of the trade-off between static and dynamic efficiency gains. Competition may lead to a loss in economies of scale and scope when total output is provided by several entities. Monopoly supply on the other hand relinquishes potential gains from process and product innovation. Finally, even if competition is preferred, entry barriers may prevent competition from becoming intensive.

For two reasons, however, I find that this general trade-off comes out in favour of competition. The first one is related to *time*. While fifty years ago static efficiency gains may have outweighed dynamic ones, the latter have become dominant during the last decade. As long as there was only one cable technology available and communication was limited to plain voice telephony, the network infrastructure was dominated by static considerations. The TO's write-off period for network equipment was decided on the moment of replacement.[1] The emergence of various substitute means of communication as described in chapter 2 and the diversification of consumer needs have fundamentally changed the environment in which TOs operate. Technological progress and demand shifts now determine the investment decisions of the network operator. Technical and qualitative efficiency goals dominate those of allocative efficiency. The former, however, are better served in a competitive environment. Compared to the rather stable traditional telecommunications network, today a large potential for innovation exists.

The second argument in favour of competition is related to *specific characteristics* of the European telecommunications market which render general comparions of a trade-off inadequate. The latter, as described above, may describe the situation of a sole member country which considers licensing of a new cable entrant.[2]

However, it does not apply if entrants are considered who have already installed their communication networks, as cable companies, railways or satellites. In the latter case the prohibition of entry actually reduces static efficiency because cable companies cannot

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1 In chapter 6 it is argued that the period of "early" network competition in the US showed empirically that a natural monopoly existed. AT&T was able to oust all of its competitors and to monopolise the market.

2 Thus, broadly speaking, it may apply for the case of Mercury's entry in the UK.

realise economies of scope of TV and telecommunications services. Since networks are already installed, few additional fixed and sunk costs arise if entry into telecommunications networking is permitted. The natural monopoly argument is no longer applicable. Secondly, unlike the general model, in Europe there already exist a multitude of incumbents instead of only one. If the still separated national markets were integrated, in the EC twelve national TOs (plus Mercury) could enter into competition. Having installed their networks already, a policy fostering competition among these incumbents would not relinquish economies of scale and scope. Sunk cost would turn out to be pro-competitive. They prevent *exit* of already installed operators. The 12 incumbents are unlikely to be driven out of the market. Instead of a natural monopoly, the specific circumstances in the EC create a *natural oligopoly*.[3] Thus, there are already enough players in the market to generate intensive competition.[4] Newly developed technology as satellite and mobile networks foster market integration and competition among incumbents. The technological rationale (cable) for market fragmentation is more and more eliminated.

The discussion in chapter 3 has put forward further arguments why the economic foundation for monopoly provision of a telecommunications network is weak. The latter can be defended on the basis of an unsustainable natural monopoly and universal service goals. Econometric studies overall did not support the viewpoint that the entire telecommunications network is a natural monopoly. A comparison of European TOs' performance, moreover, indicated that the smaller ones are more efficient. Furthermore entry barriers make it unlikely that even if a natural monopoly existed, sustainability would become a serious issue. The presence of high sunk costs shelters the incumbent from inefficient entry. If the natural monopoly is sustainable, there is no need for granting special or exclusive rights. Instead a policy of liberalisation could introduce some disciplinatory force through potential competitors.

The present tariff structure, however, is unsustainable since it leads to internal cross-subsidisation. Digital networks and "smart" terminals make it increasingly possible to divert international traffic from basic telephony to enhanced "off-net" services. The present tariff structure artificially supports the bypass by using private networks. Estimates of demand elasticities and optimal pricing considerations have also shown that it is highly inefficient. While inefficient pricing is not a necessary result from public provision, the fact that it is common for all EC member states shows clearly that public provision is likely to create these price distortions. Regulatory inertia and a regulator captured by political interest groups are the reason for the existing tariff scheme. Vote maximising politicians have an interest in maintaining a cross-subsidy which makes the median customer better off. Competition raises the pressure on the incumbent to rebalance tariffs which contradict

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[3] A natural oligopoly is defined by the property that the welfare maximising number of firms is small, but larger than 1. See, for instance: Vogelsang, I. (1990).

[4] This argument is explained in more detail in: Stehmann, O. (1991).

rules of optimal pricing both in the static and in the dynamic sense. Part of the efficiency gains which can be expected from competition therefore are due to state failure of public provision.

Universal service as the second rational for public provision has become a weaker argument over time. First, many countries have already achieved universal service. The low price elasticity of demand for access renders it unlikely that this achievement would be jeopardised if the cross-subsidy were reduced.[5] In those countries where universal service has not yet been achieved, there exist more efficient means of fostering residential access. An entry tax could be imposed on all operators in the market. This tax should depend on the net revenue of the individual operator. After having paid the tax, they should be free to set their tariffs. Secondly, customers having a high reservation price for access (rich households, business) could be charged higher access tariffs. Additional revenues stemming from these measures then could be used to set up a universal service fund which is targetted on the marginal network customer. By doing so, some of the gains stemming from competition could be used to finance universal service coverage.

While the arguments for public provision have become weaker, the ones for competition have gained momentum. Sunk costs stimulate competition by innovation instead of competition by duplication. The rapid development of substitutive means of communication supports this view. Even in markets where in the short run entry cannot be expected, a competitive outcome can be mimicked by using franchising and yardstick competition.

However, although competition is thought to be superior to monopoly provision, at least for a long transitional period state supervision will remain necessary. Liberalisation does not lead to deregulation but rather to reregulation. Its incumbent position, the control over the only universal network, economies of scale and entry barriers ensure that the TO remains the dominant firm. Hence an independent regulator is required which essentially has to fulfil two tasks. On the one hand, the TO has to be freed from politically motivated obligations which impose an unsustainable price structure and lead to inefficient entry. Thus the incumbent has to be permitted to carry out competitive price responses in markets where entry occurs. On the other hand, the regulator has to ensure that anticompetitive behaviour is prevented. Cross-subsidisating services provided under competition by using revenues from monopolised or dominated markets one possible anticompetitive action which TOs are able to carry out.

Finally, one has to decide which level of the market shall be opened to competition. Basically, two approaches can be distinguished. Service-based competition does not

[5] As was pointed out in chapter 1, demand for access is derived demand which depends on the demand for services. While it is unlikely that an increase in the fixed monthly charge induces many customers to switch off, it becomes even less likely if the monthly telephone bill does not rise correspondingly due to simultaneous price decreases for services.

challenge the de jure network monopoly of the TOs. Since it comprises the provision of basic services, this strategy still leaves 80% of telecommunications revenues under exclusive rights. Moreover, it does not put TOs under pressure to reduce the cost of network installation and mangagement. Instead, facility based competition also liberalises the provision of telecommunications networks. Supposedly, this also fosters service provision to the extent that input costs of the network shrink. It, moreover, reduces the scope for anti-competitive cross subsidisation of the TO.

However, facility-based competition does not abolish completely the trheat of anti-competitive behaviour. Although the core of market failure may be small, not all markets are likely to become highly competitive. While the latter can be expected for the long-distance network, the local network is less competitive.[6] Separating the natural monopoly core from the competitive parts - as it was intended by the divestiture of AT&T - may create the loss of economies of scope. This becomes even more relevant in small European markets. If, on the other hand, the TO is left integrated, the incumbent's ability to cross-subsidise persists. This problem may diminish over time when the local network also becomes competitive. Local competitors may arise from the combination of PCN and cable television firms. Licensed mobile operators also start competing in urban areas. MAN operators provide alternative fibre optic networks for instance in New York (see chapter 6). Further competition arises from private networks and the possibility of bypass. However, for the foreseeable future, the local network is unlikley to become highly competitive. Regulatory safeguards remain indispensable. Thus, while the regulator's influence should diminish rapidly in some markets, it will remain crucial for others. Hence a gradual approach towards network competition is likely to occur. A "middle-of-the-road" strategy may increase competitive pressure step-by-step while for a transitional period the incumbent gains time to adapt.[7] Moreover, infrastructural obligations can be gradually reduced and necessary substitutes can be created.

Network liberalisation therefore leads initially to a mixed regime in which some markets face entry and competitive pressure while others remain controlled by the TO. A strategy towards network competition faces three fundamental problems. On the one hand it has to avoid inefficient entry. The latter is likely to happen if the incumbent is kept from making competitive price responses in market segments facing a potential entry threat. *Constraint-market- pricing* has to be applied, which allows the operator to set prices between stand-alone and incremental cost. On the other hand, it was pointed out that the industry characteristics foster anti-competitive behaviour. Finally, as the rat-race model showed, depending on the approach taken towards liberalising entry, incorrect incentives may be

[6] Natural monopoly elements may still exist in the local network due to economies of density which save switching and line costs. See chapter 2.1.1.1.

[7] Having been run for a century as a state office, TOs lack the business expertise which is necessary to operate in a competitive environment. Often employees are civil servants, which reduces significantly the TO's flexibility.

given to incumbents. An ISDN investment race may be detrimental for society because it leads to overinvestment. Furthermore, a strategy towards facility based competition should aim at a maximum of *intensity* of competition. The higher is the competitive pressure on the incumbent, the smaller is the need for regulatory supervision. To raise the intensity of competition, one should concentrate on specific features of the European telecommunications industry. Telecommunications markets are separated according to products, technology and geographic areas. Different product markets are point-to-point and point-to-multipoint (TV) communication. Differences in technology refer to the fixed cable, mobile, satellite and microwave networks. Geographically markets are separated between countries. The more these markets become integrated, the greater is the potential for competition. Thus priority should be given to firms which already have installed their own networks (cable firms, railways) and to entrants using a technology which leads to *market integration*. As was shown, satellite networks surmount market fragmentation and foster geographical, technological and product market integration. This makes them very attractive for a policy which aims at raising the intensity of competition.

The existence of 12 or 13 incumbents in the EC is a big asset for a strategy of facility-based competition. Instead of licensing new cable entrants, priority may be given to spur competition between already existing ones. Competition between already established TOs would not require big investments in sunk costs. No economies of scope would be lost since all of them operate already fully-fledged national networks. Thus, innovative entry can be fostered which leads to competition between different communication systems (cable, satellite, mobile microwave systems). Since the intensity of competition has to be maximised, the incumbent TOs should be banned from new communication systems in the absence of economies of scope. For instance, the GSM mobile network is estimated to become one of the major competitors of the fixed terrestrial network in the future. Scarcity of bandwidths restrict the number of mobile operators. The limited number of operators then may render it beneficial to grant these licences to private firms which are not affiliated with the TO. This would increase competitive pressure.

The intensity of competition, finally, could be increased by applying a combination of measures discussed before. While competition in the intra-EC international market may be spurred by letting TOs compete against one another, mobile operators are most effective in the national urban and long distance markets. Yardstick competition then could be introduced on the local level by running local network as profit centers.

The following part (III) investigates recent developments in four member states of the EC, the intercontinental market and the approach chosen by the Commission. A comparison is made to the policy approach chosen in the USA. This is analysed in view of the arguments raised in part (I) and (II). Part (IV) finally leads to a concrete policy proposal for the liberalisation of the European market of telecommunications networks.

PART III

Policy Approaches towards

National and International Telecommunications

Introduction

After the preceding theoretical considerations part (III) is concerned with the actual telecommunications policy. In all industrialised countries a process of liberalisation has come about during the last decade. Broadly speaking, two strategies have been followed. In the USA and the UK[1] to some extent facility-based competition has been introduced. In the EC countries of continental Europe instead a service-based strategy emerged. This strategy has been sketched mainly by the Commission of the EC. Nevertheless individual member countries have parallely developed national approaches. International telecommunications, finally, turns out to be an unique market on its own. This happens to be the case because in this market the more liberal anglo-saxon approach conflicts with the European concept of network monopoly.

Besides being interesting for its own sake, the recent development of the regulatory regime in European telecommunications has to be scrutinised carefully before developing a strategy towards facility-based competition (part IV). The degree of liberalisation already achieved, will be investigated. I will discuss the extent to which interests of member countries diverge. In this context the different level of development of national networks becomes important. The scope of the work does not allow investigation of all twelve member countries. However, national telecommunications sectors can be categorised into three groups. The main distinction refers to the degree of network development already achieved. For each group one representative country has been chosen. West Germany represents the case of a fully developed telecommunications natwork, which, however, is still fully owned and controlled by the state. In this context it is interesting to analyse to what extent this market structure is adequate for the urgent need to develop the rudimentary telecommunications infrastructure of the old GDR territory. Spain represents the case of a member country which has not yet achieved universal service. Italy, as the third example, is a hybrid. While the north has reached an infrastructural level similar to more advanced EC member countries, southern Italy is still far behind. In this combination of in terms of telecommunications advanced and less developed regions, Italy resembles the EC as a whole. GB, finally, is distinct in that it is the only EC member country which has already introduced some competition among network operators. In what follows I analyse the regulatory system as it developed through the last decade for all four countries. For all four member countries the price elasticities of demand for national and international telephone services have been estimated. As has been seen in part (I), different price elasticities of demand for local and long distance services are a crucial argument against the existing cross-subsidisation. Similar research already has been carried out for other countries (especially the USA), however, no recent comprehensive studies on demand

[1] Similar developments have occured also in Japan. Although an analysis of the Japanese telecommunications sector promises to lead to interesting insights it had to be neglected here.

elasticities could be found for the countries discussed here. While some reference to the results is already made before, chapter 13 presents an overall comparison. In chapter 14, finally, some conclusions are drawn.

Beside the UK, the road towards competition chosen in the USA is most revealing for continental EC countries. The breakup of AT&T was the precendent and spurred European efforts to restructure the industry. For that reason I start with the development in the USA. In chapter 6 no full account can be made of the development in the US market. However, some interesting lessons for the EC may be drawn.

6. The Precedent: Network Competition in US Telecommunications

While in Europe the telecommunications network traditionally has been provided by public Telecommunications Organisations (TO), in the US there is considerable experience with competition, even before the breakup of AT&T. When analysing the (dis)advantages of network competition in Europe, this experience has to be taken into consideration. In this respect two periods of competition can be distinguished. At the beginning of the century there was no dominant firm. After a short interval of competition, however, AT&T succeeded in monopolising the market. The second period started in the mid 1960s when the first specialised long-distance carrier was licensed. A process of decentralization began. Both periods offer interesting insights for an approach towards network competition. In the following this development is briefly analysed. Thereafter I try to point out the main lessons which can be drawn for a policy of network liberalisation in the EC.

6.1. Before the Breakup: Early Competition and Regulation

Contrary to Europe, in the USA the provision of the telephone service and the corresponding infrastructure was never controlled by the state. After the invention of the telephone by Alexander Bell in 1876, the Bell company ousted Western Union (telegraph), which previously had been the dominant firm in the communications market. Western Union did not anticipate the importance of the new technology. For some time thereafter the Bell company was protected by patents. However, after the expiry of its basic patent rights in 1893 more than 1000 companies were attracted into the market[1]. By this time technology allowed only the establishment of local networks. It has been argued that the Bell company probably underestimated the price elasticity of demand for telephones. By maintaining a high price it encouraged entry and allowed its competitors to gather a high market share[2]. By 1900 the "independents" controlled 38% of all installed telephone sets. This share rose subsequently to 49% in 1907[3]. At this time no significant area was left without a telephone network in the USA. Major cities had two competing networks which were not interconnected. Fierce competition had encouraged quick development by cutting prices and thereby causing a dramatic surge in demand. This period will be later referred to as **"early competition"**.

Again a technological breakthrough reshaped the US communications market. AT&T (the former Bell company) was the first to construct a long-distance network. Since it refused interconnection to other companies, the latter lost consumers. Subsequently they merged

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1 Monopolkommission (1981), p. 78.

2 A detailed analysis of the development of the telephone network in the USA can be found in Brock, Gerald W. (1981), pp. 111-114.

3 Brock, Gerald W. (1981), p. 121.

with AT&T. By 1932 the market share of the latter had risen up to 80%[4]. Still existing "independent" companies by then were granted interconnection. However, thereby they had come to terms with the dominant firm, thus they did not exert further competitive pressure. The rapid monopolisation of the market which came about in the USA therefore has been considered as an empirical proof of the natural monopoly character of the telecommunications network. By 1945, federal and state policy was grounded on the premise that the telephone network was a natural monopoly.[5] Nevertheless, the monopolist's high profits thereafter made new entry attractive especially in the long-distance market. AT&T was continuously aware of the need for defensive measures. From the beginning the control of technological innovation became a crucial means to fence off potential competitors. Patents became an important protection for the monopolist. With the "*Bell Laboratories*" AT&T established the world largest private research institute. By 1935 the Bell system owned 9,255 patents itself and was licensed under 6,000 owned by others[6]. A potential entrant had to be afraid of infringing any of these patents as soon as a separate network was installed. Thus technological progress itself became an important entry barrier. The highly subsidised Bell-Labs were only maintainable for a company of AT&T's size.
The second protective means of AT&T arouse from *vertical integration*. Besides the local, long-distance and international networks, and the Bell labs, AT&T also owned the manufacturer Western Electric. AT&T procurement policy made Western Electric essentially its only supplier of equipment and terminals[7]. Thus any potential entrant was obliged to install a network and to start manufacturing at the same time.

6.2. The Road towards Divestiture

6.2.1. Entry on the Fringe

Given AT&T's dominant position, generally speaking there existed three different alternatives for behavioral control. The first was to enforce more competition by antitrust policy. This would have led to the break up of the vertically integrated firm. The second alternative was nationalization and public provision. Finally, public regulation of the private monopolist was chosen and in 1934 the *Federal Communications Commission* (FCC) was set up. AT&T itself regarded regulation as the best choice, and for several decades it succeeeded in playing the "regulatory game" to its own advantage. After the second world war pressure rose to switch to the first strategy. The antitrust case of 1948 aimed at

4 Brock, Gerald W. (1981), p. 157.

5 Compare: Noll, R. G. and B.M. Owen (1989).

6 Brock, Gerald W. (1981), p. 173.

7 Brock, Gerald W. (1981), p. 235.

separating AT&T networks from Western Electric and at liberalising the equipment market[8]. AT&T's vertical integration increased the difficulty of regulating local and long-distance services.[9]

However, by intensive lobbying and with the support of the Defense Department AT&T was able to preserve its vertical structure. The *Consent Decree of 1956* confirmed AT&T's position as a regulated private monopolist. As a result the latter was prohibited from entering the competitive computer markets and it was obliged to license its patents to companies operating in these markets. On the other hand the separation of the computer and telecommunications markets sheltered AT&T from entry. Thus, with the Consent Decree it relinquished patents as a means of protection. Instead it tried to use the regulatory mechanism as an effective substitute. However, by doing so, the firm passed over some of its power to the regulatory authorities. Later-on this proved to be a decisive mistake from the company's viewpoint. Despite the consent decree of 1956 the FCC did not relinquish all kinds of competition. It agreed with AT&T that a breakup of the company and a complete liberalisation would be detrimental due to the existing economies of scale and scope. Thus, the main threat for AT&T's monopoly position was not a full scale liberalisation policy. However, AT&T and the FCC disagreed about the potential advantages which could arise from entry on the fringe. AT&T fiercely resisted the latter, knowing that any precedent could lead to a quick erosion of its profitable position. The main regulator, however, favoured opening up market niches. It was mainly concerned with the exploitation of benefits arising from new communications technology. The dominant firm was regarded as being too slow in exploiting these. Therefore the FCC first permitted entry for a microwave carrier and later liberalised the satellite market. However, AT&T correctly foresaw the danger steming from this entry on the fringe. Once *Microwave Communications Inc* (MCI) had been licensed to construct a link between St Louis and Chicago in 1971, further entry could not be successfully prevented by the main carrier.

Entry by MCI set off a step by step procedure of liberalisation. This development did not follow any deliberate plan. To a large extent it was driven by "regulatory accidents".

Broadly speaking three different factors led to network liberalisation in the USA:

a) changing political interests

b) technological progress

c) uncoordinated actions of a disjointed regulatory system

While only b) delivered a rationale to switch from regulation to competition, it was not the most important factor to bring about the fundamental change.

Political interests were mainly concerned with the pricing policy of the telecommunications carrier. Until 1930 the *board-to-board* pricing mechanism was applied.

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[8] Brock, Gerald W. (1981), pp 187.

[9] Noll, R.G. and B.M. Owen (1988).

According to the latter all costs of the local network were allocated to local services and access. This calculation mechanism was relatively easy to administer and relied on cost based pricing. However, in *Smith vs. Illinois Bell* the Supreme Court rejected this pricing scheme in 1930[10]. It obliged AT&T to switch to the *station-to-station* principle. Under this policy, distance calls had to make a contribution to the local network costs. This led to the cross-subsidisation of local services and access by long-distance services. Since the costs for the latter decreased sharply over time, cross-subsidisation steadily increased despite modest price cuts. Given these price cuts the FCC did not face pressure to investigate AT&T's pricing policy. Moreover, cross-subsidisation was politically popular. Any full scale investigation was put off until the 1960s. Rates had an uniform nationwide charge per circuit for a given mileage. They were based on average costs. Thus AT&T could prevent capital losses on old equipment if a new technology appeared. AT&T did not oppose the subsidy because it only meant a mere bookkeeping procedure, a transfer from AT&T long-distance to its fully owned local operating Bell companies. Moreover, the uniform price setting helped the company to develop the image of an enterprise concerned with national integration and social objectives instead of a profit maximising monopolist. It hoped to use the cross subsidy politically to fence off entry. Thus, the rate structure benefitted both the regulated private monopolist and also the regulator.

However, AT&T thereby was completely at the regulator's mercy. The higher the profit margin of the high density long-distance routes, the more attractive entry became. Thus regulation itself created artificial incentives to end AT&T's monopoly. When political interests changed, AT&T was locked in a trap. Long-distance services had become an important input factor for the service sector as a whole. Subsequently an increasingly strong pressure group lobbied against the continuation of the station-to-station principle[11]. However, after the Supreme Court decision and given strong political support for the cross-subsidisation, a direct reversal of the tariff principles appeared difficult to accomplish. Instead, the liberalisation of the long-distance network was regarded as a proper means to pass by the overpriced AT&T long-distance network. This also offered the possibility for a compromise with regulators. While being favourable to "specialised entry", regulators resisted a full switch to cost based pricing[12]. The FCC obliged the dominant firm to stick to its old "fully distributed costs" principle. Each service had to recover a portion of the

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10 See in more detail: Temin, P. and Galambos, L. (1987), p.19-27.

11 For the importance of interest groups: Joshow, Paul L. and Roger Noll (1991), pp 12-14.

12 For instance, in 1973 AT&T attempted to implement the "Hi-Lo" tariff, after the Specialised Common Carrier decision of the FCC. The "Hi-Lo" tariff intended to de-average single channel leased lines rates on the basis of traffic density and costs. The proposed tariff on high density routes was less than one third the tariff of low density ones. The FCC, however, disallowed the "Hi-Lo" tariff. Further examples can be found in: Phillips, A. (1991), p. 52-53.

common costs[13]. The FCC thereby ensured that entrants could undercut AT&T, whether they were more efficient or not[14].

Specialised entry fitted the interests of the FCC and the pressure groups favouring liberalisation. It allowed an initial bypass of the AT&T network, while preserving cross-subsidisation. As a result, however, the stand-alone costs of large users were substantially lower than the rates AT&T was allowed to charge. From the viewpoint of the dominant firm the regulatory system had failed to provide the expected protection against entry. It had also prevented AT&T from launching a "competition price response" against entry. The latter was rejected as predatory pricing.[15]

Thus one may argue that the second factor, **technological progress**, became a pretext for MCI, when filing its request for authorization as a common carrier in 1963. By using microwaves it was able to argue that no duplication of investment into telephone cables took place. Instead, better usage of existing communication technology would come about. In its "*Above 890 Decision*", the FCC permitted the private use of otherwise idle microwave bands in 1959. This decision offered a specialised carrier like MCI the possibility of entering the highly profitable long-distance market. The FCC confirmed this in the decision on *Specialised Common Carriers* in 1971. The FCC declared that it would license further entrants, as far as they serviced new and specialised demand. Direct competition to AT&T, however, was not envisaged.

The second technological challenge to AT&T's monopoly position arose from satellites. In its "open-sky" decision of 1972 the FCC allowed any company to establish an independent satellite network and to provide communications services.[16] However, until recently satellite carriers had to interconnect into the terrestrial network of AT&T due to the size of the ground stations. Only the recent development of VSAT terminals has made it possible to bypass the terrestrial network altogether. Thus, initially the threat steming from "satellite entry" was rather small (see below).

Finally, however, the existence of **rivalrous regulatory institutions** brought about the decisive blow to AT&T's monopoly position. In the USA the telecommunications sector is regulated mainly by *five* different institutions, which have sometimes overlapping jurisdiction and diverging interests. Potentially the most powerful source is Congressional legislation. However, different political interests ensured that Congress was blockaded as

13 In more detail: Breyer, Stephen, p. 1024.

14 Differently to AT&T, in the early days of long-distance competition, specialised common carriers did not have to pay local companies part of their revenues. See: Joshow, P. and Roger Noll (1991), p. 22; and: Temin, pp. 33-35.

15 Noll, R.G. and B.M. Owen (1989).

16 RCA and Western Union launched satellites in 1974/75. Other companies leased capacity. Besides television transmission services, subsequently specialised services for individual companies and private line voice circuits were offered too.

an attractive regulatory force. Different "AT&T bills", either seeking more protection or liberalisation, fell through[17]. Day-to-day regulation is carried out by the FCC and state regulators. While the FCC is responsible for the approving of licences for common carriers, to require interconnection and to supervise the rate setting in the *interstate* market, state regulators supervise the *intrastate* market[18]. Antitrust policy is carried out by the Justice Department. While AT&T was de facto exempted from antitrust policy since the consent decree of 1956, antitrust became important again after specialised carriers entered the market. However, the most important changes in the 1970s were brought about by District Courts. In 1975 MCI offered a new service called *Execunet*. Using AT&T local networks, Execunet created a dial up long-distance service[19]. This service was in direct competition to AT&T and violated the FCC's regulation on specialised common carriers of 1971. Consequently, the regulator rejected the Execunet service. In 1977, an appeals court reversed the decision made by the FCC on formal grounds[20]. This led to the "accidential" liberalisation of the US long-distance market against the will of the main regulatory commission. The district court's decision thereby became the decisive breakthrough for network competition in the USA.

However, not only the district courts, but also the Justice Department enforced a policy which initially contradicted the intentions of the FCC. For 20 years antitrust policy was not applied to the telecommunications industry. However, after specialised carriers had successfully entered the market, they were able to challenge AT&T's anticompetitive behaviour. In 1974 a new antitrust case was filed. By charging high access fees AT&T had tried to prevent interconnection of its competitors[21]. The intention of the new case was similar to the previous one of 1948: to separate those parts of the Bell system which could be opened to competition from the "natural monopoly core".

6.2.2. An Evaluation

The antitrust case of 1974 led to the breakup of AT&T and the full liberalisation of the interstate long-distance market. Thus, neither Congress nor the main regulator but the Courts had reshaped the telecommunications industry. Although very much restricted at the beginning, specialised carriers were able to set off a dynamic process of liberalisation even though this contradicted the regulator's policy objectives. On the other hand it is

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17 In the 1970s Congress was devided between cutting down the oversized AT&T and preserving the popular cross-subsidy scheme. In more detail: Brock, Gerald W. (1981), p. 289-294 and Turnstall, J. (1986), pp. 107-109.

18 Hills, J. (1986), p. 55.

19 In detail: Brock, Gerald W. (1981), p. 225.

20 The judge argued that neither AT&T had got an explicit monopoly for the switched long-distance market, nor had the FCC properly defined the boundaries for the specialised carriers.

21 Turnstall, J. (1986), p. 111.

important to note that competition was not the outcome of a carefully developed strategy. Two approaches were applied simultaneously. The FCC was concerned with **efficiency in production**. Given the existence of economies of scale and scope it reckoned that the integrated monoplist would be the most efficient means of supply. Instead the Department of Justice was concerned with potentially detrimental effects of market power and the abuse of a monopoly position. It interpreted previous experience with regulation as evidence that AT&T could not be sufficiently controlled by the FCC. It therefore gave priority to **efficiency due to competition**. However, antitrust policy originally did not intend to liberalise networks. It was mainly concerned with the separation of manufacturing and services. Only for the former competition was envisaged. Thus, while each regulatory institution followed a peacemeal approach on its own, only the combination of both led to regulatory changes which were far more radical. While this ended AT&T's monopoly position in manufacturing and long-distance services, at the same time it led to a decisive shift of regulatory power. Since divestiture there has been a transfer of power from the FCC to the Court. The Federal District Court of Columbia which oversees the new consent decree can be regarded as an additional regulator.

To a large extent entry came about due to political inertia which created artificial incentives and thereafter protected the new competitors from fierce price responses of the dominant firm. On the other hand, AT&T had used all means available to bar entry. Monopolistic abuses included refusals to deal[22], the denial of interconnection with its local facilities, and the raising of competitor's costs.[23] No "fair market test" had taken place, to prove whether the long-distance market is a natural monopoly and whether this monopoly would be sustainable. It is arguable whether an earlier revision of the rate structure probably would have avoided the "Execunet" controversy and the later divestiture of AT&T.

Thus while the earlier process of concentration clearly indicated the natural monopoly character of the traditional cable telephone network, the more recent change back towards competition cannot be cited as a sign that "natural monopoly" characteristics have evaporated in the meantime. Entrants were well enough cushioned to survive. On the other hand it does not strengthen either the claim for regulatory protection of AT&T. That entry has been successful does not imply the existence of an *unsustainable* natural monopoly. It has only proven the unsustainability of the cross-subsidisation scheme.

6.3. The Divestiture of AT&T and Subsequent Regulation

Before a final decision had been made in the antitrust case of 1974, AT&T and the Justice Department settled the case in an agreement by 1982. AT&T thereby was allowed to

22 AT&T, for instance, did not permit its customers to buy equipment from other sources.

23 See in detail: Noll, R.G. and B.M. Owen (1988).

participate in the decision concerning which parts were to be split. It divested itself from the 22 *Bell operating local companies* (BOC), while keeping AT&T long-distance, Western Electric and the Bell Labs. According to the *Modification of Final Judgement* (MFI) of 1982, the BOCs were formed into seven independent *Regional Holding Companies* (RHC). They operate in 160 "*Local Access and Transport Areas*" (LATA), in which access charges are levied to replace the previously existing long line contributions[24]. LATAs are usually confined to one state. The FCC regulates interstate interLATA and interstate intraLATA services.

The MFI forbade AT&T from offering value-added services. This restriction, however, was reversed by the FCC in 1986[25]. As a bargaining chip Justice had offered AT&T relief from the constraints of the old consent decree of 1956. It therefore got permission to enter the unregulated computer market. Expecting AT&T and IBM to become fierce competitors, the 13 years old antitrust case against IBM was dismissed at the same time. This twin decision relied on the assumption that voice and data transmission technology would eventually merge. In 1984 the FCC then also deregulated the customer premise equipment (CPE) market[26].

The interstate market was liberalised. Any company may compete either by reselling capacity or by constructing its own facilities. Except for microwaves, no licence is required for entering the market. Presently there are more than 100 companies offering long-distance services, while three operate throughout the country as common carriers. Of all carriers only AT&T is still subject to price regulation[27]. Price-cap regulation replaced the traditional rate-of-return regulation in 1989. AT&T's services are divided into four categories.[28]

The MFI, however, did not completely liberalise the long-distance market. Interexchange carriers are generally allowed to offer services between LATAs, while intra LATA long-distance service is controlled by state regulators. Thus by 1984 about 25% of long-distance calls were exempted from competition. By 1990 twenty six states had allowed full intra-LATA competition, while forty-two had allowed the resale of services.[29] However, LATA boundaries still often demarcate the boundary between monopoly and competition. This also inhibited the development of robust competition between LATAs.[30]

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[24] Hill, J. (1986), p. 68.

[25] Tarifica Annual (1991), p. 384.

[26] Johnson, E. (1986), p. 57.

[27] US Council for International Business (1990), p.5.

[28] These are residential and small business, toll free 800 services, business services including WATS and special services.

[29] Crandall, R.W. (1991), p.50

[30] Noll, R.G. and B.M. Owen (1989).

The district court of Columbia did not allow the RHCs to produce their own equipment, to enter the long-distance market, or to offer information services[31]. Otherwise, it was feared, they could cross subsidize their activities in the competitive markets or allow discriminatory access of long-distance carriers to their local networks. In the absence of generally accepted standards, the RHCs could design network technology which would exclude competition in sophisticated downstream services which require the public switched network. This applies for instance for electronic mail, call forwarding etc.[32]. In contrast to the approach pursued in the EC, in the US originally the separation of basic and value-added services was envisaged. Even without the RHC's ability to preclude competition, regulators would face serious problems deciding on adequate access charges for VANS providers using the local networks. These restrictions imposed on the RHCs have been continuously critisized[33]. They were opposed by the FCC which reckoned that the costs of structural separation would outweigh the benefits. By 1986 antitrust authorities themselves had changed their mind and advocated that the BOCs should reintegrate into nearly all of the liberalised markets (manufacturing, information services and long-distance). Only their own service territories were supposed to be exempted.[34] Some BOCs had refused to offer new forms of ISDN interconnection since they did not want to offer VANS competitors a first-in advantage. Thus, the separation became a handicap for network development.[35] In its Computer Inquiry III of 1986 the FCC adopted "non-structural safeguards" to prevent cross-subsidisation of the dominant carriers. The latter then were allowed to provide VANS as well. A concept of "*Open Network Architecture*" (ONA)[36] was developed to provide for nondiscriminatory access to networks for suppliers of VANS[37]. On July 25th 1991 the District Court finally reversed its decision on information services and permitted the RHCs to sell them too[38].

The regulation for local network carriers also has been challenged recently. Presently different bills have been put before Congress to let the RHCs carry television and telephone services or to start manufacturing[39]. In a bid to break the local cable TV

31 Like electronic yellow pages, on-line news and share price quotations.

32 Pepper, R. and N. Brotman (1987), p. 148.

33 See for instance: Noll, R. (1983), and: Economist, August 3, 1991.

34 Joshow, P.L. and R.G. Noll (1991), p. 57.

35 Noll, R.G. (1991), p.51.

36 ONA is a framework of disaggregating network components such that open access is permitted also for entities using their own installations. It relies on the principle of unbundling the multiple functions of the exchange switch. Thereby outside parties can substitute parts by their own facilities if they can provide these functions cheaper themselves. More in detail: Noam, Eli A. (1986), p. 61-62.

37 In more detail: Phillips, a. (1991), p.56/57; and: Wollenberg, R., Witten, R. and J. Nadler (1990), p. 25.

38 Economist, August 3, 1991.

39 Economist, July 6, 1991.

monopolies, the FCC ruled in October 1991 that the Bell Operating Companies should be able to provide a "video dialphone". Customers then can use their phone lines to dial up video services. On the other hand their local monopoly position has been put at risk. Some state regulators have made new access arrangements for local networks. Thereby RHCs are obliged to interconnect private bypass networks. While the latter are allowed to use leased lines of the RHCs, state regulators also consider bypass carriers to enter switched services. The latter account for the vast majority of the RHCs' revenues[40].

Further competition in the local network may come from cable TV firms. The revision of the 1984 cable act which bars cable TV firms from the telephone business is at stake. Cable companies could offer the next generation of mobile telephone service (PCN). They could thereby link their cable networks to the transmission masts of a digital, cellular radio telephone system[41]. Moreover AT&T has applied for permission to test a new network for pocket sized radio phones using its network of microwave towers. The latter were gradually taken out of service when traffic was concentrated to the fibre-optic lines and digital switches. This would put AT&T in direct competition with the RHCs[42].

Fiber-based local competitors already install *Metropolitan Area Networks* (MAN) which provide alternative access to the long-distance carriers. This allows the latter to avoid the access fees to the RHC's local network. MAN revenues have been growing by 22% a year. In New York, for instance, Teleport has more than 70 customers, including AT&T and US Sprint.[43]

Thus the period after divestiture has shown that in the USA the drawing of a borderline between "competitive" and "natural monopoly" parts of the network and service industry has failed. This holds clearly for the separation of basic and value-added services which has been abolished in the meantime. However, the convergence of telecommunications and broadcasting and new developments in mobile technology also put into question the "natural monopoly" character of the local network.

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40 Fin Tech, March 21, 1991. The New York State Public Service Commission in November 1991 adopted rules under which rival companies can offer basic telephone services in New York city. Compare: Harald Tribune, December 28, 1991.

41 Economist, January 12, 1991.

42 Wall Street Journal, June 26, 1991.

43 Teske, P. and J. Gebosky (1991), p.432.

6.4. Has Competition Prevailed? An Assessment of Divestiture

6.4.1. AT&T's Declining Market Share

Despite all institutional differences and the divergent structure of the network operator, the experience with facility based competition in the USA is revealing for a policy concept for the EC. In this respect the intensity of competition in the interLATA long-distance market and repercussions on the universal service goal are most relevant. They will be scrutinised in what follows.

In the long-distance market competition has come about from two different sources. First, beside AT&T there are two other common carriers providing nationwide long-distance services. The market share of MCI and US-Sprint has increased continuously over the past seven years. This can be seen from table 6.1. However, in 1990 for the first time AT&T was able to stop the trend and to reverse it slightly.

Year		Share (%)
1984		80.2
1985		77.1
1986		74.0
1987		70.4
1988		67.1
1989		63.9
1990	2nd quarter	62.1
	4th quarter	62.8
1991	1st quarter	63.1
	3rd quarter	62.5

Table 6.1.: *AT&T share of US Interstate Minutes*[44]

With a market share of above 60% still AT&T remains the dominant firm in the market. However, its competitors are well established.

To some extent AT&T is still protected by the method chosen for customer access. Customers make a one-off choice of carrier through which all their long-distance calls are routed. They can switch the carrier later if preferred. Customers who express no preference are allocated to the available carriers in proportion to the existing market share. This

[44] Source: Federal Communications Commission (1992).

method offers the traditional carrier an inbuilt advantage, which would end if customers had to choose their carrier on a call-by-call basis, by putting in an appropriate code. Prices would thereby become more significant for the customer's choice[45].

The second source of competition stems from private carriers[46]. They lease space on the network of the three common carriers and resell to their customers. Thereby they design their routes to minimize costs in a particular region or specialize on a few cities. In order to avoid paying local access charges they can connect their customers directly to the long-distance network. A private line can connect a customer to the total network of a long-distance carrier, to another local area, ot to a specific office[47]. Finally big business set up their own installations mainly to connect their own branches. Thereby they avoid the public network altogether. Spare capacity then is sold to other firms.

The importance of private lines can be estimated from the fact that since divestiture up to one third of total investment in telecommunications networks was accounted for by private carriers. According to the Bureau of Economic Analysis (BEA), the capital expenditures in telephone and telegraph tripled from 1975 to 1988. However, the capital expenditure of local and long-distance carriers rose much less. According to Crandall probably 25 percent of all telecommunications net capital stock is now in the hand of non-TOs (like airlines, banks, insurance companies etc.)[48]. Large users shift massively towards private carriage. This leads to a bypass of the public telecommunications network[49]. Beside being advantageous by satisfying specialised needs, private carriers avoid access charges which have to be paid by common carriers when interconnecting into the BOCs local networks. Access charges for interconnection into local networks still impose some of the non traffic sensitive costs on the long-distance carriers in order to subsidize consumer access. Thus they comprise some efficiency losses as those which materialized from the old cross-subsidisation scheme. Fixed cost (local access) are paid for by a usage sensitive charge. Bypass is considered to be uneconomic if the private communications are more costly than the incremental costs of providing the service by the local switched network. Thus additional social costs are produced if bypass is encouraged by the existing access charges. It erodes substantially revenues needed to invest into the fibre optic local networks and into digitalization of switches. The RHCs claim to have lost $ 3.73 billion in 1989 due to bypass[50]. It is impossible to measure exactly the volume of private carriage. Moreover, it is

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[45] Mullins, Stephen (1990).

[46] Private carriers are here defined as carriers which offer specialised services to some user groups.

[47] Joshow, O.L. and Roger Noll (1991), p. 61-62.

[48] Noam, Eli (1988), p. 14; Economist, October 5, 1991 and: Crandall, R.W. (1991), p. 45-50.

[49] Bypass may be defined as a situation where a toll service customer or a toll service carrier utilizes facilities which are not owned by local telephone companies for toll traffic, thereby avoiding to pay a toll-to-local subsidy. So defined in: Egan, Bruce L. and Dennis L. Weisman (1986), p. 166.

[50] Fin Tech, March 21, 1991.

not possible to conclude that all of it is inefficient. However, as with the entry of specialised carriers in the 1960s and 70s, the regulatory regime still gives artificial incentives to avoid the public switched network.

A second form of bypass emerged from common carriers setting up direct links to the end users. They thereby avoid local access charge as well. A cost breakdown of AT&T revealed the strong incentive to do so. 60% of total costs of a long-distance call consists of access charges, 25% represent general and marketing costs, 13% network and 2% operator service costs[51]. In 1985 the FCC allowed AT&T to construct the first bypass facilities[52]. Thus RHCs face competitive inroads into their local markets to which they are not permitted to respond. Access charges are regulated by state regulators and the FCC. In 1985 the FCC began to change the system of access charges which until the mid-1980s covered about 25% of the total cost of local exchange service. By 1990, the FCC had transfered about half of the federal share of local costs to *subscriber line charges* (SLC). Interstate long-distance rates fell approximately by 25% while residential and business access charges rose by 20% and 10% respectively[53]. The FCC has authority to preempt state regulation that would frustrate FCC objectives[54]. While the latter wants access charges to be reduced to costs, state regulators try often to preserve cross-subsidisation. Thus the permission granted by the FCC to common carriers to build their own bypass facilities is a means to put state regulators under pressure to revise access charges. The SLC is an example where the FCC itself imposed a significant change. However, as before divestiture, the MFI could not end the rivalrous regulatory system.

6.4.2. Development of Prices

During the 1960s and 1970s the price of a basket of telephone services rose at roughly one half the rate of general inflation. During the period of AT&T's divestiture it rose more rapidly than the general price index. This was mainly due to the sharp price increase for local calls. The least urbanized states and communities and rural areas in smaller states were hit most. Smaller communities in larger states still receive a subsidy by the larger intrastate long-distance service. Since 1986 the average telephone rate again moves according to the historic tendency, below the general inflation rate. More important, however, are the diverse trends of individual services. Graph 6.1. gives a rough idea of the price development of different telephone services since divestiture in the USA.

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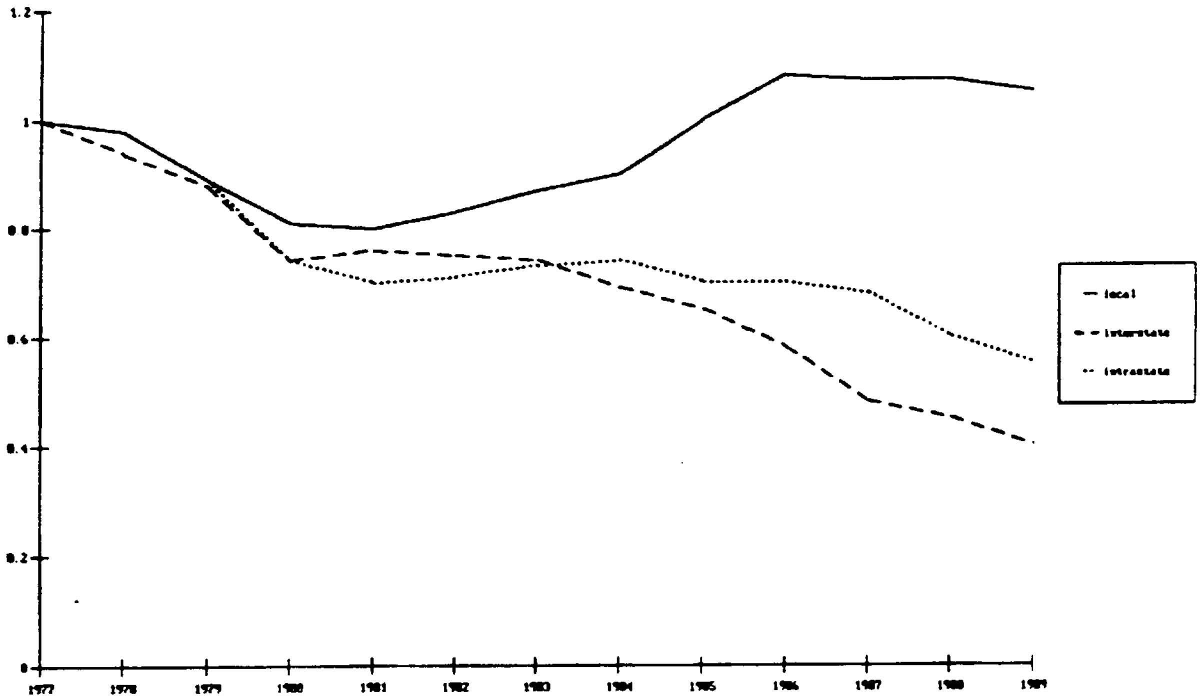
51 National Telecommunications & Information Administration (NTIA) (1985).

52 Hills, J. (1986), p. 72.

53 Joshow, P.L. and R.G. Noll (1991), p. 61.

54 See: US Council (1990), p. 7.



Graph 6.1.: *Real prices for telephone services in the US*[55] *(1977 = 100)*

As can be seen from graph 6.1., in the interLATA market competition has produced the expected price decreases. By 1991 the real price of interstate long-distance services has shrunk by 59.7% since 1977, while the price decrease accelerated through the last seven years. Real prices for *intrastate* long-distance calls also fell over time. However, the price decrease was less significant. Local prices fell until 1981. Thereafter they rose to a level about 10% above the one of 1977. However, since 1986 they have started to decrease again. Real international call prices on average dropped by 71.8% in the decade 1977 to 1987[56]. Generally, competition for market share between the three common carriers is considered to be fierce. AT&T's marketing expenditure has risen considerably during the period 1988-1991. The main area of competition, however, has been rate cutting. All carriers have offered a lot of price discounts in the residential markets and for large business users[57]. As has been pointed out AT&T is still subject to price cap regulation. So far, however, prices filed by AT&T have with one exception been accepted. Thus the regulatory restraint on AT&T has been much relaxed since divestiture.

Though the price decrease in the long-distance market is considerable, the related welfare effects may be less impressive if one accounts for the lower cross-subsidisation which has come about. Though the present access charges are still regarded as too high to prevail

[55] Source: US Council (1990).

[56] US Council (1990), p. 17.

[57] Fin Tech, March 7, 1991.

under competition, they are much lower than the previous ones paid by AT&T to its formerly fully owned BOCs. On an aggregated level the price development in telecommunications since the introduction of competition in 1978 is not too impressive if compared with the period prior to liberalisation. As Phillips points out the ratio of the CPI for all telephone service to the CPI of all items[58] was 2.31 in 1968, 0.87 in 1978 and 0.40 in 1988 (1977 = 100). Thus the decade before competition saw relatively higher price reduction than the decade which followed liberalisation. It is therefore impossible to tell to what extent price cuts in the competitive markets are due to an increase in productivity or to a mere abolition of the previous price structure.

Finally, as far as service quality is concerned, little evidence was found that a deterioration has been taken place since the breakup[59].

However, overall the introduction of competition is regarded as successful. This can be seen from the fact that most states by now also permit competition in the intraLata long-distance market[60].

6.4.3. Universal Service

It is widely believed that network competition and universal service are two conflicting goals. This view is based on the assumption that the cross-subsidisation of access is necessary in order to offer all households access on "reasonable terms". Full network competition, would quickly erode this basis for the subsidy. Above, however, it was pointed out that the cross-subsidisation of access through services is only one possible means to foster interconnection. This general subsidy which does not discriminate among customers has been described as very inefficient.

The repercussions of competition on the universal service goal may be very different depending on whether universal service has already been achieved when the market is liberalised. Once universal service has been achieved, competition would be only detrimental if it induced many households to disconnect. Given the low price elasticity of demand for access, this is not likely to occur. Instead, if universal service has not yet been achieved, competition may erode the means of the operator to subsidize interconnection of remote areas which have not joined the network.

As was pointed out in chapter 6.1, in the USA two periods of competition have occured. In the first decade of the century fierce competition came about when various operators built up local networks. Brock pointed out that competition at this time spurred considerably the

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58 A measure of telephone service prices in terms of all consumer goods. CPI = Consumer Price Index. See: Phillips, A. (1991), p. 53, Footnote 10.

59 In more detail: Crandall, Robert W. (1991), p. 121-122.

60 US Council for International Business (1990), p.7.

provision of local telephone services throughout the country[61]. The main carrier was put under pressure to speed up the installation of its own networks. Moreover, the immense capital needed for investment was raised easier by several independent firms. Thus at an early stage of network development competition fostered the universal service goal. However, by the time when AT&T had monopolized the telecommunications network many remote areas were not interconnected. It is generally acknowledged that thereafter the cross-subsidisation of access has helped to interconnect these regions. While in 1950 only 50% of households were connected to the Bell network, the percentage was growing steadily by 2% a year. 1983 91.4% of all households had access[62]. Thus in the USA the universal service goal had been achieved by the time of liberalisation. From what was said above, it was unlikely that thereafter liberalisation would threaten this achievement. In fact, despite the high rate of access already achieved before, it rose further to 93.4% in 1991[63].

This may be explained mainly by three factors. Contrary to forecasts, the effects of repricing on equity have been rather small. The lowest income classes incurred an increase in telephone related expenditures of about 4%, while the highest income classes realized savings of less than 3% since the breakup[64]. From these income effects one cannot expect a high rate of disconnection.

Secondly, however, divestiture did not end the subsidisation of household access to the network. While not all of the traditional cross-subsidisation steming from long-distance services was stopped[65], additional programs were set up. Currently, about 27% of local loop costs are recovered from interstate rates.[66] Programs to subsidize poor housholds' access were started by individual states and also by the FCC. For instance, in 1983 California adopted the "Moore Universal Telephone Service Act" according to which households below a certain income level receive a 50% discount on basic local services. This program is financed by a 4% surcharge on intrastate services. In 1984 the FCC adopted a plan which allows a total reduction of 50% in fixed charges for households satisfying a means test. Lifeline programs are available in all states. They are funded through charges paid by interstate ratepayers and not by federal taxes[67]. Nevertheless, consumers qualifying for

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61 Brock, Gerald W. (1981), p. 144.

62 Phillips, Almarin (1991), p. 50.

63 Source: FCC (1992).

64 For the effects of repricing through 1987 Crandall estimated that lower income households payed about US $ 16 more a year. A detailed analysis of income effects caused by price changes since the breakup: Crandall, Robert, W. (1991), p. 112-115, 164.

65 Long-distance carriers pay carrier access charges to the RHCs. They are divided into Carrier Common Line (CCL) charges that recover non-traffic-sensitive costs and other traffic-sensitive charges.

66 Mitchell, B. and I. Vogelsang (1991b), p.70.

67 On January 1990 the FCC estimated that about 1.8 million subscribers received reduced rates under the federal Lifeline Assistance programme. See in more detail: Dordick, H.S. and M.D. Fife (1991), pp. 119-120.

Lifeline assistance in 1990 paid 11% more for unlimited calling, 36% more for the lowest generally available rate and 44% more for connection[68].

Besides the low income subscribers, rural areas were expected to be hit by the tariff changes. The Rural Elictrification Administration (REA) established by Congress in 1949 makes funds available to rural telephone companies. These funds at low interest rates are used to serve towns with populations of 1500 or less. In 1986 around five million subscribers were provided by REA borrowing telephone companies[69].

Thus the liberalisation of the long-distance market in the USA has not stopped the subsidisation of access. However, it led to a concentration on those subscribers who are expected to need subsidies most. As a side effect the liberalisation process brought about more detailed studies on access demand. Thereby the strong relationship of "access to the telephone network" and the "households income" has been shown empirically in various studies. It was found also that the low income elderly household is not the one likely to disconnect in case of price increases. While the latter have been the traditional target of assistance, recent studies provided evidence that low income households aged 16-24 years are the least served[70].

Moreover, existing cross subsidies do not stem from long-distance services. Instead, explicit charges are levied to the customer for *access* to the long-distance service (Subscriber Line Charge). These charges allow a closer alignment of rates with marginal cost.

Finally, the third reason why liberalisation did not cause harm to universal service stems from technological progress. It is important to note that rapid technological progress makes the telephone service a special bargain for consumers. When compared to cost increases in other services, telephone charges have risen modestly. Even for local calls, after a sharp increase in 1984, the CPI has steadily fallen. It has been equal or lower than the CPI for all items. Given the drastic price decreases for long-distance and international calls, relative to other goods and services, on average telephone services have become much cheaper over time[71].

Suming up, one finds that universal service has not been put at risk despite considerable rebalancing of tariffs. While the overall burden of cross-subsidisation was reduced, it became more efficient in two ways. The subsidisation was targeted more closely on needy customers. Secondly the remaining burden was shifted away from the very price elastic long-distance services. Moreover, a very low price elasticity of demand for telephone access meant that households did not switch off when prices rose. Finally, technical progress itself ensured that in comparison to other products and services, telecommunications prices have decreased over time.

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68 Dorderick, H.s. and M.D. Fife (1991), p. 122.

69 Fuhr, Joseph P. Jr. (1990), p. 183/184.

70 See: Dordick, H.S. and M.S. Fife (1991), p. 120-122; Hudson, H.E. and Edwin P. Parker (1990), p. 198; Hills, J. (1989), p. 137.

71 Dordick, H.S. and M.S. Fife (1991), p. 123.

6.5. Lessons for Europe

In the USA competition in the long-distance market came about mainly for two reasons. The first was related to cross subsidies which increased over time. Given strong political interests in preserving the subsidy, a rebalancing within the existing regulatory regime was more difficult to obtain than the opening of the long-distance market. The latter, however, led automatically towards cost based pricing. The second motivation was technological progress. The dominant firm did not make full use of new transmission technology. The FCC therefore allowed specialised carriers to exploit the related benefits.

While the divestiture of AT&T is often referred to as the "big bang" of liberalisation, in the USA much more a step-by-step approach was applied. The experience made by this step-by-step approach is threefold.

One important lesson from the process of liberalisation in the US is the considerable **dynamic momentum** which is gained, once entry on the fringe is permitted. Once specialised carriers were established in the market, protectionist regulation of the dominant firm became obviously unfair. This is much less apparent if competitors exist only "potentially". AT&T (like European PTTs) was exempted from antitrust policy as long as it operated as a monopolist. Once installed, however, small entrants used antitrust quickly as a powerful means to put away with protection. However, one should note, that in the EC antitrust is not privately enforceable, as it is in the USA. To gain a similar dynamic momentum as in the USA, small firms would need an active support from the Commission.

The second lesson is related to the continuous efforts to draw a line between the **"competitive"** area and the **"natural monopoly" parts**. The FCC only favoured entrants using technology which would have left idle otherwise. Soon these entrants competed in the main market of the dominant firm. After divestiture value-added and basic services were separated in order to prevent cross-subsidisation. This separation meanwhile has been given up. The main idea of divestiture was, however, to split the local networks as the "natural monopoly core" from the long-distance market. As has been pointed out recent technological development is likely to put an end to the local monopolies as well. Thus technological advance made any borderline futile as soon as it was drawn. This has been clearly seen from various efforts made by the FCC in its "computer inquiries" trying to distinguish value-added and basic services. The spectrum of technical possibilities in telecommunications is continuous. In that case there is a danger involved in imposing an artificial separation of regulated and unregulated parts. By doing so, incentives are given to direct innovation towards a service or a technology which is a very close substitute to the regulated part, but still remains open for entry. The already existing service is merely copied. The competitor nevertheless will be able to make profits since he or she does not operate under the regulatory burden. This leads to the third lesson which is concerned with inefficient entry.

Inefficient entry has become a serious problem because regulators wanted to have both cross-subsidisation for social reasons and competition to raise efficiency in the long-distance market. Entry by specialised carriers has been stimulated significantly by preventing the dominant carrier from realigning its tariff structure. In the US, the FCC did not begin a broad investigation of the sustainability of geographical rate averaging before taking its "above 890 decision". It probably underestimated the scope for "cream-skimming". Prohibiting competitive price responses by AT&T, the regulator almost guaranteed profits for entrants. This prevented a "fair market test". Thus if the telecommunications network is a sustainable natural monopoly, entry appeared only due to flawed regulation. It may be argued that the success of MCI and US-Sprint after divestiture gives some empirical evidence against the "natural monopoly" case. Although AT&T by now has been mostly relieved from regulatory constraints, it could not avoid losing market share. However, losing market share initially may have been in the incumbent's interest. It helped to convince the FCC to loosen control. Secondly, AT&T avoided across-the-board pricing cuts which would have reduced profits. Moreover, the fact that MCI and US-Sprint have not been pushed out of the market may be due to the existence of high sunk costs. Due to the latter barriers to exit exist. Once carriers have established their networks they are unlikely to be driven out of the market again. Anticipating this, the dominant carrier may abstain from a price war, though it might produce at lower cost. It will rather choose to accomodate the entrants.

The artificial incentives for bypass given to private and common carriers have shown that until today this problem has not been resolved. Given the high investments especially undertaken to install private networks, it is therefore likely that considerable funds are misallocated.

Thus, before taking measures of liberalisation, the main operator has to be relieved of uneconomic tariffs. While this appears straightforward, in the US this principle has not prevailed despite 25 years of experience with the liberalisation of telecommunications networks. As was pointed out this is mainly due to the existing regulatory system.

However, the main advantage of competition has proven to be the rapid development of new comunication technology (mobile systems, VSATs, the fusion of telecommunications and TV services on cable), which allows for competition among different systems. While this was probably not the main intention behind the liberalisation process in the USA, it is nevertheless an important outcome which has to be taken into consideration for network competition in Europe. Instead of introducing competition between operators using the same cable technology, more emphasis should be given to competition between operators using different communication systems.

The experience made in the USA has shown that the main carrier is hardly put at the risk of disappearance. Despite artificial incentives for entry AT&T has lost only in market share. However, it did not have to reduce total output. Market growth for basic services was strong enough to make room for the additional carriers.

Universal service goals have not been put at risk in the USA. In this respect it might be useful to distinguish three periods of network development. At the first stage local networks are set up mainly in urban areas. These networks promise to be profitable even if no subsidisation is made. In the second period the network can be increased only by providing access to customers with either incur high costs of access (remote areas, small villages) or have a low income. In this second stage cross-subsidisation becomes necessary to raise access share further. In the third period universal service is accomplished. During the first period the USA achieved a much higher penetration of telephones than European countries. This has been mainly due to the strong competition between AT&T and the "independents". Providing services in remote areas, the independent companies ensured a widespread supply of the telephone network. When competition was reintroduced universal service goals were not threatened. Liberalisation led to a more efficient use of those means which remained to subsidize access. Contrary to the assumption that universal service and competition are conflicting goals, the experience made in the USA has been different. At an early stage competition fosters universal service. At the time of a mature network it is unlikely to create much harm. Only at a medium stage of network development one might therefore expect both goals to conflict.

7. Competition versus Integration: The Commission's Approach

The rapid change of the US telecom industry had an important impact on European policy makers. However, the approach chosen in Continental Europe has been very different from the USA.

During 1980s the telecommunications sector was restructured on both the national and the supranational level. As will be seen in the following, the main driving force has been the Commission of the EC. Actions taken by individual Member States appeared in the service sector only after the former had already sketched a broad concept. Despite the differences still existing on the national level, one therefore may regard the Commission's approach as a synthesis to which continental policies will converge. For this reason the latter becomes especially important when exploring the road towards facility based competition in Europe.

In what follows, first the rationale for action at the Community level is discussed. Then the legal scope of supranational action is looked at. Subsequently I review the policy measures taken by the Commission. In an evaluation of the Commission's approach I put the emphasis on its ISDN policy which is especially relevant for network competition.

7.1. The Motivation for Supranational Action

Until the early 1980s telecommunications was not considered a priority sector for the European Community. The Commission of the European Communities (CEC) had not established a distinct policy approach in its own right.[1] "Telecommunications" was almost identical with the provision of the plain voice telephony service which was carried out by TOs being exempted from national and European competition policy.

In 1983 a telecom Task Force was set up, coming out of DG XII (Industrial Policy). The Task Force was initially concerned with infrastructure projects and public procurement related to terminals and the equipment market. By then telecommunications was more and more regarded as a key industry of the Community. Technological progress during the previous two decades had fundamentally changed the industry sector. The convergence of the telecommunications and information technology enabled the introduction of new services and products which vastly improved the quality and the range of telecommunications services. Telecommunications and data processing became related industries. The demand of industry for communication was rising fast. It became an important **input factor** especially for the growing service sector of the economy. Cheaper and faster means of communication reduce transaction costs in all areas of the Community. Therefore the rapid development of an efficient communications network was regarded crucial for fostering higher productivity growth, a central aim of the Single Market project. Substantial economic gains for instance are expected for the European financial service markets. Finally, the existing national networks were regarded insufficient to cater the

1 For a detailed analysis of the origins of EC policy in telecommunications: Schneider, V. and R. Werle (1988), pp.17-46.

forecast increase in demand for telecom services. Demand was especially expected to rise for international communication, due to the envisaged market integration.

Besides the importance as an input factor for other industries, the telecommunications industry itself has a considerable size.[2] The growth potential is considerable. While in 1984 the sector's share of Community gdp was slightly above 2%, it is expected to rise to 7% at the end of the century.[3] The world market for telecommunications services presently grows at 12% a year.[4] The digitalization of communication allows the integration of telecommunications services, data transmission, and audio-visual media. New markets for value added network services arise. Since the latter are highly specialized services, they only succeed in a large integrated market. Providing a European wide homogeneous infrastructure was supposed to be beneficial also for the development of value added network services. The VANS markets are expected to overtake basic services in importance. They are growing by 20% annually.[5]

From recognizing the growing importance of the telecommunications sector to establishing the need for supranational action was only a small step. The Commission justified its own involvement by the existing market fragmentation and restrictive national public procurement policies.

Market fragmentation became the central concern of the Commission. It appeared detrimental for both the equipment and the service markets. Digitalization had tremendously increased the cost of R&D for transmission and switching technology. This established the need for integration and standardization in the Community's telecommunications market. Market integration through standardization supposedly increases price competition in switching markets. An network operator's production cost could thereby fall by between 2 and 8%.[6] Market fragmentation is a serious problem in an industry facing considerable economies of scale. The United States' share of the world market for telecommunications amounts to 35% followed by Japan with 11%. A genuine common market would amount to more than 20%. However, even the biggest national market in the EC does not account for more than 6%.[7] It has been estimated that at least an 8% share of the world market in telecommunications equipment is needed to recoup R&D investments. Cost estimations indicate that the fragmentation of the European telecommunications market due to different technical standards and nationalistic public

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2 The world market of telecom equipment amounted to ECU 90 billion in 1986, of which the Community share is roughly ECU 17.5 billion. See: Com (87) 290, p.3.

3 At this time up to 60% of all jobs in the EC will depend directly or indirectly on telematic technologies. Com(87) 290, p. 2 and: Schulte-Braucks, R. (1988), p.6.

4 Roulet, M. (1988), p.11.

5 Roulet, M. (1988), p.11.

6 Müller, Jürgen (1989), p.271 and: Müller, Jürgen (1987), p.65.

7 Ungerer, Herbert (1987), p.20.

procurement policy has considerably driven up costs of production. In the middle of the 1980s the costs of procurement for instance were 60% to 100% above those in the USA. Prices for mobile telephone systems on average were seven times those in the USA.

Small national markets also have hampered the development of specialized VAN services. The total market size of telecommunications services in Europe amounts to only one half of the size in the USA,[8] despite the fact that there are more inhabitants in the EC. As long as national markets in the EC are fragmented, they will not permit enterprises to reap the considerable economies of scale which materialize for these services. Finally, as has been discussed in some detail the welfare losses due to inefficient price setting were considerable. The welfare losses due to noncompetitive pricing in international phone calls for Germany alone have been estimated to be above ECU 1 billion annually.[9] These welfare losses are mainly borne by business customers who use long distance service intensively. Therefore they may be considered as a specific tax, which increases input cost for other enterprises. The need for a European wide strategy to overcome market fragmentation for services therefore was widely accepted among Member States.

The need to liberalize markets for VANS was put forward. It was argued that only a "Schumpeter" type of entrepreneur could reap full benefits from the newly emerging technologies. State monopolies were seen as too risk averse to let all potential gains materialize.

While the importance of deregulating telecommunications markets was widely accepted, different national approaches bore the risk of deepening the existing market fragmentation. The Commission therefore saw the need to integrate markets for equipment and VANS and to coordinate national action. Furthermore, the Commission pointed to the danger of an extension of state monopoly. The possibility existed that national PTTs would extend their monopoly rights from basic services to VANS. Finally, the wide discrepancies of telephone tariffs for interstate calls[10] were regarded in contradiction to the principle of harmonization and integration as prescribed for "1992".

Having established the need for action at the Community level, the Commission started with liberalizing the markets for equipment and terminals. Recently the liberalization of service markets was undertaken. The following analysis is concentrated on the latter. Before scrutinising the measures already undertaken by the Commission I first discuss briefly the scope for a telecommunications policy at the Community level.

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8 Cecchini, Paolo (1988), p.43.

9 Zietz, J. (1986), p. 421 and Zietz, J. (1985).

10 For instance a phone call from Athens to Bonn (minimum rates always) costs more than twice as much as from Bonn to Athens. A detailed study of the tariff structure can be found in: BEUC (1988), p. 33.

7.2. EEC Powers to Regulate Telecommunications Services in Europe

As has been pointed out, telecommunications traditionally was regarded as the exclusive domain of national regulators. The provision of services was an integral part of the national infrastructure without a sufficient Community interest in the context of Community competition law. The scope for European telecommunications law was explored (only after the Green Paper). As will be seen, over the past five years the Community's power to regulate this sector has increased rapidly.

This chapter analyses the various types of regulatory instruments which are at the disposal of the Commission. This is important for two reasons. First, the analysis of the Commission's approach towards telecommunications renders it necessary to clarify the scope for action which actually exists at the supranational level. Second, when discussing alternative strategies it will be interesting to see to what extent they could be implemented within the present regulatory framework. Thus the question will arise whether steps towards facility based competition in Europe can be launched by the Commission itself.

7.2.1. Regulatory Instruments

Article 189 (1) of the Treaty of Rome mentions four types of Community acts to exercise its regulatory power in the telecommunications field. These acts are distinguishable according to their binding force and the scope of their applicability.[11]

a) *Regulation*: a regulation is binding and has to be directly applied in all Member States. It has the force of law. There is no need for transformation or confirmation by the Member States.

b) *Directive*: directives differ from regulations with respect to the scope of their binding force. A directive is only binding upon the Member State to which it is addressed. A directive requires implementation on the national level. National authorities have to adapt national laws in order to meet the content of the directive.[12]

c) *Decision*: a decision is binding only upon those to whom it is addressed.

d) *Recommendations* and *Opinions*: Neither recommendations nor opinions have a binding force.

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[11] Here and in the following: Scherer, Joachim (1990), pp. 235-255.

[12] Member States have to implement a directive by a legally binding act. A mere change of administrative practices does not suffice.

In practise, directives have become the main regulatory instrument for European telecommunications. The failure of a Member State to implement a directive constitutes a violation of the EEC Treaty leading to infringement procedures under Article 169 EEC Treaty. Directives can either be issued by the Commission or by the Council, depending on their legal basis. The difference becomes important because Council directives generally take more time. Moreover, they rely more on a compromise seeking approach.

7.2.2. Regulatory Powers of the Commission in the Field of Telecommunications

The EEC Treaty of Rome does not contain specific provisions for telecommunications. The application of competition rules was further limited due to the public service character of telecommunications.[13] Nevertheless the EC's competition policy has been applied recently to the sector.

In principle there is *supremacy* of Community law over national law. Moreover, there is an *implementation requirement* on Member States. Given the tools as described above one therefore would expect that the Commission is in a strong position to go ahead with its telecommunications policy. However, the scope of regulatory powers of the Commission is highly disputed. This stems from the fact that the Commission has only recently started to apply general competition rules to the telecommunications sector.

The legal framework for EEC competition policy is laid down in Article 85 and 86 for the market behaviour of commercial undertakings. They apply both *directly* and *throughout* the Community to all undertakings, whether public or private on equal terms and to the same extent. If the challenged behaviour is imposed on the firm by a mandatory State measure, then Article 90 may be applied to the State, while Article 85 and 86 apply to the undertaking. The Commission has made clear that TOs are undertakings within the meaning of Articles 85 and 86. The only exemption is provided by Article 90(2).[14]

The power to enforce these rules is conferred upon the Commission which can impose fines for infringement. The European Court of Justice has virtually unlimited jurisdiction in respect to appeals against decisions by the Commission.

Article 85:

Article 85 prohibits all agreements between undertakings[15] and concerted actions which may restrict or distort competition within the common market. According to 85(3) exceptions can be made if a specific agreement improves general welfare.

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13 Ravaioli, P. (1991), p.103.

14 See: Commission of the EC (1991a); and also: Mensi, M. (1991).

15 The notion of "undertakings" includes public companies when they do not exercise powers of public authority. In more detail: de Cockborne, Jean-Eric (1990), p.854.

In its "*Guidelines on the Application of EEC Competition Rules in the Telecommunications Sector*"[16] the Commission points out that horizontal agreements between TOs concerning terrestrial facilities and reserved services are covered by Article 85. This is the case if these agreements affect trade between member states. Especially price agreements as settled by the CEPT may be seen as serious infringements of Article 85.[17] However, Article 85 may also be applied against TOs agreements which limit hub-competition and the routing of calls.

Article 86:
Article 86 prohibits an abuse of a dominant position of an undertaking. It applies if a dominant position is held and if the abuse affects trade between Member States.

If a company is in a dominant position as a result of Member States measures (e.g. granting of exclusive rights), and if it thereafter abuses this position, Article 86 is applicable. The company's behaviour is its sole responsibility.[18]
National TOs individually or collectively hold a dominant position for the installation of fixed terrestrial public networks. Moreover, they hold dominant positions for the reserved services and some competitive services. Abuses of TOs for instance may occur when they try to acquire a foothold in non-reserved service markets by cross-subsidization or when they restrict competitors' access to their networks.[19] However, cross-subsidization among reserved services is not covered by Article 86 since no distortion of competition is feasible.

Article 90:
In case of public undertakings Article 90 EEC Treaty is relevant. Article 90(1) states that Member States shall not maintain in force any measure contrary to the rules of the Treaty if special rights are granted to public undertakings. 90(2) states that these undertakings are subject in particular to the rules on competition, in so far that these rules do not obstruct the particular tasks assigned to them. Finally, 90(3) states that the Commission shall ensure the application of the provisions of the Article. It shall address appropriate directives or decisions to Member States.

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16 The "Guidelines" offer advice on general legal and economic principles when applying the EC's competition policy. They are not binding and their application is enforced on a case-by-case basis. Compare: Com(91a) 233.

17 Following the Commission's intervention, the CEPT abolished recommendation PGT/10 for a 30% surcharge for third-party traffic using leased lines. See below.

18 de Cockborne, J.-E. (1990), p. 856.

19 For instance the Commission has taken action in respect of the Belgian *Régie des Télégraphes et Téléphones* (RTT) after receiving a complaint concerning an alleged abuse of dominant position from a private supplier of value added services. After discussions with the Commission RTT authorised the private supplier to use the leased circuits. See: Com(91a) 233.

According to the Court's case law it is the Member State's choice to grant certain undertakings the right to provide special services. However, the Commission decides on the basis of the Community law whether these services are of general economic interest. The same applies for the provision of Article 90(2).[20] From the case law of the Court of Justice the Commission infers that it has exclusive competence to decide whether an exception according to 90(2) shall be made.

In its Green Book, the Commission recognised the central role of TOs performing their public task. The latter consists in the provision of a universal network and universal service. This fundamental obligation is regarded as a justification for the exception provided by Article 90(2), under certain circumstances.[21]

Thus when operating services of public interest, the granting of exclusive rights is not prohibited under the Treaty. However, also state monopolies have to comply with the basic objectives of the Treaty. They are not permitted to take measures which distort competition in the common market.[22] As a result the operational and commercial activities of all TOs are subject to a strict and continuous review by the Commission for compliance with EC rules on competition. In this respect the Community's power for competition policy often exceeds the power granted to corresponding national authorities. In Germany, for instance, the "*Kartellgesetz*" exempts the Deutsche Bundespost from national competition rules. The power granted by Article 90 is essential especially since the Commission favours a "mixed regime". TOs provide "reserved" services and operate also in the liberalized service markets. This enables them to restrict access to their networks and to cross subsidize services under competitive pressure. While the application of competition rules to the liberalized service markets seems straightforward, as the examples above have shown, the Commission also has some power to intervene in the sphere of exclusive rights of TOs. However, the extent to which the Commission may do so has not been clearly defined yet.

After reviewing the situation, the Commission found that many member countries were not in conformity with competition rules as regards terminal equipment and services. For this reason the Commission refrained from taking individual action and chose Article 90(3) to implement the terminal equipment directive and the service directive. In order to avoid delay and duplication it resolved to use directives addressed to all Member States.

It has to be stressed that according to the "*Guidelines*" the application of EC competition policy cannot be avoided by international conventions. Article 234 of the EC Treaty only protects the rights of third countries but it does not protect obligations between EC member countries. Thus, for instance, the competition rules apply to the "*International Telegraph and Telephone Consultative Committee*" (CCITT) recommendations.

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20 As an exception to the ruling of the Treaty, Article 90(2) has to be interpreted strictly. It must be demonstrated that the relevant task cannot be performed by other means. See: de Cockborne, J.-E. (1990), p.859.

21 See: Com(91a) 233.

22 Pappalardo, Aurelio (1980), pp.203-205.

Council legislation

While Article 90(3) is the basis for the Commission's directives concerning telecommunications, Council directives may be based on Article 100a EEC Treaty.[23]

Article 100a is the amendment to Article 100, created by the Single European Act. In contrast to the latter, Article 100a does not require unanimous decisions by the Council. It enables the Council to enact measures for the approximations of national laws on the basis of a *qualified majority* voting. A dynamisation and acceleration of harmonising national laws is envisaged. However, compared to directives applied by the Commission, action undertaken by the Council ensures more influence for national policy makers. It is generally assumed that Council legislation would be considerably less oriented towards liberalization. Council legislation, for instance, was chosen for the ONP directive which aims at harmonizing access conditions to national networks.

The use of Article 90(3) for directives by the Commission is therefore not undisputed. Procedural questions are highly political since they implicitly lead to a redistribution of power. A success when applying EC competition rules directly to TOs not only made European telecommunications policy more effective, but increased the competence of EC institutions. The first breakthrough was the cornerstone decision of the European Court in the *British Telecom Case*.[24] Before the Telecommunications Act of 1984 the British authorities had prohibited the transit of telexes between third countries by a private British agency. This service had been offered by Telespeed which took advantage of substantial price differences in various Member Countries. These differences were due to different tariffs, costs and currency fluctuations. The Commission overruled this decision on the basis of Article 90(3). Thereafter the Commission's action was challenged by the Italian government. In its judgement of March 20, 1985 the European Court dismissed the action brought by the Italian government. It confirmed the Commission's view in two important aspects. First, it was confirmed that the competition rules of the Treaty of Rome apply to TOs.[25] Second, and as a result, the rejection of the extension of monopoly from voice transmission to data transmission and storage was correct. The private firm therefore was entitled to use the line it had already rented to forward telex messages.[26] The *British Telecom* decision supported the Commission's view that the inherent tendency of

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[23] In fact the Commission is not obliged to adopt a directive under Article 90(3) to liberalize the service market. The Treaty of Rome leaves the Commission considerable scope of discretion to exercise its supervisory functions. The Court of Justice has laid down basic principles for the exercise of legislative powers under Article 90(3). In more detail: Scherer, J. (1990), pp.240-242.

[24] A detailed analysis can be found in: Bruce, R.R. and Jeffrey P.C. Mark (1988), pp.304. See also: Ravaioli, P.(1991), pp.105.

[25] Ungerer, H. (1988), p.167/168.

[26] Schulte-Braucks, R. (1987), p.90/91.

undertakings enjoying special rights to extend the scope of their exclusive activities, is an abuse of a dominant position.[27]

In 1988 France took the Commission to Court when it used Article 90(1) and 90(3) for the equipment directive. France argued that instead this would have had to pass through the Council, thus ensuring national authorities some influence on the process. France asserted that Article 90 could not be used to make law in new areas and that the Commission had gone beyond its competence.[28] In its final decision on March 19, 1991 [29] the European Court confirmed the legal approach made by the Commission on the application of Article 90 to liberalize the market for terminal equipments.[30] Overall the Court's decision is regarded as a "landmark judgement" which confirms the Commission's power to correct breaches of the EC free trade and competition rules by public sector entities which are entrusted with special rights. Belgium, Spain and Italy have already launched an appeal against a similar procedure for the service directive. It seems unlikely to be successful after the previous ruling.[31]

Summing up, the provisions of the Treaty of Rome offer the Commission a powerful instrument to ensure free trade in services. Moreover, given its power to judge whether Article 90(2) can be applied, the Commission may have a say also as far as the network monopoly is concerned. While according to Article 222 the Commission is *not* entitled to decide on public or private ownership of TOs [32], it nevertheless may have the power to challenge the network monopoly of the latter. If it is deemed favourable the Commission may adopt a directive asking Member States to licence further network operators.

7.2.3. The Commission's Approach towards Telecommunications

7.2.3.1. Terrestrial Networks and Services

In 1987 the *Green Paper on Telecommunications*[33] introduced a programme for future regulation of the telecommunications sector. The removal of trade barriers, mainly those due to public procurement policy, was a principal aim. TOs would have to abandon any special rights for the installation of terminals. The separation of business functions and

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27 Ellger, R. and D. Witt (1990), p.328.

28 See: Ravaioli, P. (1991) pp.110-127 and also: Economist, October 28, 1989, p.87.

29 Decision March 19, 1991, aff 202/88 France/Commission.

30 However, the Court limited the Commission's power by stating that Article 90(3) EEC Treaty cannot be used to ask a Member State to end an infringement in relation to a firm which has been granted exclusive rights.

31 FinTech Telecom Markets, April 18, 1991.

32 Article 222 EEC Treaty rules that the Community shall in no way prejudice the choice of property ownership in Member States.

33 Commission of the EC (1987).

regulatory power was seen necessary to avoid an abuse of special rights by TOs when competing with private entities. Otherwise the TOs would have a dominant position for instance for type approval, licensing, interface specifications, allocation of frequencies and the general surveillance of network usage conditions. Finally, the Green Paper stressed the importance of clear requirements for transparency in financial relations between Member States' governments and TOs.[34] A major cause of distortion of regulatory efficiency is the lack of protection available for TOs against an abuse by national governments. The latter have a long tradition of using TOs for short term political objectives which are contrary to the aim of an efficient telecommunications sector. TOs often lack the autonomy and flexibility necessary for adequate financial planning.

While any special rights concerned with the equipment market were to be abolished, the network monopoly of TOs was not challenged. In the case of services voice telephony was reserved for TOs. The network monopoly and the service monopoly were justified on grounds of universal service. Moreover, the service monopoly was meant to provide the financial sources to go ahead with network investments. An integrated network throughout the Community was regarded as essential for a free market for VANS. Private undertakings offering VANS then can use the existing network without being compelled to build their own installations. The integrated ISDN system yields compatibility. Services therefore can be provided beyond national frontiers, which is necessary for the more specialised services to break even. Therefore the Commission stimulated coordinated investments into a harmonized ISDN network. The installation of an integrated ISDN network was agreed upon in 1986.[35] Building a digital fibre optic network is by far the largest investment programme ever faced by TOs.[36] The interconnection of computer and telephone networks requires huge industrial coordination efforts which supposedly are easier made in the environment of a small number of experienced network operators.

Thus beside the universal service argument there was a second motivation for reserving basic telephone services to national TOs. Granting related exclusive rights to national operators was justified because of the financial needs for the ISDN network. The revenues stemming from basic services should finance the huge investments into the infrastructure.

Competition was envisaged for value added network services which according to the Green Paper should be opened to entry. Based on the assumption of important economies of scope for the provision of basic and value added services, the TOs obtained the right to operate in both areas.

After formulating the basic policy goals, the Commission started their implementation by using different directives. Two generally different stages may be distinguished. The first

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[34] See as well: Müller, Jürgen (1989), pp. 470-477. And: Stevers, Ester (1990).

[35] See for instance the Council Recommendation 86/659/EEC on the coordinated introduction of the ISDN network and: Schulte-Braucks, R. (1988), p.14.

[36] Compare in more detail: Schön, H. and K.H. Neumann (1985), p. 478 and Scherer, J. (1987), p.11.

step was rather *defensive* in that the Commission tried to prevent the extension of exclusive rights granted to TOs. By doing so it could establish itself as a further regulator in the field of telecommunications. In this context the above-mentioned "British Telecom case" was crucial since it confirmed the Commission's rejection of the extension of monopoly rights from voice telephony to data transmission and storage.

The second stage is *offensive* in the sense that the Commission forces national authorities to restructure the telecommunications market according to the principles which have been formulated in the Green Paper. It could only be undertaken after the Commission's position as an additional regulator was entrenched by the ruling of the Court. The most obvious signs of this position have been the two service directives finally adopted in July 1990.

ONP-directive 90/387/EEC:

The directive on "*Open Network Provision*" (ONP) imposes general principles for the provision of telecommunications networks. They comprise rules of transparency, equal access and non-discrimination. Thus, the intention of ONP is to provide a legal framework allowing all users to gain access to telecommunications networks throughout the Community. Only in cases where ONP does not protect against anti-competitive practices, the Commission applies directly the principles of competition policy as outlined above.

The directive on ONP imposes clear rules for interconnection and access on TOs. Access to the network infrastructure for new service providers and for users shall not be discriminatory and conditions for access have to be transparent. Harmonization applies for technical interfaces, usage conditions and tariff principles. According to the ONP directive tariffs must be based on objective criteria, they must be transparent, non-discriminatory and cost oriented. The fixing of the tariff, however, is left to national legislation.[37]

ONP has a fundamental role in providing European-wide access to Community-wide interconnected public networks. It mainly applies to reserved services in reaching some degree of commonality within the Member States. However, ONP conditions should apply also for non-reserved services offered by TOs via joint ventures or subsidiaries. In this respect transparent and uniform accounting procedures are be necessary.[38]

Transparency of cost allocation has to be applied by TOs, which is important to prevent cross subsidization between reserved and non-reserved services. An accounting system has to be established which ensures the fully proportionate distribution of all costs between reserved and non-reserved activities.

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37 Price agreements among TOs can cause serious restrictions to trade of services. However, agreements to set up a common tariff structure or tariff principles may be permitted under Article 85(3) if the economic benefits outweigh the restrictions on competition. This could be the case due to higher transparency of tariffs, which facilitates users' decisions about traffic flows or the location of headquarters or premises. This is aimed at by the ONP definition of harmonized tariff principles.

38 Lewis, Angi (1989), p.126.

A first application of ONP has been done through a specific directive to leased lines, which was formally adopted by the Commission in February 1991.[39] As an integral part of the network infrastructure leased lines are classified as a part of the reserved area. All leased lines will be subject to usage and supply conditions that are transparent and published appropriately. Technical restrictions in respect of interconnection of leased lines are prohibited. The directive pronounces the principle of cost-oriented pricing for leased lines.

Related to the ONP approach the CEPT decided to abolish Recommendation PGT/10 on the "*General Principles for the Lease of International Telecommunications Circuits and the establishment of Private International Networks*", after the intervention of the Commission. The CEPT recommended the imposition of a 30% surcharge or an access charge when third party traffic was carried on an international leased circuit. It also recommended the application of uniform tariff coefficients in order to determine the relative price level of international telecom leased circuits. The Commission found that the Recommendation amounted to a price agreement between undertakings under Article 85 which substantially restricted competition within the European Community. The CEPT agreed to abolish this recommendation, and to allow for competition between telecom operators for the supply of international leased circuits.[40]

The Commission has proposed the Council the application of ONP to voice telephony. It aims at establishing the user's rights with respect to the supply of telephone services of a defined quality.[41] A requirement to establish cost-accounting principles and billing transparency is also foreseen. Presently, the Commission investgates to what extent the ONP concept can be applied to broadband networks, intelligent networks and mobile and satellite communications.

As Ravaioli has pointed out, the ONP directive does not establish competition rules. Hence, even after the adoption of the ONP directive Article 85 and 86 are fully applicable to the telecommunications sector.[42]

Service Directive 90/388/EEC

The service directive intends to remove all exclusive rights for TOs except for infrastructure and voice telephony. It does not apply to telex, mobile telephony, paging and satellite services. While the exclusion of telex was motivated by its declining importance, mobile and satellite services will be regulated in the future. For mobile telephony especially no consensus was reached how far liberalisation should go. Being exempted from the service directive, these services are still covered by the competition rules. Voice telephony was exempted on the basis of Article 90(2). This has been justified by the need to ensure the

[39] The Council adopted a common position in December 1991. See: Com(91) 509.

[40] Com(91a) 233.

[41] These rights include targets for network access supply time and quality, and the right of access to a minimum set of advanced telephone features.

[42] Ravaioli, P. (1991), p.128.

"financial viability" of TOs which have to provide the universal service network.[43] In practise, restrictions on the provision of unreserved telecommunications services consist mainly in the prohibition of interconnecting leased lines, in imposing high access charges or applying volume sensitive tariffs without economic justification. These restrictions will be abolished. Generally, simple resale of capacity for non voice services will be allowed from January 1, 1993. The directive establishes "essential requirements" which are the only justification to restrict the use of the public switched network for service provision.[44] However, Member states may include public service requirements in the licensing or declaration procedures.[45] Exclusive rights granted to TOs to provide non voice telecommunications services are declared incompatible with Article 90(1) in conjunction with Article 86 and have to be withdrawn. The definition of the reserved voice service is of a very limited scope and has to be interpreted strictly. Moreover, the burden of proof that a service falls within the limits of this definition is put on the TOs.[46] In case of controversy it will be the Commission who decides which category applies. Finally, the service directive asks for the withdrawal of all regulatory functions from the TOs.
A political compromise led to special rules for packet-switched data services. Here countries are allowed to establish further licensing conditions for providers. Although these conditions have to be vetted by the Commission they may obstruct the liberalization of this market.[47]

In reality the separation of basic and value added services is less clear cut then it appears to be in the service directive. The Commission opts for a strict interpretation of the voice telephony monopoly. Consequently it proposes competition in markets which overlap with the reserved area. An important market in this respect are mobile networks. Based on an initiative by the Commission the Council made the Recommendation 87/371/EEC on a coordinated introduction of public pan European cellular digital landbased mobile communications in the Community. It is envisaged that separated mobile networks are installed also by private undertakings. Moreover, the latter are permitted to provide telephone service as well as value added services. Thus in the mobile market the

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43 Ravaioli, P. (1991), p.131/132.

44 Essential requirements are related with the maintenance of network integrity, the security of network operations, and data protection.

45 This applies especially for packet & circuit switched data services.

46 The directive makes an attempt to distinguish voice and non-voice services. Thereby voice services are defined as the "commercial provision for the public of the direct transport and switching of speech in real time between public switched network termination points (...)" From this definition we can defer that services as voice messaging, voice service for closed user groups, least cost routing, voice storage, etc are non-reserved. See as well: Amory, Bernard (1990), p.7/8.

47 The Commission will make a proposal for a Council directive implementing a system for mutual recognition of licences for services within the Community. Due to pressure of some Member Countries, those having an underdeveloped infrastructure may ask the Commission for an extension of their monopolies on data services until 1996. See as well: Bernard, Keith E. (1990), p.280.

Commission is ready to make an exemption from both the network monopoly and the service monopoly of national TOs. As a result one may expect that TOs will face some competition on the fringe.

7.2.3.2. Satellite Networks

The Commission published a second Green Paper on satellite communications in 1991. While the policy approach towards satellites broadly follows the approach towards the fixed terrestrial networks, it appears to be more liberal in some points.
Traditionally, in Europe the policy towards satellite networks has been similar to the one for fixed terrestrial networks. This will be discussed in more detail in chapter 12.2. Markets remained fragmented and controlled by governmental intervention. In most member countries the installation, ownership and operation of receive-only terminals for entertainment broadcasting reception is already largely liberalized.[48] These terminals do not pose a threat to operators since they have no transmit capability. They were included in the Directive 88/301/EEC which liberalized the terminal equipment market by the latest of 30 June 1990. The new VSAT earth stations[49] which are capable of sending and receiving, however, are still not liberalized in most member countries. As a consequence it has been argued that the European satellite manufacturing industry lags behind US competitors. Equipment prices for ground stations and satellites as well as tariffs for services exceed considerably those charged in the US. Fragmented markets prevent producers from reaping the benefits of economies of scale which according to an EC estimation could reduce the costs of a commercial satellite in Europe by 40%.[50] The fragmentalization, moreover, handicaps specialized satellite services providers, while the existing monopolies are not able to provide sufficient transponder capacity to allow a rapid expansion of these services.

The Green Book on satellites follows the approach of the Green Book for terrestrial networks. The Commission again draws a line between voice satellite services and other services. While the latter have to be opened up to competition the satellite voice services are reserved. However, in case of the satellite network an exemption has been made. As was described in chapter 2.1.4. the satellite network consists of the space segment and the earth segment. The latter accounts for more than 80% of total satellite network costs. Traditionally the large earth stations used with Intelsat and Eutelsat were owned and operated by the national telecom organisations. The messages they received were transmitted into the terrestrial network which thereafter distributed them to the user. With the arrival of VSATs this link to the terrestrial network can be circumvented. VSAT earth

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[48] Com(90a), p.88.

[49] For the importance of VSATs see chapter 2.1.4.

[50] Com(90b), p.2.

stations can be installed directly on the customer's premise. When using VSAT systems the provision of liberalized services render it necessary to liberalize the use and installation of the earth segment. Consequently, the Green Book argues for an exemption of the network monopoly of TOs as far as the earth segment is concerned. Thus as a central aim the Green Book promotes the **full liberalization of the earth segment** in order to make competition possible for VANS provided over satellite networks.

Legally, the liberalization of the VSAT is based on Article 30 and 37 of the EC Treaty. According to Article 30 the restriction of imports is prohibited, thus if a certain VSAT system is marketed in one of the member states it can be deployed freely throughout the Community. Article 37 abolishes all discrimination resulting from state monopolies of a commercial character. A monopoly of the provision of satellite earth stations may prevent users from choosing freely the equipment which best suits their needs. Moreover, the monopoly may lead to an exclusion of certain producers of VSAT systems. Thus the Commission argues that the provision of satellite earth stations may no longer be monopolised by TOs. As far as VSAT systems also allow the provision of services which are still subject to special or exclusive rights (voice telephony) the *use* of these systems may be restricted by certain regulatory safeguards through licensing.[51]

Similarly to the principle of equal access for the terrestrial network, the satellite Green Book asks **open access to the space segment**. Here member countries are bound individually by international treaties and institutions like the ITU, Eutelsat, and Intelsat. The Commission urges them to initiate individually the necessary procedures to liberalise the access to space capacity. As discussed before, in international arrangements the signatories have the exclusive right to allot space capacity. Since all member countries have designated their TOs to act as signatories this raises the problem of having TOs operating as referee and player at the same time. In general since the signatories hold a dominant position in the sense of Article 86 they have to provide capacity to all potential users at fair prices and on a non-discriminatory basis. However, in practise they may abuse their power concerning the coordination of frequencies, and the use of orbital resources (resale of space capacity) in order to discriminate against private entities offering satellite services in competition to the TOs. The principle of separating regulatory and operational functions has been implemented in the Directives 88/101/EEC and 90/388/EEC and it has to be applied also to the satellite systems. While the present cartel of national operators is not challenged, Eutelsat has been asked to review its charter allowing for equitable, non-discriminatory access on a cost-based basis.[52] Free access to space capacity is necessary if national operators compete with private firms in the provision of (non-voice) services. Presently users and independent service providers have to buy transponder capacity

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51 Com(90a), p.90/91.

52 Hayes, Dawn (1991).

through public network operators. However, Eutelsat's supreme decision-making body, the Assembly of Parties has rejected the proposal that national TOs relinquish capacity control.

Thirdly, the satellite Green Paper asks for **full commercial freedom** for space segment providers. Thereby it is hoped that Eutelsat will operate at arms-length from national operators. In order to avoid any distortion of competition the best solution is seen in ensuring direct access of users to space capacity. Providers should market their capacity directly. The distribution of capacity then could apply competitive biddings by all service providers instead of an arbitrary allocation through national operators. Already Eutelsat directly offers space capacity to the European Broadcasting Union which shows that the direct lease of space capacity is feasible.[53] Eutelsat could develop into a full scale entrepreneurial organization by marketing space segment directly to service providers. Prices are expected to become more cost oriented and the existing price differences for two-way satellite services due to non-competitive market segmentation could be eliminated. It is estimated that prices in some cases could be reduced to one third or one fourth.[54] The main problem with this approach is that the investment is carried out by the signatories whose investment share depends on *their* use of the Eutelsat segment. This may lead to underinvestment if their use declines while private operators' share of the space capacity increases. Hence the existing arrangements have to be reviewed so that new parties can become members of Eutelsat. However, given that EC member states hold 88% of total share in Eutelsat and furthermore given the interest of Eastern European countries in liberalizing the satellite market, the Commission reckons that the base for reform can be found.[55]

Based on the Green Book, in 1992 the Commission will provide four key pieces of draft legislation on satellite services and equipment. Thereafter they have to be adopted by the Council of Ministers.

The satellite policy of the Commission appears to be a logical continuation of the approach applied to the terrestrial network. Liberalization is concentrated on those parts which are essential for the provision of all non voice services for which competition is envisaged. Equal access rules are supported to ensure that the Eutelsat signatories do not abuse their network monopoly power when competing with other service providers. In this context the liberalization of the earth segment cannot be regarded as a first step towards the end of the network monopoly. It is rather meant to be a necessary but exceptional device to promote the provision of non-voice services. However, it is a good example for the technology driven retreat of network monopolies.

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53 Com(90a), p.104.

54 Com(90b), p.4.

55 Com (90b), p.110.

7.2.3.3. Further actions

Finally, the Commission has started to play an active role in regional development of telecommunications networks. This is carried out by the STAR programme.[56] As was seen when discussing approaches of individual Member Countries, the penetration even of basic services varies widely throughout the Community. The integrated ISDN network is regarded an important advantage for those regions since this could help to overcome the handicap of geographical isolation. The Community provides ECU 780 million and the Member States themselves again ECU 520 million for the period 1987-1991. These funds shall be used to invest into the infrastructure and to stimulate demand.[57] A second programme (Revolve) with similar intention has been set up to explore the relevance of Integrated Broadband Communication (IBC) for these regions.[58]

The idea of these programmes is to reduce the regional disparities in economic development in the EC. A good communication network could to some extent eliminate the disadvantages associated with distance from the core markets. Thereby the less favoured regions could achieve access to the fast growing markets of value added services. In that case these regions could benefit proportionately more from advanced telecommunications than the core of the Community. The rationale then for a regional programme is, that while potential benefits are high, the poor actual demand in this area would by itself not attract private investments. Therefore a demand-led strategy would generate a penetration of VANS which is too small. On the other hand the supply-led strategy by the Commission is risky since demand is uncertain and the investment needed is tremendous.

7.3. An Evaluation of the Commission's Policy

7.3.1. A brief Comparison to the USA

In the USA the driving force towards divestiture of AT&T was the concern of the relationship of prices and underlying costs. The magnitude of subsidies among services attracted mainly the interest of industrial users.[59] It is interesting to note that a rebalancing of tariffs would have been possible by service based competition alone. The reason why the US eventually moved further towards facility based competition may be found outside the

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[56] STAR: Special Telecommunications Action for Regional development.

[57] Ungerer, H. (1988), p.157.

[58] EUI, No.4, 1988, p.64. For a general analysis: Beale, Jeremy (1988),

[59] Mansell, Robin (1990),

telecommunications sector altogether. It has been argued that the divestiture of AT&T to some extent was a regulatory accident due to the uniquely cumbersome public administration apparatus.[60]

In the EC[61], prices generally were far more out of line with costs than in the US before the AT&T breakup. Nevertheless pricing issues were not in the forefront of regulators concern. Instead the motivation to restructure the telecom industry was more related to the modernization of the infrastructure and the development of new services.

As far as the infrastructure is concerned the development therefore was quite contrary. The US went from an integrated network to network fragmentation. The regional networks were separated from AT&T long distance and, moreover, further public switched long distance networks were installed. The US began with one public network and ended up with seven. In Europe instead previously separated networks have been integrated by harmonizing standards for the ISDN network. Thus ideally continental EC countries would move from 11 separated to one integrated network. The USA chose to separate firms operating in the monopolized (local) markets from those operating in competitive ones. In the EC a corresponding separation of the reserved and the competitive area would have implied to bar TOs from the provision of non reserved services. However, in contrast to the US in the EC the scope for predatory behaviour by cross subsidizing TOs was not regarded a major problem. In order to reap economies of scope therefore TOs are permitted to operate in both markets. Thus, while the development in the USA can be described as an accelerated process of decentralization the opposite holds for the Community[62]. This applies for the telecoms network. However, it applies also for the regulatory environment. While in the USA the FCC has lost influence to the courts, in the Community the Commission dominates national regulators.

In both cases regulators refrained from complete liberalization. Natural monopoly arguments and universal service were regarded as important enough to limit entry. However, while in both cases the VANS market are liberalized, the main difference remains that the USA have introduced facility based competition in the long distance market. The emphasis given to network integration kept the Commission from taking the same step. This was justified by considerable economies of scope for the provision of basic services and economies of scale for value added services. However, it would have been within its legal power to issue a directive to member states asking them to licence further network operators.

The presumption of economies of scope differs not only as regards services, but also for the relationship of manufacturing and network operation. In the USA, the vertical integration of AT&T has not been touched. In continental Europe instead TOs in general are not

[60] Anania, Loretta (1990), p.8.

[61] When I speak of the "EC" in the following I refer to continental Member States only. Most of what is said for the US applies also for the UK.

[62] Lera, Emilio (1989), pp 32.

vertically integrated and the combination of network provision plus manufacturing was not regarded as necessary.

In Europe, the main gains from competition were expected to arise in the service markets which subsequently were liberalized. Competition among network operators in this respect was seen to be counterproductive. It could generate different networks which due to incompatibility could not be interconnected. This would hamper the development of VANS. The US approach led to several types of ISDN specifications and a lack of "system implementation". The lack of infrastructural planning therefore may turn out expensive if later a conversion of different network topologies becomes necessary.[63]

The fact that two strategies were chosen which in many respects are diametrically opposed may lead to the conclusion that measures of liberalization were driven by non-economic reasoning. Political, legal and institutional differences were decisive for the process of restructuring the telecommunications industry. If this is correct, one may conclude that considerable efficiency gains could still be expected by a further opening of markets.

7.3.2. The Concept of Network Integration

Broadly speaking, the Commission pursues two goals. On the one hand it fosters integration. This aim is promoted by regional development funds, the harmonization of standards, and most important by network integration. On the other hand the Commission has favoured competition far more than continental Member Countries have done in the past. The main point of criticism in the following is that where both principles conflict, the Commission sacrificed competition for the aim of integration.

As has been pointed out, the main concern of the Commission was to avoid an extension of the TOs' exclusive rights towards non-voice services. In order to promote competition for newly developing service markets it did not challenge the network and voice service monopoly of the TOs. The provision of an universal and integrated ISDN network is regarded as essential for a liberalized VANS market. Joint investment, however, could be achieved best by avoiding entry by private network operators. Moreover, by reserving 90% of the telecommunications revenues to entrenched TOs, the Commission could develop a mainly consensus oriented approach towards liberalization.

The main problem with this approach is that major decisions were made on a priori beliefs which are based on an unclear economic foundation. This relates especially to the installation of an integrated ISDN network and the division of reserved and unreserved services. ISDN has been mainly analysed from a technical perspective. It seems to reflect a static engeneering concept which is concentrated on technical performance, putting aside the user's perspective of costs.[64] This is discussed in what follows.

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63 Anania, L. (1990), pp. 25, 41, and: Slaa, Paul (1988), p.XIV. Quoted from: Anania, L. (1990), p.49.

64 A good example for this approach is Mossotto, C. (1991), especially p. 47. See also Mulder, R.J. (1991), and Lera, E. (1990), p. 275/276. A critical view instead is presented in: Noam, Eli (1987), pp. 44-47.

As has been analysed in chapter 2.1.1. the ISDN network consists of two distinct characteristics. First, due to digitization it is superior for data transmission when compared to analog networks. Second, it puts together separate communications networks into one unified super-pipe.[65] This integration of all services into one standardized network may be attractive from a technical point of view. However, the underlying economies are much less clear. The basic economic foundation for an integrated ISDN network are economies of scope. That the latter exist has been assumed a priori by policy makers. However, for a variety of services it is far from clear whether economies of scope among *all* services are strong enough to justify *total* network integration. Moreover, voice and digital data networks are partial substitutes. Using a modem, data can be sent through a voice network while on the other hand voice telephony can be digitized and transmitted over a digital data network. Thus separate networks could offer a competitive environment to stimulate cost reductions of network operation. The ISDN concept thus reduces the scope for network competition. This effect is enhanced by the ultimate goal to pass on to an integrated broadband network. By doing so TOs would enlarge their activities and probably pre-empt the emergence of alternative cable networks, namely those of cable TV operators who could become potential competitors.

The second drawback of the integrated ISDN network relates to the rise of entry barriers. The latter arise from two different sources. First, the ISDN network increases the required initial investment which is needed to match the upgraded technical capabilities of the incumbent's network. In chapter 2.1.1. it was pointed out that the ISDN concept requires big initial investment outlays, which the monopolistic TOs are able to carry out by cross subsidizing with service revenues. Potential competitors will not be able to raise the necessary funds in a similar pattern. Moreover, the start-up subsidy is used to justify a variety of restrictive policies to protect the incumbent. Second, there is a trade-off between fixed cost and marginal cost, when switching from the coaxial to the ISDN network.[66] While the former rise, the latter are reduced. Both effects deter potential competitors because entry as well as price competition in the market is made more difficult. The range of "natural monopoly" is increased since there are higher economies of scale involved in the upgraded network.

Third, the share of sunk cost in total fixed cost for the set up of a competing network rises considerably. Thereby entry barriers are increased even further. Finally, the new technology leads to a tremendous increase in capacity which - as has been shown theoretically and empirically[67] - may be used to deter entry. All this enhances the incumbent's scope for strategic behaviour. The Commission did not justify the assumption

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[65] Noam, Eli M. (1986), p. 5.

[66] This has been demonstrated in chapter 2.1.1.6. In West Germany, for instance the investment necessary to switch to the ISDN network is estimated to be DM 35 billion. Compare Kubicek, H. (1989), p. 184.

[67] See Stehmann, O. (1991a) and chapter 12.1.5.

that the installation of a harmonized ISDN network requires state owned TOs which exert monopoly rights. The investments into digitization carried out by US and British carriers show that also in a competitive environment ISDN networks emerge. A directive to harmonize standards could have been sufficient to guarantee that value added services can be provided throughout the Community. The initial high fixed investment also may lead to a loss of *qualitative efficiency*.[68] The high irreversibilities of investment do not allow for a response to changes in demand. as long as the *reversible* unit costs of the old network are below the *total* unit costs of the new one, the operator will stick to the old technology.[69] Thus, the higher the irreversibilities, the more likely it becomes that todays network investment will become suboptimal in the future. A mix of networks instead would presumably allow for more flexibility to qualitative changes in demand.

Thus, while the efficiency gains due to economies of scope are uncertain there may be considerable losses by forestalling facility based competition. Far from being only a technical "upgrade" the integrated ISDN network very well may be part of a general attempt of national TOs to maintain control over terrestrial public switched networks. It leads to further concentration in the market. National TOs may use it as a strategic device to preserve their exclusive rights[70]. The move towards the ISDN therefore is driven mainly by the supply-side. Frequently user groups have mentioned their concern that eventually they will have to pay for an availability of services they are not demanding. Especially those users who do not need digital data transmission are likely to pay for a non required increase in the variety of the service menu. Moreover, business customers for which the ISDN concept was mainly designed nevertheless switch from the public to private networks which are more adequate for their specialized needs. A recent survey found that large telecom users have little genuine demand for ISDN.[71] Thus, eventually a situation may arise in which those customers who have no need for ISDN nevertheless face the cost, while those for which the concept was designed do not any longer participate in the network.

Finally, as will be seen in the next chapters there is no empirical evidence that network competition hampers the development of VANS for which ISDN was mainly designed. This can be seen when comparing the UK and Continental Europe. Rather the opposite has been noted recently. There are many more non-basic services offered presently in the UK than in Continental Europe. This could have been expected, given much cheaper rental charges for leased lines in the UK[72]. Network competition, however, is the main device to

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68 Qualitative efficiency is obtained if the bundle of different characteristics (as capacity, reliability, quality of transmission and the variety of services) correspond as much as possible to consumer preference. For a definition of qualitative efficiency: Kruse, J. (1985), p.130.

69 Compare: Kruse, J. (1985), pp.113-114.

70 Musgens, G. and J. Gruppelaar (ed.), p. 64.

71 Compare: Communications Week International (21/02/1991).

72 The rental charges for national circuits are seven times cheaper in the UK than in France. Financial Times, July 7, 1991.

push down leased lines charges. Contrary to the assumption that ISDN is a prerequisite for service competition, it, moreover, may hamper access of service providers to the network. The integrated network offers TOs the possibility for cross subsidization from reserved (voice-) to unreserved services,[73] and to preempt potential service competitors by putting the intelligence already in the network (see chapter 2.3.).
A last but nevertheless important cost of the ISDN policy is related to the standardization which has come about as a side effect. The standardization may very well lock manufacturing, system development, and user application into a pattern which may become technologically obsolete after some time. It therefore may hamper innovation.

To sum up, the advantages of an integrated network for service based competition may very well be matched by disadvantages due to the restricted scope for facility based competition. This deficiency might have been due to the a priori emphasis given to the rapid development of VANS. It is therefore likely that the ISDN concept leads to a level of network integration which is higher than optimal.
Closely linked to the ISDN concept is the aim to preserve the network and voice service monopoly. The network and voice-service monopoly was defended mainly on the basis of three arguments:

- universal service of basic services
- the financial viability of TOs
- the wastefulness of network duplication.

The universal service argument was referred to when justifying the exemption by Article 90(2).[74] However, it is not clear whether the universal service argument would justify a *complete* reservation of public switched networks and voice telephony. As has been seen for the USA, the liberalization of the long distance market did not erode universal service. It is highly unlikely that the universal service goal would be obstructed if, for instance, private satellite systems were authorized to transmit voice service (see part IV). A second argument for the network and service monopoly therefore was to ensure the "financial viability" of TOs. Thereby the huge investments into the integrated ISDN network themselves became a justification for granting exclusive rights. However, even if the aim of the integrated ISDN network was undisputed, it does not appear necessary to preserve the network monopoly in order to ensure the necessary investments.
The concept of ISDN, by itself, does not require network monopoly. All it means is that the same communications link provides a range of different services. It could be provided by different carriers which fulfil certain harmonized standards and which are interconnected.

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73 See also: Müller, J. (1989), p.477.

74 Compare: Guidelines (1991), p.17.

Moreover, access charges can be imposed on service providers and network competitors in order to finance necessary investments. Since these higher cost of provision would be passed over to customers, those users who benefit from the upgraded network would pay for it. The Commission's concept instead implies that the network investments are paid for mainly by users of the telephony service. These are not identical with those who benefit from the greater variety of services provided by the integrated ISDN network. Arguably the Commission's ISDN policy leads to a subsidization from residential customers to business. The latter can be expected to use VANS relatively more. The ISDN policy leads to effects which are contrary to the ones stemming from the traditional cross subsidization among services. The latter is supposed to benefit residential customers. However, this reversal of the traditional cross-subsidisation scheme cannot be expected to be efficient.

When putting forward the financial needs of TOs, it is important to stress that a major burden on the financial viability of TOs stems from budgetary constraints imposed on them by governments. The main part of TOs' profits is not channelled towards investments, but has to balance losses made in the services of the post office, or to contribute to the federal budget. As is seen in subsequent chapters, national TOs are also used to finance industrial policy measures which increase their costs. For that reason it is highly unlikely that network competition would put the TO's financial viability on the brink, if the latter were relieved from the external burden at the same time.

Moreover, the experience in the USA has shown that AT&T's revenues did **not** drop when entry was allowed for. Overall growth of demand made up for the additional supply of MCI and US-Sprint. For these reasons it hardly can be claimed that a competitive environment would prevent TOs from investing into the ISDN upgrading.

Finally, it was put forward that the network monopoly would be a safeguard against wasteful network duplication. Again, so far no investigation has been made to clarify whether entry in the long distance market in the USA and the UK has been wasteful. Moreover, as for the previous argument, this would not preclude competition between the terrestrial public switched network of TOs and other networks already established (railways, cable networks), or between operators using different technology (satellites, microwaves, mobile and private networks). It would only offer a rationale not to license a second public carrier establishing a nationwide public *cable* network.

Quite to the contrary of the initial intention, the public network monopoly itself is likely to give artificial incentives for "wasteful" investments into private networks. Since the public network monopoly allows TOs to proceed with internal cross subsidization, more and more big users are encouraged to install their own networks which bypass the public ones. The increased use of leased lines and indoor services preempts the demand for upgraded public network provision. As long as the major motivation for these private networks stems from the tariff principles of TOs, they are inefficient.

Even when the ONP directive requires cost-orientation of tariffs, there is no mechanism which ensures that these costs are reasonably incurred, or that the TO operates efficiently.

As is discussed in chapter 14, this weakness can only be overcome if network competition is permitted.

7.3.3. The Concept of Service Based Competition

The Commission distinguishes reserved (telephony) services and unreserved services. Only the latter are open to private provision. Above it was discussed whether the network monopoly is necessary. However, even if it was, it has to be pointed out that this does not necessarily imply also the granting of exclusive rights regarding voice telephony.
The provision of basic services could be liberalized as much as VANS without threatening the financial viability of the network operator. In that case service providers only would have to pay corresponding access charges when using the public switched network. As long as there is only one national network operator, competition for basic services would be limited to simple resale and shared use of leased lines. As was explained in chapter 4.2.1., the main effect of this is cost orientation of prices and the elimination of cross subsidies. Cost orientation of tariffs, however, has been asked for by the Commission itself. The "basic" service monopoly is only necessary if cross subsidization shall be maintained, which contradicts these tariff policy aims. However, the principles of tariff policy as developed in the Green Paper are too vague to allow for clear interpretation[75]. Thus the unwillingness to challenge the exclusive rights of TOs as far as services are concerned is more likely to stem from political reasons. The politically sensitive discussion of income redistribution has been avoided by leaving Member States a free hand to provide voice telephony. However, alternatives to the inefficient internal cross subsidization - as direct subsidies for the access of poor households - were not discussed.
The separation of reserved and non-reserved services actually leaves about 90% of revenues from telecommunications services under exclusive control of public enterprises.[76] Thus as far as the market size is concerned, so far only a marginal liberalization of European telecommunications services has been achieved. [77]
The present "mixed regime" of reserved and non-reserved services appears unstable for several reasons. Despite the clear definition of the reserved voice telephony service provided in directive 90/388/EEC it will remain difficult to draw a line between "basic" and "value added" services. 5 years earlier the FCC eventually gave up similar efforts made in its computer enquiries. Given that cross subsidization among reserved services is not entirely relinquished, there will be continuous incentives to enter with services which attract some demand from the reserved area. Moreover, it is becoming increasingly clear

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[75] The Green Paper emphasizes the importance of common tariff principles and proposes that they should follow overall cost trends. On the other hand it argues that "excessive cream skimming" shall also be avoided. TOs should be allowed to prohibit simple resale of leased lines, if this is necessary to protect their financial viability. Compare: Com(87) 290, p.50/51 and pp.79-82. See also: Müller, Jürgen (1988),

[76] Ungerer, H. (1988), p. 201 and Lera, E. (1988), p.9

[77] See also: Stehmann, Oliver (1990), p. 28-30.

that advances in technology and new innovative services will circumvent any legislative or regulatory measures which control *bypass*.[78] This "cream skimming" is inefficient because it is not motivated by lower cost but by regulation. In this respect one may expect continuous legal struggle between private companies, the Commission and member states. The latter so far apply a much broader concept of "basic" service.[79] In Germany everything is considered a reserved service which - from the customer's perspective - could be used as a substitute for voice telephony.[80] If the Commission applies its definition strictly, most services are considered non-reserved by the service directive which are banned by member states' legislation. In Chapter 6.5. it was pointed out that one major deficiency of the US step-by-step approach has been that markets were liberalized without abolishing the cross-subsidization among services. The incentives for inefficient entry were described to be significant. The policy approach of the EC entails the same weakness as the previous FCC approach.

The safeguarding of fair competition between the TOs and private service providers is likely to be a further source of instability. The TOs have an advantageous position due to the opportunity of providing reserved and competitive services. Cross subsidization from reserved services to competitive ones will be difficult to monitor in reality. However, proof of a predatory intention is difficult to find. TOs are likely to restrict access of competitors to the public switched network. Moreover, they may continue a special relationship to the government. It is unlikely that large inroads by competitors are politically acceptable especially if job losses might be at stake. Thus the TO may count on political support if competition becomes fierce.[81]

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78 Robinson, Peter (1991), p.99.

79 See in detail: Gebhard, Hans-Peter (1990), p.16.

80 The reserved area, for instance, comprises also picture phone which is certainly a service which embodies some added value. Compare chapter 8.

81 As has been pointed out before, in this respect the present law in Germany is revealing. Beside the category of "reserved" and "competitive" services a third category of "mandatory" services is introduced. Mandatory services can be provided by private business. However, the TO has certain infrastructural tasks to fulfill. The Ministry may impose restrictions on private entities providing these services if the TO is supposed to be "too much" handicapped.

8. Germany: Serviced Based Competition

West Germany represents in the EC one of these countries which have already achieved the universal service goal. Until reunification it was regarded as an example of a well entrenched PTT- monopoly. As in other countries this monopoly was based on historic and cultural reasons and the pressure of interest groups. This basis for the PTT-monopoly will be described briefly. As will be seen, however, the process of reunification has to some extent spurred the liberalisation process.
After analysing the present regulatory regime in some detail, the pricing policy of the Ministry will be examined. Eventually estimations of price elasticities of demand for local, long distance and international services are presented.

8.1. The State Monopoly of the Post Office: Historical Reasons

The historical development of the German post office will not be developed here in detail. The following chapter only tries to highlight the main historical events which have shaped the telecommunications industry in its present form. As will be seen, political and historical reasons have dominated the institutional organization of this sector in West Germany. Only during the last decade have arguments based on more economic reasoning entered the discussion.
The control of the telephone network by the post office was mainly due to two reasons. First the telephone was regarded as a technical improvement of the telegraph. Since 1832 when the first telegraph line was established between Koblenz and Berlin, the telegraph was controlled by the state. This control was later almost automatically extended to the telephone. The extension had military reasons: The importance of means of communications for military operations led to the exclusion of private usage of the telegraph network until 1849. Thus the state monopoly for communications was well established long before the telephone was invented[1]. The second reason for the state monopoly has not yet lost its relevance. Bismark used the postal services as a means to foster **integration** of the German "*Reich*". In 1867 the postal services were standardized for the "*Norddeutscher Bund*". After the establishment of the "*Deutsches Reich*" in 1871 the "*Reichspost*" was formed and its jurisdiction extended to the newly acquired territories. An extension of the post office's responsibility from the letter and parcel service to the telegraph was a means to strengthen the position of the central government towards the provinces. In 1880 the post office and the telegraph were united. Private enterprises (including the US Bell company) tried to enter the market. The "*Telegraphengesetz*" of 1892 finally ruled that the post office obtained the exclusive right to provide the network for telegraph and telephone. This monopoly did not include the provision of terminal

[1] For a more detailed analysis of this period see for instance: Wieland, B. (1988). Here: p.203.

equipment[2]. The "**Fernmeldeanlagengesetz**" (FAG) of 1928 finally confirmed the state monopoly for the telephone network which was exercised by the post office.
After the end of World War II there was in principle an unique opportunity to restructure German public enterprises. The old institutional structures had been mostly destroyed. New laws had to be passed in order to reorganize the industry. In case of the post office, however, the former organizational structure was restored. The FAG of 1928 was thereby adopted without any major changes. This ensured that the institutional restructuring of the post office was soon accomplished. Beside reestablishing the public enterprise character, the quick procedure also led to the exemption of the **Deutsche Bundespost** (DBP) from the application of the German competition policy. When the debate over the anticartel law was started in 1952, the structure of the telecommunications sector had already been fixed[3].
Thus, beside the discontinuity of the political system, there is a long tradition in Germany of state provision and control over telecommunications services. At least since 1928 the industry structure has not been altered decisively.

8.2. The Institutional Foundation of the Traditional State Monopoly

8.2.1. The Legal Basis

When discussing the legal basis for telecommunications in Germany, three levels of national law have to be distinguished.

1) The "Grundgesetz" ("Basic Law" or Constitution)
2) The "Fernmeldeanlagengesetz" (FAG)
3) The "Gesetz ueber die Verwaltung der DBP" (DBP Constitution Act - PostVerwG).

For certain changes to come about it is important to specify on what level a reform is required. The legal basis of the DBP determines what steps of liberalisation appear politically feasible.

According to the "**Grundgesetz**" (GG) the Federal government has the exclusive right to make laws for post and telecommunications[4]. Furthermore the DBP has to be run as a public enterprise; the administration is headed by the *Bundesministerium fur Post und Telekommunikation* (BMPT), the ministry for postal and telecommunications services[5].

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2 see: Wieland, B. (1988), p.204.

3 see: Blankart, C.B. and E. Kaufer (1983), p.444.

4 Art. 73, Ziff 7 GG combined with Art. 123 and 124 GG.

5 Art. 87 GG.

The foundation of the public enterprise in the "Grundgesetz" is important for several reasons: First, the "Grundgesetz" does not prescribe a certain economic regime. Therefore it does not indicate whether in general market provision or public control should be prefered. Decisions made regarding the telecommunications sector not only have to satisfy certain criteria of economic efficiency, but also the aims of public welfare which are specified in the constitution[6]. The latter includes the duty for secrecy of data transmission (Art. 10 GG) and the "*Demokratie- und Sozialstaatsprinzip*" which obliges the state institutions to balance economic and social objectives. Therefore it has been argued that economic efficiency cannot have priority for state enterprises. Second, permanent employees of the DBP are civil servants. The Secretary of the Interior therefore has a say concerning wages of civil servants and their employment. The status of civil servants very much restricts any policy of internal restructuring.
The DBP is exempt from taxes. On the other hand it has to deliver 10% of its earnings to the general budget (in 1985 its contributions amounted to DM 5 billion[7]). These payments exceed the amount which the DBP would have to pay if it was subject to taxation[8]. The Minister of finance has to be consulted before any changes in the financial policy of the PTT are undertaken. The considerable contributions by the post office to finance the public deficit make the finance minister reluctant to accept any changes which erode the basis for postal revenues. Finally, privatisation of the DBP is almost impossible. A change of the Basic Law requires a two-third majority in the parliament, which made changes of the "Grundgesetz" very rare in the past.
The parliament therefore plays a crucial role for telecommunications policy in Germany. It ensures that the electorate has a direct influence in particular on issues like price setting. Fundamental changes are unlikely to materialize, if politicians reckon them to be unpopular. Tariff changes are handled with great caution. In 1991 the "reunification tax" imposed on the DBP Telecom made tariff increases necessary and started a political debate. After prolonged discussion these tariff increases were cancelled when important regional elections were approaching.[9] Normally a general increase in tariffs is compensated by special reductions for residential consumers.[10] Every change in the tariff structure is immediately scrutinized for possible repercussions on the average consumer.

More specific issues of the organization of the telecommunications sector are layed down in the FAG and the Postverwaltungsgesetz (PostVerwG) of 1953. The FAG covers both the

[6] see in more detail: Scherer, J. (1985), p.266

[7] Statistisches Jahrbuch (1987), p.68.

[8] see: Wieland, B. (1988), p.206.

[9] see for instance: Süddeutsche, 20/21.04.1991.

[10] For instance in 1974 a "moonlight" tariff was introduced to compensate an overall increase in tariffs. The former was a price reduction for the off-peak period. See: Neumann, K.H. and B. Wieland (1985), p.5.

network and the provision of services. The Postverwaltungsgesetz regulates in detail the relationship of the post office and private enterprises. Moreover, it contains the principle of "*Eigenwirtschaftlichkeit*", which demands that the PTT as a whole has to break even. Therefore as long as the postal services are in deficit, there have to be side-payments from the telecommunications sector mainly towards the letter and parcel services.[11]
Both laws can be changed by simple majority in the Parliament. Thus, for instance the licensing of other network operators is easier to accomplish than the privatisation of the DBP.

8.2.2. The Exemption of the DBP from Competition Policy

The "*Law against Restraint of Competition*" ("*Gesetz gegen Wettbewerbsbeschränkung*" (GWB)) went into operation in 1958[12]. It is directed against all private behaviour which restricts free trade. Thereby contracts, collusive behaviour, the control of dominant firms, cartels and corporate mergers as well as discriminating behaviour are regulated. According to the GWB all kind of cartel agreements which aim at the distortion of competition are prohibited (§ 1 GWB). The formation of certain cartels, however, is exempted from this prohibition (§ 2-8 GWB). Furthermore, the Minister of Economic Affairs is entitled to permit a cartel if he or she reckons this to be in the national interest. Domination of a market is assumed if a certain market share is acquired by a company (§ 22 GWB). In this case the supervision of abuse of monopoly power is undertaken automatically by the "*Kartellbehörde*" (Registrar of Restrictive Trade Practises). Certain actions or treaties which are regarded as an abuse can be declared null and void by the authority. Though the GWB appears strong in principle it is weak as far as implementation is concerned. Public regulated or owned companies are exempted from the control of the "*Kartellbehörde*"[13]. For public enterprises there exists only a "supervision of abuse". Nevertheless the GWB has been applied to certain actions of the DBP concerning its public procurement policy.[14]
Thus the provision of the network, services and terminals was not controlled by the GWB. The exemption according to § 99 (1) GWB had been justified by structural differences between the telecommunications sector and other industries. For instance complaints by

[11] see: Article 15(1) PostVerwG, and: Scherer, J (1985), p.269.

[12] Blankart, C.B. and E. Kaufer (1983), p.440.

[13] The exemption of state monopolies is made in § 101 GWB.

[14] DBP does not produce terminals or equipment itself. These products have to be acquired from private firms. The size of DBP as well as its monopoly position offers the PTT considerable market power (monopsony). This position is enhanced by the nationally biased procurement policy of all (European) countries. Thus suppliers being ignored by DBP hardly can sell their products in other markets. According to § 98 (1) GWB the law against restrictive trade practises can be applied to the procurement policy of DBP.In various cases the "*Kartellbehörde*" intervened. So far a formal rejection of practises by DBP did not take place because the latter had always been persuaded to change the objected behaviour before. Especially its "invitations for bidding" have been challenged repeatedly. The "*Kartellbehörde*" was afraid of small competitors being ousted by the procedure alone. In detail see Monopolkommission (1981), p.30-35.

customers about price increases did not lead to a supervision of the rate-setting practises of the DBP. This, however, only applied as long as the DBP did not compete directly with private enterprises. Once the de jure monopoly position is altered, the GWB thereafter may apply to the supply side as well[15].

8.2.3. Cross Subsidization in the German PTT

In the past, the DBP enjoyed a comprehensive monopoly for the provision of the public switched network and services. Moreover, it directly participated within the Ministry in the regulatory decision making process. Several private networks were licensed[16] for closed user groups. These licences, however, did not lead to competition between network operators because they were limited to certain users who were members of a "club".

The traditional organization of the German telecommunications sector created a comprehensive system of cross subsidization. While being critizised for its allocative inefficiency, it created strong pressure groups interested in preserving the status quo. The most important feature is the principle of uniform service. A brief overview about the entire cross-subsidizing scheme of the DBP reveals six different features:

1.) There is the familiar subsidy from the long distance service to the local network and customer's access.

2.) Due to uniform service high density areas subsidize low density regions, tariffs for local calls and for access are comparatively too high in urban compared to rural areas.

3.) The telecommunications services subsidize the traditional postal services (delivery of letters and parcels) by DM 2.6 billion (1991)[17].

4.) A part of the exceptional profits made by the DBP have to be remitted to the federal budget. This amounted for 1987 to roughly DM 5 billion[18].

5.) The status of civil servants has guaranteed working conditions for employees which are better than those offered in the private market. This includes social security benefits, salaries, and protection against the termination of the working contract. As far as this has increased costs and prices, the effect is a subsidy from telecommunications customers in general to employees of the DBP.

6.) Its size[19] has always tempted politicians to use the DBP for short term macroeconomic policy goals. In the past the DBP was obliged to use its procurement policy as a tool for

15 This has been the interpretation of the Monopolkommission. See: Monopolkommission (1981), p.32.

16 like the SWIFT network for banking transactions and START for travel agencies.

17 see: FAZ, 14/06/1991. That this is the average level of cross-subsidization can be seen from Weizsäcker, C.C. von (1988), p.26.

18 see: Statistisches Jahrbuch 1987 (1988), p.68.

19 DBP has been the largest enterprise in West Germany making exceptional profits. In 1987 the total profit of DBP amounted to DM 7.7 billion (before the contribution made to the Federal budget). It became by far the largest national investor and its budget was well above the budget of the largest state (Nordrhein Westfalen).

regional policy[20] and to increase purchases in periods of economic recession. In those periods the DBP was regularly used as a catalyst for employment programms. After reunification, the DBP Telecom was obliged to raise its subsidization of the Federal Budget by additional DM 2 billion. It thereby had to contribute to the general costs of rebuilding the old GDR.[21] The DBP itself cannot influence the extra burden imposed on it by general political considerations.[22]

The present subsidy from long distance services to customer access and local service makes the mean customer worse off. The median customer, however, is better off. This is due to the high concentration of long distance phone calls on business customers and a few residential customers. Competition, however, will erode any cross-subsidization scheme. Thus if competitiors enter, the immediate effect on prices will be contrary to the one set up by the subsidization. Therefore the majority of (residential) customers is regarded as worse off if competition is allowed for. In the political debate only the direct price effects which appear in the short run are taken into consideration. The process is perceived as a zero-sum-game, which supposedly leads to a redistribution from residential customers to business.[23]
The averaging of tariffs and the goal of universal service is regarded as part of the German "social consensus".[24] A "gemeinwirtschaftlich" organized enterprise, moreover, is obliged to directly serve the general welfare.[25] A restructuring of the industry which fosters price discrimination therefore was widely rejected as an attack on the social balance.

1987 about 560,000 people were employed by DBP. See: Statistisches Jahrbuch 1987, p.67., Monopolkommission (1981), p.26 and Busch, A. (1985), p.138.

20 See: Article 31 PostVerwG.

21 Being a "general" contribution, this amount was not meant to finance the investments into the telecommunications infrastructure of the old GDR. See: Telecommunications Week International, April 1991.

22 FAZ, 19/04/1991.

23 Indirect effects which arise through the lowering of prices for VANS and which eventually feed through in lower prices for other products are generally neglected in the political discussion.

24 The delimitation of the category "social consensus" thereby differs. Some include also the subsidy flowing from telecommunications services to the letter and parcel service. This is justified by a rather paternalistic argument: If letters and phone calls are substitutive means of communication, the present subsidy scheme is beneficial because it supports the writing of letters. Writing letters instead of using the phone, however, is considered to be superior since it raises the general level of education.

25 see in more detail: Blankart, C.B. and E. Kaufer (1983), p.443.

8.3. The Restructuring of German Telecommunications

8.3.1. The "Witte Commission"

Before the reform of post and telecommunications in 1989, the Ministry for the DBP had two distinct functions: It combined the top management with the regulatory commission. Thus it had the double role of a player and the umpire. This mixture of administrative and commercial functions under one roof did not fit any competitive framework. Furthermore political and economic interests became mixed under this arrangement. The minister of the post office is member of the cabinet. Therefore he or she has to run the enterprise according to the principles of governmental policy. The Minister is obliged to cooperate with macroeconomic and social policy.

However, due to strong political pressure a programme was developed to restructure the telecommunications industry in West Germany.

In September 1987 the "*Regierungskommission Fernmeldewesen*" which has been called "*Witte Kommission*" (after its chairman Prof. Witte) submitted a report. It proposed certain steps towards liberalisation for German telecommunications. The report's main proposals became law in 1989 without much alteration. Privatisation of the PTT (or the telecom part) was not at stake. Lawyers especially refrained from recommending privatisation because it would be contrary to the constitution. Furthermore, competition in the network for basic services had **not** been put forward[26]. Two arguments were seen as crucial against the liberalisation of network services: First, it was argued that this could undermine the infrastructural task of the DBP. Second, the Commission was concerned with the financial viability of the PTT in order to go ahead with new investments into the ISDN network. Until the mid 1990s about DM 40 billion had to be invested into the West German ISDN network.[27] Finally, it was argued that the cost arising from establishing a second public switched network exceed the potential benefits from network competition in Germany. The installation of a parallel network would need investments of about DM 90 billion.[28] Therefore the basic services (which account for about 90% of total revenues from telephone services) have been left untouched. The Witte Kommission only postulated that rates should gradually move towards costs. Instead it proposed to liberalize VANS completely. The PTT has to provide leased lines on "fair and competitive" conditions. Every three years the federal government will examine whether those requirements have been met[29]. There

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26 6 members voted for and 6 against competition. The statutes of the Commission rule that in case of parity measures towards competition are not proposed. See here and below in more detail: Wieland, B. (1988), p.266-275.

27 Zeit, 17/08/90, p. 28.

28 Monopolkommission (1981), p.98.

29 Weizsäcker points out that these governmental inquireries are unlikely to come ever to the conclusion that the PTT has failed to fulfill its duties. In that case the government would have to critizise itself for not having exercised its control function properly. See. Weizsäcker, C.C. von (1988), p.31.

are some **regulated services** which the PTT is obliged to provide. For these services entry of private firms is accepted. Lastly, there are **unregulated services** which are left completely to the market. For these services no licensing is necessary. The PTT, however, is also allowed to enter.

As far as the problem of "cream-skimming" is concerned, the Commission did not advocate a solution. It only proposed that if a clearcut distinction of VANS and basic services is not feasible, the DBP should rent lines to private competitors on the basis of volume sensitive charges.

Secondly, the separation of the postal services and telecommunications services was put forward. Thus the traditional PTT structure was broken up. On July 1, 1989 the enterprise was split into three independent parts (postal services, telecoms, banking). Originally the "*Postverwaltungsrat*" which ensured political control by parliament was meant to be abolished. However, regional states opposed any steps which challenged their influence. As a result, the"*Infrastrukturrat*" was created, which guarantees that political control persists[30]. The Infrastrukturrat consists of members of both chambers of the parliament. It has advisory functions for all decisions of the BMPT which tackle interests of the "Länder", or infrastructural questions. Moreover, it has to decide about proposals from the Ministry concerning mandatory services, data protection etc. If the Ministry and the Infrastruckturrat cannot compromise, ultimately the government has to decide. The three businesses of the DBP are expected to become economically independent from each other. Therefore the Commission proposed the phasing out of subsidy flows to the postal services by the early 1990s. The remittance to the state shall end by 1996, when the DBP Telekom will be taxed as a private enterprise. A 15% VAT is imposed on competitive services as mobile telephony from January 1, 1993. Reserved services face the VAT 1996.[31].

8.3.2. The Impact of Reunification

Parallel with the reunification of East and West Germany on October 3, 1990 the East German "*Deutsche Post*" and the DBP were unified. Given the poor state of the East German telecommunications network there was an urgent need for investment. The East German system only provided the very basic services as telephony, telex, and some limited data communications. The structure of the network exhibited enormous regional differences in the density of access. While in East Berlin nearly every second household was connected, in areas like Dresden and Rostock only every nineth household had access to the public switched network.[32] The average waiting time for a telephone connection was 10

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30 Moreover, despite the division into three sectors under one roof social issues for instance still have to be tackled uniformly for all sectors. See: Die ZEIT, (3 March 1989), p.26. A detailed analysis of the German poscal reform can be found in: Pfeiffer, G. and B. Wieland (1990).

31 FAZ, April 25, 1991 and March 30, 1992.

32 Neumann, K.H. (1990), p.6.

to 20 years. East Germany had a telephone main station density of 10.6 per 100 inhabitants. This is one of the lowest in Europe. The corresponding figure in West Germany is 46%, and 66% in Sweden.[33] The poor technical performance of the network did not allow the use of facsimile and more advanced data communications.

The DBP Telecom undertakes the modernization and extension of the East German network. Until 1997 an investment volume of about DM 60 billion is envisaged to set up a completely new network based on modern technology. Both switches and cables will be built up from scratch.[34] The "*Telecom 2000*" project plans to achieve a service level in East Germany similar to the one in West Germany by 1997. To achieve this goal the number of households having access has to grow from 1.8 billion in 1990 to about 9 billion. The most urgent need, however, has been to increase the lines between West and East Germany. The absence of reliable means of communication has been regarded as a major obstacle to private investment in East Germany. A first step to increase internal capacity was to interconnect 23 special networks which previously were exclusively used by the secret service (Stasi).[35]

By mid 1991 the number of lines from East and West Germany had increased from 1,460 to 26,000. The installation of 500,000 new telephone sets by the end of 1991 was planned.[36] According to current investment plans all regional capitals will have digital trunk and local exchanges by the end of 1993.[37] An additional "turn-key" programme for business customers entrusted private enterprises to install entire local networks on a turnkey basis (including switches, transmission lines and customer access).[38] Radio communication is used to provide for more rapid interconnection. This technology can be used to bridge a distance of up to 10 Km from the customer to the switch.[39] Nevertheless, the DBP Telekom is critizised for being too bureaucratic and perfectionist. The "Telekom 2000" project puts emphasis on medium and long term development and high standards neglecting urgent needs in the short run.[40] Moreover, the target of 500,000 new telephone sets for 1991 was not met.[41]

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[33] Neumann argues that the provision of access was lower than would have been justified by the level of economic development of the country. It was rather due to the political interest to control communications and the information flow between citizens. See: Neumann, K. H. (1990), p.9.

[34] 66% of switches are older than 30 years. About 80% of telephone sets were installed as joint connections which had to be shared by several households. See: Funkschau (Spezial), 6/91 and: Tenzer, Gerd (1991), p.38.

[35] FAZ, 20/06/1991.

[36] FAZ, 02/07/1991.

[37] For a more detailed description of the development plan: Logica (1991), Tarifica Annual, Eastern Europe, London, pp.7-10.

[38] Funkschau (Spezial), 6/91.

[39] Compare: FAZ, March 30, 1992.

[40] In detail: Wirtschaftswoche, June, 21, 1991.

[41] Compare: Handelsblatt, January 28, 1992.

A main problem for the DBP is to raise capital for these additional investments. In contrast to a private enterprise it cannot do so on the capital markets by issuing shares. This generated criticism of the approach chosen to extend the exclusive rights of the DBP Telekom to the east. The "Monopolkommission" reckons that the DBP Telekom will not be able to quickly provide a complete new network for the GDR-territory. Instead it proposed to have private operators installing and operating local networks. In this respect the period of "early competition" in the USA could have offered a prototype. As was argued in more detail above, competition among many local operators contributed significantly to the rapid spread of telecommunications networks throughout the USA.[42] Furthermore the Monopolkommission recommended licensing private carriers (railways, electricity enterprises and cable networks) to carry third party traffic.[40] It is most probable that both measures would have spurred the development of a modern telecommunications network in the old DDR territory. While new investors could have supplied local networks, operators of already existing networks could have provided additional capacity in the long distance market. Given the need to rebuild the new network, in case of the GDR a duplication of investment would not have been occured. Eventually the privatisation of the East German "Deutsche Post" would have been a further alternative. In contrast to the legal situation in West Germany, the status of the East German PTT as a public administration did not have a constitutional character. It could have been privatized by a simple legislative act.[43]

The privatisation debate also gained momentum in West Germany. Given the additional need for capital by the government for the reunification, privatisation of the DBP Telekom is favoured by the Economics Minister. The sale of a minority stake would be possible without constitutional reform and could raise up to DM 50 billion.

While these proposals were first resisted by the BMPT, the latter has recently changed its mind. The Minister now promotes the sale of less than 50% of the shares. However, the traditional links between the DBP and the BMPT ensured that the preservation of exclusive rights granted to DBP got priority over a rapid rebuilding of East German telecommunications. Nevertheless, the urgent need to improve quickly intragerman communications led to a more liberal interpretation of the present legal framework. For instance the interpretation of the exclusive right to install the telecom network has somewhat changed. Apparently, it has been limited to the terrestrial public switched network. Thus satellite, mobile and radio based networks no longer come under the network monopoly of the DBP Telecom.

In this respect the licensing of private satellite network operators is especially relevant. Operators using VSATs for transmission to East Germany may offer services for third parties including basic telephony. The resale of spare capacity is possible. While presently

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42 See in detail chapter 6.

43 Privatisation would have been relatively easy to carry out, since the PTT employees did not have the civil servant status as in West Germany. See: Neumann, K.H. (1990), p.15.

they are presently granted only for six years, it is reckoned, however, that these licences will be permanent. Thereby the BMPT has taken a more liberal approach than that sketched in the Commission's Green Paper on satellites. Moreover, the telecommunications bottleneck has made it likely that a third mobile network operator will be licensed. While this company at the beginning shall only operate in the East, it is expected to expand to the West after three years.[44]

Finally, various companies are asked to provide proposals for the installation of local radio networks.[45] So far no country uses radio-phones for anything except high-priced mobile services. Whether local radio phone networks could be used for East German cities as an alternative to the fixed terrestrial network is being studied.

For the end of 1991 it is expected that the Ministry will allow for the resale and sub-channel multiplexing of spare capacity of the terrestrial network. In this context it is interesting to note that international leased lines are already used for resale. On national leased circuits voice switching and voice transmission is prohibited. These rules do not apply to international circuits which can be used for bypass by routing traffic out of West Gemany and then back in.[46]

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[44] Communications Week International,4/3/91.

[45] Economist, June 1, 1991.

[46] For instance Comsys Deutschland GmbH switches voice traffic in the Netherlands. The Dutch law does not restrict switching of phone lines. Thereby it offers a "red phone" service for calls between West and East Germany. Subscribers can choose among four different priority levels (for waiting time) and different connection charges. This service became profitable after a 30% price cut for the use of international leased lines on July 1, 1989. See: Kafka, Gerhard (1990), p.47.

8.4. The New Regulatory Regime

In what follows a detailed analysis of the new regulatory framework in Germany after the post reform of 1989 is undertaken. The analysis is separated for the telecommunications infrastructure and the provision of services. Current developments mainly driven by the process of reunification are discussed.

In 1989 the amendment of the FAG has brought about a fundamental change in the organization of the German telecommunications market. While previously the exclusive rights of the Federation were extensive, the amendment introduced *competition* as the basic principle of the German telecommunications law. Monopoly rights are now regarded as an exception and they have to be justified.

According to the FAG exclusive rights of the Federation still exist for the transmission paths of the network (network monopoly) and for the voice telephony service (service monopoly). Both are interpreted as exceptions to the principle of competition and they are justified on grounds of infrastructural tasks. The DBP Telekom has a public mandate to carry out these rights of the Federation.

However, since the monopoly rights are vested in the Federation, the BMPT may authorize private entities as well to undertake activities which are covered by the special rights of the Federation. In that case the BMPT grants a licence to an individual firm. This policy has been applied to fringe areas of the network, like satellites and mobile telephony.

As far as non-voice-telephony services are concerned, principally private entities are free to compete against the DBP Telekom. Due to the network monopoly it is recognized that the DBP Telekom may abuse its special rights in order to gain a competitive advantage. For this reason the BMPT has laid down the principles of equal rights for the provision of non-reserved services. The DBP Telekom has to provide access to the network for external users on terms which are not less favourable than those under which the DBP Telekom operates itself. Thus leased lines have to be provided to everybody who requires them, the BMPT is responsible for the regulation of tariffs.

Finally, the FAG distinguishes between *mandatory* and *non-mandatory* services. While for the latter there exist no restrictions on their provision, the former are characterized by certain obligations which are put on the DBP Telekom. Under well defined conditions private entities which provide mandatory services, may encounter certain restrictions if necessary to balance the competitive disadvantage of the DBP Telekom.

8.4.1. Infrastructure

Generally a distinction has to be made between private and public networks. Private networks as defined above, connect only a limited number of customers. They may be completely separate from the public switched network. Alternatively service providers can use their own terminals while renting transmission lines from the TO.

Public networks may be terrestrial or space networks. Moreover, terrestrial networks may consist of the fixed (cable), the microwave and the mobile network. The microwave network is neglected in what follows, since it does not play a crucial role in Germany.

8.4.1.1. The Fixed Terrestrial Public Network

Present regulation

Article 1(2) of the " Telecommunications Installations Act" (FAG) establishes that the "Bund" (Federation) of Germany has the *exclusive* right to set up and operate transmission paths and their termination points (network monopoly). According to article 1(5) FAG the Federal Minister of Posts and Telecommunications exercises these rights, whereas the Deutsche Bundespost Telekom has a public mandate to carry them out. (Article 1(5) FAG and Article 1 DBP Constitution Act). It is up to the BMPT to concretely define the scope of these rights.

Thus under present regulation the DBP Telekom has a *de facto* monopoly for the fixed terrestrial public network. In its declaration "*basic points of the federal network monopoly*"[47] the BMPT stresses that the services provided by the DBP Telekom in the exercise of its network monopoly must comply with the principles established by the ONP directive (90/387/EC).[48]

The aim of the network monopoly of the Federation is to allow every citizen to be interconnected to the network. Moreover, the provision of a universal nationwide network is regarded as the basis for the functioning of competition in the service sector. Therefore the monopoly rights reserved for the Federation are linked to certain obligations which must be fulfilled by the DBP Telekom. These obligations refer on the one hand to certain infrastructural aims and on the other hand they are supposed to ensure equal access of private service providers to the public switched network. In more detail, if it is economically feasible the DBP Telekom is obliged to provide its monopoly transmission paths for everybody who requires it (normally within 4 months). The network termination points have to be such that they allow for the interconnection of all terminal equipment which has received a type approval. Finally, connection lines to the network switches have to be such that transmission into private networks is feasible.

It is important to note that the network monopoly has been restricted to transmission only. In chapter 2.1.1. it was pointed out that technological advance has made it possible to supply many switching functions with external terminals. For this reason these functions no longer are the exclusive rights of the DBP Telekom. Thus the law provides for a narrow definition of the network monopoly which offers service providers considerable scope to employ intelligent terminals.

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[47] BMPT (1990) and (1991).

[48] See chapter 7.2.3.1.

Insofar the "Bund" has an exclusive right the BMPT has the right to authorize other parties to install a network (Article 2(1) FAG). In that case the ministry will license a private entity to carry out these rights of the Federation.

8.4.1.2. The Mobile Public Network

Present Regulation

In case of mobile telephony the BMPT has used its power according to Article 2(1) FAG to license a private enterprise for the installation of a GSM network[49] on its own.

Beside the DBP Telekom (D_1-network) the Mannesmann Mobilfunk GmbH sets up a second digital cellular public network (D_2-network). Mobile telephony therefore represents an exemption from the transmission network monopoly since Mannesmann is entitled to establish its own signalling installations and to use its own frequencies. Mannesmann has to use leased lines of the DBP Telekom which according to Article 1(4) FAG have to be provided by the latter.

In line with Article 2(1) FAG the BMPT furthermore has granted several licences for local mobile networks ("*Buendelfunk*") to operate in certain districts (Berlin, Leipzig, Dresden, Frankfurt/M). Licences are granted if technical conditions are fulfilled and if frequencies are available. They comprise the right of data and voice transmission for closed user groups.

Finally, the Ministry has launched a call for applications for a private mobile PCN network, called E_1. The successful applicant is obliged to serve at least 75% of the population by 1997. Neither the DBP Telekom nor Mannesmann are permitted to apply for a PCN licence until 1996.

The PCN requires more investments into the network compared to the GSM network. On the other hand, once established, the PCN becomes attractive to customers since terminals are less expensive.[50]

Analysis

The main market of mobile networks is the nationwide GSM system. In the past the DBP Telekom has operated two analog "B" and "C" mobile networks. Given the relatively high price they had only a small number of subscribers (300,000). Not being subject to competition the DBP did a poor job if compared to Britain (1.2 million mobile telephone users) and Sweden (500,000), where competing mobile operators were permitted much earlier.[51] The low penetration of mobile telephony in Germany compared to other Europeen countries can be seen from figure 8.1.)

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[49] GSM = Groupe Speciale Mobile digital. The GSM is a digital mobile telephone network which is standardized throughout the Community.

[50] Les Echos, March 20, 1992; and: Handelsblatt, January 29, 1992.

[51] Economist, June 1, 1991.

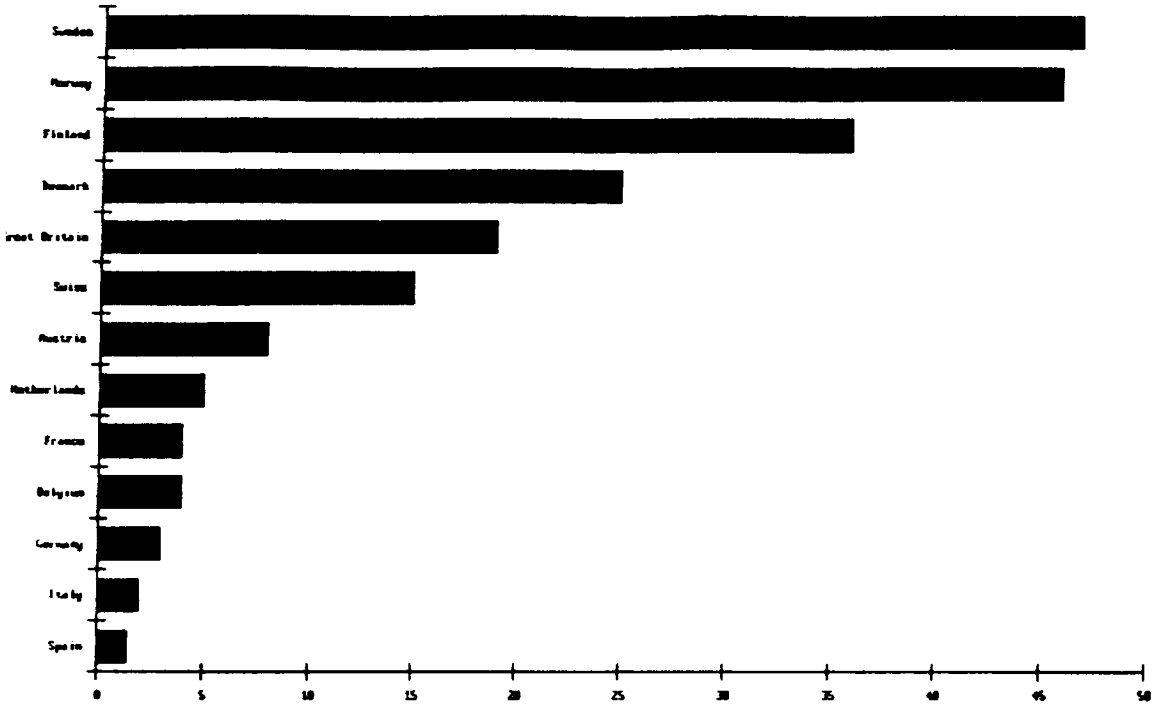

Figure 8.1.: *mobile telephons per 1000 inhabitants, Mai 1990* [52]

The new GSM system can be used throughout the Community and due to lower prices in Germany seven million subscribers are expected.[53]
The private competitor of the DBP Telekom has to interconnect with the terrestrial public switched network. Disputes have already arisen over the tariffs proposed by the DBP Telekom for its leased lines. The announced prices for standard leased lines are more than four times higher than the international average[54]. They were rejected by the Ministry.
The approach chosen to liberalize the German mobile telephone market can be criticised for various reasons. First, the limitation of entry to one competitor makes collusive behaviour likely.[55] Then it appears questionable that one licence was automatically granted to DBP Telekom which did not have to participate in the selection procedure. The other licence was not granted on the basis of an auction but by using an administrative selection process. In comparison with an auction the selection procedure is detrimental for allocative and distributive reasons. An auction might have offered a better way to select the most efficient competitor. Moreover, by an auction the rent which exists due to the scarcity of frequencies would not be privatized but instead could have been reaped by the state. This approach, for instance, was chosen in the USA where second licences were auctioned off to

52 Source: DBP Telekom and: FAZ, June 29, 1991.

53 Die ZEIT, Nr. 27,28/06/1991, p. 27.

54 Telecommunications Week International, April 1991.

55 The GSM standardization leads to a harmonized good which is provided by both competitors. This facilitates coordination among them. Moreover, the distribution of frequencies protects them from further entry. Here and in the following see in detail: Kruse, Jorn (1991).

independent companies.[56]. However, in order to put both competitors on an equal footing this would have meant auctioning off both licences. This proposition may be rejected on the ground that the DBP Telekom would have had an unfair advantage when participating in the auction. It could have used profits made in monopoly markets to cross-subsidize its bidding. Moreover, given the absence of a bankruptcy risk for the public firm, DBP Telekom would have been likely to win one licence. However, thereby DBP Telekom would have got the GSM licence on less generous terms than it got the licence now. For distributive reasons it would have been preferable to let the state reap the rent from frequency scarcity.

DBP Telekom has been offered further considerable advantages.[57] First it knew about its licence much in advance, thereby being able to start the building up of it's own mobile network earlier. Moreover, it could select its suppliers earlier.[58] Then the DBP Telekom is able to cross-subsidize when installing the mobile network. While later cross subsidization may be discovered, the investment decisions in the network cannot be made reversible. Given the high uncertainty of future market development investment decisions taken at the moment can hardly be challenged as an unfair action. Not being threatened by a bankruptcy risk DBP Telekom may therefore be induced to overinvest. Finally, as has been seen for the debates among British Telecom and Mercury and the current debate among DBP Telekom and Mannesmann, the public network operator tries to restrict access to its public switched network or to overcharge for leased lines.

For all these reasons it might have been better to exclude the DBP Telekom from the GSM network. Thereby equal chances among private operators of the D mobile network could have been more easier achieved. Furthermore the old B and C networks operated by DBP Telekom could have put some competitive pressure on the mobile duopoly. Now being operated by one of the two competitors they are likely to be neglected in the future. Finally, the two independent mobile operators might have put more competitive pressure on the fixed terrestrial network.

Thus even in a market niche like mobile telephony present policy measures try to limit the competitive pressure which arise for the state owned firm. It is likely, therefore, that consumers will be prevented from reaping all potential benefits of the new communications technologies.

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[56] The market value of the D_2 licence is estimated to be between DM 2 billion and DM 4 billion. Compare: DIW (1990), Europäischer Mobilfunk verbessert Fernmeldedienste, in: Wochenbericht 4/90, Januar 25, p. 49; and: Economist, October 5, 1991.

[57] Again in more detail: Kruse, Jörn (1991).

[58] DBP began investments in summer 1989. Not before winter 1989 Mannesmann knew about its selection as a second licencee. See: FAZ, June 29, 1991.

8.4.1.3. Satellite Public Networks

Present Regulation

According to Article 2(2) FAG the BMPT is *obliged* to grant concessions for satellite communication installations for the transmission of data at low bit rates (lower than 15 kbit/s), provided that this does not affect radio communication. Thus private companies have a legal claim to a licence (for low bit rates).[59] The installations can be used for private or public services, excluding voice service. The licencee then has to lease the necessary satellite space capacity from the DBP Telekom. The latter is obliged to arrange for interconnection with the public network (Article 1 (4) FAG). For higher bit rates the Ministry may grant permission for satellite installations.

Analysis

The distinction between transmission and switching as applied for the terrestrial network, cannot be extended to satellite networks. Moreover, the infrastructural considerations of the terrestrial network cannot be applied to satellite networks. Therefore the Ministry decided to allow for niche competition ("point-to-multipoint"), making an exemption of the network monopoly. By March 1991 11 private satellite operators were already licensed.
The reason to limit satellite concessions to low bit rates is to prevent competition with the voice communication of the terrestrial network. In fact the BMPT has indicated in the "*Amtliche Begründung zum Poststrukturgesetz*" that licences for higher bit rates will not be denied if the substitution of voice telephony can be prevented. Thereby, presently Germany operates the most liberal regime for satellite services in the EC.
A main problem is that - similarly to the D_2 operator which relies on leased lines of DBP Telekom - satellite licencees are not allowed to lease space capacity directly from Intelsat or Eutelsat. Instead they have to apply for capacity at DBP Telekom. While the latter is quick in assigning space capacity for its own purposes, competitors sometimes have to wait for months.[60]

No special licences will be granted for satellite installations for East Germany. However, for licences for traffic between East and West Germany there have been individual authorizations to transmit voice telephony as well. These authorizations are granted only if DBP Telekom is not in the position to provide an equivalent service in a comparable time frame (3 months). Moreover, the licencee has to prove that there is an urgent need for this service. While the basic licence has a duration of 10 years, the individual authorization to

59 There is no competitive selection process among licence applicants, since everyone who complies with the conditions of the lisensor will obtain a license. The licence does not include restrictions for the size or the configuration of the satellite network. Only circumventing DBP voice service monopoly is prohibited.

60 Funkschau, 10/91, "Ein Boom verbindet Ost und West".

transmit voice telephony cannot last more than six years. However, as has been mentioned earlier, it is expected that eventually the authorization to carry voice telephony will be permanent.

8.4.1.4. Private Networks

Present Regulation

According to Article 2(1) FAG the BMPT may grant an authorization to set up and operate individual telecommunications installations for certain routes or districts. If a concession is granted, the BMPT has the right to establish the concession terms (Article 2(2) FAG). A concession has to be granted to electricity suppliers for their service purposes (Article 2(2) FAG). No licence is necessary to set up and operate telecommunications installations which are used exclusively within the limits of the same premise, or between several premises belonging to the same owner provided that the distance between these premises does not exceed 25 km. This applies also for transport companies as long as these installations are used exclusively for their own service needs, and for installations for internal activities of "Länder" authorities (Article 3 (1) FAG).
The BMPT may authorize operators of installations within the same premise which are connected to the telephone service of DBP Telekom to provide monopoly services for third parties. In that case DBP Telekom has the right to impose special obligations on these operators until the 31/12/1996. These obligations, however, have to be approved of by the BMPT.

Analysis
Private networks are another exemption to the network monopoly granted to DBP Telekom. However, the limitation of private networks for sites within a small radius prevents them from being used to bypass the public switched network. The "Witte Kommission" had recommended to allow the installation of private networks covering the whole territory. So far this has not been done by the Ministry due to the possible substitutive effects of basic services.[61]

8.4.1.5. Use of Leased Circuits

Present Regulation

Article 1 (4) FAG provides that everyone has the right to provide telecommunications services for third parties over permanent or switched connections to be made available by DBP Telekom. Sub-channeling or reselling is permitted. This, however, does not include voice service. DBP Telekom is obliged to provide leased lines to everyone requiring them

[61] BMPT (1988), Reform des Post- und Fernmeldewesens, Heidelberg, p.46.

to offer non-reserved services. Leased lines have to be made available on the same terms as for DBP Telekom itself. According to Article 1(4) DBP Telekom has to allow for interconnection. Monopoly transmission paths therefore must be accessible to the user via **service neutral, freely reachable** interfaces. Any kind of discrimination among private suppliers and between private suppliers and DBP Telekom is prohibited. DBP Telekom is obliged to ensure that connection lines can be used for non-voice services, that the user can freely choose among service suppliers, and that private switches are connected to the switches of DBP Telekom network. Thus the principle of equal access for "data over voice" has to be respected.

If according to Article 2(1) FAG the BMPT authorizes someone to provide services which are covered by the exclusive right of the "Bund" (voice traffic) then the Minister or DBP Telekom according to Article 2(2) FAG may impose certain restrictions for the interconnection with the public network (like the prohibition of resale or an additional surcharge).

Tariffs for leased lines are regulated by the BMPT. They can depend on the duration of usage, the moment of provision, or on the distance of transmission. However, tariffs are not allowed to differ according to the purpose for which the lines are leased.

Thus the use of leased lines for third party traffic, shared use, and resale is permitted if no voice service is included.

Analysis

As has been mentioned already, the Ministry is responsible for leased lines tariffs. If the BMPT and DBP Telekom cannot compromise the Infrastrukturrat is consulted. If still no compromise can be found, finally the Cabinet decides. Leased lines' tariffs have to be related to costs, thus instead of usage sensitive prices flat rate pricing has to be applied.

Tariffs recently proposed by DBP Telekom have been challenged by the operator of the D_2 network as well as by VANS providers. Compared to tariffs in the UK the German ones are four times as high.[62]

International Use of Leased Circuits

The rules specified by the FAG do not apply to international circuits. Thus they can be bypassed by routing traffic out of Germany and then back in. On international circuits compression technology is allowed and there are no restrictions for transmission of data and voice signals. Using international lines leased from DBP Telekom firms can first send data or voice traffic out of Germany and then back in. Shared use, third party traffic and resale are not prohibited.[63]

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[62] Communications Week International, 27/05/1991, p.3

[63] See the example given in footnote 46.

However, the rental charges on standard border leased lines in Germany are stil exorbitant. A non German operator charges for a leased line to Japan about DM 1,800 DBP Telekom asks for DM 14,000. For leased lines to the US the German operator's price is three times as high as the price of its counterpart; for the UK it still costs twice as much.[64]

8.4.2. Services

8.4.2.1. Fixed Voice Services

Present Regulation

Article 1(4) FAG provides that the operation of telecommunications installations for the purpose of voice traffic for third parties is an *exclusive* right of the "Bund" (telephone service monopoly), which is exercised by the BMPT (1(5) FAG). As in case of the network monopoly DBP Telekom has a public mandate to carry out these rights. The basic rights based on this regulation have been passed over to DBP Telekom on the 27.11.1990. Future regulations will have to describe in more detail the scope and content of these rights.
Under Article 1(4) and 2(1) FAG the BMPT has the right to authorize other entities to set up and operate individual telecommunications installations. Thus the BMPT may allow private entities to provide services which are presently covered by the monopoly rights of the Federation. If such exceptions are made the BMPT will grant a licence. It is left to the discretion of the ministry to set the terms of these licences.

The scope of the telephone service monopoly to some extent depends on the definition of the services concerned. In that respect in the declaration of the BMPT "*Eckpunkte*" special reference is made to the telecommunications services directive of the Commission (COM/388/EC).[65] It is said that the German distinction between telephone service and other telecommunications services will be drawn according to this directive.
Thus telephone service is defined as the **direct** transmission of **speech** in **real time**, which has to be **switched** between **public** switched network termination points. Hence the transmission of speech without switching is not covered by the monopoly (this is the case for permanent connections among certain customers). If a voice message is stored or if it is transmitted with considerable delay it does not belong to the telephone service monopoly. Finally if speech is transmitted exclusively among network termination points which belong to the same customer then it does not belong to the service monopoly of the Federation.
Services which consist of a combination of voice transmission and other characteristics are only considered to belong to the service monopoly if from the viewpoint of the customer

[64] All prices for January 1991. See: Economist, October 5, 1991.

[65] See chapter 7.2.3.1.

they might substitute the voice telephony service. This ability of substitution has to be investigated by the BMPT. In that context the specific characteristics of the individual service, its purpose and the price have to be considered. A service which involves much more transmission capacity than ordinary telephone services do is not considered to be telephone service. This applies for instance for videoconferencing in a broadband network. On the other hand the joint transmission of a telephone service and pictures is regarded as being covered by the telephone service monopoly.

DBP Telekom exercises the rights which stem from the telephone service monopoly of the Federation. At the same time it has to fulfill certain obligations which mainly have to ensure that infrastructural aims are met. DBP Telekom is obliged to provide access for all users to the telephone service.[66]

8.4.2.2. Mandatory Services

Present Regulation

By Article 1(4) FAG generally erverybody has the right to provide telecommunications services for third parties if these services do not belong to the service monopoly of the Federation as described above.

However, the "competitive" services are principally divided in *mandatory* services and *non-mandatory* services (Article 22 PostVerfG). Mandatory services are services for which DBP Telekom has to fulfill certain obligations (i.e. the provision throughout the country).[67]

The Federal Government has the right to determine which mandatory services must be rendered by DBP Telekom in the public interest. For these services special regulatory rules may be set up as well for firms competing with DBP Telekom.[68]

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[66] Furthermore certain quality standards are prescribed in the law. For instance access has to be provided within 15 working days. The provision of the telephone service has to fulfill certain quality standards. Services have to be offered unbundled so that consumers are free to choose among them. Finally DBP Telekom is obliged to provide a permanent fault service. Until the 31.12.1991 it has to develop a concept which outlines the conditons on which access to the telephone service will be offered to private suppliers of non-monopoly services. DBP Telekom is obliged to keep an updated data file of the telephone service subscribers and their telephone numbers.

[67] This could for instance apply for public coin boxes and telephone enquiry services which together amount to losses of DM 1 billion annually. However, mandatory services have not been defined yet. See: Funkschau, 12/1991, p.28.

[68] Article 1(4) FAG rules that private suppliers are entitled to offer mandatory services beside DBP Telekom. However, the BMPT is authorized to put certain obligations on these enterprises (Article 1a(2) FAG). This can be done only if due to the special obligations put on DBP Telekom by Article 25(2) of DBP Constitution Act the competitive position of DBP Telekom is considerably impaired and secondly if compensation from monopoly services is not possible (Article 1a(2) FAG and Article 37(4) DBP Constitution Act). Only if both conditions are fulfilled the BMPT may impose obligations on the competitors of DBP Telekom which are suitable to remove the competitive disadvantages of DBP Telekom. The obligations may relate to the quality of services, to their coverage, and to their price. Firms having a market share below 3 % are exempted from these obligations (Article 1a(2) FAG).

Finally in the "*Eckpunkte*" the BMPT has stressed the principles of **non-discrimination** which apply if private suppliers have to use the monopoly services provided by DBP Telekom as an input for their own services. The telephone service as a bearer service has to be available for competitors of DBP Telekom on the same terms as the latter uses them themselves. DBP Telekom is not authorized to impose any restrictions regarding access or any special tariffs if these monopoly services are used by private competitors.

8.4.2.3. Non-mandatory services

Present Regulation

Value added network services, telex, and packet & circuit switched data services can be provided by everybody for third parties over permanent or switched connections of DBP Telekom (Article 1(4) FAG). A notification of the BMPT is obligatory according to Article 1a(1). DBP Telekom is obliged to offer access to its network on a non-discriminatory basis. It has to offer network capacity to external VANS - suppliers on the same basis as it is using the network for its own value added network services. If in the future an individual service is declared to be mandatory certain obligations may be imposed on private suppliers (see above).

Analysis

Despite some pressure all data and telex services were liberalized. In case of the former it was reckoned that due to technological convergence no borderline could be drawn between telecommunications and data services.

Article 37(2) PostVerwG explicitly states that compensation between basic services shall be permissable. The same applies for "compensations" using revenues from monopoly services for the benefit of mandatory ones (Article 37(4) PostVerwG). This, however, will make the control of cross-subsidization difficult.

Mandatory services are a special feature of German regulation. As the result of a political compromise, the regulation of mandatory services most clearly reveals the unstable mixture of public and private service provision.[69]

According to a study made for the Commission of the EC[70] Germany ranks second to the UK in Europe as far as the number of VANs-suppliers is concerned. The VANs offered by DBP Telekom[71] have not proven to be very successful to date. The videotext system failed to reach the market penetration goals set by DBP Telekom. Moreover, the service is losing

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69 See also: Schmidt, Susanne K. (1991), p.218.

70 Scicon Networks (1989).

71 Mainly its videotext system (BTX), an electronic mail system (Telebox) and a telemetry service (Temex).

GERMANY

INFRASTRUCTURE

	No Obligation	Declaration[1]	Licence essential requirements[2]	Licence further requirements[3]	State Monop
Public Networks					
Terrestrial					
Fixed					X
Microwave					X
Mobile				X[4]	
Satellites					
Earth Segment			X[5]	X[6]	
Spatial Segment					X
Private Installations					
Terrestrial		X[7]		X	
Microwave				X	
Satellites			X[8]	X	
Use of leased circuits					
Domestic					
Shared use/third party/		X[9]			
Interconnection	X[9]			X[10]	
International					
Shared use/third party/	X				
Interconnection	X				

(1) in the text this is called "notification" of the BMPT; only technical requirements must be met (like network security).
(2) only certain technical standards have to be fulfilled. There is no competitive selection process for granting a licence.
(3) licences might be limited in number, or conditions are imposed in order to protect the monopoly rights of the Federation.
(4) the licences for "Buendelfunk" are limited by the number of frequencies available. For the nationwide mobile network presently two licences are granted.
(5) for low bit rates. (6) for high bit rates.
(7) for closed user groups. (8) for private installations and low bit rates only an approval is necesasary.
(9) only non-voice traffic. (10) in case that voice traffic is included.

GERMANY

SERVICES

	Declaration(1)	Approval	Special Obligations	Licence: essential requirements	Licence: further requirements	State Monopoly
Fixed Voice Service						X
Mandatory Services	X		X(2)			
Non-Mandatory Services	X					
Mobile Voice Service					X(3)	
Telegraph; Telefax	X		?(4)			
Services on leased circuits	X(5)					
Packet & Circuit switched data services	X		?(4)			
Services on cable networks					X	
Services via one-way Satellites		X				
Services via two-way Satellites				X(6)	X(7)	
VANS	X		?(4)			

(1) in the text this is called "notification" of the BMPT; only technical requirements must be met (like network security).
(2) these obligations have to be fixed by the BMPT in the future.
(3) the licences for "Buendelfunk" are limited by the number of frequencies available.
Presently there are two licences for a nationwide mobile telephone network.
(4) it has not been decided yet which ones are the mandatory services.
(5) for non-voice service only.
(6) for low bit rates.
(7) for high bit rates.

DM 100 million a year.[72] Large entry comes from firms like IBM and Daimler-Benz which open their internal networks in order to provide services to third parties. Siemens created a subsidiary to enter the VANs market. There are also several small firms operating. However, especially the latter face serious problems competing with DBP Telekom because of asymmetric information. The network operator has good information about its competitor's capabilities and costs.[73]

8.5. The Tariff Structure

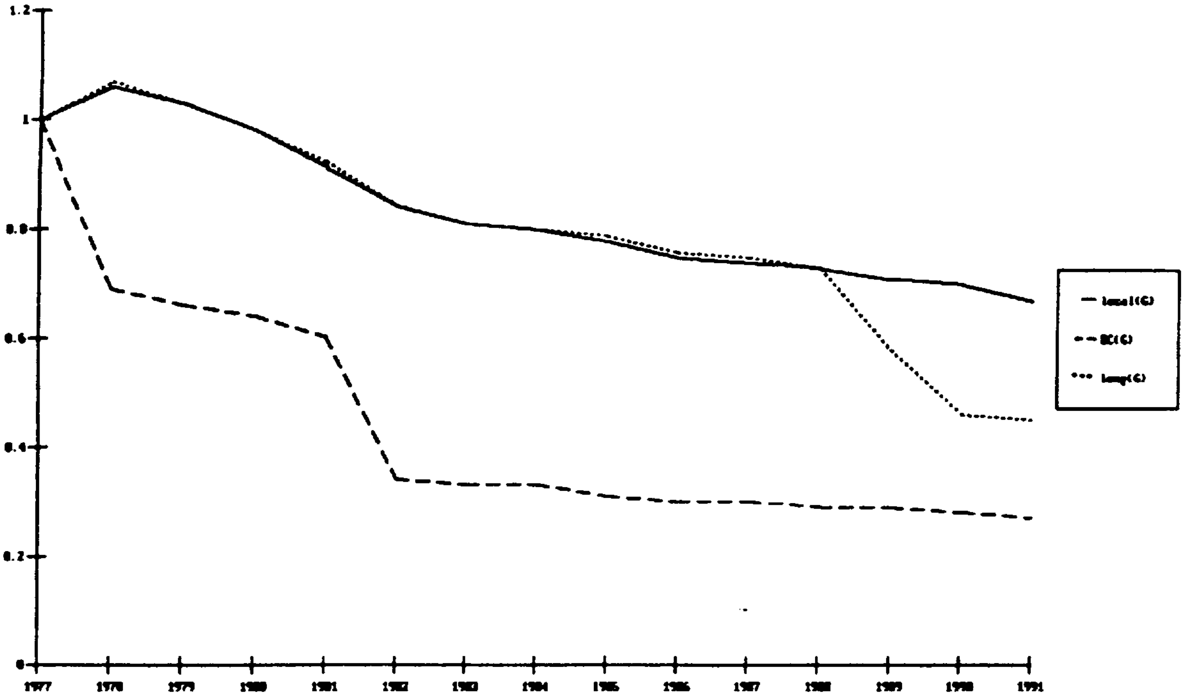
Graph 8.1 depicts the price development of basic services in West Germany for the last two decades. A the beginning of the 1980s DBP brought international EC tariffs somewhat closer towards cost. As its "contribution to European integration" it was the only European TO to set equal prices for national and international (EC) long distance tariffs in 1982. This was done to take account of the fact that the costs of provision are almost the same in both markets. As can be seen, this adjustment led to a considerable decrease in real prices to EC countries. The next important tariff step was due in 1988.

One aim of the Post reform was to achieve a further cost orientation. The "*Tarif 90*" scheme in three steps reduced long distance call prices. While before long distance and local prices developed in almost parallel fashion, the real long distance price thereafter decreased sharply. This can be seen clearly in graph 8.1.). However, prices for international long distance calls were not changed simultaneously. Thus, while adjusting national prices, the Ministry fell back on its cost orientation principle in the international market.

Revenues steming from the "Tarif 90" were supposed to suffice for additional investment in the GDR infrastructure. However, it is not certain whether the extra burden related to the contributions to the federal budget will eventually lead to price increases. As can be seen from Graph 12.1 in chapter 12, in an international context German tariffs are comparatively high.

72 While it forecasted over 2 million users by 1990, in fact only 260,000 users are currently connected. Compare: Witte, E. and M. Dowling (1991), p. 442.

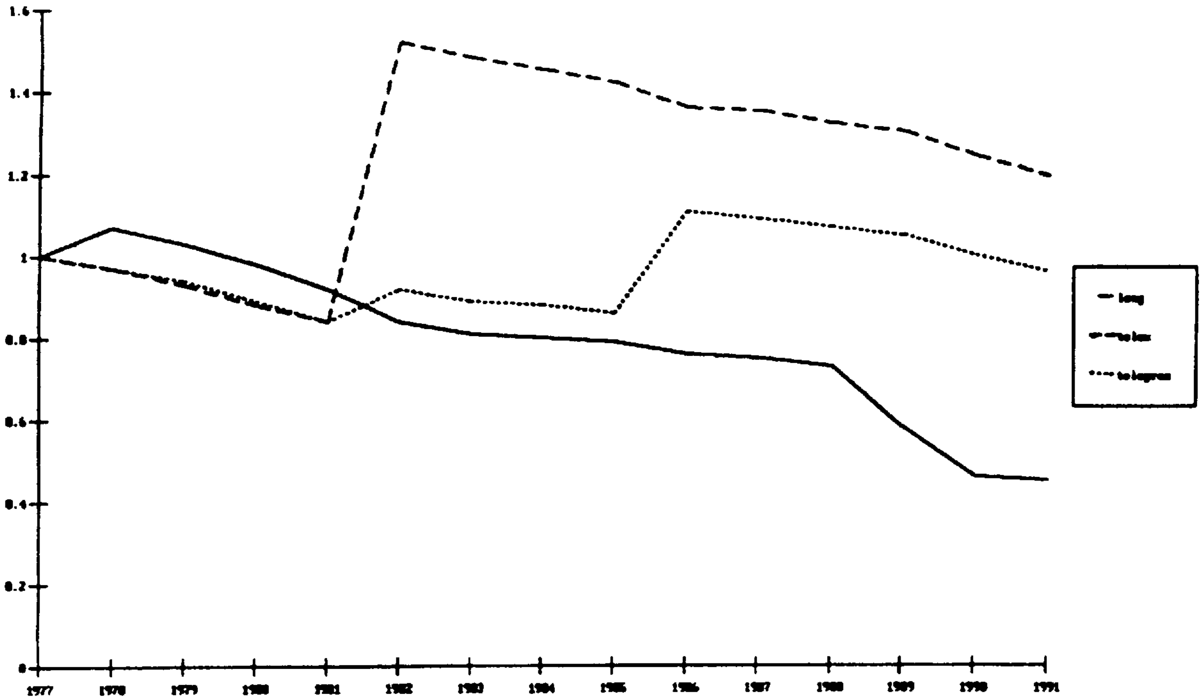
73 See in detail: Witte, E. and M. Dowling (1991), pp. 446-448.



Graph 8.1.: real prices for national and international telephone services in West Germany 1977 - 1991 (1977 = 100).[74]

Graph 8.2. shows that in comparison to other communications services, the telephone service has been a bargain. Over time local and long distance prices have decreased relative to possible substitutes.

[74] Here and in the following graphs are based on my own estimations calculated from data provided in the appendix.



Graph 8.2.: Real prices of communication services in West Germany 1977 - 1991 (1977 = 100).

8.6. Conclusions

The main intention of the reform of the German PTT has been the separation of regulatory and operational functions, the liberalisation of non-voice services, and the split of DBP in three enterprises. The latter shall be run as private enterprises. From the previous discussion of the Commission's strategy it becomes clear that the German post reform has mainly applied the policy objectives of the former. Germany probably has followed most closely the Green Paper proposals. The future development of German telecommunications therefore may be regarded as a good test of the overall approach of the EC.

The aim of the separation of the BMPT and DBP Telekom has been to prevent the firm which exercises exclusive rights of the state from abusing its special position when operating in the non-reserved markets. The Ministry remains, with the role of the industry's regulator. When DBP Telekom is put under competitive pressure there will be an incentive to lower the quality of the monopoly services or to raise their prices in order to cross-subsidize. The regulator must have the power to regulate quality standards, to investigate whether cross subsidization occurs and whether access charges for competing private firms correspond to underlying costs.

However, the present reform falls short of these aims. First, the Infrastrukturrat ensures that political control over DBP Telekom prevails. Furthermore the government continues to abuse DBP Telekom for general political objectives. The latter has been seen from current tariff discussions. The recent "reunification tax" has clearly shown that the reform has failed to live up to expectations. DBP Telekom has not gained more independence from the political system than it had before the reform. Two years later, in 1991, DBP Telekom had to remit DM 9.2 billion to the government. This included DM 4.7 billion as the obligatory surcharge of 10% of turnover, which has to be transferred annually to the federal budget. DM 2 billion were additionally imposed as a special reunification tax. Finally DM 2.5 billion had to be paid to cover losses of DBP Postbank and DBP Postdienst. Clearly this extra burden imposed on DBP Telekom contradicts the declared aim of running the state enterprise according to commercial principles. Moreover, a more radical realignment of tariffs towards costs was thereby prevented.

Moreover, the regulator still cannot be regarded as a neutral referee. Being the Ministry for telecommunications it represents the State as the only shareholder of the enterprise. The government has a strong interest in preserving DBP Telekom's profits, to cross-subsidize postal services and the federal budget. Therefore it is likely to be reluctant to have "too much" competition. This point was illustrated with the licensing procedure for the two mobile GSM networks. It has been argued that for the society as a whole it would have been better to have granted both licences to private operators. This, however, would have exposed DBP Telekom cable network to more competitive pressure. By reserving one licence for DBP Telekom, the Ministry also protected its own interests. It appears that the reform was meant to create an efficient enterprise run as if under competitive pressure which nevertheless can be exploited for external goals. This is likely to lead to a conflict of interests once competition really takes off.

Given the dynamic momentum the liberalisation process gained in the US after entry on the fringe had occured, further institutional change can be expected also in Germany. It was already triggered off by the process of reunification. The 1989 reform created only an unstable regulatory framework for an industry in transition.

9. Telecommunications in Italy: Network Fragmentation and Regional Imbalances

9.1. Historical Development of the Present Market Structure

As in other EC member countries, initially in Italy it was intended to create a state monopoly in telecomunications, run by the Ministry for Posts and Telecommunications. However, during the 1920s, foreign capital was indispensable to build up an Italian telephone network. In order to attract foreign investment, enterprises were formed outside the Post Ministry. Ericsson, for instance, participated 1924 in the establishment of the concessionaire responsible for the telephone network in the south of Italy.[1] In the 1930s the state increased its control over the sector. The limited number of independent companies which had received a licence to provide telephone services were bundled within the state owned *Istituto per la Ricostruzione Industriale* (IRI). The IRI is a stateholding independent from the Ministry of Post and Telecommunications. Thereafter the Ministry only runs those services for which no concessionaries could be found.[2] Both the structure of the telecommunications network and the regulatory framework were set up in the 1930s, without encountering important changes until today.

As a result, the structure of the network and the regulatory system in Italy are somewhat blurred. As can be seen from graph 9.1. there are presently two different institutions responsible for Italian telecommunications. One is the Ministry of Post and Telecommunications keeping control over the "*Azienda di Stato per i servizi telefonici*" (ASST) which runs most of the national long-distance and the network with EC member countries. The reason why ASST remained under control of the Ministry is mainly historical. When the telephone industry was privatized in 1925, the long-distance sector (in contrast to the local network) did not find any private investors[3]. The Post Ministry is also in charge of national telex and telegraph services, which are provided by the *Direzione Centrale Servizi Telegrafici* (DCST). Finally the *Direzione Centrale Servizi Radioelettrici* (DCSR) operate radio telephone services (primarily maritime ones).

The second institution is the stateholding "*Società Finanziaria Telefonica*" (STET). In 1933 STET was created by the IRI, which currently depends on the Ministry of Public Participation. Since 1964 STET controls the "*Società Italiana per l'Esercizio Telefonico*" (SIP), which runs the local networks. Before the turn of the century, SIP was incorporated as a privately owned company. Later it was nationalized.[4] Now SIP is a so called "*Societá a Partecipazioni Statali*" (PPSS), thus it is traded on the stock market but the government owns the majority of shares (60%). PPSS firms are endowed by the government with an

[1] CNEL (1986), p. 148.

[2] Tarifica Anual (1991), p.171.

[3] Silvano, F. (1988), p.73.

[4] Mondini, Giorgio (1991), p.67.

interest-free capital fund (Fondo di Dotazione). The interest earnings accumulated on that capital balance the costs imposed on the PPSS firms by political obligations (like keeping a certain employment level, or universal service requirements).[5] Besides running the local network and providing the subscriber's interface, in recent years SIP has also been granted a concession to provide data transmission facilities, mobile radio and telematic services.[6] The licence for the provision of these services has been granted to SIP by the Ministry for Posts and Telecommunications in 1984. It expires in 2004.

STET also owns *Italcable* which is responsible for the telephone traffic, the telex and the telegraph service to non European countries.[7] Italcable was created in 1921 for the purpose of planning, laying and operating submarine telegraph cables. By this time 77% of the shares were hold by the private sector, mainly Italians living overseas and interested in an transoceanic communications network.[8] It was absorbed in the IRI-STET holding in 1965. In August 1989 Italcable took on the responsibility for packed&circuit switched data services to European countries.[9] Italcable has been investing in different foreign markets, having a stake in the Argentinian TO *Entel*, and subsidiäries in the USA.

Finally, STET owns 100 per cent of the shares of *Italtel*. The latter is the state manufacturer, which, however, competes with private firms, especially *Telettra* (owned by Fiat). Italtel's share in the Italian telecom market is above 50 per cent[10].

The concessionary firms have to pay a fee to the state which is usually a percentage of the revenue earned during the year. Moreover, the Ministry has the right to set tariffs at a rate it deemes suitable.

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[5] Gamardella, Alfonso (1990), p.2.

[6] Prodi, R. (1989), p.10.

[7] A more detailed description of the structure of the Italian telecom sector can be found in: STET, (1988), p.89/90.

[8] Lenti, Felice (1990), p.11.

[9] Vergnano, Franco (1991), p.72.

[10] Die Welt, 10.03.1988.

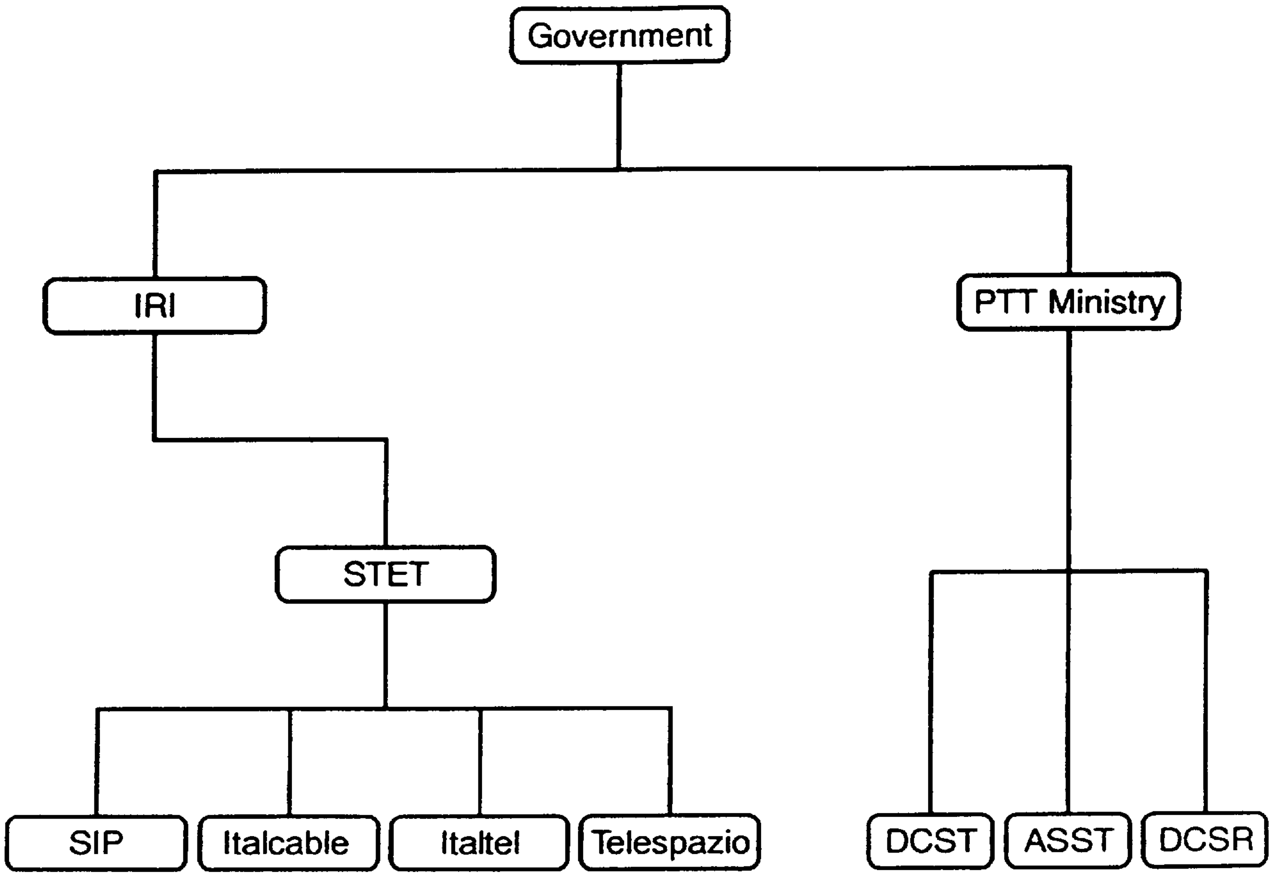

Figure 9.1: *the structure of the Italian telecommunications industry*

Among the three different network operators, SIP is by far the most important one, accounting for 79% of all revenues steming from telecommunications services. It is followed by ASST (13%), Italcable (3.7%), the PTT Ministry (3.8%) and Telespazio (0.5%)[11].

Interestingly, the Italian network structure resembles the one in the USA in that the long-distance carrier is separated from the local network. Moreover, like AT&T, STET combines both service provision and manufacturing. However, since all public networks are controlled by the Italian state, this separation has not led to network competition. On the other hand economies of scope could not be reaped either. Instead, in the past frequently problems arose for interurban calls. A call from Rome to Milano, for instance, first passes through the local network of SIP, then through the network of ASST and finally it is again channeled in the local network of Milano (SIP). This repeatedly created problems of interconnection and capacity shortage since investment decisions were not adequately coordinated between ASST and SIP.

[11] Gebhard, H.P. (1987), p. 4.

9.2. The Modernization of Italian Telecommunications

At the mid 1980s the reform of Italian telecommunications became a top issue of the political agenda in Italy. Three imminent problems were identified. First, it was recognized that the historically developed fragmentation of the network had been inefficient. As a result, the **restructuring of the industry** was envisaged, in order to make service provision more efficient. Secondly, there had been a relative decline of the Italian telecommunications network compared to other EC member countries. This decline, however, was only partly explained by the fragmented network. The operators did not have sufficient funds for investment. Finally, as for the economy as a whole, there existed a gap between the north and the south. In the south of Italy universal service had still not been achieved, which became a further handicap for development of this region.

However, restructuring of the network became the main aim on the political agenda for several years. STET, SIP, Italcable, Italtel, ASST and Telespazio (satellite calls devision) are to be joined into one company which combines operative services and equipment business.[12] Two alternative models were proposed. "*SuperSIP*" implied that SIP would be granted the sole concession for telephone services. Italcable and ASST would be incorporated within SIP. Alternatively, "*SuperStet*" was put forward to grant the holding company STET itself the concessions to offer services. ASST and Italcable then would become divisions responsible for their respective services.

Beside merging the different enterprises under one roof, the restructuring was supposed to include also the separation of business and regulatory power. Currently regulatory functions are divided between the *Istituto Superiore delle Poste e delle Telecomunicazioni* (ISPT) which handles terminal approvals, and the *Consiglio Amministrativo* responsible for granting the licences to the concessionary companies.

However, until now the operating companies also keep some regulatory power. The general director of ASST, for instance, is also the regulator of the industry, which precludes a critical revision of state policy towards the industry[13]. Moreover, ASST and SIP have to consent if private service providers use leased lines to provide competitive services. This offers both firms the opportunity to discriminate against potential competitors.

After discussing the proposed reforms for several years, eventually the "Senato" approved the transfer of ASST to IRI on July 18, 1991, and the parliament in January, 1992.[14] The main obstacle, however, is a political objection to this transfer. On the one hand, the employees of ASST would lose their status as civil servants,[15] thus the transfer is objected by the trade unions. On the other hand, the Italian system of *patronage* leads to inertia of

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[12] Compare: La Repubblica, 04.04.1988 and: Mucci, A. (1989).

[13] Compare: Cultrera, G. (1989). p.8 and STET (1988), p.37.

[14] Il Sole - 24 Ore, July 19, 1991 and January 17, 1992.

[15] Rapporto Assinform (1989), p.52.

political institutions since changes always affect political parties. Traditionally the *Partito Democrata Cristiano* keeps control over ASST.[16] The transfer of the long-distance carrier from the PTT to the STET is therefore also opposed by the biggest political party, afraid of losing control over the enterprise.

The second major aim of present Italian telecommunications policy is to catch up with the more advanced countries in the Community. When an analysis is carried out on an aggregated level, Italy is placed in a middle position within the EC.

For the country as a whole, the provision of telecommunications services has been in relative decline compared with other EC countries. At the late 1960s the density of telephone sets was higher in Italy than in France and roughly the same as in West Germany. 1987 Italy had a density of 32 per 100 inhabitants, while in West Germany and France the rate was at 43.[17] Overall the pentration of VANS is small in Italy. In 1987 voice services had a share of 88.4%, data services 6% and VANS only of 0.5% of the Italian telecommunications service market.[18] The number of videotex subscriber lines, for instance, in Italy amounts to only 6% of those in West Germany and 0.18% in France (1987). Less striking but similar is the lag behind for telex subscriber lines and mobile telephones.[19] Finally, the quality of the Italian services is low. The waiting time for service access or for the repair of faults exceeds many times the ones of the more advanced countries.[20] In 1990 only 53% of all calls made reached their destination (EC average: 70%). Italy had the lowest speed of transmission of the 7 biggest EC member countries.[21]

The relative decline of the Italian telecommunications sector is mainly due to a comparatevely slow increase of investment. Graphs 9.1. and 9.2 illustrate this development. Graph 9.1 shows that the gap in annual gross investment in telecommunications services compared to West Germany has widened in the decade to 1986. Even if account is taken of differences in national income, the Italian telecommunications sector has been relatively neglected. Investment as a share of national gdp in Italy was twice that of West Germany in 1977. In 1986, however, the German rate was significantly above the Italian one. This is seen from figure 9.2.

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[16] A detailed analysis of party interests in the proposed reforms can be found in: Carini, Alessandra (1990),

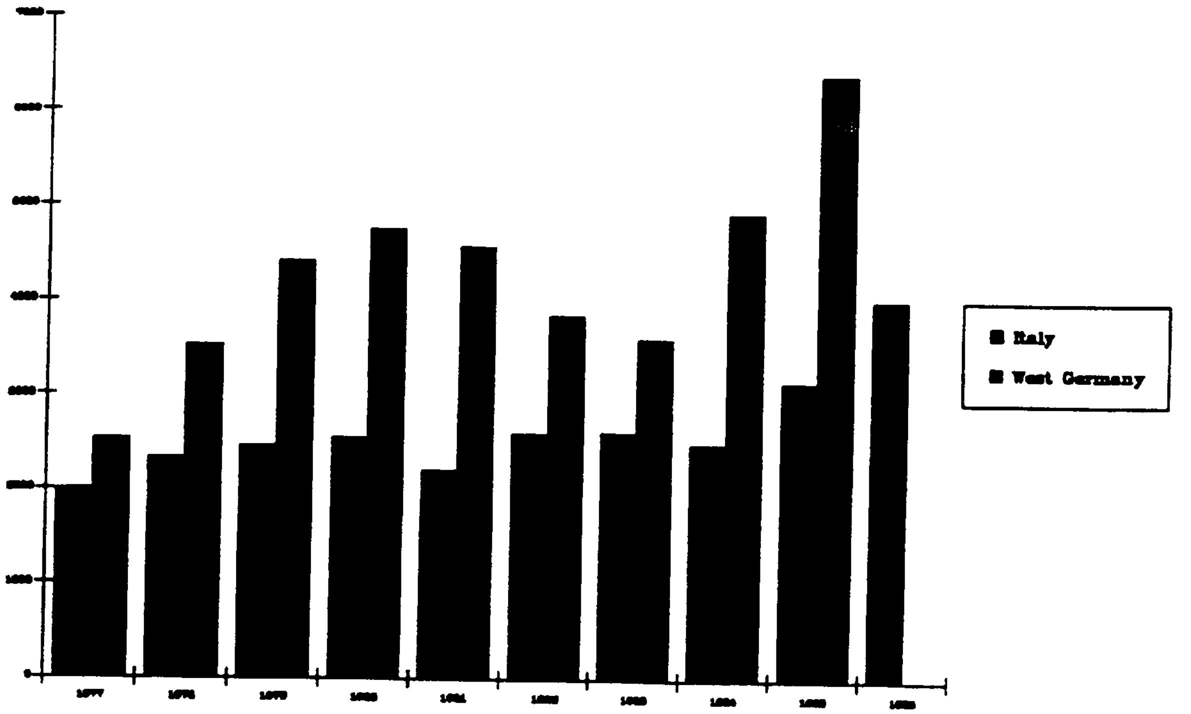
[17] Siemens (1988), p.15.

[18] Rapporto Assinform (1989), p.53.

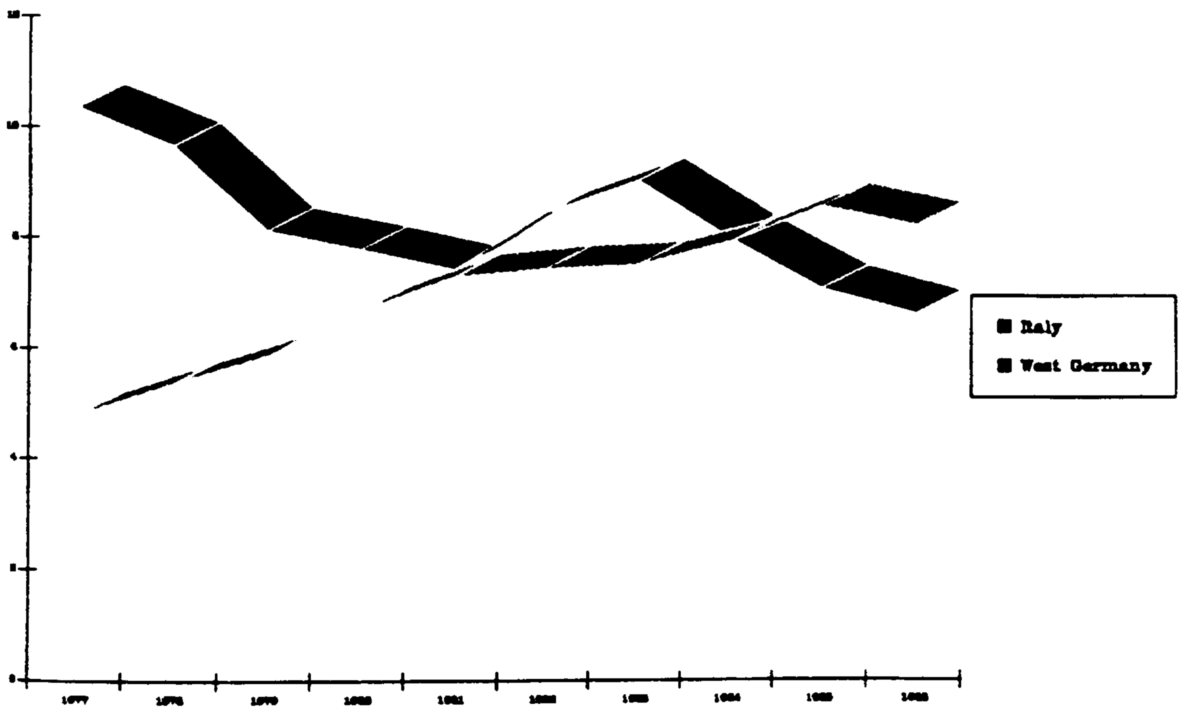
[19] Calculations based on data provided by: Siemens (1988), p. 32-35.

[20] In 1982 the average waiting time for connection to the public switched network was 8.5 months. While being reduced, in 1988 still in average one had to wait half a year for getting access to the network. However, SIP has started to pay more attention to the quality of service. By decree a new code of practice was introduced in 1990 which reduces waiting time to 35 days at maximum. SIP also promises to pay compensation if fault repairs are not undertaken within two working days of receiving an request. See: Tarifica Annual (1991), p.179 and SIP (1990).

[21] SIP (1990), p.8 and: La Repubblica, Affari&Finanze, Marzo 16, 1990, p.17.



Graph 9.1.: *annual gross investment in telecom services in Italy and Germany 1977-1987 in $US*[22]



Graph 9.2.: *investment in telecoms as a share of gnp in Italy and West Germany*

Given the high deficit of the government's general budget, when carrying out investment decisions SIP mainly depends on its own resources. These sources, however, have been

[22] Sources for Figures 9.2. to 9.4.: International Telecommunications Union (UIT) (1988),

relatively small. Graph 9.3 shows that again in comparison to the DBP Telekom, Italian operators realized relatively small net income streams.[23] This may partly be explained by the tariff policy for telecommunications services in Italy (in more detail see chapter 9.6. As in all countries, telephone tariffs are a political issue in Italy. The Ministry for Post and Telecommunications is responsible for tariff setting. However, as has been seen in chapter 9.1. the PTT is separated from the SIP. Thus while the Ministry would be blamed for tariff increases, it is not made directly responsible for a deterioration of the quality standard of services provided by SIP. During the period of high inflation rates in the 1970s, the Ministry failed to raise tariffs correspondingly, thereby depriving SIP of the necessary revenues to modernize its network. As a result STET repeatedly has asked to align telephone prices to inflation.[24] Moreover, the fragmentation of network operators into different undertakings deprived SIP of the second source of financing, the traditional cross-subsidies. SIP receives all the revenues from local calls access and some long-distance calls. However, the bulk of long-distance and international service revenues are reaped by ASST and Italcable. These revenues are split among the three companies on a fixed proportion according to the type of call. As can be seen from Figure 9.3. SIP made small profits when compared to DBP Telekom. Based on different calculations, Pellegrini got even more drastic results.[25] ASST and Italcable instead have been making reasonable and rising profits. Especially during the last years profits made by Italcable were exceptional.[26] A cross-subsidisation of SIP's losses by profits made by ASST is prohibited. Thus during the period where other European TOs accelerated the development of their networks, the financial means for the Italian operator became more limited. Thereby the level of self financing of SIP steadily declined, until 1979 nearly 80% of investments had to be financed by external borrowing. At this time 30% of its costs were on interest rate payments. Thus, the traditional network structure itself became a severe impediment to the development of the Italian telecommunications network. While in the period 1975-1979 the average percentage increase in exchange lines was 18% in France, in Italy it ran at about 6% annually.[27]

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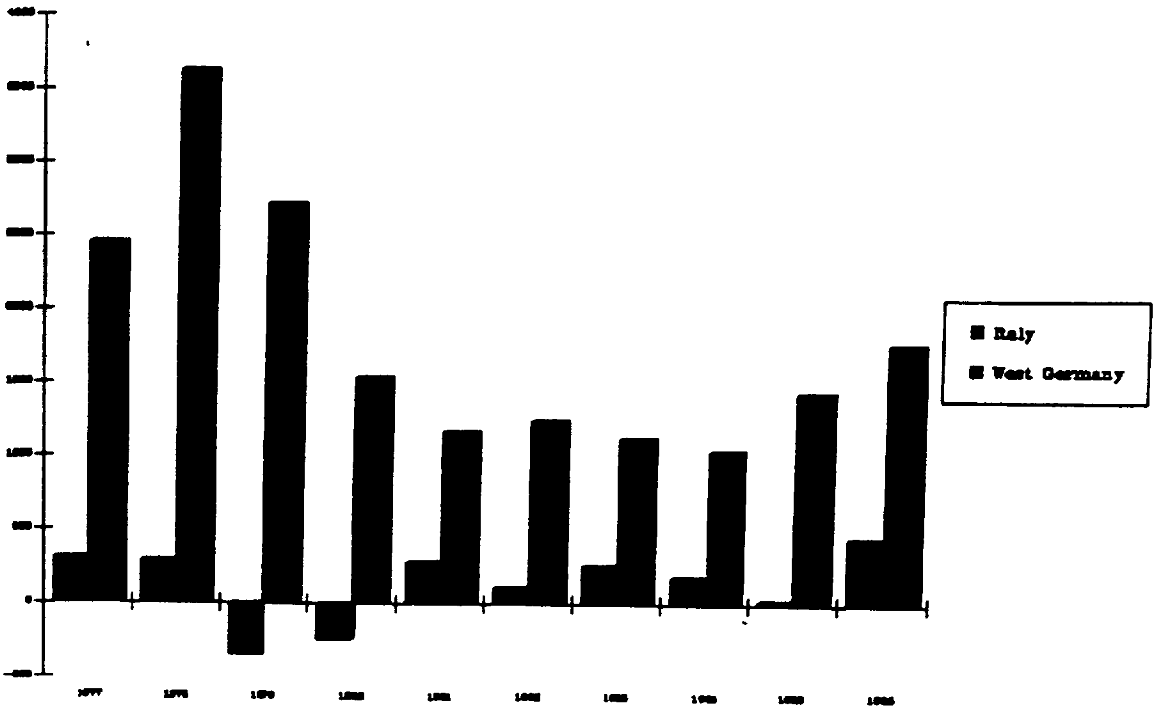
[23] Total income minus total expenditure (including taxes) for telecommunication services. See also: Stehmann, O. (1990), p. 21-23.

[24] La Repubblica, Febraio 22, 1991.

[25] He argues that until 1975 SIP made modest proficts. Since then it has been making substantial losses. See: Pellegrini, Umberto, (1989), p. 206.

[26] in detail: Lenti, Felice (1990), p.13.

[27] Pellegrini, Umberto (1989) p.204-205.



Graph 9.3.: *net income of DBP Telekom and SIP in US$ 1977-1986.*

SIP has found itself in a vicious circle. Low investment rates led to a deterioration of the quality of services. Low quality and the limited number of services provided by SIP deterred customers from using SIP's network. Thereby the revenue available for further investments shrank. Customers make less use of telecommunications services in Italy than in other countries. Per customer the monthly revenue accrued by SIP amounts to Lire 293,000 as compared to Lire 500,000 in the UK and 450,000 in Germany[28].

Finally, the situation of Italian telecommunications has been aggravated by strong regional disparities of economic development.[29] General economic divergence between the north and the south have been mirrored in the telecom network. Northern Italy has already achieved a penetration of telecommunications services comparable to countries like the Netherlands, France and West Germany. This holds for the high rate of households connected to the network and to a smaller extent also for the usage of VANS. In contrast, in the south even basic telephone services are not universally provided. The density of terminals in the Mezzogiorno is comparable to that measured in Spain. As an example, 1985 in Lombardia the density rate was at 44%, while in the south of Italy only 22% main stations were installed per 100 inhabitants.[30] Moreover, VANS remain rare in the less developed regions of Italy. Different levels of development, however, also lead to different

[28] Benzoni, Paolo (1990), p.4. See also: Gnetti, Attilo M. (1990), p.3.

[29] See for instance: Martin, José M.F., and Oliver Stehmann (1991), especially pp235-236.

[30] In more detail: SIP (1988), and Media Duemila (1988), p.101.

priorities for telecom policy. The northern regions are mainly concerned with widening the scope of the provision of VANS, which favours liberalization. In the south universal service arguments are more relevant, which supposedly requires a financially strong network operator. The costs of investments made in the south are not covered by revenues. For instance, in 1983 SIP made a loss in all but one of its eight regions in the Mezzogiorno. The loss in those regions amounted to 46% of its total profit. As a result, in Italy one finds a very heavy regional cross subsidy also in the telecommunications network.[31]

The different objectives are reflected in the current investment programme of SIP. The **"Piano Europa"** initiative entails an acceleration of investments into the sector. It is aimed at adding 1 million new subscribers each year from 1988-1992. SIP assigns about 33% to 35% of its investments to Southern Italy which produces only 27% of the company's total income.[32] 43% of the four million new subscribers aimed for by 1993 shall be in the south.[33] Thereby the density rate of 27% shall rise to 42% until 1992[34]. When delivering an intermediate report, for 1990 SIP could announce considerable progress by having reached a density rate of 37%.[35] While the main bulk of investments are concerned with the provision of new network interconnection points, 20% of the financial means of the programme are intended to raise the quality of services and about 10% are directed towards the development of VANS[36]. In its *"Rapporto Semestrale Sulla Qualità del Servizio"*[37], SIP offers a detailed analysis of the progress made in raising quality standards. Waiting time for repairing defaults, for information services and connections have been considerably reduced. The digitalization of the network switches shall be accelerated from 20% in 1989 to 45% by 1992. In 1991 an ISDN pilot service is planned to start, which becomes available in the major eight cities of Italy.[38]
Moreover, the "piano Europa" shall stimulate the growth of mobile radio telecommunications and satisfy the rising demand for data services.[39]

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[31] Pye, R. and J. Lauder (1987), p. 100.

[32] Benzoni, Paolo (1990), p.5.

[33] Tarifica Anual (1991), p. 179.

[34] STET (1988), p.65.

[35] Tarifica Anual (1991), p.177.

[36] Brabant, de, F. (1989), p.46 and STET (1988), p.36, 64.

[37] SIP (1990).

[38] To attain these goals in 1989 SIP unveiled an even more ambitious investment plan which superseded by 50% the amounts previously foreseen in its "piano Europa". Tarifica Anual (1991), p.175.

[39] The transmission of data shall rise by 19%, mobile telephones by 43% and facsimile by 44% annually. Castagni, Nicoletta (1988), p.83.

This investment programme is financed mainly by additional revenues expected from tariff increases. From this SIP expects additional revenue of about $ 855 million annually. It reckons that with higher tariffs and increasing demand for telecom services about 75% of the investment can be self-financed while the other 25% will have to be borrowed or raised through issuing new shares.[40] In 1991 residential and business fixed monthly charges were increased, as well as local tariffs. While international calls saw a 20% cut, national long-distance was left untouched.[41] Moreover, STET has asked the government for more freedom to set its own tariffs in order to make up for the high investments. It proposes a price-cap approach similarly to the one applied in the UK.

9.3.The Regulatory Regime

As was pointed out in chapter 9.1., regulatory legislation in Italy has not been fundamentally altered since the 1930s. Thus, the legislative cornerstone of Italian telecommunications is the Postal Code of 1936. Despite all amendments, this Code is still based on the principle of monopoly provision. The current legislative framework issued in 1973 was built upon a the earlier Postal Code. It regulates telecoms on the basis of a distinction between telephone, telegraph and radio services. VANs, the transmission of data and private circuits are totally ignored.

Some changes, however, have been introduced recently. The *Decreto Ministeriale 06-04-90*[42] outlines future development of Italian telecoms. The decree defines some technical requirements of access to the public switched network and fosters the implementation of ISDN. Liberalization has been restricted to some VANS, which, moreover, have been defined narrowly. However, some competition has already been introduced *de facto*.

9.3.1. Infrastructure

9.3.1.1. Fixed Terrestrial Public Networks

The "*Decreto del Presidente della Repubblica 29-03-1973*", No 156 is the relevant Italian legislation at this writing. This decree states that the provision of telecommunications services is the exclusive right of the state (Article 1). According to Article 2 the public authority competent in this field is the Ministry for Post and Telecommunications. According to Article 3 and 4 the administration can provide telecommunications services either by itself or by means of licences (*concessioni*). If the concessionaire is a state controlled company

[40] FinTech, April 18, 1991.

[41] Il Sole - 24 Ore, January 17, 1991 and Communications Week International, February 4, 1991.

[42] Ministero delle Poste e delle Telecomunicazioni (1990).

then according to Article 198 the licence can be granted without a call for tenders.
The public switched terrestrial network is run jointly by the three concessionary companies ASST, SIP and Italcable. ASST is responsible for all international traffic to European and Mediterranean countries. It, moreover, provides most of the national long-distance traffic. SIP provides local service and some trunk traffic not provided by ASST. Italcable finally provides the rest of the international traffic. All three companies have received licences within the limits of the *Decreto del Presidente della Repubblica, 13-04-1984*, No 523.
The licences oblige all carriers to fulfil the aims defined by the government for the Italian telecommunications sector. For instance, according to Article 7 of the licence granted to SIP, the company has to exploit the services conceded in respect of the principles stated in the *Piano Regolatore Nazionale delle Telecomunicazioni* of 1990. Article 20 states that SIP has to submit a long and a medium term plan to the Ministry which entails the programme to ensure the growth and the integrity of the public network. The PTT and the Treasury annually examine the budget of the concessionaire (Article 48). The licence also contains obligations concerning the build up of local networks and quality standards.[43]
The licences of the three STET enterprises have a duration of 20 years, while individual licence terms are subject to periodic re-examinations. The next reexamination will be due in 1992.

9.3.1.2. Mobile Public Networks

The current legislation does not establish a regulatory difference between fixed and mobile voice services. Thus SIP also hold an exclusive right to establish mobile telecom networks.
SIP operates an Integrated Mobile Telephone and Paging Service (RTMI). A cellular RTMS system was launched in 1985 and presently it has about 100,000 subscribers. For 1992 more than 250,000 subscribers are envisaged.[44] SIP's GSM network is due to operate by the end of 1991. However, recently the Minister of the PTT declared that SIP monopoly in mobile telephony will be ended soon.[45] The Italian government has set up a commission to examine the case for a second mobile operator. So far there are two applicants for the second GSM licence (Racal Telecom/FIAT and Olivetti/Bell Atlantic).[46] SIP, however, claims that its monopoly on telephone services includes mobile telephony until the year 2004.

[43] According to Article 27 SIP commits itself to build up a local telephone network in any site where there are at least 25 physical or legal persons waiting for a connection.

[44] Protetti, Cesare (1989).

[45] Vergnano, Franco (1991),

[46] La Repubblica, May 18, 1990.

9.3.1.3. Satellite Public Networks

Telespazio has an exclusive licence to operate the earth and the spacial segment.
Telespazio is responsible for Italian satellite communications facilities. It does not offer services directly but provides channel capacity to the international carriers, Italcable, the state television and radio operator (RAI) and ASST. Telespazio represents the Italian government within Intelsat and Eutelsat.
Data and voice services via one way and two way satellite earth stations are transmitted only by SIP. Public institutions may obtain non-exclusive licences for internal purposes.

9.3.1.4. Private Networks

A network installed only for internal use on a private property does not need an authorization, provided that there is no connection to the public network.
The Ministry has overall authority for granting licences to install private networks. These licences are granted by the DCST. Presently there are no legal provisions for the connection of private circuits to the public networks. Private networks operating domestically have to request permission from SIP.
Licences for private networks of closed user groups are granted if the public network does not offer complete coverage. The licencee is prohibited from offering services to third parties. Licences were granted to public utilities like ENEL (power), ACEA (water) or large private corporations like FIAT. Other state owned administrations (railways, public transportation operators) can operate private networks under the authorization of the PTT Ministry.

9.3.1.5. The Use of Leased Lines

The ASST is responsible for the leasing of point-to-point circuits. Resale to third parties is prohibited. Neither the licences granted to network operators nor the global legislative framework deals with non-discriminatory requirements on equal network access of private service providers. Future legislation is expected which permits interconnection of leased lines to public networks provided that simple resale of capacity is not practised.

9.3.1.6. Analysis

Presently, in Italy there is a comprehensive network monopoly hold by state owned enterprises. Despite the measures of liberalization in other EC countries regarding satellites and mobile systems, in Italy actual no steps towards competition on the fringe have been undertaken. So far there is only a declaration of the Ministry that one private mobile operator shall be licensed. Thus, Italy is one of the most protected markets in Europe. The process of restructuring will even increase the power of the state owned network operator. The Italian network thereby will mainly move in the direction of the traditional TO system which existed in other EC member countries before measures of liberalization were undertaken. Thus even when *SuperSTET* is eventually realized, the Italian telecom structure will be backward compared with more advanced member countries.

9.3.2. Services

The *Decreto Ministeriale 06-04-1990* distinguishes the following services

a) bearer services
b) teleservices
c) supplementary services
d) application and/or VANS

According to Article 3 of the decree, services under a) to c) are part of the state monopoly and hence they are supposed to be offered either directly by the state administration or under exclusive right granted to the three public network operators. Nevertheless, some of the complementary services are actually provided under a competitive regime.

9.3.2.1. Reserved Services

The "*Piano Regolatore delle Telecomunicazioni*" states that voice services, both fixed and mobile, belong to the teleservices (Article 2), which according to Article 3 are reserved. Packet&switched data services are classified as bearer services and provided exclusively by SIP. Italy, France and Spain in 1988 jointly opposed a Commission's directive to allow the leasing of lines by private data transmission providers after 1993.[47]

9.3.2.2. Competitive Services

VANS are generally open to competition. There is no licensing or declaration procedure in Italy. Thus, administrative restrictions may be considered to be small.
Teletex and telefax are classified as teleservices, however regulation treats them as VANS (Article 2 of the degree of 06-04-1990). No licence is needed to provide these services.
Italcable offers a number of innovative telematic services and is mainly responsible for providing value-added services. In 1991, for instance, Cable & Wireless entered the Italian fax market by setting up "*Securefax*" in direct competition with SIP.

[47] Economist, October, 28, 1989, p. 87.

ITALY

INFRASTRUCTURE

	No Obligation	Declaration	Licence essential requirements	Licence further requirements	State Monopoly
Public Networks					
Terrestrial					
Fixed					X
Microwave					X
Mobile					X
Satellites					
Earth Segment					X
Spatial Segment					X
Private Installations					
Terrestrial				X	
Microwave					X
Satellites					X
Use of leased circuits					
Domestic					
Shared use/third party/					X
Interconnection					X
International					
Shared use/third party/					X
Interconnection					X

ITALY

SERVICES

	Declaration	Approval	Special Obligations	Licence essential requirements	Licence further requirements	State Monopoly
Fixed Voice Service						X
Mobile Voice Service						X
Telegraph; Telefax						X(1)
Services on leased circuits		X				
Packet & Circuit switched data services						X
Services on cable networks						X
Services via one-way Satellites		X				
Services via two-way Satellites						X
VANS(2)						

(1) Teletex and telefax are treated as VANS, thus their provision is free.

(2) Presently for VANS not even a declaration is required. However, when being provided on leased lines the approval of the network operator is necessary.

9.3.2.3. Analysis

The process of service liberalization has remained rudimentary. Although VANS should be liberalized, their private provision is handicapped by the absence of clear regulation. They have to be offered over SIP public network. A key problem is that the tariffs charged by SIP for data transmission are 20% to 30% above the European average. A further obstacle is the regulation for the use of leased lines. Regulatory control has not been withdrawn from the network providers, which still decide about access. This offers them the power to prohibit or restrict access of service competitors, which partly explains the low diffusion of value-added services in Italy.

Moreover, compared to Britain or Germany and even Spain, Italy has a very restrictive policy towards entry by private service providers. While the Commission argues that beside voice all services shall be liberalized, according to the present regulation in Italy most services remain under monopoly. The Decreto Ministeriale defines VANS very narrowly which appears to be in contradiction with the EC directive. However, *de facto* some competition has already been established, since several private (also foreign) enterprises have started to offer value-added services.[48] The Italian VANS market is expected to double by 1994.[49]

9.4. Tariff Policy

Graph 9.4. depicts the development of real prices for basic services in Italy since 1977. Until 1989 the price for national long-distance calls decreased more than for local ones. This may be taken as some cost orientation of prices. However, in 1990 long-distance prices were increased while nominal local ones were left untouched. While the price setting in the early 1980s appeared to bear some cost orientation, the recent price movement eliminates this effect. As will be argued in more detail in chapter 13., in a European context Italian national tariffs appear especially out of line with costs. Graph 12.5. shows that the Italian long-distance price was the highest but one in Europe by 1990. In contrast, the local call was comperatively cheap (graph 12.3.). After the price increase for national long-distance calls in 1990, in 1991 SIP announced an increase in local ones (leaving the former untouched). These prices are explained by the additional investments required by the "piano Europa"[50]. The (by European standards) high Italian telephone charges, however, weaken the argument that operators in high inflation countries are at a comparative disadvantage.[51] Despite an above average inflation rate during the last two decades, real Italian

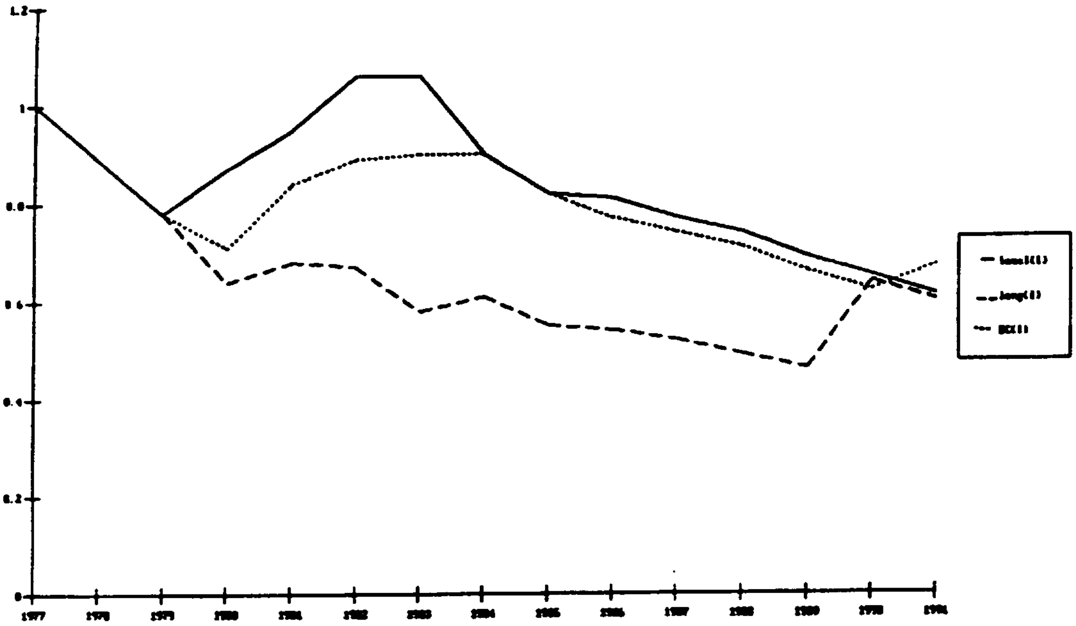
[48] Examples in: Il Sole - 24 Ore, June 27, 1991.

[49] FinTech, January 10, 1991.

[50] Il Sole-24 ore, Gennaio 17, 1991

[51] This argument, for instance, can be found in: SIP (1989).

real telephone prices have remained at the top in Europe. The price for international calls according to graph 9.4. followed closely the development of the local price. Given that costs for national long-distance and international calls do not differ much, thus over time price distortions grew especially in the international market. Graph 12.7. and 12.2. show that Italy is among the most expensive places in Europe to phone EC countries or the USA respectively. This result is not changed if the 20% rate cut for international calls in 1991 is taken into consideration.[52] The absence of the traditional cross-subsidisation scheme in Italy therefore has not protected the international telephone markets from price distortions. Quite to the contrary one finds in Italy the highest price distortions among EC countries.



Graph 9.4.: *Real prices for local, long-distance and EC calls in Italy 1977-1991 (1977 = 100)*[53]

9.5. An Alternative Reform Proposal

The Italian telecommunications sector entails certain features which make it particular in the European enviroment. The most obvious one is the fragmentation of the network which

[52] Il Sole-24 Ore, Gennaio 17, 1991.

[53] Based on data provived in the appendix.

is split among different companies. Price and cost comparisons (see chapter 2.1.3.) have indicated that the Italian operators are comparatively inefficient. Network fragmentation prevented the familiar cross-subsidisation. High profits made in the long-distance and international markets were not transfered to the main operator. SIP subsequently lacked the financial means to spur investment into the quality of the network and customer access. The apparent failure of SIP to raise customer access in line with other member countries may support the claim made earlier that in the interim period of network development some cross-subsidisation is necessary.

Interestingly enough, the smaller flow of cross subsidies and the separation of the long-distance and local network did not lead to more cost-based pricing. Quite to the contrary, the price development in Italy is more out of line with costs than in other EC countries.

When the law to pass over ASST to the IRI group was designed in 1988, the intention was to adapt the Italian telecommunications network to the dominating TO model in Europe. However, by doing so, it is unlikely that the main shortcomings of Italian telecommunications can be overcome. The *SuperSTET* reform only tries belatedly to copy a telecommunications regime which is already being relinquished by other EC member states. It grants a *de jure* monopoly to the STET and leads to the highest feasible concentration of market power. There are no incentives to reduce costs, to react quickly to demand shifts and to enter the market of news technologies. While other member countries slowly move away from an outdated network structure, the SuperSTET reform introduces it in Italy.

It is interesting to note that the Italian network structure resembles the one in the USA in that the long-distance carrier ASST is separated from the local network. Moreover, like AT&T, STET combines both, service provision and manufacturing. What had to be done by a tedious and expensive breakup in the US has existed in Italy from the beginning. The long-distance network is run by a separate operator which gained experience on its own. However, since all public networks are controlled by the state, in Italy this separation has not led to network competition. On the other hand, economies of scope could not be reaped either. The existence of economies of scope between different networks, however, has been the major rationale for network integration in Europe. Thus, one may argue that the Italian telecommunications network combined the disadvantages of the US approach (network fragmentation) with the European ones (public monopoly). Network fragmentation prevented the familiar cross-subsidisation which fosters universal service. High profits made in the long-distance sector were not transferred to the main operator to subsidise customer access. SIP subsequently lacked the financial means to spur investment into the quality of the network and customer access. Network fragmentation and public provision ensured that the Italian telecommunications system operates at high cost even when compared with European TOs.

While having been a considerable disadvantage in the past, the fragmented network structure offers a unique opportunity for reform. Without considerable transaction cost of restructuring, in Italy one could introduce competition between long-distance carriers. This, however, would require ASST becoming an independent firm which is not foreseen by the present SuperSTET reform. While ASST at the beginning would become the (regulated) dominant long-distance operator, other entrants could be licensed. By separating Italcable from STET and allowing ASST and Italcable to operate in both the national and the international long-distance market, competition would quickly set off. Further operators then could be licensed in the future. Beside private networks, railways and cable networks can be expected to enter the rapidly growing market. The latter have already installed their own networks which reduces entry barriers caused by sunk cost (as, for instance, the need to acquire the right of way). Additional competition can be expected from liberalised mobile networks which can operate throughout the country and across the border. As the experience of AT&T has shown, growth in the long-distance market is strong enough to cater for additional suppliers. AT&T lost relative market share but in spite of the entry of additional operators it increased total output. Given the high price elasticity of demand in the long-distance market, price cuts will create a sharp increase in volume demanded.

However, universal service could also be fostered by this approach. This could be ensured by leaving SIP's local monopoly untouched at the beginning. A privatisation of ASST would produce considerable revenues for the state. While SIP was previously deprived of the cross-subsidisation revenues, the revenues coming from ASST's sale could be used to foster the spread of the network. Thus, on both ends the modernisation of the Italian telecommunications network could be spurred by applying the US model of long-distance competition and local monopoly. Due to the already fragmented network, in Italy the conflict of goals between universal service and network competition does not exist. This is a major advantage in comparison with other EC member states.

While being a big step forward, the approach outlined above is unlikely to turn the whole industry upside down. Since SIP presently controls 80% of the network, at the beginning only a small segment of the Italian telecommunications market would be liberalised. Further measures of liberalisation could be taken thereafter. This, for instance, could lead to SIP entering the long-distance market as well. However, that would require that the local operator would lose its bottleneck position for the access to the local loop.

While liberalising only a relatively small part of the telecommunications network, efficiency gains can be expected to be large, since by doing so the main distortions could be eliminated.

Compared to the approach chosen in the UK, the Italian approach would have the considerable advantage of separating the competitive parts of the network from the ones which supposedly still have some natural monopoly characteristics. In the UK strong regulatory supervision has to be applied to ensure that the dominant firm BT does not abuse its monopoly position in the local network to cross-subsidise those markets where competition from Mercury arises (see in detail chapter 11). Moreover, the local networks are bottlenecks; Mercury depends on access to its competitor's network to complete its customer calls. BT repeatedly has tried to impose high access charges on Mercury, thereby raising the competitor's cost and its own revenues at the same time. The most serious regulatory problems which arose in the UK would not come up in Italy due to the separation of local and long-distance operators. Compared to the UK, therefore, the Italian long-distance market could become more competitive.

10. Spain: Universal Service and the Provision of VANS

10.1. Historical Development

1877 the first telephone line was installed in Spain. Thereafter, for 47 years private enterprises and municipalities ran different local networks. In 1924 ITT got the licence to set up the "*Compañia Telefónica Nacional de España*" (CTNE).[1] Thus about 65 years before the privatisation of British Telecom, in Spain Telefónica was established as a private enterprise. It obtained a concession valid for 20 years to provide basic telephone services throughout the country. This status has remained unaltered, for practical purposes, until today.

However, in 1945 the shares of ITT were nationalized. When the company was reprivatized thereafter the state hold less than 50% of all shares. However, by widely spreading the shares, it secured its own dominant position among Telefónica's shareholders. By then, the state also had to decide about a prolongation of Telefónica's concession, which was approved in 1946. The "*decreto de 31 de octubre de 1946*" conferred monopoly status on CTNE, with all rights and the autonomy to develop and administer a telephone service[2].

Over time the range of exclusive rights granted to Telefónica increased steadily. Initially Telefónica provided only voice services. By a State Decree of December 21, 1970 Telefónica obtained the concession to provide coasts and ports radiotelephone, public data and other services. By the Decree of October 26, 1978 were added teleinformatic, facsimile, videotex, and teletex services. Thus, over time Telefónica was not only able to maintain its monopoly position but succeeded in extending it towards related markets and newly emerging services. Until today, despite its private status, Telefónica has operated within the same monopoly framework as did other European TOs.

Private ownership mixed with state intervention did not help develop the Spanish telecommunications network during the decades of autarchy. In the period 1945-1960 Telefónica had installed roughly 1,2 million lines, less than it installed in just one year in 1989.[3] By the end of the Franco dictatorship the Spanish was among the least developed telecommunications networks in Europe. Since then Telefónica has attempted to radically improve the coverage and quality of the infrastructure. As a private company, Telefónica is to some extent able to coordinate its business strategy independently from the government. However, the budget is subject to governmental approval. The same applies for tariff increases.

For about 60 years the regulatory regime has not been altered significantly in Spain. However, during the 1980s the government's policy towards the telecommunications sector has become more active. First it removed most of the regulatory powers from Telefónica.

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[1] Plaza, Crisanto (1989), p.390-392.

[2] see: Fregoso, R.L. (1988), p.88.

[3] Compare data provided by Plaza, C. (1989), p.390 and Sharma, P. (1991), p.35.

Until 1985 Telefónica was assigned the responsibility to plan and develop telephone services. By the decree 1209 of June 19, 1985, the responsibility passed over to the *Dirección General de Telecomunicaciones* (DGT), which depends directly on the Ministry for Transport, Tourism and Communications. This rearrangement gave the DGT the power to deal with general telecommunications regulation and legislation, licences and authorizations for private provision of telecommunications services. The same decree established the *Junta Nacional de Telecomunicaciones* (JNT) which is responsible for sketching the telecommunications policy, introducing new technologies, norms and regulations. Telecommunications services are separated from postal services, telegram and telex. The latter being provided by the *Dirección General de Correos y Telégrafos* (DGCT) which is a government department.

In a second step the government liberalized the service sector to some extent. 1987 the *Ley de Ordenación de las Telecomunicaciones* (LOT) consolidated the previous decree. However, it distinguished between three different categories of telecommunications services, taking measures to liberalize VANS. The LOT is the present regulatory framework for the Spanish telecommunications market.

Recently, the government has increasingly used its influence on Telefónica to employ the enterprise for the governments aim to develop the Spanish industry. Despite the private status of Telefónica, the government has kept *de facto* control over the company. The DGT appoints the Government Delegate to Telefónica who ensures compliance with the provisions of the licence. Moreover, the government presently owns 32 per cent of CTNE's equity[4], while the rest of the shares are widely dispersed. 56 per cent of the private shareholders own less than 200 shares[5].

In December 1991 Telefónica received a new 30 years licence. Under the new agreement the Spanish TO loses its monopoly in mobile telecommunications in 1994.

10.2. Spanish Telecommunications Policy in the 1980s

During the 1980s the government recognised telecommunications as a crucial sector for the development of the Spanish economy. Consequently, Telefónica was incorporated into the governmental economic programme, which intends to push the country into the league of the highly industrialized countries. According to the "*Plan Electrónico e Informático Nacional*" (PEIN), which was approved in January 18, 1984 the information and telecommunication sector is the key sector for national development. To improve the sector's performance the Plan therefore proposed[6]:

1) to increase demand for electronic and informatic products

[4] through the Central Bank of Spain and the public sector holding INI. See: Sharma, Paul (1991), p.35.

[5] see: Financial Times, 14.01.1985.

[6] see: Fregoso, R.L. (1988), p. 87.

2) to increase national production of these products in order to reduce dependance on imports
3) to increase exports dramatically
4) to generate technological development within Spain.

These aims were based on the idea that the Spanish telecom industry faces four structural problems which make state intervention necessary:

1) The high dependence on imports of high technology products

For many high-tech products there are no national suppliers. Foreign firms therefore hold a market share of up to 100%. This is regarded as a major weakness of the Spanish industry for two reasons. First, these markets have the highest growth potentials. Thus they could contribute significantly to the industrialization of the country. Second, Spanish industry depends heavily on high-tech inputs. This is seen as a handicap since the need for specific technological characteristics significates that imported products often do not offer optimal solutions.[7]

2) The public good aspect of the telephone network

In the mid 1970s, Spain and France had approximately the same levels of telephone penetration. While France increased its telephone density from 11.8% in 1974 to 44.6% in 1987, in Spain the access rate grew only to 24%.[8] Moreover, the density rate differs considerably from region to region. In Madrid 36.8 main stations are installed per 100 inhabitants while the corresponding figure is only 18.5 in Suroeste. In comparison, in Germany the highest value is obtained in West Berlin (62.3), while the lowest appear in Rheinland Pfalz (41.7), which still exceeds the value realized in Madrid (all for 1987).[9] Although Spain is the fourth biggest telecommunications market in the EC, it nevertheless has still one of the lowest telephone penetration rates.

The low density of the Spanish telecommunications network can be explained partly by geographical reasons. Spain's population is concentrated on a few key cities and it has large areas which are sparsely populated. The low density of inhabitants in the peripherial regions increases the subscriber loop substantially. Achieving universal service is therefore more expensive in Spain than in other EC member countries. However, given the low density rate, externalities of access still can be expected for the Spanish public switched network.

Rural areas typically face a less advanced infrastructure, lower penetration, longer waiting lists and accelerating demand. Satisfied and unsatisfied demand for lines is more residentially oriented. Telephone traffic is more local and less international which has

[7] see: Buesa, M (1989), pp.82-101.

[8] Sharma, Paul (1991), p.35.

[9] Data from SIP (1988).

consequences for profitability.[10] The high costs of installation in rural areas, the uncertainty of demand and the length of user take-up periods may lead to a considerable net cash outflow in the initial years of investment. This is likely to make some public assistance necessary.[11] Thus, while in more advanced member countries of the EC the achievement of universal service has moved attention towards the advantages of competition, in Spain the case of monopoly provision may be still justified by the low access rate.

3) The low rate of diffusion of telecommunications services

Spain is among those countries which have the lowest levels of diffusion of telecommunications services in the EC. For instance, in 1987 Spain had only 500 installed teletex subscriber lines, compared to 16000 in West Germany. The number of mobile telephone subscribers in Spain amounted to only 7.5%, and for videotex subscriber lines 6.6%, of the respective number in West Germany. In all cases the latter only holds a middle position, thus the difference to the more advanced countries in the EC (UK, France), is even higher.[12] The higher proportion of small enterprises having less need for advanced telecom services has kept demand at a low level. Since economies of scale are important for the provision of VANS, the low level of actual demand prevents the take-off of an advanced service industry in Spain.

On the other hand, the availability of advanced telecommunications services is regarded as essential to foster economic development and to attract foreign investment. They are seen as a means for reducing regional differences within Spain and regarding the core of the Community.[13]

4) Network integration on the European level

The policy of network integration promoted by the Commission itself put the Spanish telecom industry under additional competitive pressure. Standardization of technology and the approval procedure makes it easier for competitors to enter the Spanish market.[14] Thus it is feared that the national champions of the Core countries of the EC will easily outdo Spanish suppliers, given that the former could realize economies of scale in their home markets.

Thus the government reckoned that due to the small domestic market and increasing external competition, Spanish firms would not be able to increase their market share. In order to reduce the high dependence on imports therefore governmental support was

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[10] Pye, R. and G. Launder (1987), p. 100.

[11] Compare: Hansen, S., Cleeveley D., Wadsworth S., Bailey H. and O. Bakewell (1990), p. 208.

[12] Calculations based on data provided by: Siemens (1988), p.34/35.

[13] In more detail: Tirado, Carlos, Granger, José R., and María Nieto (1990),

[14] El País, Septembre 16, 1990, Negocios, p.11.

envisaged. To support peripherial regions a "*Plan de Extensión del Servicio Telefónico en el Medio Rural*" was set up to provide telephony service to all villages with a population of more than 50 inhabitants.[15] In cooperation with the STAR programme of the Commission, "telecommunications centers" are installed in peripherial regions which offer advanced services to small enterprises. Thereby the demand for services like videotext or E-mail which according to Telefónica so far have not reached the "critical mass" shall be spurred.[16]
The need to spread and modernize the telephone network has led to an accelerated investment programme of Telefónica: For the period 1981-84 investment grew at an annual rate of 14 per cent which increased further in the second half of this decade[17]. Presently Telefónica has embarked on a new investment programme to expand the network. In 1989, it invested Ptas 582 billion on the network and installed 1.4 million new lines, 51% more than in the previous year. Under its present four year programme it intends to install 4 million additional lines, increasing the share of connected households to 44% by 1994.[18] Overall infrastructural spending rose from Ptas 189 million in 1985 to Ptas 721 million in 1990.[19] Quality is improving too. 87% of all lines installed in 1989 were digital.[20] By 1992 the digitalization of trunk lines is planned to stand at 75%.[21] Since 1987 extensive testing for ISDN has been carried out. For 1991 it was planned to upgrade exchanges in accordance with CCITT and CEPT recommendations.

Nevertheless, Telefónica has failed to cope with soaring demand for access to the network. At the beginning of 1990 the waiting list for a telephone line stood at over 400,000. The waiting time for customer access had increased to about 8 months.[22] The demand for access in Spain depends considerably on the business cycle. While it dropped significantly during the economic crisis 1977-1982, it took off after 1985.[23] The increase in demand for new lines rose from 1.3% in 1984 to 19.5% in 1988.[24]

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15 This still will leave about 23,000 villages without connection to the network. Castilla, Adolfo, Gaitán, Ricardo and Oscar Battistón (1990), p.13.

16 El País, Junio 26, 1991.

17 Financial Times, January 14,1985 and October 19,1987.

18 Sharma, P. (1991), p.35.

19 Communications Week International, March 4, 1991.

20 In more detail: El País, Octobre 7, 1990, Negocios, p.15 and Economist, May 12, 1990, p.74.

21 Logica (1991), p.258.

22 Logica (1991), p.258 and: Funkschau, 17/1989.

23 In more detail: Plaza, C. (1989), p. 400, 407.

24 Castilla, A., Gaitán R. and Oscar Battistón (1990), p.21.

Though impressive as such, Spain so far has not been able to reduce its discrepancy compared with the more advanced countries of the EC. Though the latter have already reached a point of saturation as far as access to the network is concerned, countries like West Germany and France have had even higher growth rates of total investment in telecommunications than Spain (for the second half of the 80s) [25]. Thereby Telefónica is under double pressure. On the one hand, it has to satisfy universal service goals. On the other hand, it is forced to upgrade the network, which can be used for VANS only after digitalization of switches and the installation of fibre optic cables has been achieved.[26]

Despite its private status Telefónica has been employed by the state for national development programmes as much as other state owned network operators in the EC. However, its private status may have given Telefónica two important advantages. One is concerned with financing. In order to raise funds to go ahead with its investment programme, Telefónica successfully floated shares on the international capital market. This source of revenues does not exist for state owned enterprises. Especially in less advanced countries, however, shortage of capital of the state is a major impediment for investment.

This advantage may be matched by the disadvantage that a private firm may have less influence on the government's decision making. As in other EC member countries, tariff setting is carried out by the Ministry. Therefore one may argue that the private status reduces the power which can be exerted to raise prices. According to this argument, compared to publicly owned companies, a private firm over time would be less able to raise revenues. This holds especially in inflation prone countries where telecom prices fail to follow the overall price trend. However, in the Spanish case apparently Telefónica succeeded in pushing prices up. As will be discussed below in more detail, in Spain telecom tariffs are well above the European average. After some political struggling, in 1990 Telefónica prevailed with a tariff scheme which raises telecom prices on an inflation **plus** 2 percent package. Given that in Britain BT presently operates under a RPI - 6.25% scheme, this rather appears a favourable deal for Telefónica. Moreover, as will be seen in chapter 6.6. Telefónica succeeded in convincing the Ministry to take a major step towards cost based pricing in 1991. Beside the UK, there has not been a similar drastic price change throughout the EC.

Thus one may conclude that overall the private status has offered Telefónica an additional source of income necessary to maintain a high level of investment. On the other hand it has not reduced the company's influence on tariff setting.

The second advantage is related to the greater scope for decision making. As a private company, Telefónica to some extent is able to coordinate its business strategy independently from the government. In that respect its international engagement distinguishes Telefónica from other mostly domestic oriented European network operators. For instance, in 1990 Telefónica got a 43.7% stake in *Compañía de Teléfonos de Chile*

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[25] Calculation based on data provided by Siemens, (1988), p.36.

[26] Plaza, C (1989), p. 407.

(CTC), which owns 94% of Chile's telephone lines.[27] It has got further stakes in south and north American companies. Having a relativly small domestic market, Telefónica reckons that international investments are indispensable to remain competitive.
Suming up, in Spain a bias has been given to a **supply-led strategy**. As a result the present legislation does not challenge the monopoly position of Telefónica. CTNE instead remains the exclusive network operator in Spain. Moreover, as will be seen in more detail, Telefónica's exclusive rights still comprise many services which according to the Commission should be liberalized. There is not a clear distinction between the provision of the network, the services and the supply of equipment. Telefónica and the "*Instituto Nacional de Industria*" (INI) have founded a joint enterprise (Amper) last year, which produces electronic goods (including products for the military sector) [28].
This supply oriented approach may have become a constraint on development. Since it left the provision of almost all services to the control of Telefónica, it has prevented the set up of further operators and service providers. Given Telefónica's inability to match soaring demand, the protection of Telefónica's exclusive rights has handicapped the development of VANS in Spain.

10.3. The New Regulatory Regime

The *Ley de Ordenacion de las Telecomunicaciones* (LOT) lays down the basic legal principles for telecommunications in Spain. As will be seen, much has been regulated only in a general manner, to allow for future secondary legislation.
The LOT generally distinguishes three kind of services:

1) bearer services
2) end - to - end services
3) value added network services

Bearer services are defined as services which use switched telecommunications networks to link termination points for the transmission of data. They include services on non-switched networks which entail switched lines (Article 14(1)). From this definition it can be seen that "bearer services" are almost identical with the public network.

End-to-end services are services which supply complete communication capacity between users, including terminal equipment and which require switched elements. End to end services comprise voice telephony, mobile telephony, telegram, telex, teletex, telefax, videotex, videophone.[29]

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[27] Economist, May 12, 1990, p.74.

[28] El País, Decembre 30,1988 and April 10,1989.

[29] in detail: Carreton, Rubio (1990).

Value added services finally are defined in the LOT as services that use as support the bearer and end to end services. They must offer some characteristics which distinguish them from the support service.

Principally two different licences are granted for the provision of non exclusive services. An *administrative authorization* is granted if the service provider uses the public switched network.

The more severe *administrative concession* is required if the provision requires the installation of separate networks. This applies for mobile and satellite services but also for services provided on leased lines. A concession will not be granted if the public network can provide the necessary infrastructure.

Regulation of telecommunications is carried out by the *Administración del Estado*, acting on proposals of the Ministry. Thereby a separation of regulatory functions and operational activities appears to be accomplished. However, despite the separation, impartiality may not be ensured. This depends mainly on the role of the Government agent in Telefónica. He or she has a power of veto which is exercised if the public interest is at stake. Thereby a confusion of the "public interest" and the interest of the State as the major shareholder is probable.

The new 30-year agreement signed between the TO and the government on December 26, 1991 replaces the earlier one dating from 1946. Under the new regime Telefónica will maintain its monopoly on local, long-distance and international telefone traffic. A progressive reduction of this monopoly, however, is foreseen. Telefónica is obliged to invest annually 500 billion pesetas (about 3.5 billion ECUs) over the next 5 years.

According to the new contract, the government increases the number of its own Telefónica board members from three to five, while retaining one government's member the right for veto for matters of "public interest".[30]

10.3.1. Infrastructure

10.3.1.1. Fixed Terrestrial Public Networks

Article 1(1) LOT states that any communication via cable or radio frequencies is the exclusive right of the state. The LOT treats network infrastructure as one of bearer services. According to Article 14(5) of the LOT, bearer services shall be offered under a monopoly regime. The Spanish telecommunications administration keeps the monopoly rights. According to the exclusive licence granted to Telefónica, the latter carries out these rights of the state. Article 13(2) LOT rules that Telefónica has to offer bearer services to operators providing VANS.

[30] Fin Tech, November 14, 1991.

10.3.1.2. Mobile Public Networks

Presently Telefónica has the exclusive right to operate mobile networks. It is discussed whether for the GSM system a second licence shall be granted to a private operator. Under the new licence agreement, Telefónica loses its mobile monopoly in 1994.

Although the first mobile system in Spain was installed as early as 1982, mobile communications took off very slowly. By 1990 it had a penetration of just under 1 per cent of the population.[31] Currently there are two separate cellular telephone networks in operation. When opening the GSM digital cellular network at the end of 1991, there will be three systems, all operated by Telefónica.[32] However, car phones are picking up quickly. From 1986 to 1990 more than 40,000 car phones were installed. This number is expected to raise up to 120,000 by the end of 1991. This was spurred by the liberalization of terminals in 1986 which subsequently reduced prices by more than a half.[33] Prices for mobile telephony are still high in Spain. In mid 1991 a car phone plus installation fees costed about Ptas 175,000 (= $ 1,620), which compares with £ 50 (=$ 84,75) in the UK.[34] The monthly rental charge amounts to Ptas 6000 (=$ 55) compared to £ 25 (=$ 42) in GB.

10.3.1.3. Satellite Public Networks

Only one-way earth stations are open to competition.
Article 8 of the LOT provides that the use of communications satellites is reserved to the state. Telefónica therefore controls both the space segment as a signatory to Intelsat and Eutelsat and also earth segment for two-way earth stations.

10.3.1.4. Private Networks

Licences may be granted to establish private networks of closed user groups. However, Article 23(1) provides that no separate networks may be used if there exist bearer or final services which can substitute the separate network. According to Article 23(2) a concession which has already been granted to set up such installations can be withdrawn if equivalent bearer or final services are provided.

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31 Sharma, P. (1991). p.40.

32 Ivorra, Felix (1991), p.10.

33 El País, Julio 7, 1991.

34 At 1991 exchange rate. El País, Julio 7, 1991 and: Wirtschaftswoche, Juni 21, 1991.

10.3.1.5. Use of Leased Circuits

Service providers using leased lines have to have an administrative concession (Article 22). Thus they are treated equally as independent networks. Simple resale of bearer or end to end services is not allowed.
A further restriction is put on foreign capital if services are provided for third parties. According to Article 15(2) service providers using their own installation must have the Spanish nationality. In case of an undertaking, foreign share holding shall not exceed 25 % of the capital.[35] This restriction does not apply for service providers using bearer services of the Spanish TO.

10.3.2. Services

10.3.2.1. Reserved Services

Article 13(1) of the LOT gives a general definition of reserved services, then providing a list of those services covered *initially* thereby. Among these are all voice telephony, mobile telephony, telegram, telex, teletex, telefax, videotex.
Given the regulation of the LOT, further services may be later declared as reserved.

10.3.2.2. Competitive Services

Article 20(2) LOT provides that value added services shall be offered under competition. VANS are defined as "*telecommunications services which (...) use the support of bearer or final telecommunications services, and add other facilities to them (...)*". However, Article 24(4) provides that competition may be excluded if

a) there is no private initiative to provide the service
b) the optimal size of the undertaking makes competition impossible
c) it is in the public or social interest to extend the service.

VANS providers using switched networks must obtain an administrative authorization according to Article 21 LOT. Those using leased lines instead need an administrative concession (Article 22).
If Telefónica provides competitive services, Article 21(5) LOT provides for separate accounting for monopoly services and value added network services. Thereby the state regulator has broad discretionary power to restrict competition.
According to Telefónica's new licence, leased lines will be liberalised in 1996. Data transmission services are liberalised from January 1993.

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[35] This regulation probably infringes Article 7, 52-53, 59-66 of the Treaty of Rome.

SPAIN

INFRASTRUCTURE

	No Obligation	Declaration	Licence(1) essential requirements	further requirements	State Monopoly
Public Networks					
Terrestrial					
Fixed					X
Microwave					X
Mobile					X
Satellites					
Earth Segment				X	
Spatial Segment					X
Private Installations					
Terrestrial				X	
Microwave				X	
Satellites				X	
Use of leased circuits					
Domestic					
Shared use/third party/				X	
Interconnection				X	
International					
Shared use/third party/				X	
Interconnection				X	

(1) Here "essential requirements" are assumed to apply for the "administrative authorization", while "further requirements" apply for the "administrative concession".

SPAIN

SERVICES

	Declaration	Approval	Special Obligations	Licence[1] essential requirements	Licence[1] further requirements	State Monopoly
Fixed Voice Service						X
Mobile Voice Service						X
Telegraph; Telefax						X[2]
Services on leased circuits					X	
Packet & Circuit switched data services						X
Services on cable networks						X
Services via one-way Satellites		X				
Services via two-way Satellites					X	
VANS				X[3]	X[3]	

(1) Here "essential requirements" are assumed to apply for the "administrative authorization", while "further requirements" apply for the "administrative concession".
(2) provided by the DGCT.
(3) depending on whether separate installations have to be installed or not.

Analysis

The LOT has granted wide discretionary power to the state. While most services are kept under monopoly, competition for the remaing ones can be stopped whenever it seems suitable.

Despite private ownership Telefónica therefore turns out to be among the most sheltered TOs in Europe. Although the LOT was adopted half a year after the publication of the Green Paper, it does not take account of the Commission's policy towards service liberalization. In contrast to, the Green Paper, LOT defines reserved services broadly and competitive services narrowly.

Many services still under monopoly regime in Spain are supposed to be liberalised by the service directive. Given that Article 5(2) of the Treaty of Rome provides that Member States refrain from all measures which undermine the competition rules, it is likely that the LOT will be challenged by EC law in the future. Further pressure is likely to rise also in the market for mobile telephony and satellites.

The Commission of the EC has recently informed the Spanish government that some parts of the LOT may be in contradicton to Community law. This applies, for instance, to the limitation of foreign ownership in telecommunications enterprises to 25%. The Commission also rejects that services as telex and videotex are considered as reserved services.[36]

10.4. Tariff Policy

Until 1990 the government exerted strong pressure to keep prices for local calls down. Since the price for local calls is included in the RPI index it thereby tried to keep control over inflation. As a result, Spain was one of the countries where prices diverged most from costs. Being obliged to keep local prices down, Telefónica increased tariffs for long distance services. Spain was the most expensive country in Europe to call the USA, Telefónica charging twice as much as DBP Telekom and four times as much as BT.[37] In March 1990 the government decided to include all services in the RPI, not just local ones. Telefónica only has an overall price cap, thus being free to raise local prices within limits. This procedure resembles regulation for British Telecom. As a result, more cost oriented prices have been introduced. On April 15, 1991 charges for calls to the USA fell by 21.3% and intra EC calls by 2.6%. National calls were reduced as well. On the other hand, three minute local calls cost three times as much as before, while line installation fees were increased by 19%.[38]

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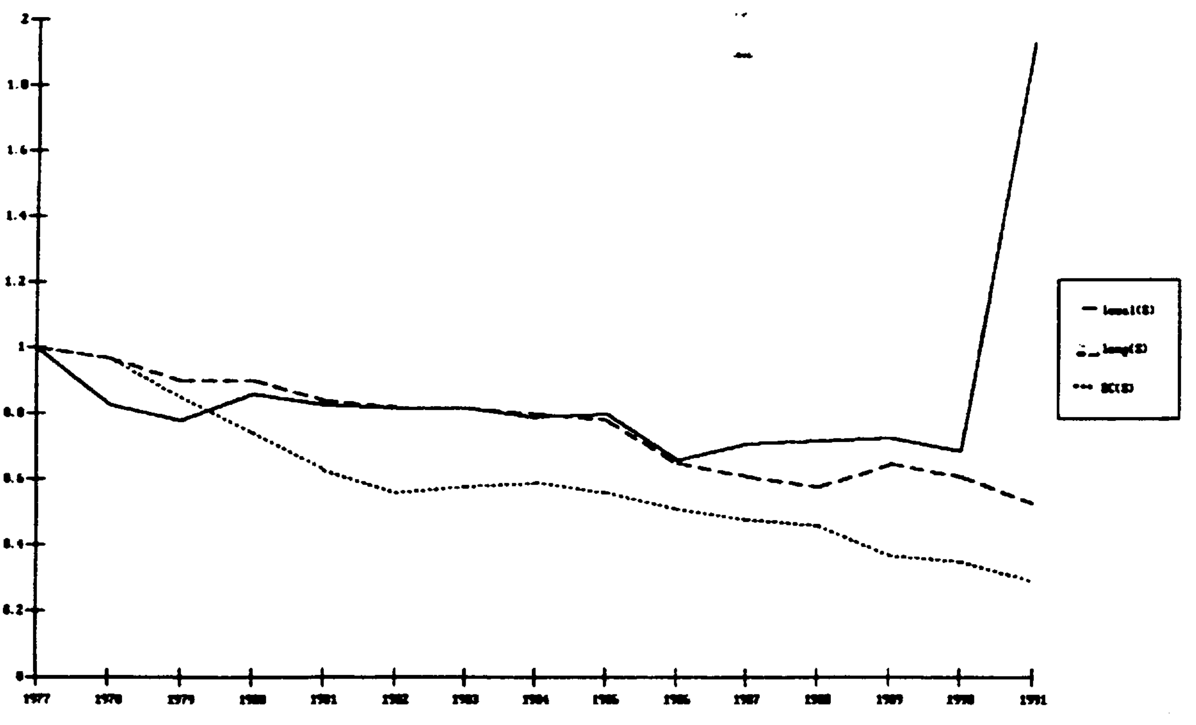
[36] El País, Marzo 9, 1992.

[37] FinTech, April 18, 1991.

[38] El País, April 30, 1991, and: Communications Week International, April 29, 1991 and: FinTech, March 22, 1990.

Graph 10.1 depicts the development of real prices for basic services in Spain. It can be seen that overall the development can be described as cost oriented. Local prices fell less than prices for national long distance ones. The strongest price decrease was seen for international calls to EC countries. However, nominal prices for national services were increased considerably by 1989, while the one for calls to EC countries were not reduced. This has been justified by the increased investment programme of Telefónica. The most outstanding price change occured in 1991 when tariffs for local calls increased by more than 200%.

International calls are still comparatively expensive in Spain compared to other EC countries. This can be seen from Graph 12.7.) and 12.8.) in chapter 12.) On the other hand, even after the strong price increase in 1991, a Spanish local call remains cheaper than a German one.[39]



Graph 10.1.: *real prices for basic telephone services in Spain 1977-1991 (1977 = 100)*

10.5. An Evaluation of the Spanish Telecommunications Regulation

Summing up, the Spanish telecom industry can be characterized by as much state intervention as other EC member countries. This holds though legally *Telefónica* is a private firm. The intended separation of operational and regulatory functions has not yet been achieved in practise. The government continues to exert strong influence over the company. Besides being the major shareholder it sends a government delegate at the board

[39] The Spanish 3 minute call costed ECU 0.09, the German ECU 0.11 in 1991.

of directors. In addition to the normal rights connected to this position, the delegate, moreover, has a veto power for many policy issues, particularly those related to finance and tariffs. Finally, the government can, at any time, renegotiate the concessionary agreements and add further legal obligations on Telefónica. Its private status by and large has not sheltered Telefónica from state intervention. This comprises investment programmes, but also tariff policy. In fact distortions in the Spanish price policy have been worse than for other EC countries, having state owned TOs.

Private ownership by itself does not give an incentive to the government to liberalise the sector. Compared to publicly owned TOs in other member countries Telefónica has been more successful in sheltering its market against entry.

The telecom sector is under pressure from two sides: On the one hand, a special effort is needed in order to raise the number of households connected with the network (universal service). On the other hand, if Spain wants to close the gap as far as the provision of VANs is concerned, it has to liberalise the sector. The highly innovative and risky nature of these services make them a "natural" candidate for private industry. Both aims, however, are difficult to combine: the technical problems of separating clearly basic and advanced services imply that a liberalised VANs market will erode revenues of *Telefónica* as long as there is cross-subsidisation among basic services. The latter, however, might be regarded as necessary to foster the goal of universal service. However, the main problem remains the shortage of capital, necessary to proceed with investments. The interconnection of rural areas present particular problems for the TO; it generates a high cost of installation and a slow take-up of services. Thus over the initial years of investment the TO suffers from negative cash flows.

While in the past Telefónica even lacked the capital to finance all necessary investments in rural areas, it presently is moreover expected to expand the provision of VANS and mobile telephony. This is likely to enhance the TO's shortage of capital. The development of these new services has common features with investment in rural areas. Given that demand is likely to increase only slowly, they require considerable investment at the beginning while revenue streams are difficult to predict.

Telefónica is therefore put under pressure from two sides. It is for this reason that the extension of monopoly rights to new services does not appear sensible, especially in a country still lacking universal service. The lack of capital will hinder the rapid development of Spanish telecommunications. While financial assistance from the state will not be available at a sufficient level, rising prices and cross-subsidisation appear inevitable. This, however, will handicap the whole society by increasing costs of communications. For this reason, private investment into the provision of VANS and the set up of local networks in rural areas, would spur telecommunications development. Thus, competition for local networks would probably stimulate the access to the network thereby increasing the demand also for Telefónica's services. New competitors which raise additional capital and increase overall investments therefore would help to alleviate the main obstacle to telecommunications development in Spain. By doing so, it would release Telefónica's financial means needed to reduce congestion and to increase the quality of the existing network.

11. Privatisation and Competition: The UK-Approach

11.1. The Road towards Privatisation

The policy adopted by the British government towards telecommunications has departed from approaches undertaken in continental Europe. Presently, the structure of the British telecom industry in many aspects resembles more the US market than the German or the French. Nevertheless the starting point in the UK has been very much the same as on the continent. Up to the 1970s the industry sector was controlled by the British post office which was reorganized in 1969. While before this reorganization the PTT was part of the public administration, it became a public enterprise thereafter. The employees lost their status as civil servants. In 1974 the Department of Industry took on the supervision of the PTT from the Ministry of Posts and Telecommunications, which was dissolved[1].

In 1981 the British Telecommunications Act split the Post Office in two distinct enterprises. **British Telecom** (BT) was established as a public corporation which became responsible for telecommunications services.[2] It was separated from the postal services which were left to the Post Office. The Act retained BT's exclusive privilege to provide services[3]. Regulatory power was transferred to the Department of Industry. The latter became responsible for:

1) The separation of the Post Office and the telecom sector.
2) The licensing of new network operators.
3) The licensing of private enterprises supplying VANS on leased lines.

While before, the monopoly for terminal-equipment was handled more strictly than for instance in West Germany, the 1981 Act introduced more competition for manufacturing.

In the 1980s the structure of British telecoms was changed fundamentally. Different options were discussed for further liberalisation. In order to introduce competition for telecom services the government had basically two alternatives. One was to allow the sharing and resale of leased lines by private firms. This would have led to service-based competition, comparable to later developments in the rest of the EC. The second proposal was entry by another carrier. The latter either would be allowed to specialize on certain routes or to build a second network. Parallel to the question of competition the government also scrutinized the possibility of privatising BT.

Two reports were asked for by the government in order to analyse these issues. The **Beesley report** (1981) considered the question of unrestricted resale of BT's capacity. The report concluded that all restrictions to offer services to third parties should be abolished, and that BT should be authorized to set prices for leased circuits. According to the report, given

[1] See in more detail: Heuermann, A. and K.H. Neumann (1985), p.43-46.

[2] Müller, Jürgen (1987), p.250.

[3] Vickers, J. and G. Yarrow (1985), p.35.

regulatory safeguards, BT also should have been able to enter competition in the non-voice market. However, the Beesley report went further and favoured entry of other network operators[4]. The government mainly followed the proposals of the Beesley report. In February 1982, the Mercury Consortium received a 25 year licence to operate a private digital network for voice and data.[5] Three companies set up a consortium. Cable & Wireless owned 40%, British Petroleum 40% and Barclays Bank 20% of the shares. In 1984 Cable & Wireless acquired the shares of the two other companies and became the sole owner of Mercury. Generally this was regarded as a strengthening of Mercury, because Cable & Wireless afterwards had a stronger incentive to transfer "knowhow". Cable & Wireless itself is a telecom enterprise, which owns 79% of the Hongkong Telephone Company and produces fibreoptic cable for digital transmission in the USA[6].

In July 1982 the government announced formally that it considered the transfer of ownership. Since a privatised BT still had to be regulated, a second report by Prof. Littlechild had to evaluate several proposals for regulation. Thereby it tackled problems of consumer protection against monopolistic exploitation, how to encourage innovation and to minimize the burden of regulation. Various forms of regulatory mechanism of BT were checked against five different criteria[7]. Generally the government did not trust the "rate-of-return" regulation applied in the USA. This was rejected because it does not encourage efficiency and, moreover, it has an element of discretion in regulation. The latter enhances the danger of "capture" by the incumbent firm[8]. Finally, the Littlechild report recommended the "*local tariff reduction scheme*" (LTR), according to which prices of long-distance services would be reduced gradually[9]. Eventually, a scheme similar to the one proposed by the Littlechild report was adopted by the government. According to the "RPI - x"[10] rule, BT is permitted to increase prices for a bundle of services (including customer access, local call services and long-distance traffic) in line with the retail price index minus x%. The "x" has to be negotiated with the regulatory authority. It has to reflect cost reductions due to technological advance. Thereby the company should be forced to pass over cost savings to consumers. Within the basket of different products BT kept price-setting flexibility and thereby the opportunity to defend itself against competitive pricing by competitors. Therefore, the RPI - x% scheme allowed BT to reform its tariff structure up to a certain point.

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4 See: Heuermann, A. and K.H. Neumann (1985), p.102/103.

5 Müller, Jürgen (1987), p.253.

6 See: Heuermann, A. and K.H. Neumann (1985), p. 127/128.

7 (1) Protection against Monopoly, (2) Efficiency and Innovation, (3) Burden of Regulation, (4) Promotion of Competition, (5) Proceeds and Prospects.

8 See: Beesley, M.E., Laidlaw, B.H. and P.Gist (1987), p.231.

9 Vickers, J. and G. Yarrow (1985), p.40.

10 RPI = Retail Price Index

In 1984 the new Telecommunications Act led to the sale of slightly more than 50% of BT shares to the public. The official share price was undervalued and rose rapidly after trading began[11].

11.2. The Asymmetric Duopoly Regime

11.2.1. The Telecommunications Act 1984

Section 2 of the Telecom Act 1984 ("the Act") abolished BT's exclusive right to run the telecom system and its statutory involvement in regulation. Instead, BT was required to operate under a licensing scheme from the Secretary of State.[12] The Act also required the licensing of one other operator (Mercury) and establishes the **"Office of Telecommunications"** (OFTEL). OFTEL is headed by a *Director General of Telecommunications* (DGT) who has to be appointed by the Secretary of State for five years. The Secretary of State and the DGT are under a general duty to maintain and promote effective competition in the provision of telecommunications services in the UK (Sections 3(2) and 4(3) of the Telcom Act 1984). Licences are granted by the Secretary of State after consultation with the DGT. Thus the Act does not create any rights in law to obtain an operating licence. If necessary OFTEL, can change regulations of a licence ex post. Its main duty, however, is to supervise the network operators. It is obliged to ensure "fair competition" and protect consumers. The DGT has to secure that the company, which is obliged to provide universal service, is financially viable[13]. Section 3 of the Act contains universal service requirements obliging the Secretary of State and OFTEL to secure the provision of telecommunications services such as emergency services, public call services and services in rural areas. As far as the manufacturing is concerned the Office has to ensure that the international competitiveness of British equipment producers is improved.[14]

Thus in the present regulatory process four major parties are involved:

1) The Department of Trade & Industry, which appoints the DGT and is responsible for granting licences.

2) OFTEL, which has to enforce the obligations put on the network operators by their licences.

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[11] In more detail: Vickers, J. and G. Yarrow (1985), p.36.

[12] Müller, Jürgen (1987), p.254.

[13] Beesley, M.E., Laidlaw, B.H. and P. Gist (1987), p. 231.

[14] When BT tried to buy digital switching equipment from the Swedish company L.M Ericson, OFTEL intervened in order to support British producers (GEC and Plessey) which were more expensive. This intervention was justified by "vital interests" of the British industry. See: Heuermann, A. and K.H. Neumann (1985), p.197/198 and: Carsberg, B. (1987), p.238.

3) The Monopolies & Mergers Commission (MMC), which has to consider changes of licences and has to respond to anti-competitive behaviour of network operators.

4) The Director General of Fair Trading: He has to monitor agreements in restraint of trade (collusion).

The latter potentially has the most pro-competitive weapon in the UK. The law on restrictive practises, however, can not be applied by OFTEL where the expertise on telecommunications resides, but has to be applied by the Office of Fair Trading[15].

Continuing regulation of BT is justified by its dominant position. Since local network services are still monopolized by British Telecom, cross-subsidisation and predatory pricing are likely, if no control is exerted. Moreover, given the importance of telecommunications as an input for production, certain quality standards and continuity of supply has to be guaranteed. Further justifications are related to non-economic interests: The information industry is considered to be crucial for security (defense) reasons. Furthermore, certain goals related to social objectives (universal service, maintainance of public telephone cabins, etc) have to be satisfied.

11.2.2. The Licences of BT and Mercury

Mercury and British Telecom started competition from very different points. BT owned the only existing network. Furthermore, it was permitted to enter manufacturing. Mercury had only recently begun to build up its own long-distance lines. Therefore, during the first couple of years, it was mainly concerned with investments in infrastructure. The asymmetric market situation required asymmetric regulation. As a result, the two enterprises obtained very different licences. Obligations put on the two competing network operators differ in at least five aspects:

1) **Universal service:**

§1 of the licence contract commits BT to provide all services in the entire country. The obligation to provide services was stressed for rural areas in particular[16]. Though Mercury received the same status as a "public telecoms operator" in 1984[17], it does not have to provide universal service. However, until 1986 it was obliged to establish a network which linked at least 15 of the main cities in GB. While there is no obligation to do so, Mercury is entitled to offer all telecoms services nationally and internationally.

15 Beesley, M.E., Laidlaw, B.H. and P. Gist (1987), p.236.

16 More details about the licensing contracts can be found in: Heuermann, A. and K.H. Neumann (1985), p.212-220.

17 The license for Mercury was granted by the Secretary of State for Trade and Industry under sec.7 of the Telecom Act 1984.

2) **Infrastructural obligations**:

§4 and §11 of the BT contract oblige the latter to maintain all existing public phone boxes, to provide emergency call- and maritime services and to provide maintainance of the network. There is no similar obligation for Mercury.

3) **Interconnection**:

British Telecom is obliged to offer access to its network to all network operators which possess a licence (§13 + §14). Access charges have to been settled among the companies. In case of failure, the Director General of OFTEL has the power to decide the proper conditions for access .

4) **Resale**:

British Telecom is not allowed to offer access to other enterprises which only want to resell basic services (§46).

5) **Price setting**:

Mercury does not encounter restrictions on its price setting flexibility[18]. British Telecom in contrast has got upper bounds for its prices. Initially, a RPI - 3%* scheme was agreed upon. Furthermore, OFTEL investigates periodically tariffs of BT in order to prevent any abuse of market power.

11.2.3. Has Competition Prevailed? The Development after Privatisation

11.2.3.1. A Critique of the British Approach

Liberalisation of the market for terminals has been complete. Even the monopoly to install the first telephone set was dissolved in 1985. On the other hand BT was entitled to enter manufacturing as well. By doing so it became a fully integrated telecom-enterprise similar to AT&T before divestiture. Its 1987/88 market share for the basic telephone set was estimated to amount to ca 60%[19].

In contrast, the development of the service sector has been ambiguous. The British approach has three characteristics:

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[18] Though internal cross-subsidisation is prohibited for Mercury as well.

[19] See: Heuermann, A. and K.H. Neumann (1985), p.73/82.

1) Privatisation
2) Market duopoly
3) Re-regulation

Privatisation and liberalisation have been undertaken simultaneously. However, there is no necessary link between them. Similarly, the new regulator may have two objectives. One is to be the watchdog of the privatised dominant firm, protecting consumers' interests by fixing the price bundle. Independent of this control function, the regulator also may be responsible for introducing as much competition as possible. To the extent that the latter prevails, one may expect the need for control to be reduced.

A major problem arose when both companies failed to agree about the conditions for interconnection. The trade unions of BT torpedoed access of Mercury. The requirement for access with the BT system on nondiscriminatory grounds originally referred to the local network. For a supplier of solely high density routes, it would be very costly to connect all individual customers directly with its network. Therefore it was envisaged from the beginning that Mercury would lease lines from BT to complete phone calls transmitted through its long-distance network. The problem, however, is that the dominant carrier and its competitor have contrary interests concerning the charges for interconnection. By raising the access price, BT may not only increase its revenues stemming from Mercury but also it can raise directly the input-costs of its rival. Moreover, the dominant firm had an interest in postponing access alltogether, in order to prolong its monopoly position. The asymmetric bargaining position therefore created the need to regulate access charges by an independent commission. After long discussions, in 1984 an agreement was reached which allowed Mercury to connect its lines to terminals of BT customers through existing local switches[20].

Still, the issue of access was not settled yet. In 1985 Mercury succeeded in Court with its interpretation of "**unrestricted access**"[21]. It additionally claimed access to the long-distance network of BT. The *earlier* decision ruled that a phone call using Mercury long-distance lines had to get access on both sides of caller and receiver to the **local network**. Since Mercury did not have a complete intercity network, it could not interconnect all of its customers. Its interpretation of unrestricted access (which prevailed) implied that a call could be switched from the local (BT-) network into Mercury long-distance line. Afterwards Mercury could channel it into BT's long-distance and thereafter into its local network. This arrangement obviously offered Mercury the opportunity to provide a much greater range of service, while its own network still was only rudimentarily developed. The Court decision also relieved Mercury from strong pressure to build up its own network. Thus "unrestricted access" strengthened Mercury considerably. The important burden of **capacity risk** was entirely put on British Telecom.

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20 See: Heuermann, A. and K.H. Neumann (1985), p.139-149.

21 Financial Times, 9 March 1985.

A second success for Mercury was the government agreement not to license further network operators at least until 1990. Thereby Mercury had a six year lead in building up its own network. Unrestricted access and the exclusion of further entrants at least until 1990 have ensured very favourable conditions for Mercury. Both arrangements were not made in order to prevent wasteful duplication of the network but they were justified by the "**infant industry argument**": Protection for Mercury had to be ensured while it struggled for a foothold in the industry. It is, however, arguable whether systematic featherbedding of the new entrant was necessary. Obviously the government had an interest in keeping Mercury in the market in order to prove that its approach was appropriate.

The asymmetric market situation and the asymmetric regulatory scheme make an assessment of the transitional period difficult. The fact that Mercury still remains in the market does not prove that competition among public operators is a feasible concept for a small European country. It rather proves that regulatory protection was sufficient to keep Mercury alive.

On the other hand the experience with regulation has already shown that the British authorities face basically the same problems as the FCC before. The regulatory authority has the disadvantage of having less information than the dominant carrier. Since the only source about cost development is British Telecom itself, it is likely that the latter is able to dominate the bargaining about the "x" in the RPI-x scheme. The value for "x" has changed twice until 1991. While at the beginning RPI-3% was established, "x" thereafter rose to 4.5 % and the White Paper declared a value of 6.25%, which applies from August 1, 1991.[22] Thus, each time when the price cap was reconsidered, it was increased. Though it is impossible to tell the exact motivation of the DGT, it might be very well that ex post the previous price cap was considered too small. While not giving detailed explanation for his choice of "x", the regulator nevertheless indicated that rate-of-return was the most important criterion.[23] For the same reason BT is able to overcharge Mercury for access to the local network, because it is better informed about the incremental cost than is OFTEL[24]. The latter will therefore hardly succeed in establishing "fair terms" for interconnection. It is not certain, whether the RPI - x% scheme will not eventually lead to rate-of-return regulation, when profits made by BT influence the decision about "x". Then the price cap will be used to restrict the company's profit to a given rate-of-return of capital, which reduces the firm's incentive to become efficient. The company may believe that the short term advantages of increased efficiency and lower costs may be more than offset by a tougher "x" and lower prices in the following period. Thus, RPI - x% only works if the regulator has a good idea of how efficient the regulated firm actually is.[25] Another

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22 DTI (1991), p.6.

23 Beesley, M.E. and S.C. Littlechild (1989), p. 460.

24 See: The ECONOMIST (21 January 1989), p. 75 and: Kay, J. and J. Vickers (1988).

25 Economist June 1, 1991.

drawback of the RPI - x% mechanism is the implicit assumption that rates have been reasonable at a starting point. Then, in the aftermath, "x" has to follow costs which are reduced by technological development. This assumption, however, cannot reasonably be maintained. Before privatisation BT's prices were as much distorted as those of other European TOs. Thus even if the regulator succeeded in fixing "x" according to cost savings, price distortions existing before, would not be eliminated. Moreover, given rapid technological development, it is very unlikely to be the case that the regulator will correctly foresee the implications of technological development on prices. Thus, the mechanism can be critisized for its arbitrariness.[26] The problem of *capture* is likely to rise again, since the regulated company (BT) can be expected to have strong advantages in the bargaining process, due to a lead in information. Furthermore, due to its inflexibility, the RPI-x% rule cannot ensure that BT will indeed pass over all of the cost reductions which it achieves[27].

Further drawbacks may have arisen from the **privatisation** policy, carried out simultaneously to the introduction of competition. "Unfair" price setting could be applied by a publicly owned company. However, it is much more likely in case of a private company where less control can be exerted. Moreover, the scope to put obligations on the latter to publish its commercial data is limited. As a major deficiency the excessive secrecy of the present regulatory system has been critizised: OFTEL is anxious to avoid being challenged in court. Thus its reports on the pricing policy of network operators can hardly be used to properly examine the market. It has been argued that if OFTEL is not entitled to publish commercial data, which suggests that the asymmetric position in favour of BT is likely to rise in future[28]. A similar threat to competition can arise for terminal equipment. Though BT faces the possibility of investigation by the Monopoly & Mergers Commission, it may be able to distort competition by using its dominant position in the network. Here too the US experience with AT&T is instructive. Therefore the priority given to the transfer of ownership has rather limited the scope for competition. Since the government used its privatisation program of public enterprises as a means of reducing the public deficit, it had an interest in a high market price before selling the shares. A transfer of ownership is more successful the higher are expected profits. If fierce competition is envisaged, demand for the shares offered will drop. So will the price. The planned privatization thus gave the Treasury an effective veto on plans to breakup BT in 1982-83.[29] Therefore, the emphasis put on privatisation sacrifised some crucial elements of liberalisation. The most important are the failure to restructure the industry, the failure to license further network operators and the refusal of resale of leased lines.

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[26] Müller, Jürgen (1987), p.255.

[27] See for instance: Beesley, M.E., Laidlaw, B.H. and P. Gist (1987), p.230.

[28] Beesley, M.E., Laidlaw, B.H. and P. Gist (1987), p.235.

[29] Economist, October 5, 1991.

Arguably the goverment repeats the same mistakes by simultaneously announcing further steps of liberalisation and a further sale of BT's shares.[30] The urgency of privatisation furthermore prevented the restructuring of British Telecom. In contrast to AT&T in the USA, British Telecom was not divested. Instead the dominant firm integrated vertically by being allowed to enter manufacturing. The intention behind this decision might have been to avoid the fragmentation of the US market. Despite competition, British Telecom still should have the opportunity to reap economies of scope. The government therefore wanted to have both efficiency in production (vertical integration) and efficiency due to competition. Thus one may conclude that BT rather resembles the old AT&T before divestiture than the new one, operating only in the long-distance market and in manufacturing. It is surprising that little notice was taken of the lasting regulatory difficulties which led to the break up of the vertically integrated AT&T. A restructuring similar to the divestiture of AT&T could have promoted competition threefold[31]:

1) The divided component parts could compete with each other (yardstick competition).
2) Experience and expertise could be spread, instead of being concentrated on one enterprise.
3) The danger of anti-competitive behaviour could have been reduced.

The problem of supervising cross-subsidisation from the monopolized local to the (more) competitive long-distance market could have been avoided by changing priorities: "*...the pressing desire to transfer a company into private ownership has stood in the way of ensuring a proper framework for competition in the industry.*"[32] Thus, one may conclude that the aims of allocative efficiency did not require privatisation. To the contrary, privatisation may have postponed further steps of liberalisation and more intensive competition.

Finally, a further point of criticism is that the government did not go far enough to liberalize the industry from state intervention. By doing so, cost-based pricing and a business-like management of BT could have been expected to materialise. However, the government has ensured its influence on the telecommunications market. It controls the **licensing of entrants**. Thus the most important negotiations still take place between the Department of Industry and British Telecom. In comparison to the FCC, the power of OFTEL is rather limited.

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30 The announcement of March 1991 to apply full cost interconnection charges to BT's local network may be explained by the government's interest to raise BT's profitability before the sale envisaged for the end of the year. Only after fierce protests this decision was taken back later in the year. Moreover, it is argued that necessary restructuring of BT is postponed in order not to threaten the second tranche of privatisation. See: Economist, June 1, 1991, and Financial Times, July 16, 1991. In December 1991 the government sold half of its BT stake, thus its holding has been reduced to 25.8%.

31 See as well: Vickers, J. and G. Yarrow (1985), p.48.

32 Vickers, J. and G. Yarrow (1985), p.49.

11.2.3.2. Some Empirical Evidence

In 1990 the government undertook a general review of the previous seven years. By the end of 1990 BT still controlled 95% of the UK's telecommunications market.[33] After seven years of network competition Mercury's market share could hardly be seen as a threat to BT's dominant position. The difference from the development in the US intraLATA market is striking. As was discussed in chapter 6, in almost the same period AT&T's market share dropped considerably more (to 63%). It has been argued that contrary to the US, during the last years in Britain the competitive impulse has become less strong while price differences between both operators shrunk. Both operators avoided a price war, BT apparently accepting the 10 to 20 per cent price gap with Mercury.[34] Thus so far BT has not been forced to a general lowering of prices by competition.[35] Improvements in BT's services have been due more to pressure coming from the regulator then the other competitor. BT's profits rose steadily until 1989. When BT announced a further 14% increase in profits for 1990, it was widely argued that despite regulation the dominant firm was able to abuse its market position.[36]

At the beginning of 1991 Mercury was able to serve 75 per cent of the UK's population. Since the remaining 25% are those customers who are the farthest from the Mercury network, they would cost Mercury most in interconnection payments paid to BT. An alternative means would be to lease lines from BT, thereby reducing the distance of BT's network over which the calls would have to be carried.[37] The leasing of lines from BT so far has been prohibited for Mercury. However, the governments plans to lift these restrictions.

A persistant problem has been the settlement of access charges for Mercury to use BT's local networks. In 1985 OFTEL laid down the conditions for interconnection of Mercury and BT. Payments were calculated on the basis of incremental cost and increased every year by RPI - 3%.[38] Generally, it was argued that BT's charges to Mercury were low.[39] In October 1990, however, Mercury claimed that its payments to BT had risen above costs since 1986. BT instead argues that access charges are below cost, since it runs deficits on the local networks.

At the beginning of 1991, OFTEL changed its approach by proposing fully applied costs, thereby increasing Mercury's cost by up to 20%. Before this price increase Mercury paid

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33 Economist, November 17, 1990; and: Financial Times, January 20, 1992.

34 FinTech, March 7, 1991..

35 Financial Times March 11, 1991.

36 Before tax BT made a profit of £ 3.1 billion in 1990. Handelsblatt, 25. Mai 1991, and Economist July 7, and June 1, 1991.

37 FinTech, June 13, 1991.

38 The level of payments varies according to daytime and the distance that BT has to carry the call.

39 See for instance: Economist, June 1, 1991.

about 30 percent of its total call revenues to BT for interconnection charges.[40] According to OFTEL's new concept competitors to BT would have had to pay an "access deficit charge" to BT. This charge has to be paid in addition to the interconnection fee. The latter is a slice of the variable cost of each call. The "access deficit charge" was meant as a share of the fixed cost of the local network. However, it is questionable since BT's losses may be partly due to inefficiency. Moreover, some account should be taken of BT's advantage in inheriting a complete network including customers in 1984 from the taxpayers.[41] Finally, the "access deficit charge" would have discouraged entry by further competitors. Some months later OFTEL fell back on its previous decision, resolving that BT would have to bear full losses in maintaining the local network until its market share had fallen from 95% to 85%.[42] The continuing debate on access charges, Mercury's fringe position even after 7 years of operation and BT's rising profits may lead to the conclusion that the asymmetric duopoly did not create much competition in British telecommunications. Further liberalisation therefore was considered to be inevitable.

The DGT thereafter proposed that BT put local and long-distance networks into different subsidiaries dealing with each other at arm's length basis. This could be the starting point for a restructuring similar to the AT&T.

11.2.3.3. The Rebalancing of Tariffs

The intensity of competition between BT and Mercury cannot be assessed from market shares alone. Price development since 1984 has to be scrutinized as well. From liberalisation one would expect two different results, first a rebalancing of tariffs towards costs and second a lowering of tariffs due to competitive pressure. Graph 11.1.) clearly indicates that a rebalancing has occured for national tariffs. While the long-distance price dropped by 1991 to below 30% of the real price in 1977, the local price rose after 1986. However, it can be seen, that compared to 1977, by 1991 the real price of a local call had also declined. Compared to national long-distance, the price for intra EC countries has decreased less. International calls were not included in the price cap. Furthermore, as discussed in some detail in chapter 12, the accounting rate systems prevent carriers from reducing international calls unilaterally.

Beside the indicated rebalancing, BT and Mercury offer now many discounts and various price bands which furthermore lead to be more efficient pricing (see chapter 3.3.)

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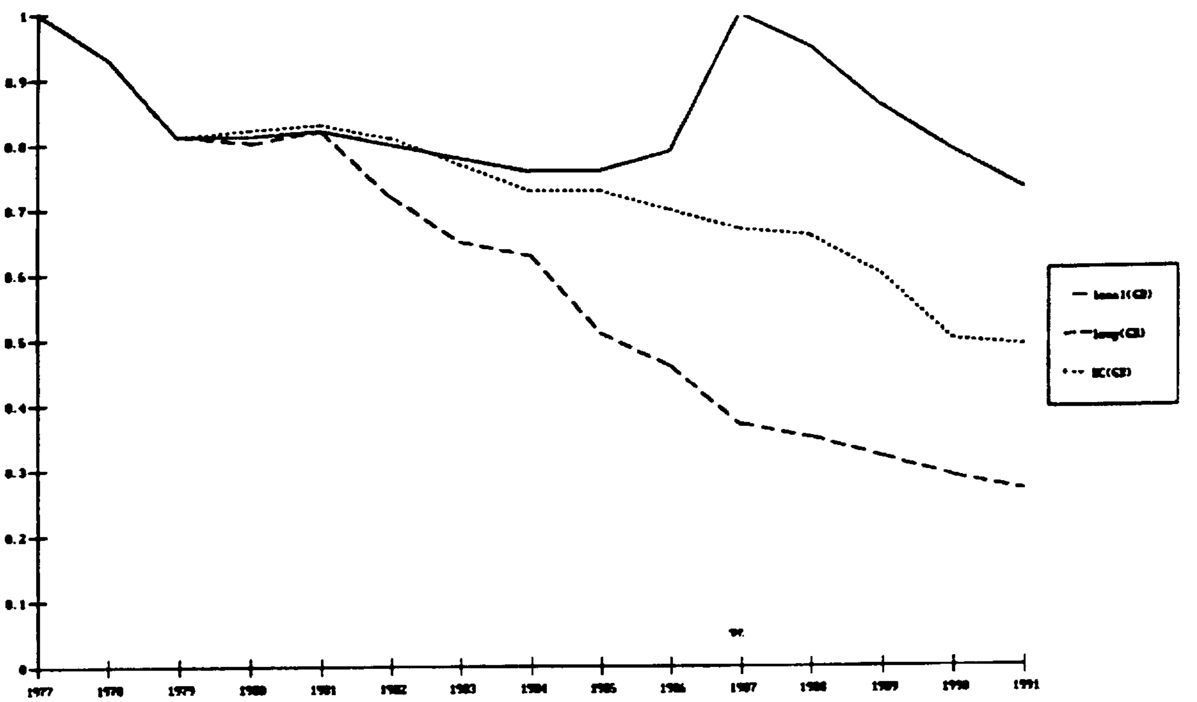
[40] Gilhooly, Denis (1991).

[41] Economist, June 1, 1991.

[42] The Independent July 7, 1991.



Graph 11.1.: *Real prices of BT for 3 minute calls at peaktime 1977-1991 (1977 = 100)*[43]

The second effect, however, is more difficult to measure. It is difficult to maintain whether overall tariff decreases have been due to competitive pressure or to cost reductions due to technological advance which would have emerged also under monopoly. However, in chapter 12.2.2. a comparison of tariffs in different EC countries is provided. As will be seen in the EC the UK only has a middle position. Some member countries enjoy cheaper telecommunications services, although their TOs operate under monopoly.

11.2.4. Competition and Universal Service

At the heart of the debate about liberalisation is the question of the effect on universal service. Generally, it was feared that competition could cut off poorer households by increasing residential and local charges.

In the Telecom Act and in BT's licence the government introduced certain safeguards. BT essentially is required to offer basic voice service throughout the UK at non-discriminatory prices, decreasing in real terms. So far these prices have been nationally uniform.[44]

According to the survey of the Central Statistical Office[45] 1989 85% of households were connected to the telephone network. This was a higher percentage than the one which was

[43] Sources: Calculations based on data provived in the appendix.

[44] Milne, Claire (1990), p.367.

[45] Central Statistical Office (1990), p.365/366.

achieved before 1984. Despite higher residential and local charges privatisation and liberalisation thus did not lead to a lower density rate. This rather limited effect on network penetration could have been expected, given the price inelastic demand for access and local phone calls (see below). However, compared to continental Europe, in Britain the density rate did not keep pace with the rising penetration in other EC countries.[46] Thus, one may conclude that while measures of liberalisation did not lead to a deterioration of the level of network penetration, it nevertheless stood in the way of further improvements. However, this relatively small impact of liberalisation on universal service may be partly due to the safeguards built in the Telecom Act of 1984. Moreover, when investigating households without telephone, it was found that most had low income (63% of them under £ 150 a week), while other criteria (regional differences, age) were less significant.[47] Thus, income appears to be the most important reason for households to abstain from the telephone network. This would make direct income subsidies an efficient means to foster universal service. OFTEL and BT therefore agreed to provide subsidies for the access of low income households. Moreover, BT agreed to provide a low-user tariff under which the rental will not exceed 60% of the standard residential charge.

Overall, however, the experience ofthe UK confirms previous conclusions that universal service goals are not likely to suffer by liberalisation. This holds if measures of liberalisation are introduced when nation wide coverage has been already achieved.

11.3. The White Paper "Competition and Choice"

In March 1991 the *Department of Trade and Industry* published a *White Paper* on the future telecom policy in Britain.[48]

In the White Paper the government announced its decision to end the duopoly policy applied to network operators. Further public operators shall be licensed, while special reference was made to *cable television companies*. While BT and Mercury may not get a national franchise to supply broadcasting services, cable television companies shall be allowed to provide telecommunications services in their own right.[49] However, new public operators will be allowed to provide both television and telecommunications services. Cable operators are expected to provide mainly local services along the networks they have already installed. In connection with Mercury and further long-distance operators thereby a complete alternative network could be installed to BT's network. This supposedly would diminish the importance of interconnection charges. The government sees the problem that if the cable operator serves only a part of its franchise area, it would be more expensive for

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[46] Milne, Claire (1990), p.366.

[47] Milne, Claire (1990), p.368.

[48] DTI (1991).

[49] DTI (1991), p.iii.

a public operator with an universal service obligation (BT) to serve the rest. In the future this problem would be solved either by levying extra charges, or by imposing an universal service obligation on the cable operator.
This decision was anticipated by the US Regional Holding Companies (RHCs) which until now have been prohibited from competing in the domestic long-distance market. The RHCs have systematically bought into British cable franchises since 1989. Due to this, one may expect competent local competitors in the UK. Presently the RHCs are also preparing to enter the British long-distance market,[50] which needs fewer expensive switches and fewer physical lines than local networks. Moreover, in the long-distance market BT's profit margin is still high. Further entry can be expected from British Rail which can use its own 2,500 km fibre-optic telecommunications network already installed along the railway tracks[51] and British Waterways which may join US Sprint. By the end of 1991 the latter announced that it had applied for a full UK licence including international telecommunications. National Network, a private UK operator, receives the first licence to compete against BT and Mercury.[52]
While proposing to liberalize entry in local and long-distance networks, the White Paper suggests more freedom for BT to rebalance prices.[53]

However, two major restrictions on full competition shall remain at least in the short term. Until 1993 *equal access* is put off. Equal access means that customers would be able to route their calls to the long-distance carrier of their choice. Presently, to use Mercury's network, subscribers have to buy necessary additional equipment for indirect access via the BT network. Equal access would offer Mercury access to BT's enormous customer base. However, by 1993 a first step towards equal access shall be realized. This will comprise the long-distance network. A code put in by the customer shall signal which network is chosen. Those customers who do not choose will automatically be put in BT's network.[54] For 1995 a second step is envisaged. This will extend the "equal access" procedure also to the local network[55].
The second restriction refers to the highly profitable international market. Entry of network operators will be licensed only for the national market. The government declared that in the short term international operating licences will not be granted. The reason for this decision may be found in chapter 12. Unilateral liberalisation offers foreign TOs the

50 In Spring 1991 already eight RHCs had invested in British cable franchises. See: Commission (DG XIII) (1991).

51 Economist July 7, 1990.

52 Financial Times, March 31, 1992.

53 FinTech, March 7, 1991.

54 FinTech, February 7, 1991, and March 7, 1991.

55 Nachrichtentechnische Zeitschrift, Mai 5, 1991.

possibility to play one British operator off against the other. OFTEL therefore is willing to liberalize the international market only on a bilateral or multilateral basis.

11.4. The Regulatory Regime

Since the White Paper is only a policy document it is not legally binding. Thus, the Telecom Act 1984 is still valid as far as the regulatory regime is concerned.
According to the Act the Secretary of State has wide discretionary power as regards the licensing procedure. For the set up of telecom installations and also for the provision of all services a licence is necessary. Notwithstanding the general duty to promote competition, the Secretary of State is free to decide when granting individual licences.
The Telecom Act of 1984 thus did not create any new rights in law to obtain an operating licence. Given this discretionary power of the State, the degree of liberalisation achieved in the UK cannot be established from the legal text alone. While in Germany, for instance, private undertakings have a legal claim to provide certain services, in the UK similar rights do not exist. For this reason the White Paper becomes crucial since it reveals the government's intentions regarding the licensing policy in the future.

11.4.1. Infrastructure

11.4.1.1. Fixed Terrestrial Public Networks

Beside the White Paper, the Department of Trade and Industry (DTI) has published guidance notes to be read in conjunction with the former.[56] According to these notes for applications which do not include the use of radio, the first come, first served basis is applied. In contrast to BT, Mercury and Kingston[57], specific service obligations will not be imposed on new operators. Those applicants offering two-way services to a substantial class of customers and those offering long-distance services to local operators will be considered to be public operators. Licences for public operators prohibit cross-subsidisation.
As was pointed out before, entry is expected for both the local and the long-distance networks. Emphasis is given to those entrants which already operate cable networks for other puposes. In the local markets TV operators are expected to apply for licences. In the long-distance market entry is expected from the Railways, Water Companies and undertakings reselling the spare capacity of their private networks.
On March 26, 1991 the resale of spare capacity from the Post Office's private network was permitted. Thereby *National Network* (Natnet) entered the market as a small third national competitor. Natnet will sell idle capacity to other organisations for their internal

[56] DTI (1991), Notes for the Guidance of Applicants for a Licence to Run a Telecommunications System, March 25.

[57] BT is under a universal service obligation, Mercury has to meet minimum requirements for its network and Kingston has a universal service obligation for its local network.

communications. To do so Natnet has to rent lines from BT or Mercury to complete the connection.[58]

11.4.1.2. Mobile Public Networks

Presently fixed network operators are prevented from offering mobile services under their fixed link licences. According to the White Paper the government intends to maintain this restriction on fixed operators.[59] Thereby it hopes that mobile systems will add competitive pressure on the cable network operators.

At the moment there are two British mobile telephone networks (Vodafone and Cellnet) which have helped the UK to get by far the largest penetration of any EC member state. In 1991 about 1.2 million mobile telephones were installled.[60] This can be seen also from Figure 8.1. in chapter 8.4.1.2.
At the end of 1989 three companies were licensed to install GSM systems. They are expected to operate by 1993. While on the one hand it is expected that this will lead to considerable competition among mobile operators, on the other hand it is feared that too many systems will lead to market fragmentation. In order to survive, it is estimated that at least three and a half million subscribers are needed. Too many mobile networks may not allow operators to reap economies of scale. They may end up with a market share which is too small to become competitive also with the fixed network.[61]

11.4.1.3. Satellite Public Networks

While there will be a class licence for private satellite networks, public networks via satellite links will not get an "across- the- board" authorisation.[62] Instead, satellite licences will be granted on a case by case basis. Regarding satellite installations the government does not reveal its criteria for granting a licence. The reason for the government's reluctance to grant public satellite network licences is mainly that these networks allow the bypassing of the international accounting rate system. Individual licences for data or voice traffic, however, may be granted.
Initially, licences were limited to BT, Mercury and Kingston. Thereafter licences were granted also to a number of specialized satellite service operators.

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58 Economist, March 31, 1991.

59 However, BT and Mercury already have invested in this area, either by subsidiaries or through substantial shareholdings.

60 Wirtschaftswoche, 21 Juni, 1991.

61 Economist, September 16, 1989.

62 DTI (1991), p.13.

11.4.1.4. Private Networks

The installlation of fixed private networks requires only a class licence. Private mobile networks, used only for internal purposes (taxi companies etc) are only limited by the scarcity of spectrum. Several licences also have already been granted for private satellite networks. A new class licence is envisaged, which does not limit entry.

11.4.1.5. The Use of Leased Lines and Interconnection

As far as the licences of Mercury and BT are concerned, changes are proposed to oblige both network operators to interconnect new operators to their networks. The DGT is entitled to determine tariffs of leased lines, in order to ensure that costs are fairly apportioned between public network operators. BT and Mercury shall be paid fully allocated costs plus a return on capital employed, and a contribution to any deficit incurred in the provision of exchange lines. After December 31, 1992 the DGT is empowered to publish a directive requiring the provision of equal access facilities among all operators. BT and Mercury will be required to provide circuits to other public operators except where the DGT reckons that demand could be met by other means.

The White Paper reconsiders also the policy concerning the interconnection of systems. Thereby it recognises that BT should receive a contribution to its deficit on exchange lines.[63]

As far as international circuits are concerned, existing restrictions on voice telephony and telex shall be removed. Moreover, as regards those countries which apply a similar regulatory freedom, simple resale shall also be permitted.[64] In order to prevent international network operators from restricting competition by raising prices of leased lines, OFTEL will introduce price control. In the case of BT a licence modification is undertaken to include international leased circuits in the domestic price cap for leased circuits of RPI - 0%.[65]

11.4.1.6. Analysis

The approach chosen in the White Paper implies a clear departure from the duopoly policy applied before. It appears that the UK is heading for full liberalisation of the public telecommunications networks. However, as was pointed out before, given the discretionary power of the state, only future licensing policy will tell whether the government lives up to these aims. The main restrictions which apparently remain due to the White Paper are

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[63] DTI (1991), p.7.

[64] DTI (1991), p.3.

[65] DTI (1991), p.15.

related to the international market. The aim is to avoid that a dominant overseas operator negotiates accounting rates to the disadvantage of the competing operators in the UK.[66] Presently the main exemption from full competition appears to be the satellite market.
The reasoning behind the restriction on the provision of international satellite services is not totally convincing. One may argue that the bypass of the accounting rate system is beneficial in order to raise pressure to reform the system. Moreover, BT and Mercury have the possibility to compete in the satellite market. It is therefore not the case that only foreign firms will be able to use satellite transmission for the UK international services, while high accounting rates keep domestic cable operators from setting competitive prices.

11.4.2. Services

Generally all services can be provided if the requirements of the "*Branch Systems General Licence*" (BSGL) are fulfilled. The BSGL system covers telegraph, telex, telextex, telefax, packet&circuit switched data services, amd VANS.-Domestic leased lines have to be provided by BT, Mercury, and Kingston. Special licences instead are required only for services provided on cable networks and two-way satellite services. In mid 1991 about 850 special licences had been issued.[67]

11.4.2.3. Analysis

As for telecommunications networks, the main problem for service provision in the UK is again the wide discretionary power of the government. It does not reveal any criteria against which applications for licences are judged. This will make it difficult for applicants to challenge a refusal through the Courts. Since BT dominates the service market and the government still owns 49% of shares, there may still exist incentives for the government to abuse the licensing procedure in favour of BT.

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[66] DTI (1991), p.12. See also chapter 12.

[67] Information provided by OFTEL.

UNITED KINGDOM

INFRASTRUCTURE

	No Obligation	Declaration	Licence(1) essential requirements	Licence(1) further requirements	State Monopoly
Public Networks					
Terrestrial					
Fixed				X	
Microwave				X	
Mobile				X	
Satellites					
Earth Segment			X		
Spatial Segment				X	
Private Installations					
Terrestrial			X		
Microwave			X		
Satellites			X		
Use of leased circuits					
Domestic					
Shared use/third party/			X		
Interconnection	X				
International					
Shared use/third party/			X		
Interconnection			X		

(1) Here "essential requirements" are assumed to apply for the "general class licence" (BSGL), while "further requirements" apply for the case by case licences.

UNITED KINGDOM

SERVICES

	Declaration	Approval	Special Obligations	Licence(1) essential requirements	further requirements	State Monopoly
Fixed Voice Service					X	
Mobile Voice Service					X	
Telegraph; Telefax				X		
Services on leased circuits				X		
Packet & Circuit switched data services				X		
Services on cable networks					X	
Services via one-way Satellites				X		
Services via two-way Satellites					X	
VANS				X		

(1) Here "essential requirements" are assumed to apply for the "general class licences" (BSGL), while "further requirements" apply for the case by case licences.

11.5. An Evaluation: Privatisation versus Liberalisation

Seven years after the reorganization of British telecommunications a very **unbalanced duopoly** has emerged. When compared to the almost simultaneous process of liberalisation in the USA, in the UK the competitive pressure on the main operator has been rather limited. While AT&T's market share dropped to about 63% in 1991 BT still hold 95% of the British telecommunications market. It has been argued that after some preliminary struggling for market share, the BT-Mercury duopoly has moved more towards a peaceful coexistance. Entry led to a rebalancing of BT's tariff structure without, however, stimulating overall price cuts. As will be seen in chapter 12 different sources calculated similar basket prices for BT and continental TOs like France Telecom and the DBP Telekom. This limited competitive pressure on BT led to a steady rise in profits of the dominant operator. The profit made in 1990 was comparable to that of the German TO in the same year.

I therefore conclude that the **small market size** of the British telecommunications sector is a considerable handicap for national liberalisation strategies. It reduces the scope for entry and therby enhances the possibility of collusion.

Furthermore it was argued that privatization stood in the way of more competition. It prevented a previous restructuring of British Telecom and supposedly has encouraged the government to put off further liberalisation until the second tranche of BT's shares is sold.

Similar to the USA, access charges have been a continuous problem for the regulator. The recent struggle about full cost pricing revealed that OFTEL has not developed yet a clear cut approach to this problem.

Nevertheless the British duopoly may be defended as a "second best" solution towards network competition. This, however, only applies from a national perspective. As will be argued in chapter 14, a multilateral approach chosen simultaneously by several member states is more likely to stirr up competition. This, however, was never put forward by British policy makers, who chose a do-it-alone strategy. Moreover, with the exception of mobile telephony no emphasis was given to "system competition". The latter refers to competition between operators using different technology. Thus cable networks and British Rail were not allowed to enter before the recent White Paper. The same applies to two-way satellite systems. Instead a second cable entrant was licensed which mainly duplicates the already existing BT network. It is still unclear whether the competitive impact of a second cable operator will be strong enough to make up for the high fixed cost of establishing the network. As was pointed out in chapter 8 an independent Commission found for the even bigger West German market that the costs of network duplication would exceed the expected benefits from having a second operator.

The recent White Paper can be regarded as a step to mend the deficiencies of the duopoly approach. It declares the governments will to permit further entry and stresses the importance of system competition by refering to cable operators and the railway network. Having already established the necessary networks, these enterprises incur less sunk cost when entering telecommunications. It is reckoned that BT's new competitors will be able to bypass its local networks, thereby solving the persistent access charge controversy.

The success of the competitive British mobile market may be taken as a hint of the scope of competition steming from new transmission technologies.

Finally the service market in Britain turns out to be the most developed one in the Community. The variety of services provided and the lower prices charged in the UK clearly contradicts the argument that network monopoly is required to foster service competition.

12. The Regulatory Regime of International Telecommunications

The previous chapters discussed the regulatory environment in the US and the EC from the point of view of domestic markets. No reference was made to the regulatory regime of transborder communications. While the latter is a "logial consequence" of the national regimes, the international market nevertheless is organized differently. Most important, there is a multitude of players operating in this market.

Diverging national policy approaches recently have destabilized the traditional system of transborder telecommunications, leading to increasing competitive pressure on TOs. Without being enforced by a regulatory reform, current developments in the intercontinental market lead to facility based competition.

As will be discussed in part IV this could provide a precedent for competition in the intra-European long-distance market.

12.1. The Intercontinental Market

Each country is sovereign in the determination of access conditions to the national network. This control over access is exercised by requiring an operating agreement from foreign carriers. When national TOs acquired a monopoly status in their domestic markets, foreign carriers were *de jure* prevented from terminating locally the traffic they had carried to the national frontier. Thereby domestic operators were granted sole rights to offer international services. International communications was not regarded as a market in its own right. Instead it was reduced to a technical problem of interconnection of independent national networks. To solve the technical problems bilateral agreements were needed. Nevertheless multilateral cooperation was set up to develop common principles for interconnection. As a result, in the past telecommunications services between countries have been governed by the same exclusionary rule as services provided domestically. The international telecommunications market is organised by the *International Telecommunications Union* (ITU), a specialised agency of the United Nations. Founded in 1865 the ITU is the oldest inter-governmental organisation. It was born in the era of national monopoly in telecommunications. The national telecommunications administration operated the national network and represented the country in the ITU. Thus the ITU was responsible for the coordination of national telecommunications providers, regulating all kinds of services. Its paramount objective was to foster interconnectivity and interoperability of networks. Despite fundamental changes in technology and services and despite the arrival of new network operators the structure of the ITU has not been changed over the last four decades. Its main components are the *Plenipotentiary Conference* which is the supreme organ of the ITU and which periodically revises the International Telecommunications Convention (ITC), the *Administrative*

Conferences which deal with regulatory matters, the *Administrative Council* responsible for general policy and the *General Secretariat* who has financial and administrative responsibilities.[1] The ITU has no legal power to shape the international telecommunications market. It is mainly responsible to keep a regulatory regime working which is based on bilateral agreements.

Thus the structure of the international telecommunications market was determined by bilateral cooperation of national TOs sharing the costs of interconnecting their domestic networks. Since national markets were similarly organized this **cooperative model** required little regulation. The ITU sponsors a *Consultative Committee on International Telegraph & Telephone* (CCITT) whose recommendations concerning technical matters and accounting procedures are widely accepted. They fit a multipolar network which is managed by firms that are dominant and sovereign within their own borders and which cooperate on the basis of shared interest. The emergence of satellite technology first seemed to threaten this non-rivalrous structure. However, the new technology also was turned into a system of global cooperation.

Nevertheless, recent measures of deregulation and liberalisation undertaken on the national level of different member states have had a strong impact on the the intercontinental telecommunications market. The "cooperative model" has been put under strain. The intercontinental market consists of two distinct networks: the suboceanic cable and the satellite network. In the following recent developments in the intercontinental cable network are first discussed. This comprises the price setting scheme of the TOs which form an international cartel. Then I briefly review the policy which has been applied for the installation of Intelsat's network. Finally, I discusse the extent to which the cooperative model has been changed into a competitive one during the last decade.

12.1.1. Intercontinental Submarine Cables

Intercontinental cables are installed on a bilateral or multilateral basis between the carriers on both sides. A foreign carrier has to make arrangements with the destination carrier to complete a telecom message. These arrangements are typically reciprocal. Each carrier sets his own price and the terms of availability of international services which originate in his country.[2] In the case of transit of a third country, carriers have to negotiate mutually satisfactory agreements. Investment costs and revenues are shared according to the concept of *half-circuit*. The carrier on either side contributes one half of the investment costs of the circuit. *Accounting rates* are calculated to compensate the destination carrier for one-half of the international transfer plus the domestic interconnection costs. They are supposed to be

1 In more detail: Ellgar, R., and D. Witt (1990), p.289/290.

2 Trezise, Philip, H. (1987), p.334

set at a level equal of the cost of a call. Corresponding rules have been set up in the CCITT recommendations. Though the CCITT regulations are not binding in a legal sense they are widely accepted. Being based on the explicit principle that circuit switching and message transmission are the exclusive function of national TOs they generally prohibit subleasing and shared use of private leased lines.[3] Recommendation D1 forbids the resale of capacity by a customer to a third party. The intention is to prevent large users with spare capacity on leased lines from undercutting the TO's international tariffs. Since the CCITT recommendations are widely observed any entrant is confronted with business terms which hardly can be negotiated. In a deregulated environment they therefore create distortions of competition in favour of incumbents. Moreover, being licensed to provide international traffic in one country does not serve a private operator if he cannot get access to another national network. Due to long cooperation among TOs, this access is difficult to obtain. This effect can be clearly seen from market shares of US carriers. As was shown in table 6.1. the interLATA market share of AT&T dropped to 67% by 1988. In the intercontinental market by the same year AT&T's market share was still at 90%[4]. The CCITT recommendations have allowed formation of a **cartel** which hardly can be broken up. A good example are the accounting rates which are calculated on the basis of CCITT recommendations.[5] These accounting rates have remained powerful despite the arrival of new carriers.

12.1.2. The Tariff Policy of the International Cartel

Having the exclusive right to set tariffs and collect payments in the domestic markets, the originating carrier is free to levy any charge for a particular international call. The price users are charged for an international service is called *collection charge*. The collection charge varies depending on where the call originates. For international links a mechanism is needed to compensate the terminating carrier and transit carriers for costs they incurred in handling a specific call. An *accounting rate* is established between the originating and the destination carrier as the basis for international settlements. These accounting rates are generally denominated in Special Drawing Rights (SDR) or US dollar per paid minute of

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[3] Witt, D.,(1987), p.359 and : Ellger, R. and D. Witt (1990), p.294/295.

[4] Source: FCC, quoted from: Johnson, Lleland L. (1991), p. 226.

[5] The basic principles of the recommendations are

a) The rate for a communication between two countries shall be the same independently of the route used (direct or transit).

b) Each country shall be considered as a single unit of area.

c) International accounts shall be settled on a bilateral basis.

d) Rates should be reduced as low as possible on a reciprocal basis.

traffic. The originating carrier agrees to reimburse the carrier of destination by a fixed proportion of the accounting rate. This proportion, called *settlement rate*, is generally one half of the accounting rate. Finally, settlements are made on a net basis. When the traffic in each direction is unequal, the carrier sending more traffic pays the other one the difference.[6] The accounting rate therefore may be described as a *uniform usage sensitive* price for access to foreign networks.[7]

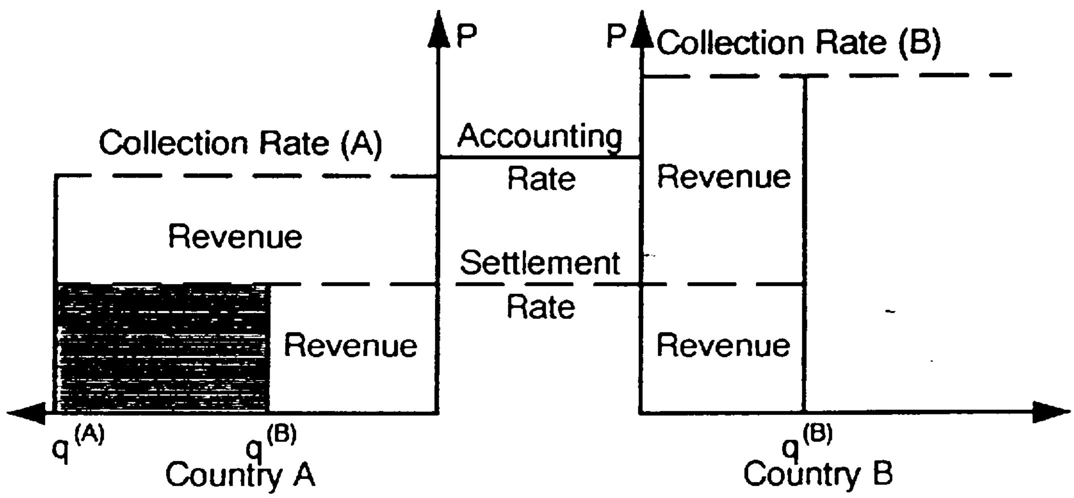


Figure 12.1.: *the international settlement mechanism*

Figure 12.1.[8] illustrates the international settlement system. Country B has a higher collection rate and less outgoing calls q(B) (measured in billed minutes of traffic). Thus it is reimbursed by country A. If S is the settlement rate and q(A) the quantity of outgoing calls from country A then the transfer paid to country B is $T = [q(A) - q(B)]\ S$ which corresponds to the hatched area.

The mechanism described in figure 12.1. causes a profit maximising carrier in country B to set a price which exceeds the monopoly price. If the collection rate is raised, q(B) will decline. However, the negative quantity effect is partly offset by an increase in the transfer payments of carrier A. On the other hand, given the price of country B, carrier A has an incentive to raise its price in order to reduce the reimbursement paid. Thus both carriers have an incentive either to raise their price or to keep it at a high level. The settlement

[6] Ergas, H. and Paul Paterson (1991), p.30.

[7] Neumann, K. H. (1987), p.383.

[8] A similar explanation can be found in: Ergas, H. and P. Paterson (1990).

procedure has an inbuilt gravity towards a high collection price.[9] In practise this effect has been even strengthened by the decline of costs for international calls. The settlement procedure leads to tariff inertia since unilateral reductions of the collection charge are punished. Combined with cost reductions, the tariff inertia thereby led to a rising gap between prices and costs.

However, the international settlement mechanism only worked smoothly as long as TOs applied similar tariff principles. As soon as prices diverge considerably, both carriers have conflicting interests. The low price carrier A has an interest in reducing the settlement rate while the contrary is true for the high price carrier (as long as the low price carrier has more outgoing calls). As soon as collecting rates diverge, high price carriers get an additional incentive to keep up their collecting and accounting rates. To the contrary carriers which are forced to reduce their collection rates also have an incentive to reduce accounting rates.

In the case of the intercontinental market TOs are free to set accounting rates and collection charges arbitrarily. Accounting rates are not published. Within Europe and the Mediterranean Basin the CCITT recommendations put forward further regulation. European TOs have agreed to use *uniform rates* for the use of international transmission and switching facilities.[10] Furthermore exact ratios are prescribed for the price relations of automatic switched services and the monthly rental for leased lines.[11] Thereby "harmful" competition to the switched network shall be precluded. Moreover, leased circuits are made available only for the customer's own needs, while sharing and resale are prohibited. Similarly the interconnection of two or more private leased circuit networks is not permitted without prior agreement by the regulator (TO or Ministry).[12]

The accounting rate system has served carriers well in the past, providing workable arrangements between them and meeting a number of key requirements for the development of the international network.[13] It was a consequence of the postwar institutional structure and adequate to serve the aim of universality and joint provision of transmission facilities. The simplicity of the accounting rate system reduced the transaction costs of service agreements, and introduced uniformity into international pricing

[9] As von Weizsäcker has pointed out, the tariff setting procedure led to international prices which exceed those tariffs necessary for the joint profit maximum of the two operators involved in an international call. The settlement rate can be regarded as the marginal cost for the originating carrier. It exceeds, however, the cost which is incurred by the carrier of destination. Thus the operator of origin which is responsible for the collection charge maximises profits at a tariff level higher than the true costs of the destination carrier. Von Weizsäcker argues that by a joint agreement to lower their prices both operators could raise their profits.

[10] Neumann, K.H. (1987), pp.385-389.

[11] Leased circuits are normally priced on the basis of a flat monthly rental charge. Witt, D. (1987), p. 360/361.

[12] Neumann, K.H. (1987), pp.399-405.

[13] Ergas, Henry and Paul Paterson (1990).

arrangements. The 50:50 split spread the risk of capacity expansion equally among carriers.[14]

From a general welfare viewpoint the accounting rate system is detrimental because it prevents competition and offers the wrong incentives to TOs. There is little discipline imposed on carriers to pass on cost reductions arising from technological advance. The accounting rates impose a floor on the overall price level under which collecting rates cannot drop, irrespective of costs. Since accounting rates do not vary by time of day they do not allow for efficient price setting. Off-peak tariffs especially exceed considerably underlying costs. By generating strong incentives to perpetuate existing price-cost distortions the accounting rate system increasingly handicaps the growth of the international network. In this respect the US-European intercontinental market is revealing.

Although calls from the US to foreign destinations are on average 25 per cent cheaper than incoming calls[15] the accounting rate system has widely prevented competition. From 1980 to 1984 the average price per minute for an international call originating in the US dropped from $2.01 to $1.29 due to pressure exerted by the FCC. After competition was introduced in 1984 it only fell modestly to $1.18 by 1988 and still remains four times above the average national long-distance price. The reason for this is twofold. First, the new competitors to AT&T prefer to become members of the international cartel agreements themselves. Secondly, the accounting rates became the largest element in costs of foreign calls, with 75% of the amount collected from consumers being passed over to foreign companies. In an extreme case in 1988 99% of what AT&T collected on calls made to Brazil was handed over to the Brazilian telephone company.[16] Since accounting rates do not drop parallel to the prices charged the consumers, they become the lower threshold under which no carrier will set their price. In fact as table 12.1. shows in the case of the peak-off calls with some countries AT&T encounters losses for each call made.

[14] Ergas, H. and P. Paterson (1991), p.34/35.

[15] See: Dixon, Hugo, Financial Times, April 4, 1990; July 16, 1990.

[16] Economist, July 6, 1991, p.14.

	AT&T revenue in $	Payment to TO in $
Germany	3.76	4.62
France	3.76	4.69
Italy	3.76	5.39

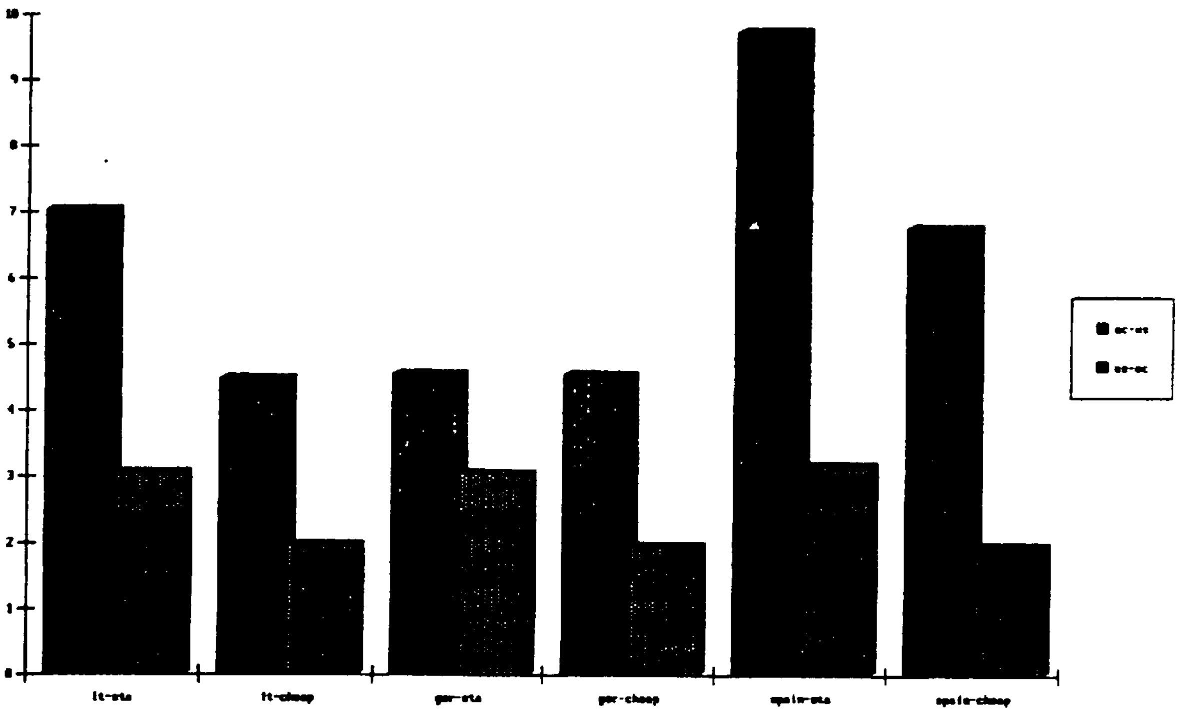
Table 12.1.: *AT&T revenues and payments to European TOs, direct call economy rate (5 minutes), 1988.*[17]

As a result national regulators of domestically liberalised markets have not sought to reduce national collection charges for international calls for instance by imposing formal price-cap regulation. As was pointed out, profits from incoming calls and accounting rates cannot be controlled nationally.[18]

Nevertheless, collection rates for EC-US calls diverge considerably, depending on where the call originates. This can be seen from graph 12.1. which compares the collection rates for the peak and off-peak periods between Italy, Germany, Spain and the USA.

[17] Stanley, V.B. (1988), p. 240.

[18] Cheong, K. and M. Mullins (1991), p.108.



Graph 12.1.: *Standard and cheap collection rates between Italy, Germany, Spain and the USA in US $ (1991)*[19]

In some cases the same call costs more than twice as much, depending on where the call originates. Given that the US tariffs are also kept well above the competitive price, this clearly illustrates the scope for tariff reductions in the intercontinental market.

Pressure on the accounting rate system is rapidly increasing. A potential threat stems from technological progress. According to the EEC analysis and forecasting group GAP costs for long-distance transmission in Europe fell by 9% annually throughout the decade ending in 1985. After the introduction of the ISDN network a further acceleration of this cost decrease is expected.[20] In the early days of the system collecting rates were closely linked to accounting rates. However, the degree to which cost savings are passed on to collection rates differs much from country to country. Hence the collection rates at the two ends of each relation started to diverge. This effect was enhanced by differences in inflation rates and exchange rate fluctuations. Downward rigidity in collection rates carried over into accounting rates which subsequently moved far out of line with costs. The ratio of accounting rate to collection rate thereby rose inevitably for carriers which sought to

[19] sta: standard rate; cheap: cheap rate; it: Italy; spain: Spain; ger: Germany. The black column always presents the collection rate charged in the EC country; the shaded column presents the collection rate of US-Sprint.

[20] Figures given by an OECD study are even more dramatic. See: Ungerer, H. (1990), p.9.

reduce their prices. Moreover, traffic flows were changed considerably with diverging price policies. As can be expected from the high price elasticity of demand for international calls due to diverging collection rates the quantity demanded on each side started to diverge[21]. Countries with lower collection charges thereby became likely to run permanent settlement deficits. This is especially apparent in the EC-US market.

As mentioned above, due to price regulation of the FCC and some competitive pressure AT&T had to reduce prices for international calls during the 1980s which increased volume considerably. In Europe TOs are under less pressure to readjust tariffs. As a consequence they have moved far out of line with costs.[22] In the case of traffic to and from Germany this led to a significant financial deficit for US carriers. In 1989, 420 million calls were made from the US to Germany while there were only 250 million in the opposite direction.[23] Given the bilateral agreements the US carriers had to reimburse the DBP Telecom 167 million dollars for delivering calls to their final destination.

As a result US carriers have lobbied the FCC to enforce a general price cut for international calls. Due to this pressure the DBP Telekom recently lowered the accounting rates for AT&T, MCI, and Sprint by 17%.[24]

However, the present international settlement procedure puts carriers in liberalised domestic markets at a second disadvantage. Monopoly TOs are able to play one off against the other when negotiating agreements concerning the accounting rate. Newly established carriers in the USA long to get access agreements with foreign TOs. In order to provide full service to their customers they must offer international dial access comparable to that provided by AT&T. For this reason the foreign TO is likely to be successful when offering access to these carriers under less favourable terms.[25] This process of "*whipsawing*" diverts the welfare gains from competition among US carriers to other countries[26]. For this reason the FCC requires operating agreements which stipulate partially uniform accounting rates on parallel routes to the same country[27]. However, TOs are likely to find other tools than

[21] This development is strengthened by the "call me back" effect. When the same phone call is differently priced depending on the country of origin, especially large customers have an incentive to set up their calls in the low price country.

[22] For an empirical investigation see: Ergas, H. and Paul Paterson (1991), p. 35-45.

[23] Compare: "Telekom taucht im Atlantik", Frankfurter Rundschau, November 17, 1990.

[24] "Telekom taucht im Atlantik", Frankfurter Rundschau, November 17, 1990.

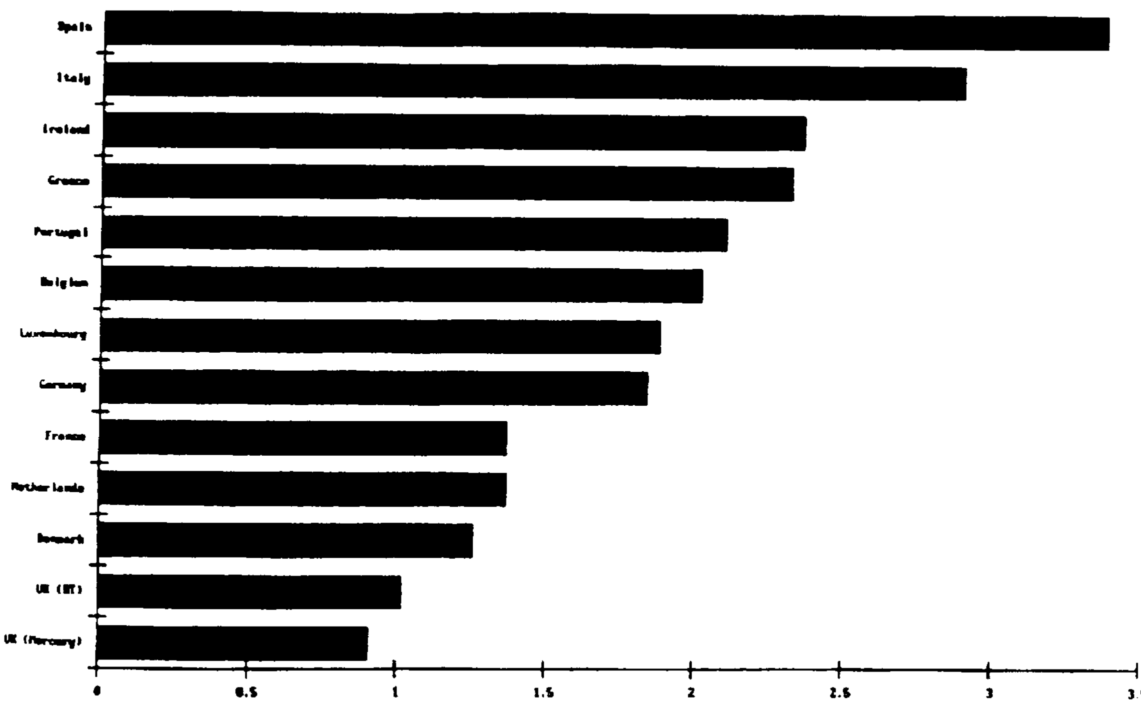
[25] For instance it may force the US carrier to relinquish the half circuit concept and take 60% of total costs instead.

[26] Compare in more detail: Johnson, L.L. (1991), p. 228-231.

[27] In 1989 MCI proposed to extend its "call USA" service to Spain. Its agreement with Telefónica involved a surcharge of 0.35 SDR on the current accounting rate. Thereafter AT&T came to a similar agreement for its "USA Direct" service. In mid-1990 the FCC rejected both accords on grounds of whipsawing. Compare: Johnson, L.L. (1991), p. 233.

the accounting rate to extract concessions from US carriers. As a consequence, on the one hand regulators of liberalizing countries restrict competition among their carriers in the international market. On the other hand, however, they increase pressure on high tariff countries to renegotiate the accounting rate procedure.

The second challenge to the accounting rate system comes from national measures of liberalisation. In April 1991 the USA and UK unilaterally reduced their transatlantic settlement rates by 30% over the next two years.[28] Since long-distance markets in both markets become increasingly competitive accounting rates will be driven towards costs. In 1989 US Sprint and Cable & Wireless as the parent firm of Mercury installed the first private cable (PTAT-1). This erodes the near monopoly position previously held by AT&T and BT for the intercontinental market. Bilateral competition will lead to even greater price divergence in the European-US market, revealing the true costs of monopoly provision to consumers in the EC. Already before the new settlement agreement the UK was the cheapest site for calling the USA, as can be seen from graph 12.2.



Graph 12.2: *price of a 1 minute call to USA in $US 1990*[29]

However, beside foreign regulators like the FCC and domestic consumers, European TOs will face additional pressure to abolish the present accounting rate system.

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[28] Economist, July 6, 1991, p.14.

[29] Derived from a basket of prices, taking in peak, standard and off-peak rates. Source: Fin Tech, September 6, 1990.

Instead of using direct links end users and carriers may route traffic through third countries, thereby avoiding high price TOs. Thereby TOs themselves may be forced to compete for US traffic.

This is feasible for instance for calls from Germany to the USA. The collection rate for a call from Germany to the UK plus the price from the UK to the USA is lower than the collection rate for a direct call from Germany to the USA. An international firm therefore can route its call to the USA through its PBX in the UK[30].

12.1.3. Satellites

When satellite communications became commercially viable in the early 1960s, they were perceived as being superior to cable networks for communications which involved the greatest distance (due to the insensitivity of satellites to distance or transmission path). The limited quality and quantity available at that time made a single supplier desirable. Moreover, all countries depended on the US satellite and launcher technology, which encouraged the establishment of a joint enterprise.[31] This backround led to the foundation of the *International Telecommunications Satellite Organisation* (Intelsat) as a non-profit organisation[32] by the USA and 13 other nations in 1964. Currently 118 nations have become members of Intelsat. After an interim period permanent agreements entered into force on February 12, 1973. The first agreement is among governments, called *parties*. It establishes Intelsat as an international organisation. The second operational agreement is signed by operating entities designated by member governments. Beside France, the Netherlands, and Spain all other EC countries designated their TOs.[33] In the USA Comsat was founded as a private, profit making corporation which is organized without government ownership or financing. Comsat is the US representative to Intelsat. All US domestic carriers who want access to the Intelsat system have to rent capacity from Comsat.

Costs of investments and revenues from operation are distributed among member countries according to their relative share of usage. Each signatory is assigned an investment **quota** which corresponds to the relative usage of Intelsat's capacity. After deducting the operating costs, the revenues from utilization charges are distributed to the signatories in proportion to their quota.

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[30] For instance, in 1987 the peak rate for a five minute call from West Germany to the USA costed US$ 10.09. Routed via the UK the price dropped to US$ 8.86. Source: Eurodata Foundation (1987), quoted from: Johnson, L.L. (1991), p. 242.

[31] Snow, Marcellus S. (1987a), p.43.

[32] While initially Intelsat was founded as a consortium this status was changed to that of an international organisation in 1983. In more detail: Gershon, Richard A. (1990), p.249-259.

[33] Snow, M.S. (1987a), p.44 and 51.

The institutional structure of Intelsat consists of three features:

The Board of Governors: The executive body of Intelsat is the Board of Governors in which member countries are represented according to their national quota. The Board is encouraged to make unanimous decisions. Otherwise the votes are counted on the basis of the quota. Thus the power structure of Intelsat resembles more a commercial organisation, in which ownership share determines control, than a political entity of equal votes.

The Assembly of Parties and the Meeting of Signatories: Both bodies consist of representatives of all parties or signatories, each taking decisions on the basis of equal vote regardless the investment share. The main duties are to formulate "recommendations" and "views" on long-term objectives, amendments to the agreements, authorization of the use of specialized satellite facilities outside of Intelsat etc. Both bodies were created in order to give Intelsat a more "democratic" structure since all designated operating entities are represented on an equal basis.

The director general: While in the interim period Comsat was responsible for the managing of Intelsat, the permanent agreements of 1973 created the position of a director general who has to supervise the construction, establishment, operation and maintenance of the space segment.[34]

Intelsat thus has the status of an international organisation. Its internal structure, however, resembles one of a private firm which pursues commercial interests. As will be seen this contradictory structure has led to conflicting interests between political and commercial goals. Moreover, it made Intelsat especially vulnerable to entry. As an international organisation Intelsat has certain obligations which are founded in political aims. For instance it offers international distribution of voice, data and video signals to the member countries on a *non-discriminatory* basis.[35] Therefore a system of cross-subsidisation was set up which resembles the one described already for national networks. Revenues from high traffic routes (eg the North Atlantic region) subsidize low density ones. As a consequence signatories from industrialized countries subsidize less profitable traffic routes that interconnect geographically isolated and /or developing countries.[36] Again similarly to the national debate, market entry in the intercontinental market is therefore disputed not only in terms of efficiency but also as regards the redistributional impact.

Also from an institutional point of view the Intelsat agreements may be seen as an extension of national arrangements to the international market. Intelsat owns only the space segment of the international satellite network (including tracking, telemetry and

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[34] All in more detail: Snow,(1987a), pp.44-54.

[35] Article V of the intergovernmental agreement prohibits price discrimination among users of the same service.

[36] Gershon, R.A. (1990), p.249.

control), while the ground segments are owned and operated by the national telecommunications entities. On the European side therefore the Intelsat system gives full control over the satellite network to national operators. Being the only national signatory, they control the space capacity available and decide about the conditions for access by other users.

Since the beginning, Intelsat almost enjoyed a monopoly status in the delivery of international satellite communications. Currently it's share of the world's international telephone calls is at about 70% while it delivers almost all international television transmission.[37] This exclusive position is stipulated in the permanent agreements of 1973 which also contain provisions regarding the use of separate satellite systems by Intelsat members (Article XIV of the intergovernmental agreement). Before using separate satellite systems for domestic needs a member must consult the Board of Governors on technical compatibility. An economic criterion is also applied. The member country is obliged to avoid *significant economic harm* to the global system of Intelsat. After being consultated the Assembly of Parties will make recommendations. Although article XIV does not explicitly deal with the question of non-compliance, member states can be sanctioned in the case of a breach of rules. According to article XVI of the intergovernmental agreement the expulsion of a member country is possible. Further sanctions can be applied if a signatory fails to pay the capital contributions due to the quota. However, so far no member country has actually been expelled.[38] The "economic harm" Article appears rather to apply moral suasion instead of legal sanctions. In particular those countries which foster private satellite systems do not interpret Article XIV(d) as prohibiting their installations.[39] Moreover, it is directed only towards the challenge of private *satellite* systems. Due to the technological progress, however, Intelsat is mainly challenged by submarine fibre optic cables which are not covered by the Intelsat treaty.

Intelsat's **tariff policy** is regulated in the permanent agreements. In contrast to the bilateral character of international tariffs routed through terrestrial networks in the case of satellite technology, tariffs are settled by multilateral agreements. Generally, collection charges do not depend on whether a call is routed through the terrestrial or through the space network.

Article V of the intergovernmental agreement and Article 8 of the Operating Agreement constrain Intelsat to non-discriminatory and average-cost tariffs, resepectively. Average cost pricing, however, only applies in an aggregated sense, thus individual services can divert from this principle. The pricing regime is consistent with the rate-base pricing

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[37] The transatlantic satellites had a capacity of 6300 voice circuits in 1986; roughly six times the capacity of AT&T cables. Compare: Trezise, Philip, H. (1987), p.337.

[38] Snow, M.S. (1987a), pp 61-63.

[39] Snow, M.S. (1987b), p.136.

principles used by regulated public utilities in the US. The prohibition of price discrimination leads to a subsidy of low density routes. As a consequence Intelsat has to prohibit *rate arbitrage* by users engaging in the resale of their circuits to third parties (cream skimming).

Suming up, in the past TOs succeeded in extending their network monopoly from cable to satellite technology. Both systems were part of what has been described as the "cooperative model". The next chapter will investigate the sources from which competition may arise in international telecommunication. It will be seen that there are increasing spillover effects from national measures of liberalisation.

12.1.4. Competition in the Intercontinental Market

Generally, facility based competition in international telecommunications may stem from four different sources:

1) private networks which satisfy demand of closed user groups and which may resell spare capacity.

2) public network operators establishing further cable links and reselling capacity to other countries.

3) competition among the satellite and the cable networks.

4) entry by additional satellite operators.

To a different extent all four sources of competition already work in the intercontinental market. Case 2) of traffic routing was already discussed above. In particular, the importance of private networks is rising fast.

The current international arrangements have so far determined the pattern of market entry. They undermine the competitiveness of established carriers especially in relation to private networks. Large users get artificial advantages to shift their traffic from public switched telecom networks (PSTN) to specialized networks, which allow them to avoid the accounting rate mechanism. This very much resembles the bypass of access charges to local networks in the USA (discussed in chapter 6). The same applies for operators installing separate satellite systems who do not have to take account of the accounting rate when settling their tariff structure. Instead entry by carriers establishing public switched networks is discouraged.

However, the main threat to Intelsat's position as a dominant firm appeared from 3) and 4). First, Intelsat member countries became more interested in establishing *separate satellite systems*. Secondly, on bilateral and multilateral basis national common carriers have started to deploy *sub-oceanic fibre optic cables*. In both cases technological progress and political interests fostered entry into the international communications market.

In the case of separate satellite systems two cases again have to be distinguished. First, some Intelsat member countries wanted to install regional systems owned by TOs. Thereby a certain share of satellite traffic was diverted from Intelsat. However, since the separate system is owned by Intelsat members themselves, competition was not at stake. Second and more recently, the USA have licensed *private* separate satellite systems which, however only operate in niche markets.

The first step was mainly chosen for political interests. In the 70's the dependence on US satellites and rocketry diminished and Intelsat member countries wished to install their own domestic satellite systems. To avoid this Intelsat agreed to lease transponders for domestic use by its members in 1973. By doing so, however, it could not achieve more than a postponement of regional and domestic systems (like Eutelsat). Thus the first inroads into Intelsat's domain came from other governmental institutions which were set up mainly in order to support the regional space industry.[40] The intention was not to stir up price competition. On the other hand the favourable attitude of Intelsat's dominant member changed over time. While in the 60s the USA had a veto right concerning decisions of the Board, their quota diminished gradually to below 25%. This was accompanied by a declining share of US participation in Intelsat spacecraft and research subcontracting. As a result, the US interest in maintaining Intelsat's predominance declined. Moreover, the national deregulatory movement quickly led to spillover effects to the international market. The liberalisation of the domestic satellite market in 1972 ("open sky policy") encouraged private satellite carriers also to file with the FCC for the international market. In 1981 the FCC authorized limited use of domestic satellites for transborder communications between the US and neighbouring countries. Intelsat was too expensive for these markets.[41] The US government asserted that the "significant economic harm" clause did not commit Intelsat members to refrain from establishing separate international systems. It asserted that Article XIV only provided for consultations. In November 1984 the Reagan administration declared support for private international satellites. However, they were not meant to operate on the basis of a common carrier status which would have allowed them to route communications through public switched networks. By preventing them from doing so it was claimed that *significant* economic harm could be avoided. Only 20% of Intelsat traffic were put under pressure while the "core" of Intelsat earnings would remain unchallenged. By 1985 five applicants sought licensing to provide private satellite services in the North Atlantic region. Being excluded from the public switched network they proposed to carry traffic within the network owned or leased by the customer. PanAmSat was the only applicant who proposed traffic to Latin America. Thereby it claimed to fill a market niche

[40] European aerospace firms complained that they did not receive their "fair share" of Intelsat contracts.

[41] Compare: Gershon, R.A. (1990), p.251.

which was not served satisfactorily by Intelsat. In 1987 PanAmSat launched its first satellite which currently offers services for sale and lease between the USA, Latin America, the Carribean and Spain.

By the end of 1991, the US government declared its intention to abolish Intelsat's monopoly. Firms like Alpha Lyracom which so far were allowed to use their satellites only for the transmission of TV signals, are potential entrants in the telecommunications market.[42]

On the technological side over time the scarcity and high cost of satellite channels were overcome. Moreover, technological progress facilitated the provision of a much greater diversity of services, a potential which cannot be catered solely by Intelsat. As a result again potential entrants claimed that they would not compete with Intelsat "core" services, but instead they would offer complementary ones. Furthermore the high rate of absolute traffic growth was regarded sufficient to compensate Intelsat for any relative losses in market share due to entry.[43]

More recently **fibre optic submarine cables** have become the major threat to Intelsat's long term financial viability. Intelsat's agreements do not put obligations on its signatories to ensure that non-satellite transmission modes do not cause "economic harm". However, while European operators have no incentive to threaten Intelsat, US carriers may have an artificial one to do so. Being signatories of Intelsat, European PTTs may not wish to build submarine cable capacity in order to compete with their own satellite venture. On the other hand the US regulatory environment encourages carriers to do so. AT&T as a rate-base regulated company has an uneconomic incentive to build and use its own cables which it can include in its rate base. If AT&T instead leases Comsat's satellite circuits it has to cover all expenses. As a result the FCC had to apply a *proportional-fill-policy* requiring AT&T to use an approximately equal number of satellite and cable circuits for overseas links. However, this proportinal-fill policy has been challenged and recently the FCC has relaxed the loading requirement for AT&T. By 1994 this requirement will be down to 30%.

Moreover, the Intelsat pricing policy gives artificial advantages to the installation of fibre optic cables for which carriers are free to apply their own tariff principles. This is encouraged by the cross-subsidizing policy applied by Intelsat. Finally, in the US the trend towards liberalisation of the domestic market has also stimulated competition for Intelsat. The emergence of new long-distance carriers has led to separate agreements which circumvent the network build up by TOs. On both sides of the Atlantic national competitors occur which are able to instal competing private cable networks. Besides the PTAT-1, BT cooperates with MCI building the TAT-X cable which will handle 150,000 calls

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[42] Wirtschaftswoche, Dezember 7, 1991.

[43] Snow, M.S. (1987a), p.99.

simultaneously.[44] After some resistance European TOs also start cooperating with competitors to AT&T in the USA. MCI for example concluded agreements with the Belgian TO to carry traffic to and from that country. As a result, 1990 Intelsat's revenues plunged 19% because of competition from fibre-optic cables.[45]

The rapid increase of satellites and fibre optic transatlantic cables will most likely create *excess capacity* in the 1990s.[46] As a result a significant competitive challenge is expected for Intelsat. While in 1975 there were about 8,000 voice circuits in transatlantic cable, this number rose to 37,000 in 1985.[47] It is reckoned that by the mid 1990s about 650,000 voice circuits are available between the USA and Europe while projected demand is estimated to rise only to 82,000 circuits.[48] Thus even if Intelsat were protected against entry of private satellite systems the fibre optic cables would put it under competitive pressure. Intelsat has already reacted to the changing environment by redeploying its resources to the markets for which satellite communications are best suited: point-to-multipoint communications (broadcasting) and private corporate networks. Since 1984 Intelsat has introduced more than 100 new services. However, in order to prevent artificial entry it is necessary to free Intelsat from regulatory restrictions which prevent it from responding to competition. Presently the incumbent is put at an disadvantage due to the average-cost pricing rule. It is assumed that the incumbent could have formidable power if it gets permission to set prices flexibly. Thereby entry would be foreclosed until market growth would require further capacity. Once being freed from regulatory restrictions the "core" of Intelsat services could prove to be a *sustainable* natural monopoly which does not need regulatory protection. Since the intercontinental market is rapidly growing in both basic and value added services, Intelsat is likely to lose market share rather than absolute levels of traffic. Moreover, due to technical problems which arise for fibre-otic cables carriers are expected to keep satellite capacity always as a backup if their submarine cable is down.[49]

During the last decade the intercontinental communications market has changed fundamentally. Although the vast majority of Intelsat member countries still grant exclusive powers to their signatories, in the intercontinental market competition has come about. This is due to national policies of liberalisation in the US and the UK. While the homogeneous market structure is destroyed, interests of carriers start to diverge. A market

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[44] Financial Times, November 6, 1990.

[45] Wall Street Journal, December 2, 1991.

[46] Compare: Gershon, R.A. (1990), p.255.

[47] Source: FCC. Quoted from: Dixon, H., Financial Times, April 3, 1990.

[48] Gershon, R.A. (1990), p.255.

[49] FinTech, May 31, 1990.

is emerging which consists of a dominant firm Intelsat, private satellite systems, regional satellite institutions, and different fibre-optic consortia.

12.1.5. Evidence of Strategic Behavior

Experience in the intercontinental market is also interesting from the aspect of *strategic behavior* of incumbents. Both, carriers investing into suboceanic cable networks and Intelsat have been challenged for strategic investments.

Several authors have pointed out that *excess capacity* in both the Atlantic and the Pacific Ocean Basins has been a persistent problem. Between 1970 and 1985 nearly every year fewer than 50% of satellite circuits were actually used.[50] Similar overinvestment has materialized in the intercontinental cable networks. TAT-8 by itself has a capacity which alone was sufficient to cover all voice traffic between the USA and Western Europe in 1990. Nevertheless, carriers filed for completion of TAT-9 for 1991 with a potential capacity double that of TAT-8.[51] Based on cronically overoptimistic estimates of the growth of demand, capacity generally was well above utilization. The effect would have been even stronger if not for the FCC. In accordance with the Communications Act of 1934 the FCC has an obligation to prevent unreasonable high investments of US carriers. However, as experience showed with TAT-7 in 1983 and TAT-8 the Commission could not prevent the establishment of these links, although it initially had concluded that they were not needed.

While some excess capacity is desirable to protect against failure of existing facilities, it has been claimed that the existing scope of idle capacity in the system cannot be explained on technical grounds alone. On the side of the US carriers overinvestment could be explained by rate-of-return regulation which gives an incentive to Comsat to inflate its rate base. Given that AT&T was forced by the FCC to use satellites for about one-half of its circuit requirements, Comsat did not have to fear that rising costs would induce its main customer to switch to alternative means of transmission. This, however, does not explain the interest of European TOs to pay for their share in capacity investment. Only in cooperation with foreign TOs, however, could Comsat and AT&T overinvest into satellite and cable capacity. Intelsat's overall investment programme reflects the collective decisions of its more than 100 members.

An alternative interpretation therefore is that overcapacity was regarded as a means to fence off potential entrants. Since the US in 1972 had liberalised the domestic satellite market, spillover effects into the intercontinental market were likely to occur. Excess capacity than could be used as a signal to both, the regulators and potential competitors.

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[50] Johnson, L.L. (1987), p.282. And: Trezise, P. H. (1987), p.336.

[51] Johnson, L.L. (1989), p. 228.

The latter had to reckon that the incumbent was able to increase output rapidly without incurring high investment costs. Despite the high profit margin which could be observed in the market, competitors then had to assume that these would shrink drastically in the case of entry.

A second motivation for "strategic" investments may have been to give a certain signal to the FCC. Excess capacity could be used to convince the regulator that actually the licensing of further networks would be a waste of resources.

From a strategic point of view, similar to US carriers, European TOs therefore may seek to forestall the installation of private networks by investing in excess capacity in Intelsat and suboceanic cables. This joint interest of incumbents may explain the rapid increase in transAtlantic fibre optic cables and Intelsat's capacity which occured during the last years.

Pricing behaviour of Intelsat is also consistent with this interpretation. Anticipating the competitive pressure which came about from private fibre optic cables and the PanAmSat satellite system, Intelsat sought to reduce tariffs in selected uses. Rather rapidly Intelsat managed to market new services at relatively low prices and subsequently in 1988 its utilization of worldwide capacity grew to 69%.[52] Thus its postentry behavior corresponded exactly to that expected from a strategically behaving incumbent. This led to disputes whether Intelsat would apply predatory pricing to discourage entry.[53] Predatory behaviour might have become a feasible strategy for Intelsat, first, because it was able to compensate for losses by using profits made in still monopolised markets ("deep pocket strategy"). Second, due to the previous establishment of excess capacity, it was able to rapidly increase quantity at low additional cost.

12.2. The European International Telecommunications Market

12.2.1. The Regulatory Regime

Generally, the regulatory regime of the international European market is not different from the intercontinental one. So far on the European level apart from the ITU, no regulatory body has emerged which specifically regulates the bilateral agreements of national carriers. However, recently the Commission has started to play a more active role in the international telecommunications market. On 10 May, 1990 it threatened to challenge the TO cartel on grounds of the competition rules of the Treaty of Rome.[54]

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[52] Johnson, L.L. (1989), p. 226.

[53] Johnson, L.L. (1989), p. 223.

[54] The Commission announced its intention to examine whether the arrangements governing international telephone charges are compatible with the competition rules of the Treaty of Rome. See in detail: Cheong, K. and M. Mullins (1991), p.114, and FinTech, May 2, 1991.

For the continental cable network in Europe, CCITT recommendations prescribe exact ratios between the prices of automatic switched services and the monthly rental for leased lines. As far as they are applied nationally, the opportunity to use leased lines for competing services is thereby restricted. Thus the CCITT recommendations have the purpose to protect the monopoly revenues of the incumbent firms.[55] Private leased circuit networks are generally only permitted for single subscribers which may not resell capacity or provide third party traffic.[56] Accounting rates among service providers have been fixed by the CCITT, based on cost studies carried out by this institution. In order to prevent bypass the recommendations ask for the prohibition of tariff arbitrage. Telecommunications *routing* could be used to gain cost advantages. However, by this regulation the incentive to do so is diminished. In order to avoid financial disadvantages for a destination operator, the operator of origin using a transit route not agreed upon before, has to reimburse the operator of destination as if the authorized routes had been used.[57]

Although Intelsat capacity is used for the intercontinental market as well as for intra-continental ("regional") markets, in Europe Eutelsat was set up as an additional satellite institution. It has presently 28 member countries. The regulatory regime for the space segment in Europe was designed according to the intercontinental market. In contrast to the intercontinental market where Intelsat until recently enjoyed a monopoly position for satellite communication, in Europe different satellite networks already exist. Beside Intelsat and Eutelsat various European states have set up their own national satellite systems. France launched the TELECOM and TDF satellites, Germany the DFS and TV-SAT satellites and Italy and Spain will follow suit with their own systems. In 1988 the first private (TV only) European satellite was set up (ASTRA). Furthermore, a growing number of non-European satellites has emerged which also can be used for services with European coverage.[58] However, since national TOs keep control over Intelsat, Eutelsat and national satellites, the different systems so far have not started to compete. In 1990 there were 11 satellite carriers with 24 operational telecommunications satellites serving Western Europe.[59] However, Eutelsat is the dominant player in Europe. It operates telecom satellites for telephony, data and video services within the FSS frequency band. All EC countries are members of Eutelsat and presently their investment share is 88%.[60] The signatories have the exclusive right to purchase and resell space segment capacity. Any organisations which want to rent capacity from Eutelsat in order to set up their own service

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[55] Witt, D. (1987), p.360.

[56] Leased circuits for instance are provided for SWIFT, a network for transactions between banks.

[57] Witt, D. (1987), p.360/361.

[58] Com(90) 490, 20/11/90, p.78.

[59] EC (1990), Annex III.

[60] Com(90) 20/11/90, p.14-15.

are obliged to purchase the segment from the national signatory.[61] Again the European TOs have formed a cartel which restricts competition in two ways. First, as signatories they individually have control over the distribution of the national quota of Eutelsat space capacity. This is provided for in Article 16a of the Operating Agreement in conjunction with Article IIb of the Convention. Thereby they can preclude or discriminate against private satellite service providers. Second, by pooling together their sales of space segment capacity they also restrict competition between themselves. As with Intelsat there are "*economic harm*" procedures which bind national governments not to establish other satellite systems which cause an economic harm to Eutelsat.[62] However, the treaty's ruling does not determine what actions can be taken against a member country which does not comply with these obligations.

Moreover, the procedure under Article XVI has never led to the conclusion that significant economic harm has been caused by a competing provider. As has been pointed out before separate satellite networks have already been installed by Member Countries. As in the case of Intelsat the "significant economic harm" clause cannot prevent a Party from authorizing such a competitor. Since these national satellite systems are installed by the same organisations which control Intelsat and Eutelsat, they are not used for price competition with the latter. The impact of these national satellite systems on Eutelsat may be compared to the installation of a private network for closed user groups. They cut out a certain slice of Eutelsat's market. The size of the slice is exogenously given. Then Eutelsat has no incentive to change its pricing behaviour to regain part of the lost market share. Thus competitive pressure is not exerted by these systems. If established unilaterally, a *private* satellite operator would face problems achieving the necessary uplink authorization from other countries. This also keeps TOs from using their national satellite systems from competing with Eutelsat.

Moreover, the present regulatory regime leads to a conflict of interests in that the national telecom organisation has regulatory and operational responsabilities. Since normally the TOs are the national signatory to Eutelsat, potential private users of space capacity have to apply to their competitor in order to get access. As a result they are likely to be discriminated against if their services compete with those provided by the national TO. Moreover, the present regime keeps Eutelsat from developing independent commercial strategies when selling space capacity. A further drawback of the present system is that the potential benefits of the satellite system cannot be reaped if TOs operate both the terrestrial and the space network. This can be explained by the TOs subordinating the usage and the pricing of their satellite capacity to the specific targets of their own business

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61 The European Broadcasting Union (EBU) is the only exception. Communications Week International, April.

62 Article XVI a) of the EUTELSAT convention provides that "any Party or Signatory which intends (...) to establish, acquire or utilize space segment equipment separate from the EUTELSAT Space Segment (...) shall (...) furnish all relevant information to the Assembly of Parties through the Board of signatories which shall establish whether there is likely to be any significant economic harm to EUTELSAT."

strategy. Since their main business is still the operation of the terrestrial network the satellite system is used rather as a backup for the former. Thereby the satellite capacity is not fully used.

12.2.2. International Tariffs in Europe

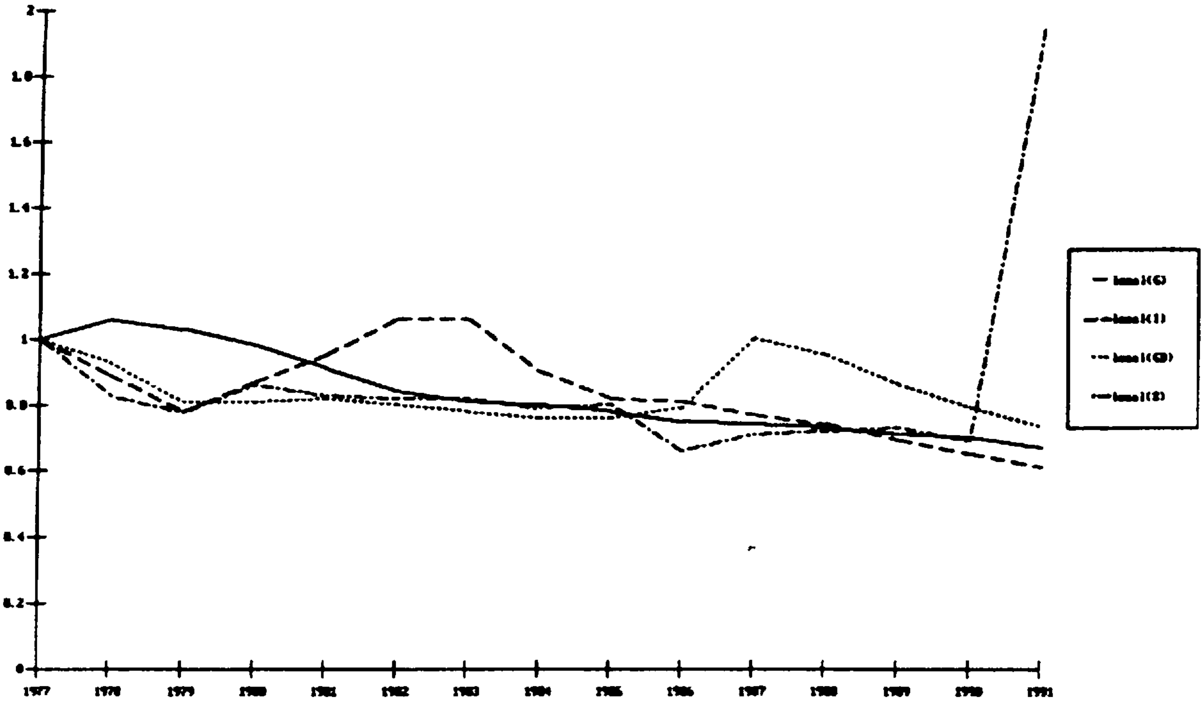
The following empirical investigation of the tariff structure in EC member countries will first look at the price development for basic telephone services. I concentrate on those member countries which were discussed in some detail before.

The tariff structure of the public switched telephone network (PSTN) is fairly uniform throughout Europe. There are three different services: local, long-distance and international. However, sometimes there exist also intermediate cases like special prices for border zones. Moreover, tariff zones vary considerably among EC countries. Many calls considered to be local by BT are long-distance in other countries. Charges depend on day time, duration and distance. In the UK competition between BT and Mercury has led to a large variety of discounts for big users. Finally, some countries levy a value-added tax (VAT) on telecommunications services, while others do not.

For these differences the following price comparisons can only be a rough approximation of the true cost of telecommunications in individual member countries. However, they may provide an overview on general developments in telecommunications pricing.

a) Local calls

In the case of local telephony one finds that until 1990 relative prices were developing in the same way in all four member countries. Italy (1982) and GB (1987) saw drastic price increases. However, the price increase in GB was less dramatic than predicted after the partial liberalisation of 1984. Instead in 1990 in Spain, Telefónica increased the price for local phone calls by 200%. For the other three countries, the 1991 real local price was lower in 1977.



Graph 12.3.: *relative prices for local service in 4 member countries 1977-1991 for a 3 minute call (1977 = 100)*[63]

Graph 12.4. instead depicts absolute local prices in all EC member countries in 1990. It shows that in the UK local calls are the most expensive. They are comparatively cheap in the other three member countries discussed here (this does not include the recent price increase in Spain). A local call costs about four times more in the UK, compared with Germany. In general, European TOs either have kept nominal local calls constant, or lowered them in the period 1985-1990[64]

Generally, there is a trend in Europe towards *enlarged local-tariff-zones*. This results from technical network developments which renders it economical to switch the traffic further away from customer premises.

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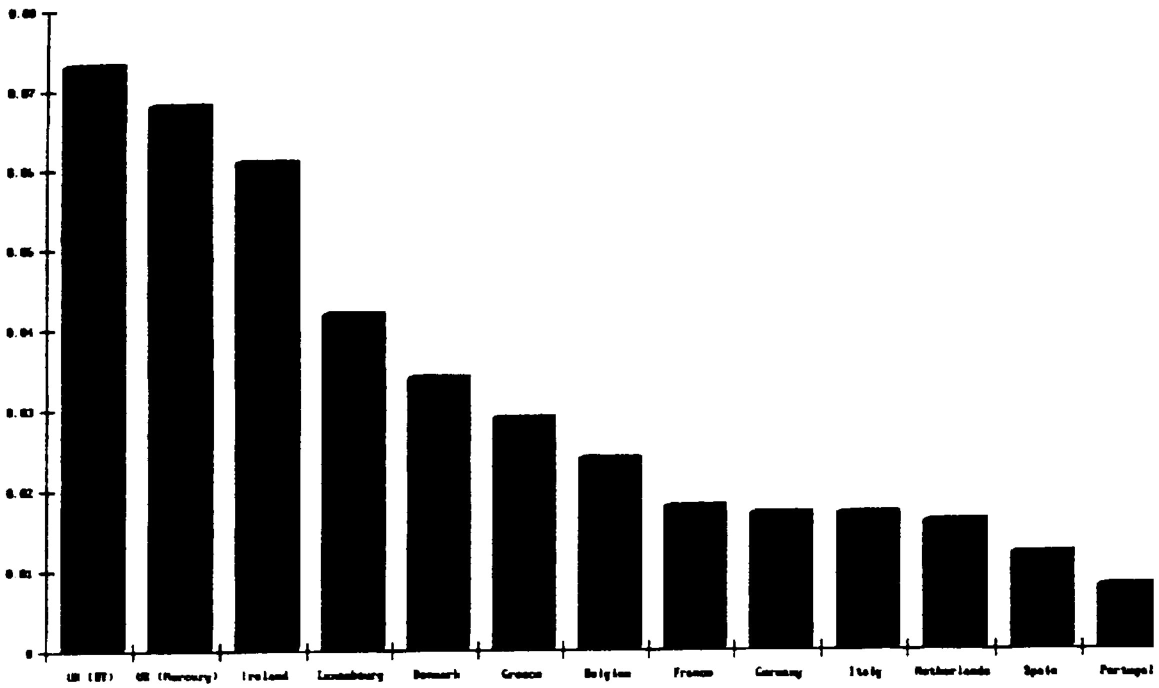
[63] Sources for relative price development: See appendix. In the case of GB the price for BT has been chosen.

G = Germany I = Italy GB = Great Britain S = Spain

[64] Source: Fin Tech, September 6, 1990.

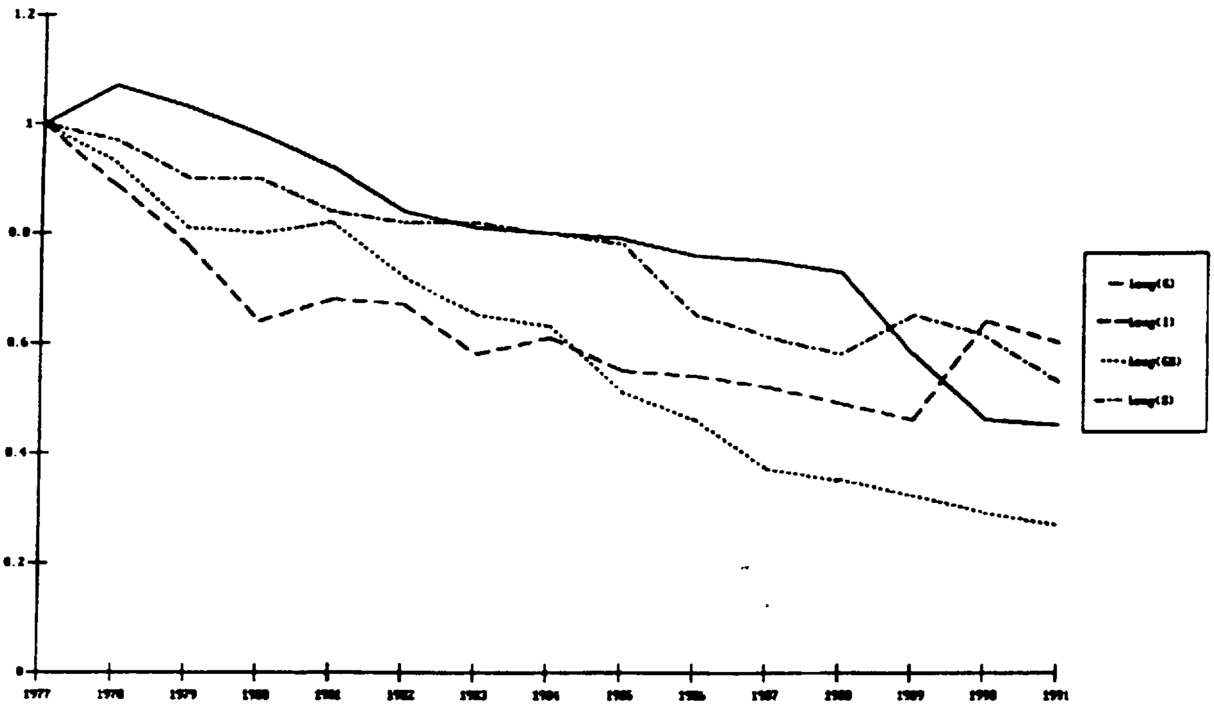


Graph 12.4.: *absolute Prices one minute local call in US$, 1990*[65]

b) long-distance calls

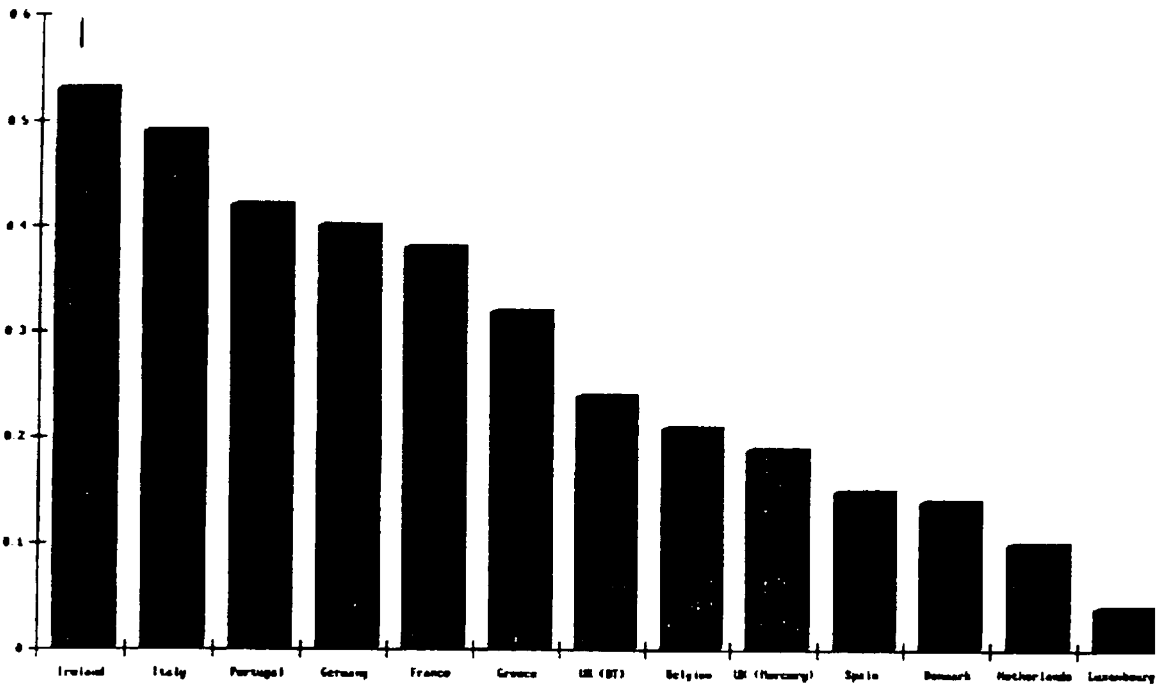
In the long-distance market GB saw the sharpest decline in relative prices since 1977. As can be seen from graph 12.5, after 1984 the price decrease accelerated. By 1991 a three-minute-call costed about 35% of the price of 1977. Price developments in Spain and Germany indicate that since the late 1980s an effort has been made to move long-distance prices more towards costs. The opposite holds for Italy where long-distance calls decreased significantly until 1989. Thereafter the long-distance prices were increased while local calls became cheaper.

[65] See: Sessions, Margrit (1991), p. 29.



Graph 12.5.: *relative prices for a 3 minute long-distance call above 100 Km (peak rate) in 4 member countries 1977-1991 (1977 = 100)*

However, when comparing absolute long-distance prices, both carriers in the UK have only a middle position. Luxembourg, Netherlands, Denmark and Spain had cheaper rates in 1990.



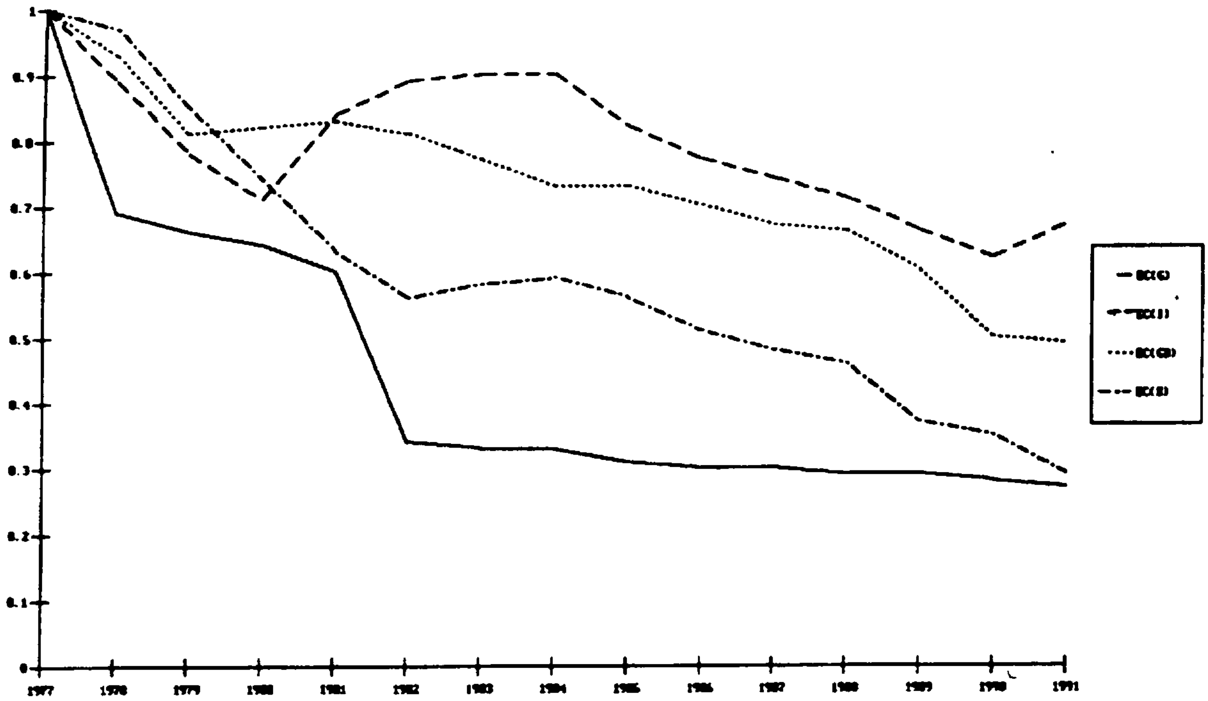
Graph 12.6.: *absolute prices of a one minute long-distance call (> 100 Km) in US$, 1990*[66]

c) intra EC calls

In the case of calls to EC member countries, Germany saw the greatest decline in relative prices, due to price changes in the early 1980s. GB was passed over by Spain, which, however according to graph 12.8. still had the highest absolute price for calling the EC among all twelve member countries.

As in the case of national long-distance calls, prices for EC calls are cheaper in Denmark, Luxembourg and Netherlands when compared to Mercury. Italy did not see much price decrease in relative prices and in 1990 beside Ireland it was the most expensive place for national and international long-distance calls (see also graph 12.2. for prices to the USA).

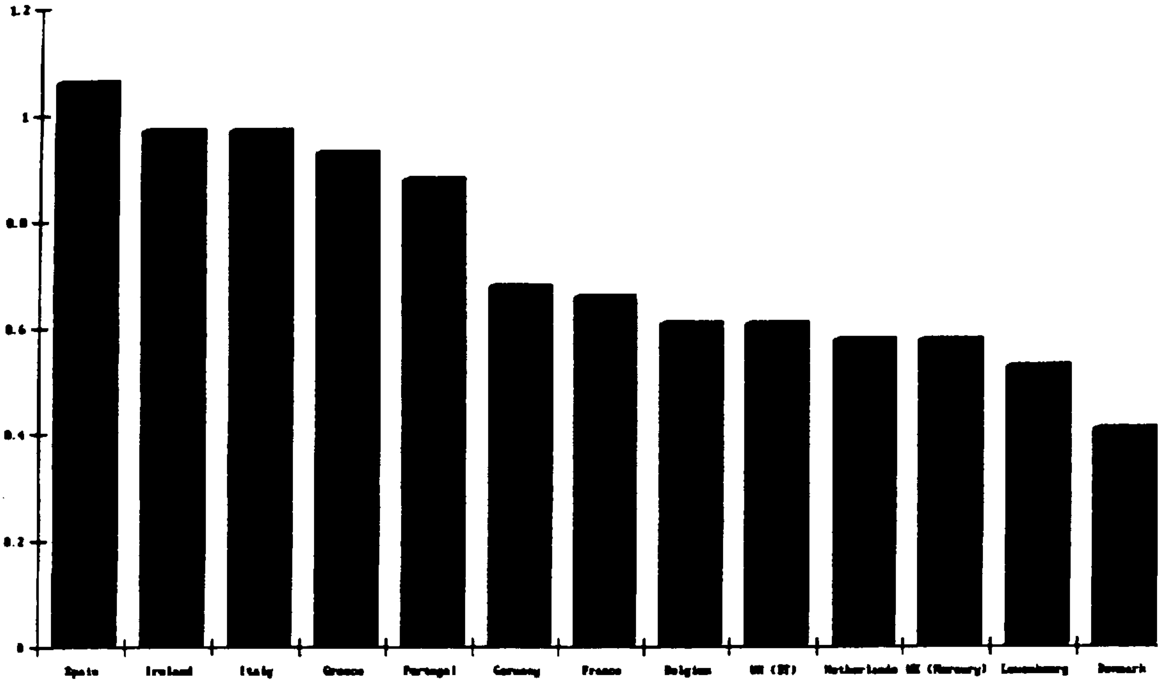
[66] Source: FinTech, September 6, 1990.



Graph 12.7.: *relative prices of calls to EC member countries, peak time 1977-1991 (1977 = 100).*

While especially BT and Mercury charge many different rates for international calls, other TOs like France Telecom apply only a single rate. The use of a single charging zone, however, is against the principle of cost orientation. Costs vary whether a call is made to a neighbouring country (France - Germany) or to a more distant one (France - Greece).

On average, across-the-border peak-time calls are 2.5 to 3 times as expensive as equivalent national long-distance calls. Moreover, prices for a call in one direction differ up to a factor of 2 from a price for the same call in the opposite direction.

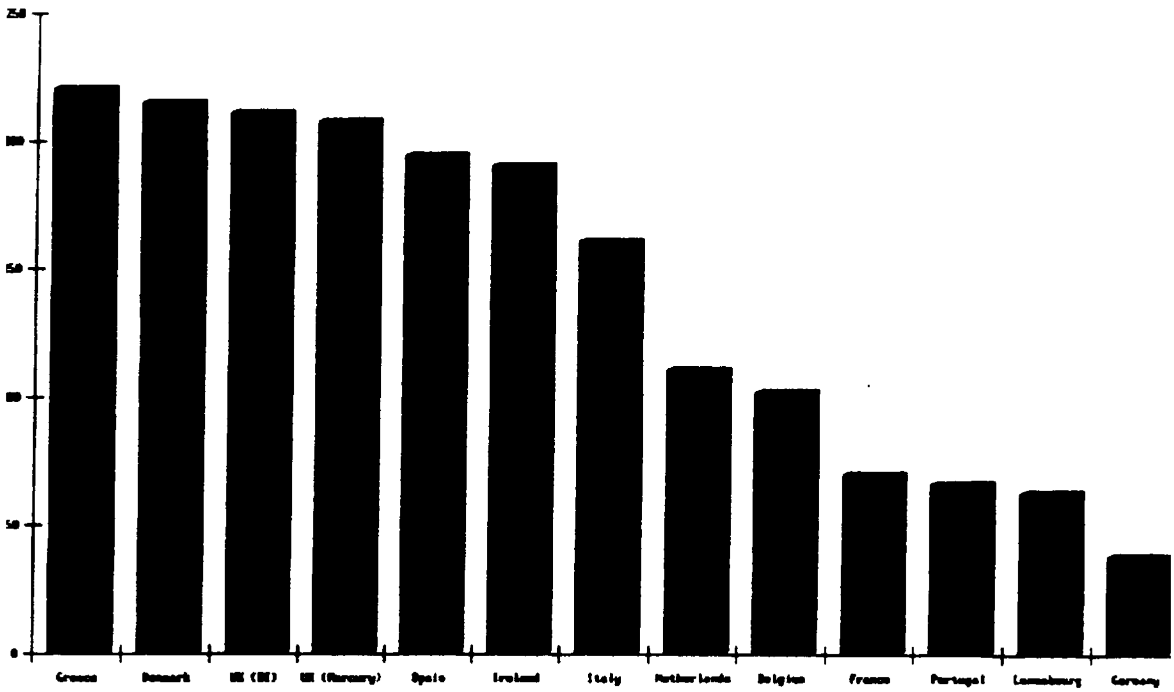


Graph 12.8.: *absolute prices for 1 minute call to EC countries in US$, 1990 derived from a basket*[67]

d) Access prices

Graph 12.9. depicts the connection charges in EC countries. These are relatively high in the UK, Denmark and Greece, while the DBP Telekom has the lowest access charges in Europe.

[67] Source: Fin Tech, September 6, 1990.



Graph 12.9. : *absolute connection charges in EC countries, in US$, 1990*[68]

Overall comparison

The price comparison has shown that in the UK competition has led to a rebalancing of tariffs similar to that in the USA. In an European context, the UK is among the countries with the highest connection and local charges. Considerable price decreases were encountered in those markets where competition has come about (national long-distance and intercontinental calls). Supposedly the cost variety of discounts and tariff bands leads to a price structure which is more related to the costs of providing an individual service. On the other hand, among the TOs operating as monopolists, currently five do not offer off-peak reduction for European wide calls.[69]

However, when compared with EC countries which have introduced cost orientation in tariffs, the UK is not especially cheap. The Netherlands, Denmark and Luxembourg are cheaper in access, local service, long-distance and intra EC calls. In the case of calls to the US they are next to the UK operators. OECD and Oftel studies have compared residential and business price baskets for the UK, Germany, France and Italy (1991). According to those studies France was the cheapest place for residential and business, while the UK and Germany were close.[70] Logica calculated the basket for business telephone costs for 1990 for EC and Scandinavian countries. The basket consisted of 30% local, 10% long-distance,

[68] Source: FinTech, September 6, 1990.

[69] Ungerer, H. (1990), p. 11.

[70] FinTech, February 21, 1991.

30% EC and 30% USA call prices. While getting similar results for the previously mentioned countries, the Logica index showed that business telephone costs in Denmark and Netherlands amount only to two third of the UK (BT). Several other countries also remained cheaper than BT.[71]

These data suggest that in the UK the duopoly mainly led to a rebalancing of tariffs. Compared with telecommunications tariffs in other advanced EC member countries, the UK has not become a cheaper place.

For universal service reasons one would expect countries with a relatively low connections rate to have relatively low prices for access and local services, while being expensive for long-distance services. The opposite may hold for countries having already achieved country wide coverage. These countries could be expected to be more concerned with cost based pricing. Overall, these presumptions are confirmed by the data, with some noteworthy exceptions. Countries like Spain, Greece, Ireland, Italy and Portugal have been the most expensive ones for international calls. However, only Portugal turned out to be among the cheapest for access and local calls. Italy and Greece instead are expensive also when access is concerned and take a middle position for local calls. In the case of Greece this might be explained with higher cost of installing cables among the different islands. That Italy is especially expensive in telecommunications services was further shown by the abovementioned international price comparisons of OFTEL. According to OFTEL, Italian customers are charged up to 30 per cent more than those in the UK[72]. Given the low quality of service, the Italian telecommunications operators therefore appear especially inefficient. This partly can be explained by the disjoint telecommunications system which prevented the TO from reaping economies of scope (compare chapter 9).

When investigating the pricing policies of countries with an advanced telecommunications network, one finds that some TOs already apply a cost orientation. Moreover these countries appear to be the cheapest places for telecommunications service in Europe (Luxembourg, Netherlands and Denmark). Germany instead has not gone far in realigning prices with costs. Although it has reached already universal service it is by far the cheapest country in Europe as far as customer access is concerned. In 1990 access cost in Germany less than one fifth of the price charged by BT. Access and relatively low local charges are cross subsidized by national and international long-distance charges which are the highest among the advanced EC member countries. As far as TOs have started to rebalance their tariffs, this process was concentrated on national services. Thereby over time the main burden of cross-subsidisation has been shifted towards international services. This was seen most clearly in Italy, where international tariffs followed local ones, while long-distance tariffs decreased over time. Intra EC tariffs are still 2.5 times higher than the highest

71 Logica (1991), Tarifica Annual, Tariff Comparisons and: Financial Times, July 4, 1991.

72 FinTech, February 21, 1991.

national long-distance tariffs[73]. Moreover, it could be seen that among member countries national prices diverge more than international ones. This may be explained by the existing of accounting rates which put a lower floor to international prices.

[73] Compare: Sessions, M. (1991), p. 30.

13. Estimation of Demand Elasticities

13.1. Introduction

As was pointed out in part II, assumptions concerning price elasticities of demand for telecommunications services are important when studying pricing principles. In the following estimates are presented to examine whether the assumptions made can be empirically supported. There already exists a literature of similar studies which were made for a variety of countries.[1] Most investigations, however, are concentrated on the USA.[2] No comprehensive study has been found for EC member countries.[3] For the four countries discussed here in detail I have therefore carried out these estimations myself.

In the following the results of estimates of the price elasticity of demand are reported for different basic services in Germany, Italy, Spain and the UK. In order to compare the findings, the estimations carried out below all rely on the same models. In this chapter I first present the models, explain the underying assumptions and describe the data set. Thereafter results are presented for the four EC member countries.

Most studies use demand functions for telephone services which contain as independent variables only the telephone price and real income.[4] Thereby possible cross price effects are neglected. In the first model presented here other means of communication are included as possible substitutes (like telex or telegram). A similar investigation has been carried out by Rea and Lage.[5] However, in order to compare results and to estimate subsamples, for international services I also estimated a second model without substitute services.

13.2. Demand Equations

The demand functions for telephone services are postulated to be:

(1) $\log \text{Local} = \alpha_0 + \alpha_1 \log(\text{PTL}/p) + \alpha_2 \log(\text{PEL}/p) + \alpha_3 \log(\text{PTx}/p) + \alpha_4 \log(\text{PTg}/P) + \alpha_5 \log(\text{Disinc}/p) + \epsilon_1$

1 See for instance for Australia: Beweley, Ronald and Delnzil G. Fiebig (1988), pp.393 - 409. For the USA: Griffin, James M. (1982), pp.59-66. Ben-Akiva, M., McFadden, D. and K.E. Train (1987), pp.109-123. Lage, G.M. and J.D. Rea (1978), pp. 363-381. For Switzerland: Gassmann, J.M., Gfeller, A. and W. Wasserfallen (1986), pp. 187-197. For West Germany: Neumann, K.-H., Schweizer, U., von Weizsäcker C. C. (1982), pp. 185-204, especially p. 194.

2 A good presentation and critique can be found in: Taylor, Lester D. (1980).

3 This may be explained by the fact that the necessary data are not systematically collected by TOs or related libraries. For my own studies they had to be assembled step by step from different sources (see appendix).

4 See for instance: Gassmann, J.M., Gfeller, A. and W. Wasserfallen (1986), p.188 and Bewley, R. and D.G. Fiebig (1988), p. 395.

5 For international communication services of the USA. Rea, J.D. and G.M. Lage (1978), p. 364.

(2) $\log \text{Long} = \beta_0 + \beta_1 \log(\text{PTLL}/p) + \beta_2 \log(\text{PEL}/p) + \beta_3 \log(\text{PTx}/p) + \beta_4 \log(\text{PTg}/P) + \beta_5 \log(\text{Disinc}/p) + \epsilon_2$

(3) $\log \text{France} = \tau_0 + \tau_1 \log(\text{PTFrance}/p) + \tau_2 \log(\text{PEL}/p) + \tau_3 \log(\text{PTx}/p) + \tau_4 \log(\text{PTg}/P) + \tau_5 \log(\text{Disinc}/p) + \tau_6 \log(\text{Trade}/p) + \epsilon_3$

where:

Local = number of local phone calls (annually).
Long: = number of long-distance phone calls (annually).
France = number of outgoing phone calls to, for instance, France (annually).
PTL = price index for a 3 minute local call.
PTLL = price index for a 3 minute long-distance call (> 100km) at day time.
PTFrance = price index for a 3 minute international call to, for instance, France at day time.
PEL = price index for an express letter.
PTx = price index for a telex (2 minutes).
PTg = price index for a telegram (20 words).
Disinc = household disposable income.
Trade = value of exports and imports between the two countries involved in the communication.
p = general price index.
ϵ_i = random disturbances.

The α's, β's, and τ's are assumed to be constant coefficients. Given the logarithmic specification they are also the elasticities of demand. It is assumed that the own-price effects are negative. The opposite is expected for the substitute services (express letters, telex, and telegram). Disposable income is supposed to represent the income constraint on households. In case of the international demand function the "trade" variable is used to represent the business sector which is supposed to have a high share in international calls.[6] For both variables it is expected that the elasticity of demand is positive.

13.3. Data

For all services annual data were collected for the period 1970 - 1989. Complete data for the years before 1970 could not be obtained. The dependent variable is measured as the total volume of phone calls made in one year.[7] Prices have been deflated by an index of

[6] For the national demand function different variables were introduced to represent "business demand". However, all available data was too much aggregated. Variables like "gnp" then had the same impact as the "disinc" variable. The latter was finally chosen to allow comparisons of national and international demand equations.

[7] For the same reason they are generally used in the literature as proxis. See for instance: Rea, J.D. and G.M. Lage (1978), p. 366-367.

general prices. The price for an individual service is determined for each year. In case of price changes during a year a weighted average was calculated. The appendix contains all data used for the estimations, including sources.

In order to investigate whether results have changed over time, I have also estimated the equations for subsamples. Results of these subsamples, however, can be taken only as a indicative, due to the small number of degrees of freedom. Compared to the model of the domestic market, as can be seen from equation (3), in the international market an additional variable has been added (trade). As a result, in case of subsamples too many degrees of freedom were lost. Subsamples therefore have only been calculated for the second model which excludes substitute services (see tables 13.3) to 13.6) for West Germany). Over the entire sample both models have been estimated in order to see whether results depend on the specific model chosen. Before calculating subsamples, first by introducing a dummy variable I tested whether a significant change in the own-price elasticity of demand occured. If this was the case, the estimations for subsamples were carried out.

There are several limitations imposed by the availability of data. The **aggregate measures** for household income and total trade are too broad in scope to measure the constraints of the demand function. Given the high concentration of long-distance phone calls on a few households and firms, some weighting is necessary. However, I had to rely on these imperfect proxys since more disaggregated data are not available.[8]

A second limitation stems from the **identification problem**. Generally, equations are identified since all nominal prices are determined by the Ministry. Thus all the independent variables are exogenous and no problem of simultaneity exists. However, it has to be assumed that capacity always had been sufficient, so that there has not been a constraint on demand. Thus it was assumed that the annual quantities of phone calls were indeed the quantities demanded at the particular price and year. Unfortunately it could not be determined whether supply has always been adequate.[9]

Finally, the problem of **spurious relationship** may occur in these demand equations. The problem of misspecification arises if two variables move in the same direction but do not have a causal relationship. This may appear if the data are strongly time trended, which leads to non-stationarity of time series.[10] A spurious relationship can be eliminated by including a further variable which determines the other two.[11] I introduced the "trend"

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8 This also applies for phone calls made during off-peak periods. No breakdown could be obtained from the DBP Telekom in order to weigh the price index.

9 For the identification problem see: Pindyk, R.S. and D.L. Rubinfeld (1987), pp. 186-190. And: Lage, G.M. and J.D. Rea (1978), p. 367.

10 See for instance: Hunt, L.C. and E.L. Lynk (1990), 232.

11 In several cases this was carried out. For instance, in the case of the Italian-German telephone market a variable representing "tourism" was introduced. Thereby I tried to investigate whether the annual flow of German tourists would explain some part of the dependent and the "disinc" variable. See also chapter 9.

variable, which was tested for significance. Where it was significant the variable is included in the model. Overall the "trend" variable did not considerably change the results.

13.4. Empirical Results for West Germany

The empirical results are presented in tables 13.1 to 13.6 for West Germany. After the results for the three other member countries have been reported, in chapter 14 I will discuss the conclusions which can be drawn for the European telecommunications sector in general.

The tables contain the estimates of demand elasticities. In brackets the values of the t-statistic are reported. The table includes also the Durbin Watson value (DW), the R^2, and the "F-statistic for significance". The models have been calculated and tested with the PC-give program. Various test statistics can be found in the appendix.

a) domestic services

Table 13.1 and 13.2 comprise the empirical results for the local and national long-distance services in West Germany. Comparing equations (1) and (2) one finds that the own-price elasticity of demand for the local service is almost zero (-0.008), the t - value indicates that the null hypothesis that PTL is equal to zero cannot be rejected. Instead the own-price elasticity for the long-distance service has been estimated to be -0.18. The value is significant. In both cases the elasticity is negative as was expected. Moreover, the result supports the assumption made that long-distance services are more price elastic than local ones. The demand for both services is very elastic in regards to disposable household income. The results for the substitute services were not satisfying. While not always significant, in two cases they have the "wrong" sign. It was expected that the cross price elasticity would be positive.
For the subsamples it can be said that apparently the own-price elasticity of demand has risen over time in the long-distance market.[12] However, as the DW test indicates, there is negative serial correlation for equation (2b). For national services, therefore, the results of the subsample are not relyable.

b) International Services

Results for international services are depicted in table 13.3 to 13.6. Table 13.3 to 13.5 present estimations for services to EC member countries. These are compared afterwards with the German-US market.
The estimates of the own-price elasticity of demand for services to the three EC member countries report values between -0.33 and -0.51. All values are significant. On average they are more than twice the value estimated for the price elasticity for national long-distance.

12 Given the low t-value for the local service in equation (1a) and (1b), for this service a similar conclusion cannot be made.

The "trade" variable is significant only in the case of France, with the predicted positive sign. The income elasticity again is high, positive and always significant. The cross-price elasticities of substitute services appear to be low and positive (with the exception of telex). Equation (3a) to (5a) represent the alternative model which excludes the substitute services. As can be seen, the own-price elasticity increases to the range -0.5 to -0.67.
The subsamples show clearly for all three markets that the own-price elasticity of demand rose significantly for the second period. The value estimated for the entire period thereby lies in between the ones obtained for the two subsamples. Test results did not indicate autocorrelation, misspecification, heteroscedasticity or missing variables.
Finally, if compared to the telephone demand for calls outgoing from West Germany to the US, these results are confirmed. In the second period the own-price elasticity increases. However, one finds that for both models and also for the subsamples the price elasticity for calls to the USA exceeds that estimated for EC countries.

Equation No	Time period	Intercept	PTL	PRL	PTx	PTg	Disinc	F-statistic for significance	R^2	DW
(1)	1970-89	-12.158 (4.531)	-0.008 (0.040)	-0.438 (3.415)	0.748 (5.791)	-0.050 (0.705)	3.462 (7.857)	422.82	0.993	2.47
(1a)	1970-82	-8.451 (1.581)	-0.144 (0.387)	-0.036 (0.096)	0.513 (1.795)	-0.192 (1.818)	2.851 (3.234)	198.78	0.993	2.37
(1b)	1977-89	-9.750 (2.023)	-0.197 (0.521)	-0.425 (2.708)	0.639 (2.971)	-0.056 (0.433)	3.069 (3.892)	70.62	0.981	2.48

Table 13.1: *Demand for local telephone service in West Germany*

Equation No	Time period	Intercept	PTL	PBL	PTx	PTg	Disinc	F-statistic for significance	R^2	DW
(2)	1970-89	-13.557 (7.095)	-0.180 (2.097)	-0.222 (2.069)	0.595 (5.610)	-0.023 (0.290)	3.565 (11.396)	587.63	0.995	1.73
(2a)	1970-81	-1.199 (0.212)	-0.135 (1.858)	0.213 (0.985)	-0.532 (1.034)	-0.226 (2.316)	1.533 (1.646)	318.98	0.996	1.57
(2b)	1978-89	-11.030 (2.672)	-0.189 (1.650)	-0.133 (1.218)	0.532 (4.021)	0.210 (1.793)	3.160 (4.745)	122.90	0.990	2.96

Table 13.2: *Demand for long distance telephone service in West Germany*

Equation No	Time period	Intercept	PT	PBL	PT_x	PT_g	Disinc	Trade	F-statistic for significance	R^2	DW
(3)	1970-1989	-9.549 (4.666)	-0.477 (7.847)	0.193 (1.269)	-0.907 (4.575)	0.141 (1.390)	1.567 (3.340)	0.522 (1.626)	688.93	0.997	2.27
(3a)	1970-1989	-10.709 (4.014)	-0.658 (11.267)				1.395 (2.316)	1.205 (3.149)	591.61	0.991	1.73
(3b)	1970-1981	-21.568 (5.421)	-0.222 (1.490)				3.720 (4.231)	0.219 (0.432)	267.60	0.990	1.90
(3c)	1978-1989	-24.419 (7.633)	-0.857 (23.102)				4.104 (6.233)	0.213 (0.735)	713.44	0.996	2.06

Table 13.3: *Demand for international phone calls from West Germany to France*

Equation No	Time period	Intercept	PT	PBL	PT_I	PT_g	Disinc	Trade	F-statistic for significance	R^2	DW
(4)	1970-1989	-20.854 (3.925)	-0.515 (3.163)	0.229 (1.135)	-0.456 (1.262)	0.261 (1.175)	3.587 (8.708)	0.143 (0.488)	383.51	0.994	1.44
(4a)	1970-1989	-25.536 (6.315)	-0.672 (5.461)				4.420 (5.923)	-0.017 (0.064)	793.61	0.993	1.51
(4b)	1970-1981	-18.791 (4.271)	-0.270 (1.188)				3.110 (3.842)	0.546 (1.826)	467.47	0.994	1.65
(4c)	1978-1989	-35.358 (8.633)	-0.771 (7.901)				6.017 (8.303)	-0.154 (0.700)	200.96	0.990	2.09

Table 13.4: *Demand for international phone calls from West Germany to Great Britain*

Equation No	Time period	Intercept	PT	PBL	PTx	PTg	Disinc	Trade	F-statistic for significance	R^2	DW
(5)	1970-1989	-20.715 (9.972)	-0.334 (3.760)	0.066 (0.403)	-0.900 (3.574)	0.226 (1.372)	3.692 (8.839)	-0.029 (0.107)	482.98	0.995	1.98
(5a)	1970-1989	-24.699 (11.320)	-0.497 (6.333)				4.367 (9.797)	-0.038 (0.126)	596.56	0.991	1.49
(5b)	1970-1981	-33.503 (10.398)	0.056 (0.0304				5.786 (9.344)	-0.014 (0.033)	302.00	0.991	2.27
(5c)	1978-1989	-24.409 (5.460)	-0.620 (8.389)				4.316 (5.031)	-0.070 (0.218)	247.70	0.989	2.47

Table 13.5: *Demand for international phone calls from West Germany to Italy*

Equation No	Time period	Intercept	PT	PBL	PTx	PTg	Disinc	Trade	F-statistic for significance	R^2	DW
(6)	1970-1989	-32.981 (5.208)	-0.606 (1.709)	-0.142 (0.232)	-0.047 (0.188)	-1.180 (1.716)	5.165 (4.402)	0.499 (1.052)	236.46	0.991	1.53
(6a)	1970-1989	-38.976 (12.471)	-0.897 (5.973)				6.267 (12.293)	0.300 (0.857)	443.19	0.988	1.68
(6b)	1970-1981	-38.828 (11.428)	-0.850 (2.130)				6.167 (10.720)	0.446 (1.637)	471.34	0.994	2.05
(6c)	1978-1989	-17.123 (1.998)	-1.135 (6.801)				3.067 (2.325)	-0.187 (0.453)	91.92	0.972	1.78

Table 13.6: *Demand for international phone calls from West Germany to the USA*

13.5. Estimation of Demand Elasticities For Italy

As in the case of Germany, data were collected for the period 1970-1989. Principally the models have not changed to the ones used before. However, due to the availability of data minor changes had to be introduced. Unfortunately for the telex service national data were available only for the period 1976-1989. The latter period, however, does not offer sufficient observations to estimate subsamples. Therefore, for the model comprising the period 1971-1989 the telex service had to be neglected. However, estimates for the period starting 1976 are included to see whether results change. The "disinc" variable has been lagged since test results indicated that the lag is significant. Moreover, without the lag the value of the RCSS test was high, indicating autocorrelation. The test results generally improved with the lag. They can be found in the appendix.

Local Service

For the entire period and also for the subperiods all variables are significant. The substitute service PEL has the expected sign, while the price for telegrams is negative. The coefficient for household incume is above 1 and positive. It does not change much for the two subperiods. The own-price elasticity of demand finally is relatively low over the entire period (-0.139). This corresponds to the result obtained for West Germany. In contrast to the results obtained for the former, however, equation (7a) and (7b) indicate that the price elasticity for local telephone calls has risen over time.

For the latter two equations the small number of observations and the test results reduce their reliability.

Equation (7c) then mainly confirms the previous results. The substitute services have small coefficients. Telex and express letters are not significant. The income variable has not changed.

Long-distance Service

Again the equation for the entire period excludes "telex". Coefficients do not change considerably if (8) is compared with (8a). I tried to break down equation (8) into two subsamples as before. However, a low Durbin Watson value and also a very low value for the Reset test indicated misspecification due to missing variable(s). I therefore do not report the results for the subsamples.

In both equations PEL is significant and has the predicted positive sign. The other substitute services are not significant. The income variable is significant and positive. Finally, the coefficient of the own-price elasticity of demand is significant and negative. It exceeds the estimated elasticity for local service. Moreover, one finds that for the more recent period (8a) the price elasticity of demand is increased.

International Services

As can be seen in the appendix data have been collected for phone calls from Italy to Germany and to all the EC. The former were reported as incoming calls from Italy per year by DBP Telekom. Unfortunately the estimates and the test results were not conclusive. A very low Durbin Watson value and the Reset test indicated missing variables. Several variables were introduced, without improving test results decisively.[13] Thus, no findings can be reported for international services here.

[13] For instance, a variable for "tourism" was introduced, supposing that the number of outgoing calls from Italy to EC countries may be influenced by the number of tourists travelling to Italy every year. The variable was significant but did not improve test results sufficiently.

Equation No	Time period	Intercept	PT	PBL	PTx	PTg	Disincl	F-statistic for significance	R^2	DW
(7)	1971-1989	-4.100	-0.139	0.200		-0.102	1.162	350.00	0.990	1.85
		(4.754)	(1.632)	(5.232)		(2.220)	(14.999)			
(7a)	1971-1981	-2.654	-0.147	0.207		-0.160	1.031	82.95	0.982	2.23
		(2.381)	(1.568)	(2.541)		(2.861)	(10.270)			
(7b)	1978-1989	-5.204	-0.256	0.129		-0.178	1.259	107.87	0.984	2.50
		(3.131)	(1.870)	(2.558)		(0.247)	(8.599)			
(7c)	1976-1989	-4.318	-0.270	0.124	0.029	-0.028	1.183	137.62	0.989	2.40
		(3.707)	(2.024)	(1.993)	(0.279)	(0.257)	(11.119)			

Table 13.7: *Local demand equations for Italy*

Equation No	Time period	Intercept	PT	PRL	PTr	PTg	Disincl	F-statistic for significance	R^2	DW
(8)	1971-1989	-8.208 (1.873)	-0.340 (1.908)	0.481 (7.106)		-0.211 (2.553)	1.401 (3.524)	379.58	0.991	1.19
(8a)	1976-1989	-7.840 (0.916)	-0.389 (1.731)	0.473 (3.431)	-0.194 (0.447)	-0.102 (0.665)	1.350 (1.699)	176.31	0.991	2.29

Table 13.8: *Long-distance demand equations for Italy*

13.6. Estimation of Demand Elasticities For Spain

Demand equations for Spanish telephone services correspond to those discussed for Germany. Unfortunately for Spain no data about the quantity of local calls was available. Prices for substitute services could not be obtained for the early 1970s. Thus for the equation for national long-distance calls I had to choose a shorter interval (1974-1987). Subperiods were formed again for the second model, neglecting substitute services.

Regional data have been published by the Banco di Bilbao. These comprise disaggregated data on the quantity of national long-distance calls and disposable income of households, available for the period 1976-1986. For the "disinc" variable only every second year was reported, so that half of the values had to be estimated. The share of disposable income of each region to the national value of disposable income has been relatively stable. The approximation of the missing variable for a certain region then was carried out according the following procedure:

$$\frac{disinc^r_{1978}}{disinc^n_{1978}} = 0.5\,\frac{disinc^r_{1977}}{disinc^n_{1977}} + 0.5\,\frac{disinc^r_{1979}}{disinc^n_{1979}}$$

$disinc^r_{1978}$ = the estimated value of disposable income of region r in 1978

$disinc^n_{1978}$ = national disposable income in 1978.

Then I carried out estimations for three poor spanish regions: Guadalajara, Soria,Teruel and for three rich regions: Madrid, Alicante, Barcelona.

The selection was based on per capita income. The short period and the estimation of the disinc variable reduce the reliability of the results for the regions. In some cases the result of the reset test indicates missing variables. However, further variables could not be included given the small number of degrees of freedom. Moreover, especially for the less developed regions, results to some extent might have been influenced by insufficient capacity. Thus actual demand might have been higher than the number of calls observed. However, as will be seen, the main result of the regional estimates is that in poor regions the price elasticity of demand is considerable higher. Since over time the real price of long-distance calls has fallen, capacity shortage leads then to an underestimation of price elasticity. Thus as far as congestion has occured in poorer regions, one might expect even more drastic differences in the price elasticity of demand.

For international phone calls originating in Spain no disaggregated data could be obtained. However, from the DBP Telekom I received data of incoming calls from Spain to West Germany, measured in million chargeable minutes 1970-1988. Thus estimation could be carried out for the Spanish-German telephone market. Unfortunately from Telefónica I only obtained prices for a 3 minute call to Germany for the period 1978-1988. Therefore for the international market there are not enough degrees of freedom to create subsamples. For the same reason not all substitute services could be included. In the

equation presented here I have left out "telex". The estimation results for the coefficients of other variables did not depend much on which substitute service was left out. This can be seen also when comparing results for (10) and (10a). The "disinc" variable was lagged which improved test results.
As before I present in the following the main results of these estimations. Test results are reported in the appendix.

1) National services

a) national long-distance

Both, model 1 including substitute services and also model 2 show that the absolute value of the direct price elasticity of demand for Spanish long-distance calls is above 1. In both cases the price elasticity is significant. The value of the own-price elasticity is not altered much when substitute services were taken out. To see this, compare (9) and (9a). Not all substitute services are significant. Disposable income is significant only in the second model, neglecting substitute services.
When compared to the results of Germany, Italy and the UK one finds that the values obtained for the direct price elasticity of national long-distance services are very high. They are well above one and exceed the values obtained for other countries by more than 100%. In all cases the estimate has been significant.
Equations (9b) and (9c) again show the results for the subperiods. As for Germany and Italy one finds that the price elasticity has increased in the second period.

b) Regional equations

The most striking result of the regional estimates is that they indicate that the own-price elasticity of demand varies considerable among regions. In the case of the three rich regions the estimated coefficients correspond to the results which were obtained for West Germany overall. However, in the case of the poor regions a much higher price elasticity of demand was obtained. On average the absolute value for the poor regions exceeds the ones obtained for the rich ones by more than 100%. These results may be compared to the ones obtained for the national level. Also in the latter case, the relatively poorer country (Spain) has a much higher own-price elasticity of demand than richer Germany. Italy remains in between.
All values obtained for substitute services have not been significant.

2) International services

As has already been pointed out, the availability of data does not permit the estimation of subsamples for the international service. For the decade 1978-1988 for both models I found that the own-price elasticity of demand, disposable income and trade are significant. They all have the predicted sign. The own-price elasticity of demand of -0.8 corresponds to values obtained for other EC member countries. However, it is lower than the one for national long-distance services. This result is especially striking because from chapter 12.2.2. it could be seen that national prices are relatively cheap, while international ones are expensive in Spain.

Trade has had a relativelly small impact on telephone demand, while the income elasticity has been relatively high. This confirms results obtained for other EC countries. The substitute services are significant, telegram having the supposed substitute effect. Express letters instead have a negative sign, indicating a complementary character.

Rquation No	Time period	Intercept	PT	PRL	PTr	PTg	Disincl	F-statistic for significance	R^2	DW
(9)	1974-1987	6.364 (0.573)	-1.424 (6.321)	-0.143 (0.284)	0.097 (0.401)	0.406 (0.788)	0.934 (0.672)	25.83	0.942	1.94
(9a)	1971-1987	-1.632 (0.419)	-1.336 (7.721)				1.907 (3.875)	173.97	0.961	1.37
(9b)	1971-1980	-6.101 (2.257)	-0.906 (5.160)				2.475 (7.223)	175.87	0.980	2.14
(9c)	1978-1987	25.950 (3.47)	-1.657 (7.735)				-1.528 (1.633)	36.95	0.913	2.04

Table 13.9: *Long-distance demand equations for Spain*

Equation No	Time period	Intercept	PT	PEL	PT_g	Trade	Disinc	F-statistic for significance	R^2	DW
(10)	1978-1988	-10.739 (6.360)	-0.780 (5.969)	-0.543 (3.688)	0.345 (1.792)	0.157 (1.505)	1.412 (4.630)	545.74	0.998	2.49
(10a)	1978-1988	-10.790 (5.460)	-0.877 (6.099)			0.232 (1.415)	1.356 (3.670)	294.73	0.992	1.53

Table 13.10: *Demand for telephone calls from Spain to West-Germany*

Equation No	Time period	Intercept	PT	PBL	PTr	PTg	Disincl	F-statistic for significance	R^2	DW
(11)	1976-1986	1.204 (1.389)	-0.810 (0.490)	1.170 (0.889)	-1.353 (1.229)	0.910 (1.356)	0.549 (1.791)	20.88	0.954	2.28
(11a)	1976-1986	0.718 (0.915)	-1.020 (0.758)	0.944 (0.842)	-0.831 (0.946)	0.571 (0.975)	0.464 (1.581)	17.91	0.947	2.27
(11b)	1976-1986	-0.152 (0.095)	-2.725 (0.896)	0.045 (0.018)	-0.466 (0.216)	1.390 (1.121)	0.421 (0.717)	10.00	0.909	2.37

Table 13.11: *Long-distance demand equations for three poor Spanish regions*

Equation No	Time period	Intercept	PT	PBL	PT_x	PT_g	Disincl	F-statistic for significance	R^2	DW
(12)	1976-1986	5.461 (14.014)	-0.347 (0.483)	0.633 (1.021)	-0.706 (1.447)	0.308 (0.965)	0.115 (2.238)	21.42	0.955	2.18
(12a)	1976-1986	3.722 (8.502)	-0.429 (0.519)	-0.672 (0.980)	-0.782 (1.444)	0.404 (1.119)	0.177 (2.240)	24.05	0.960	2.11
(12b)	1976-1986	5.355 (14.381)	-0.472 (0.682)	0.715 (1.191)	-0.625 (1.311)	0.181 (0.589)	0.100 (1.993)	22.32	0.957	2.16

Table 13.12: *Long-distance telephone demand for three rich Spanish regions*

13.7. Estimation of Demand Elasticities For the UK

Data

While for Italy and Spain the data were constrained by missing information about prices, in the case of the UK the constraint has been quantities. British Telecom does not reveal any information about the quantity of calls transmitted after competition was introduced in 1984. As a consequence no subsamples could be formed due to the small sample size. For the same reason no comparison could be made of the pre-competitive period and the time thereafter. However, from the DBP Telekom I received the quantities of incoming calls from Britain until 1988. While these data only refer to one international market, at least some comparisons could be made.

In the anual *Statistical Abstracts* furthermore one finds quantities of all international phone calls made in Britain each year (until 1984). However, given the wide range of price bands applied by BT, these data were too much aggregated.[14], so that I did not use them for my estimations. For national services the "trend" variable was significant and therefore it was included in the model.

Overall the estimates for the British telephone services are less reliable than those obtained for the other countries. This is mainly due to a strong price increase in 1974 (the price per unit rose by 300%).

Given that no data were available for the period after 1984, I could not compare the results obtained with others for a period starting after 1974. The only exception being the UK-Germany market.

Local and Long-distance Calls

Overall the results for national services are not satisfactory. They are presented in table 13.13. The own-price elasticity for the local service is very low but does not have the predicted sign. Household disposable income has an elasticity below 1 and is significant.

In the case of the long-distance market the own-price elqsticity is not significant. The "disinc" variable turns out to be the only significant one beside the "trend", both having the predicted positive sign.

International Services

In table 13.14 equation (14) refers to the UK-EC market and equations (14a) to (14c) refer to the British-German market.

As was said before the strong price increase in 1974 very much determines results if it is included. This was the case for national services and also applies for the UK-EC and UK-Germany market in equations (14) and (14a). The own-price elasticity of demand is very low and it is not significant.

[14] Without having rough estimates of the share of continental and intercontinental calls, no weighing was possible.

For the British-German market results are much improved if only the post 1973 period is looked at. This is done in (14b) and (14c). The "disinc" and "trade" variables are significant and have the predicted sign. The value for the own-price elasticity is negative and significant. It is higher for the more recent period. This confirms results previously obtained for Germany and Spain. Comparing (14c) and (4c) - the demand equation for the German-UK market - I find that the own-price elasticity does not vary much for both markets. However, for the latter the "disinc" variable is much more elastic.

Equation No	Time period	Intercept	PT	Pg	PTx	Disinc	Trend	F-statistic for significance	R^2	DW
(13)	1970-1984	0.870 (0.285)	0.091 (2.495)			0.780 (2.677)	0.409 (6.815)	302.37	0.988	1.70
(13a)	1971-1984	-5.279 (1.696)	-0.002 (0.039)		0.068 (0.706)	1.198 (4.041)	0.060 (3.673)	280.68	0.992	1.25

Table 13.13: *Local and long distance demand equations for GB*

Equation No	Time period	Intercept	PT	PBL	PT_r	PT_g	Disincl	Trade	F-statistic for significance	R^2	DW
(14)	1972-1984	-23.637 (1.943)	-0.091 (0.200)		-0.763 (4.528)	0.149 (0.582)	2.210 (1.694)	1.156 (3.529)	43.75	0.969	2.24
(14a)	1971-1988	-16.295 (2.492)	-0.151 (0.572)	0.318 (2.093)	-0.506 (6.169)	-0.283 (0.229)	1.347 (1.980)	0.713 (5.144)	178.94	0.990	1.97
(14b)	1974-1988	-10.885 (3.503)	-0.326 (2.842)		-0.706 (12.338)		0.983 (3.361)	0.550 (7.183)	947.30	0.997	1.90
(14c)	1977-1988	-10.014 (2.067)	-0.871 (1.791)		-0.517 (4.140)		1.029 (2.447)	0.366 (2.097)	394.81	0.996	2.44

Table 13.14: *Demand equations for international phone calls from GB to the EC and to West Germany*

14. A Concluding Assessment

The previous disscussion has shown that continental EC countries unanimously opt for a **service - based** approach towards competition.
This approach has been sketched by the Commission. However, considerable differences persist, given that member countries like Spain and Italy have appeared reluctant to follow suit. The basic strategy relies on the separation of reserved and unreserved services. According to the Commission's approach the former only comprise the basic telephone service. They remain under the exclusive domain of the national TOs. For all other services the national network operator has to permit access on non discriminatory terms. However, while this approach still reserves 85 per cent of telecommunications service revenues for the former (state) monopolists, several member countries still object it as being too liberal.
Facility - based competition was rejected on the national level as involving excessive investment costs. The costs of a second network were reckoned to be higher than the benefits of competition. This view, however, was not shared by the UK. On the EC - wide level the Commission maintained that the necessary investments into the ISDN network would justify restrictive measures to protect the TO's monopoly as a source of revenues. Thus, it is argued that network competition would threaten the establishing of the ISDN network which is deemed necessary for the VANS market. Indeed the recent price increases were justified by the ISDN investment programmes. Thereby to a large extent residential consumers pay for a network upgrade mainly used by business. This put the traditional scheme of redistribution upside down. However, the present scheme is no better justified than had been the former.[1] I have argued that the economic rationale for total network integration via ISDN is weak. The ISDN concept corresponds to the traditional view of a centrally planned network and exclusive provision. It is used as a defense against private entry which allegedly creates network fragmentation. The rationale for ISDN is based implicitly on the assumption of static cost functions. The aim is to avoid duplication of network investments. However, the large cost reductions due to technological progress make a static approach hardly applicable to the telecommunications network (see chapter 2.1.1.7.). Contrary to a monopolistic structure, competition can be expected to shift the cost curves downwards. The cost effects due to this downward shift may very well offset economies of scope which are associated with network integration. Thus, ISDN cannot be defended on the basis of economies of scope and preempts the possibility of competition between different types of network.
National TOs have been surprisingly fast in carrying out the upgrading ot the network. It has been argued that one possible reason for the speed with which ISDN investments are carried out may be found in strategic behavior. The ISDN network will imply higher fixed and sunk costs and lower marginal costs compared to the coaxial cable network. This raises entry barriers in the industry. Potential entrants have to fulfil higher technical standards in

1 Since the Commission did not force TOs to switch to cost based pricing, the services which face a high price elasticity of demand pay for the fixed investment costs. This contradicts the Ramsey pricing rule.

order to get interconnection with the existing network. Moreover, the fibre optic cables have a capacity which is about 10 times higher than the one of the old coaxial cables. This may allow incumbents to deter entry. It also can be interpreted as a signal to regulators that further investment by private competitors into transmission capacity is not needed. Evidence for this kind of strategic behavior has been found in the intercontinental market where measures of liberalisation have occured earlier. Over two decades Intelsat held excess capacity in the space segment of the satellite network. The FCC intervened repeatedly to prevent further investments into the satellite capacity. More recenty incumbents have greatly increased the capacity of submarine intercontinental cables. For the mid 1990s considerable excess capacity is expected in this market.

One interesting conclusion of the **country-by-country** analysis is that economic reasoning has hardly played a major role for the development of the present market structure. Instead historical and political reasons dominated. Recently, all three continental member countries have had a rationale to introduce network competition. In all cases these reasons are related to national pecularities. This leads to the conclusion that there does not exist a unique strategy which is optimal for all member countries. However, in all cases governments refrained from investigating seriously the alternative of liberalizing the infrastructure. In case of Spain, Telefonica is not able to keep pace with raising demand. Shortage of capital is a major constraint on network development. In these circumstances it could be beneficial to allow private firms establishing local networks in rural areas which are not sufficiently catered for by the TO. The "independents" in the USA could be taken as a possible example. They developed parallel to AT&T and thus existed long before 1984. The period of "early competition" in the USA showed that competition does not hamper network development. Instead it allowed the USA to obtain national coverage much quicker than the PTT system in Europe did. Until today the USA have a higher access rate of households than EC member countries. This can be seen from figure 14.1.

In the case of Germany, reunification created a somewhat similar situation. The rudimentary state of development of the East-German telecommunications network required a huge investment programme. The underdeveloped telephone network is considered one of the main obstacles to economic development of what used to be East Germany. The potential benefits which can be expected from licensing private firms setting up local or long-distance networks in this territory were pointed out. The merger of the West German and East German PTTs and the extending of DBP's monopoly rights supposedly has slowed the process of network development in the east.

Italy, finally, demonstrates most clearly that economic reasoning has not been the backbone for the set-up of the network structure. As was pointed out in part II, the major rationale for monopoly provision is the existence of economies of scale and scope of an integrated network. For historic reasons, however, in Italy the local, long-distance and international networks have been kept separated. Cross-subsidisation between the different entities has been prohibited. In any case the state kept control over all different networks. The Italian industry structure therefore to some extent resembles that of the United States after the

breakup of AT&T. Similar to the BOCs, SIP controls the local and parts of the long-distance network while the ASST is responsible for the main bulk of long-distance traffic. However, network fragmentation and state control ensured that while efficiency gains due to economies of scope were relinquished, no efficiency gains were reaped according to competition. Thus Italian consumers supposedly got the worst of both worlds in telecommunications. All empiricial evidence found supported this conclusion. In the past the Italian TOs provided low quality at a high price without having sufficient financial means to foster universal service. As a result demand for telecommunications services is considerably lower in Italy compared with other European countries. Parallel to other EC member countries, Italy also chose to reform the telecommunications industry in the 1980s. More clearly than in all other cases the reform of the Italian telecommunications industry offered the alternative of going the US or the (continental) European way. Introducing competition in the long-distance sector would have been feasible without undergoing a tedious and costly process of divestiture as was necessary in the case of AT&T. While network competition was not studied at all, the proposed reform belately tries to introduce the traditional TO model in Italy. However, given the political inertia, it is likely that by the time *SuperSTET* is created, several European countries may have already introduced network competition. Thus it may be outdated from the beginning.
Despite various promises to mend their ways when carrying out reforms on a national level, governments continue to abuse "their" TOs for general policy objectives. Recent examples of this behavior could be found for all three continental member countries.[2] Moreover, when measures of liberalisation were introduced at all, this was done in a way to protect the TO from "too much" competition. An example at hand is, for instance, mobile telephony.

The "EC-approach" was compared with the "Atlantic" approach of facility-based competition. It was found that the US and UK have chosen very different strategies towards this end. In both cases a "mixed regime" came about in which a dominant firm remains regulated by an independent authority. Experience in the US computer enquiries have hinted towards the nonsustainability of most regulation. The growing complexity of networks and services makes it difficult to develop consistent rules. It was found that the separation of the "competitive" parts and the "natural monopoly" core has not created a new stable industry structure. Already seven years after divestiture it becomes obvious that the local network is also losing its "natural monopoly" characteristics. Adding that state regulators do not want to relinquish the old cross-subsidisation scheme, the danger of inefficient entry arose. Mainly private networks are increasingly used to bypass the public switched network.

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2 As a further example one may refer to France. *France Telecom* is not treated differently to DBP Telekom. Being France's sixth biggest company it nevertheless is its largest taxpayer, thanks to a special levy. It shall be used, moreover, to subsidize the French computer and electronic firms like Bull and Thompson. See: Economist, October 5, 1991.

In the UK instead this separation was not carried out. However, by leaving BT as an vertically integrated firm, the problems of interconnection charges arose. The dominant operator has a strong incentive to discriminate against its competitor as far as interconnection into the local network is concerned. Simultaneously introducing liberalisation and privatisation handicapped competition. It prevented the restructuring of BT and led to a asymmetric duopoly regime.
I have argued that Mercury's competitive impact on BT has been rather low. When a comparison of basket prices was made, different sources found that BT is not cheaper than the monopolistic DBP Telekom or France Télécom. Thus, competition mainly led to a rebalancing of tariffs but not necessarily to cost reductions and generally lower prices. BT's profits, moreover, were similar to those realized by the monopolistic DBP Telekom in 1990. Among TOs in continental Europe the latter's profits are exceptional. This was interpreted as a further sign of competitive pressure on the dominant firm in the UK. As a result, the recent White Paper has pressed for further steps of liberalisation.

Although in both cases the mixed regime has created serious regulatory problems, the overall impact of liberalisation is positive. In both countries it led to a rebalancing of tariffs without threatening the universal service goal. Cross subsidies were more directed to needy households, thereby becoming more efficient themselves. In both countries also the service market has developed much more than in EC member countries which supposedly follow the "*service-based*" strategy towards competition. Both the variety and the prices of VANS provided in the UK are more favourable to consumers than on the continent. This clearly contradicts the view that network competition hampers the development of the VANS sector. The benefits from the electronics revolution spurred by competition may very well offset those related to economies of scale and scope.

In the empirical part I estimated the price elasticities of demand for basic telephone services and compared the price setting policy in the four EC member countries. The estimated regressions confirmed the assumption made that demand for the long-distance service is more elastic than the one for the local service. Moreover, it was found that for all international services the own-price elasticity exceeds the one for national ones. In the intra-EC market, price elasticities vary considerably depending on the origin of the call. Among the international services the highest estimates were obtained for the service to the USA. This result is interesting because it indicates that price decreases following from liberalisation will have the strongest quantity effects in the intercontinental market. Relatively speaking, it can be expected that measures of liberalisation will create higher (positive) welfare effects for international services than for national ones. This result leads to the conclusion that a "second-best-strategy" towards facility based competition in Europe should start with liberalizing the international telecommunications sector (a point which is discussed in more detail in part IV).

The demand estimates also showed clearly that telephone demand is very responsive to changes in household income. For international services, moreover, a positive correlation between trade and telephone demand was found. However, telephone demand appears less elastic as regards to "trade" than regarding household income.
A further interesting result of the empirical investigations is related to the apparent increase of the own-price elasticity over time. A development which did not emerge as a structural break but as a continuous development over time. This could be found for the national long-distance and the international services. The increase in the price elasticity of demand could not be expected, given the overall decline in real telephone prices for all countries over time. I the case of a linear demand curve, a lower price signifies a downward move on the demand curve, thus ceteris paribus the price elasticity of demand should be lower. This effect then must have been more than compensated by an outward shift of the demand curve. The increase in the price elasticity of demand appeared parallel to a more mature network, a higher access rate, and increasing national income. This may lead to the conclusion that cost based pricing leads to higher welfare gains in a relative advanced economy having already established a fully fledged telecom network. Competition then becomes more attractive when a nationwide network has already been installed.
The results for alternative means of communication services were less clearcut. Some authors have claimed that telegram and telex are substitutes for the telephone service in the international market while they are not for national ones. Overall, this could not be confirmed by my estimates. In the regressions I have carried out, the coefficients for substitute services were often not significant and they did not always have the predicted sign. Among other reasons this may explained by two factors. First, the substitute relationship between these services and the telephone service may be weak. Secondly, these services may not have either a purely substitute or complementary character. For instance a telegram may be sent to confirm a certain information given already on the phone (complementary). In another situation it may be chosen instead of the phone call because it is less expensive (substitute effect). In this case there are two overlapping effects which partly cancel out.
The price comparisons have shown that TOs have introduced some cost orientation during the last decade. However, compared to the dramatic rebalancing of tariffs which occured in the USA and the UK, in continental Europe this "cost orientation" has not gone far. It may rather be a reluctant response to increasing pressure from the Commission and business pressure groups. Moreover, the rebalancing of tariffs was limited towards national services. Even in the UK and the USA international services were not included in the tariff rebalancing. The present "cooperative" system in the international market prevents any drastic unilateral price adjustments. Thus, over time the burden of cross-subsidisation has been shifted from the national long-distance to the international services.
Cost orientation of tariffs does not depend on whether a (public) monopolistic or a competitive regime prevails. As was seen from the discussion of optimal telecommunications tariffs, a public monopolist may be encouraged to apply cost based

pricing by state regulators. In general the tariff policy of Scandinavian operators has followed more narrowly optimal pricing rules. However, in the EC all experience has shown that the political process prevents a rebalancing of tariffs in countries with a monopolistic regime. When comparing the tariff structure of member countries this clearly could be seen.

It was pointed out in part II that the rationale for cross-subsidisation becomes weaker the more developed a network is. From this one may expect lower cross-subsidisation in member countries which already have established a fully fledged telecommunications network. For West Germany, however, it was found that compared to other EC members, customer access and local services are especially cheap. On the other hand long-distance tariffs are comparatively high. Countries like Spain or Italy instead have been found to cross subsidise to a smaller extent. Thus, on an aggregate level one does not find in the EC a process of phasing out of cross-subsidisation parallel to network development. Thus, not only on the national but also on an EC level the present tariff principles are contrary to the rules of optimal pricing.

Finally, it was argued that the benefits of competition may be more clear-cut if the **universal service goal** has already been achieved. Figure 14.1 shows that this is not the case for a number of EC member states.

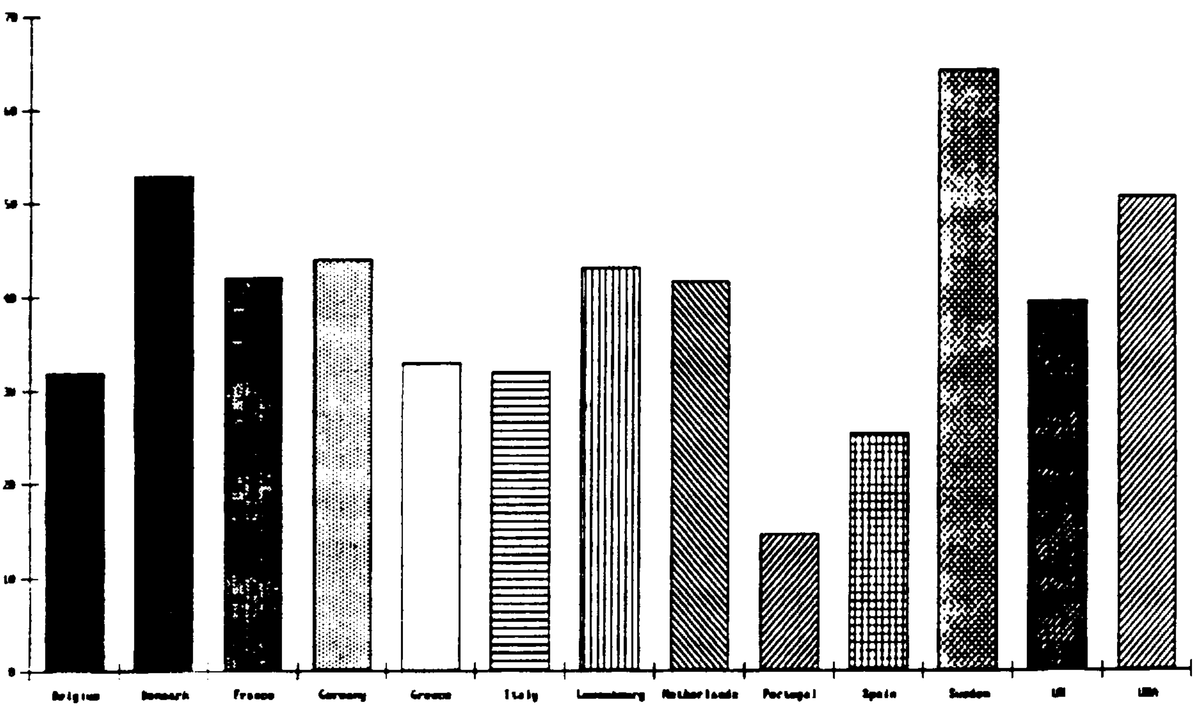

Figure 14.1: *percentage of households connected to the telephone network*[3]

[3] Based on data provided in Siemens (1989).

The highest access rates have been achieved by the Scandinavian countries and the USA. Compared to these countries the UK for instance still lags behind to some extent. Countries like Spain, Portugal and Greece have not yet achieved universal service.
It was pointed out that the impact of network competition on the universal service goal is not clearcut. This stems from the fact that the latter is related to two different categories of consumers. First, if *geographical* coverage has not been achieved yet, universal service can be spurred by providing access to rural communities. This often requires the set up of new local networks in remote areas.
As was shown in the case of Spain the failure to interconnect rural areas is often related to a shortage of capital for the national TO. It was argued that by allowing entry on a local level, interconnection of rural areas could be achieved quicker. Here network competition would spur universal service.
The second category is related to income. Poor households do not interconnect at the present access- and monthly flat rate. In their case only an income subsidy can ensure access. If this subsidy is paid for by raising tariffs for (long-distance) services, competition has to be excluded to avoid cream skimming. Only in the latter case universal service and liberalisation conflict.
One may conclude that given the different level of network development, member countries have diverging interests related to network competition. Countries like Spain, Portugal and Greece may give a higher priority to universal service, keeping some range for subsidizing poor household's access to the network. However, as was pointed out in chapter 3.3.3. the universal serice goal can be fostered without giving up competition. On the other hand those countries having already established a countrywide network are more interested in liberalizing the long-distance market. This promises welfare gains due to the rebalancing of tariffs and due to gains in productivity.
Given the experience in the USA and GB and furthermore the diverging interests among member states, it is likely that an EC approach for network competition will also end up with a "mixed regime". Therefore in the following a step-by-step approach towards facility-based competition is put forward which takes account of both the economic principles derived in part II and the lessons from institutional reform taken from part III.

PART IV

A Strategy towards

Facility-based Competition in Europe

15. Liberalising the Intra-EC Long-Distance Market

Part II pointed out the potential benefits which may be reaped from facility-based competition in Europe. An entry threat may facilitate a "process of discovery" which reduces costs of network provision and spurs the development of new communications means. The industry structure fosters innovative entry which promises significant cost reductions.[1] Additional benefits can be expected from terminating efficiency losses which are caused by state failure. Competitive pressure leads to a rebalancing of tariffs towards optimal pricing rules as developed in chapter 3.3. Thus, it can be expected that competition supports all three goals of efficiency: allocative, technological and qualitative efficiency. Network competition also supports the Commission's policy to enforce a more efficient *procurement policy* of TOs. Being obliged to reduce their network costs, the operators cannot afford to continue with "buy national" principles. Finally, it was pointed out that the high elasticity of demand for telecommunications services ensures that price reductions due to competition generate a strong increase in demand. Additional demand may suffice to cater for the new network operators. Compared to Europe, in the US the number of phone calls made per telephone is up to three times higher.[2]

On the other hand it was pointed out that for a long transitional period a regulatory body has to supervise the incumbent TO's behaviour, since the latter has market power and controls bottleneck facilities (local network). Having a first-mover advantage, incumbents are likely to engage in strategic behaviour in order to deter entrants. Experience in those countries which have ventured on liberalising telecommunications networks has shown that incumbents prevail in keeping a dominant position for a very long transitional period. In the US interstate market, 8 years after liberalisation AT&T still controls over 60%. Entry in the Japanese telecom market was permitted in 1985. In spite of a regulatory system which is biased in favour of new entrants, in 1992 NTT still hold a market share of above 95% in the domestic and KDD 90 % in the international market.[3] In the UK, BT controlled more than 90% of phone calls in 1992. Thus, the need for regulatory supervision is unlikely to disappear quickly.

Moreover, the competitive impact of liberalisation diverges significantly from market to market. In spite of newly developing technology, for the time being the local networks will still enjoy natural monopoly characteristics. Chapter 5 therefore concluded that a strategy towards network liberalisation should aim at exploiting all existing possibilities to increase the intensity of competitive pressure. In order to spur innovative entry and to reduce sunk investment costs, emphasis should be given to *system* competition. Thus, entrants using new communications systems (mobile, radio or satellite networks), may be preferred to others

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1 For example, in the first three years after divestiture AT&T reduced employment by 17% despite increasing output. Compare: Wenders, J.T. (1992), p.14.

2 Financial Times, July 11, 1991.

3 Regulatory Research (1991), p. 11; 13.

which install an additional fixed cable network. When investigating national policy approaches in part III, I pointed out that all member countries have fallen short of this principle. Countries like Germany, Italy and Spain have reduced the competitive impact on the TO which may arise from mobile GSM networks by automatically granting one licence to the latter. Furthermore the TO gains an advantage by receiving its licence before the competitors do. Cross subsidies from their monopoly revenues to support their investments into the mobile network are almost impossible to control. This offers them a lead in the investment race. The strategy in mobile networks so far has been dominated by the aim to prevent "too much" competition instead of aiming at "as much competition as possible". By doing so the already limited scope to challenge the incumbent is further reduced and more regulatory interference will be the consequence.
Also the unilateral step chosen by the UK has fallen short of the previous expectations. Mercury's market share is still negligible, BTs profits have been burgoing and overall prices are not lower than those of public enterprises on the continent. High entry barriers for cable technology and the small market so far have prevented a strong competitive impact from Mercury's entry.

In what follows I sketch an alternative road towards network competition which may avoid some of the previously mentioned shortcomings.
Principally six steps towards network competition may be distinguished:[4]

1) Competition for the customer's hub

Reserved services can be provided by one TO to customers located in other member states who decide to move their telecommunications *hub* into the former's member state. An incentive exists if TOs offer qualitatively different services or charge different prices. Horizontal agreements among TOs concerning the provision of reserved services presently restrict "hub competition". Hub competition could be fostered by the Commission applying Article 85 of the Treaty of Rome since member states are not allowed to prevent such competition.[5] Hub competition may become relevant for international enterprises.

2) Telecommunications Routing

The routing of telephone calls allows the exploitation of price differences among TOs. A French firm with a London branch may prefer to route its phone call to the US via GB, thereby taking advantage of the lower transatlantic tariffs of Mercury or BT in comparison to France Télécom. In the intercontinental market International Discount Telecommunications (IDT) has entered, using an automatic *call-me-back* system.[6]

[4] Compare: Stehmann, Oliver (1992).

[5] The Service Directive allows only for the granting of exclusive rights by each member state on its own territory. See: Com(91a) pp.18-19.

[6] The European client calls a node in Hackensack, New Jersey. After one ring the client hangs up. Within three seconds she is called back. Thereafter the client is able to make her long-distance call using any US long-

European subscribers of IDT can make their international phone calls through cheaper US carriers. On a call from Rome to Rio de Janeiro IDT's customers pay US $ 1.64 a minute while being charged 4,917 Lire ($ 4.10) by Italcable (1991 prices).[7] While being challenged by European TOs as illegal, IDT competition has already forced the latter to cut collection rates significantly. Telefónica proposed to the Spanish government to cut its tariffs by 25% as a response to IDT's entry. Italcable and France Télécom also have announced considerable reductions.[8]

In Germany AT&T and MCI got the permission to use Calling Cards (initially only for US soldiers). These cards can be used for similar call-me-back services. As a response to increased transatlatic competition the DBP Telekom announced a 30% price cut in 1992.[9]

3) Simple Resale

By leasing lines from the TOs, resellers and aggregators can sell capacity to third parties and undercut the TOs tariffs. Competitors could enter this market easily, since they do not bear costs of building and operating entire networks. They effectively operate as retailers. Recent recommendations of the *Consultative Committee for International Telegraph and Telephone* (CCITT) would permit companies to resell spare capacity and share telecommuncations resources.[10] In Germany, for instance, Worldcom GmbH offers leased lines to business customers for data transmission and phone calls. The latter are about 25% cheaper than DBP Telekom's tariffs. In chapter 4.2.1. it was pointed out that the detrimental effect of simple resale is to reduce the scope for optimal pricing packages. In the international market, however, the main distortions arise from accounting-rates. The introduction of full two-way resale then could be used to stimulate accounting and collection rate reductions.

4) Private Networks

Competition from private networks may have different levels. Big enterprises may install their own network for internal use if their stand-alone costs are lower that the costs they face when using the public-switched network. Private networks, however, are also chosen for quality reasons. They can be designed to meet the special needs of the enterprise. There are two levels of competitive pressure which arise from private networks. The first one stems from the big user's potential to withdraw from the public-switched network. This

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distance carrier. To use the IDT service, clients have to pay a fixed monthly sum of US$ 150 - 250. IDT offers tariffs which are up to 75% cheaper than those charged by Telefónica for the transatlantic route. IDT has already won clients as the World Bank and big enterprises. Compare: Economist, February 15, 1992; El País, Febrero 19, 1992.

[7] Compare: Economist, February 15, 1992, FAZ, November 18, 1991.

[8] El País, Febrero, 19, 1992.

[9] Compare: Wirtschaftswoche, Februar 15, 1992.

[10] See: Communications International, April 1991.

forces TOs to introduce special price packages. Secondly, TOs themselves compete in the provision of private networks.[11] They can offer their expertise in network construction and management which non-communication enterprises barely have. European TOs expect that at the end of this decade up to 10% of their turnover may stem from the provision of international private networks.[12] The competitive pressure of private networks increases if they are interconnected into the public-switched network. Then idle capacity can be resold to third parties.

5.) Long-Distance Network Competition

Basically two types of long-distance network competition may be distinguished. The first one implies competition between different communication systems. MCI applied innovative entry when using microwave systems to enter the US long-distance market in the 1960s. In what follows, I discuss the advantages of satellite entry. System competition avoids the cost of network duplication. It also leads to product market integration. Cable systems and satellites are used for both broadcasting and telecommunications.[13] By doing so, the number of players in both markets is increased and the scope of use for an installed system reduces the risk of entry.

The second case refers to competition between different competitors using the same network system (BT and Mercury). Also in this case several options exist besides installing a new network from scratch. Railways have already installed their own communication network and may be entitled to interconnect into the public-switched network. The same applies for the post office, which runs a closed network. The railway network is installed along the tracks and is used for internal transmission of data and voice communication. Due to the use of fibre-optics, railway networks have expanded their capacity beyond their internal needs. British Rail, for instance, runs a network with a higher capacity than Mercury's public network.[14] The European Railways are connected via *Hermes*[15] and propose a consortium with private communication enterprises to expand a European-wide telecommunications network. Companies running electricity, water, gas, transport underground, and cable TV networks already have obtained a right of way and can use their infrastructure to lay telecommunications cables. Unlike railways and the post office,

11 AT&T and Sprint, for instance, edged out European rivals bidding for the construction and managing of a global data network of Unilever. The latter owns 500 companies and has subsidiaries worldwide. Compare: Communications Week International, May 13, 1991.

12 On a European level France Télécom has concluded an agreement with Maxwell Communications for the supply of satellite business services in Britain and the rest of Europe. This could bring FT and BT into direct competition.

13 The ASTRA satellite uses a telecommunications frequency for broadcasting, while the DBS satellites plan a range of data services.

14 Compare: Funkschau, January 21, 1990.

15 Hermes: Handling through European Railways Message Electronic System.

however, their present networks do not comprise switches which account for the main bulk of network costs. Thus, the latter face considerably higher entry costs.

6.) Local Competition

Only at a final stage may competition between local networks be envisaged. As was pointed out, cable TV networks, PCN and a combination of paging and Telepoint services may be envisaged as potential competitors. However, at the present stage technology is still not sufficiently developed to provide a significant competitive impact. Competition on the local level is rapidly increasing in the US. The major example is New York City where the New York Telephone Company is bypassed by other operators which connect corporate customers directly. In the US some manufacturers have already obtained licences to install cordless *Local Area Networks*. (LAN).[16] In Europe, no radio spectrum is presently available for this technology.[17] Potential entrants in the local network could be cable networks linked to PCN systems.[18] The main advantage of local competition probably stems from withdrawing the bottleneck position of the TOs. Long-distance competitors and VANS suppliers then have an alternative local network, which reduces the TO's ability to use access charges as a means of discrimination against competitors. Alternative local networks reduce the need for regulatory supervision. One may also envisage the breaking up of European TOs which would allow the introduction of yardstick competition at the local level. This also would ease the task for future regulation.[19]

It is obvious that some competition has already evolved from steps 1) to 4). National approaches to liberalisation in the USA and GB have created spill-over effects on the international market. This was demonstrated in chapter 12. Pressure is exerted on European TOs to renegotiate accounting-rates and reduce collection rates. However, national legislation and international agreements still prevent steps 1) to 4) being fully implemented. TOs prevailed in completely preventing steps 5) and 6) on an international and national level in continental Europe.

It was pointed out that the service-based approach to competition in the EC, reserves about 80% of telecommunications revenues to national TOs. Moreover, it does not exert pressure on the network operator to reduce costs and to introduce optimal or at least cost-based

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16 In 1990, for instance, NCR Corp started selling a cordless LAN in the USA operating at 900 Megahertz, while Motorola Inc introduced a LAN at 18 Gigahertz. Also, Apple Computer plans the installation of a cordless LAN. See: Communications Week International, May 13, 1991.

17 Freeing the spectrum may affect other systems which use the same frequencies for maritime or military communications. To the extent that the need for the latter vanishes, bandwith may become available in the future.

18 In countries like Belgium and the Netherlands, cable systems for the use of broadcasting services have a penetration rate of around 80-90%. Compare: Garnham, N. and G. Mulgan (1990), p.2.

19 In Britain, the DGT has proposed to separate local and long-distance business. In Finland, they operate presently about 50 local telephone companies, run as co-operatives. See: Economist, October 5, 1991.

pricing schemes. The capacity installed is not used to its full potential. According to recent studies, telecommunication systems in France, Germany and the UK are used from 35% to 60% less than in the USA. There is no incentive to use capacity efficiently.[20] The significant productivity differences among national TOs suggest that facility-based competition could put poorly performing operators under considerable pressure to improve their performance. Moreover, the higher productivity of smaller operators indicates that economies of scale and scope play a minor role compared to the choice of production technology and the degree of X-inefficiency. The last two factors, however, are variable and mainly depend on the degree of competition which prevails in the market.

The small size of national markets may render the licensing of separate public fixed terrestrial network operators unecomomic from a national perspective. The limited impact of Mercury on the British telecommunications market is an example.

However, there may be a different path towards facility-based competition in the Community which takes account of the political, economic and technological aspects of the present structure of the telecommunications market.[21]

While public provision of a network is well entrenched in national law, the intra-Community long-distance market is not similarly protected. On the other hand, a step-by-step approach, starting with network liberalisation of the intra-Community long-distance traffic may be considered as a *second best* strategy for promoting facility-based competition in Europe. After having established an integrated ISDN network, the EC would follow the path pioneered by the USA while being able to avoid the major problems which arose after the divestiture of AT&T. The approach follows step 5 as characterised above and in particular emphasises the beneficial effects which may arise from system competition.

Competition for the Intra-Community Long-distance Market

At present each national operator has the exclusive right to charge all calls going out of its country according to national tariff principles. The operator of the destination country is reimbursed for the costs of transmitting the call in its national network. Rules for these agreements are specified in the CCITT recommendations.

International telecommunications services thereby have been governed by the same exclusionary rule as national services. The so-called cooperative model has created an international cartel of TOs which applies open price fixing.

These bilateral agreements between national telecommunications administrations actually split the *intra-Community market* into submarkets. In each *submarket* the national administration which sets up an individual call operates as a monopolist. This regime prevents international specialisation on the basis of individual companies' *comparative advantage*. It has led to prices which greatly exceed costs. On the other hand, this market

[20] Ungerer, H. (1990), p.18.

[21] Here and in the following compare: Stehmann, O. (1991b), pp.131-135.

fragmentation has led to the installation of 12 incumbent TOs in the EC (plus Mercury). Chapter 5 emphasised the competitive potential which stems from traditional market separation in the EC. At the Community level this market fragmentation has prevented a dominant firm from emerging. While in the normal framework the existence of sunk costs is regarded as detrimental due to an entry deterring effect, in the international EC market they turn out to be beneficial since they prevent exit. After having liberalised the intra-Community market, monopolisation through predatory pricing is not likely to occur. The intra-Community market may therefore be best described as a *natural oligopoly*. In that case the main objective of a policy promoting facility-based competition in Europe should aim at overcoming the present market fragmentation which exists due to regulation and cable technology.

The liberalisation of the intra-Community long-distance market then could follow the following procedure:

At the **first stage** each TO should be entitled to transfer calls in *both* directions. Thus in each submarket the monopoly would be transformed into a *duopoly*. Private companies should be permitted to lease lines for resale.

The **second stage** would lead to the licensing of private operators who employ a technology which has a market integration effect. This may be a separate satellite system and mobile operators.[22]

The **third stage** allows TOs of third countries to enter the bidding, so for instance France Télécom could enter the German-Italian market. This may happen by leasing lines or by the installation of a separate network. Thereby a large number of financially viable competitors would emerge.

In the **fourth stage** private competitors would be licensed to establish their own networks. This could involve companies such as the European railways which have already installed their own network, or others as cable networks (etc).

Below the main advantages of this concept are described. It will be argued that there are parallels with the US model of liberalisation, in which the interstate market is open to entry while intra-state markets are exempted from competition.

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[22] In detail see below.

Figure 15.1 depicts the 1977-1989 growth of the number of phone calls in West Germany. As can be readily seen, international calls have grown twice as fast as national long-distance calls. Moreover, 89.9% of all international calls which originated in West Germany were directed to EC member countries in 1987[23]. Since the growth of international phone calls is linked to the growth of trade, the increase in trade envisaged with the advent of the single market in 1993 is likely to spur their growth even further. Thus, the growth rate of international calls is likely to be similar to that envisaged for VANS. It will further accelerate if prices reduce to cost levels. This is essential for new competitors whose additional investments do not lead to a wasteful duplication of existing network facilities. As was seen for AT&T after 1984 and the Japanese domestic TO, NTT, the growth in demand caters for the additional supply of new entrants. For both incumbents total telephone service revenues rose after entry had taken place.[24] Thus, while incumbents lose *relative* market share, one may not expect their absolute output to decrease. Already they cannot cope with the rising demand for international phone calls.

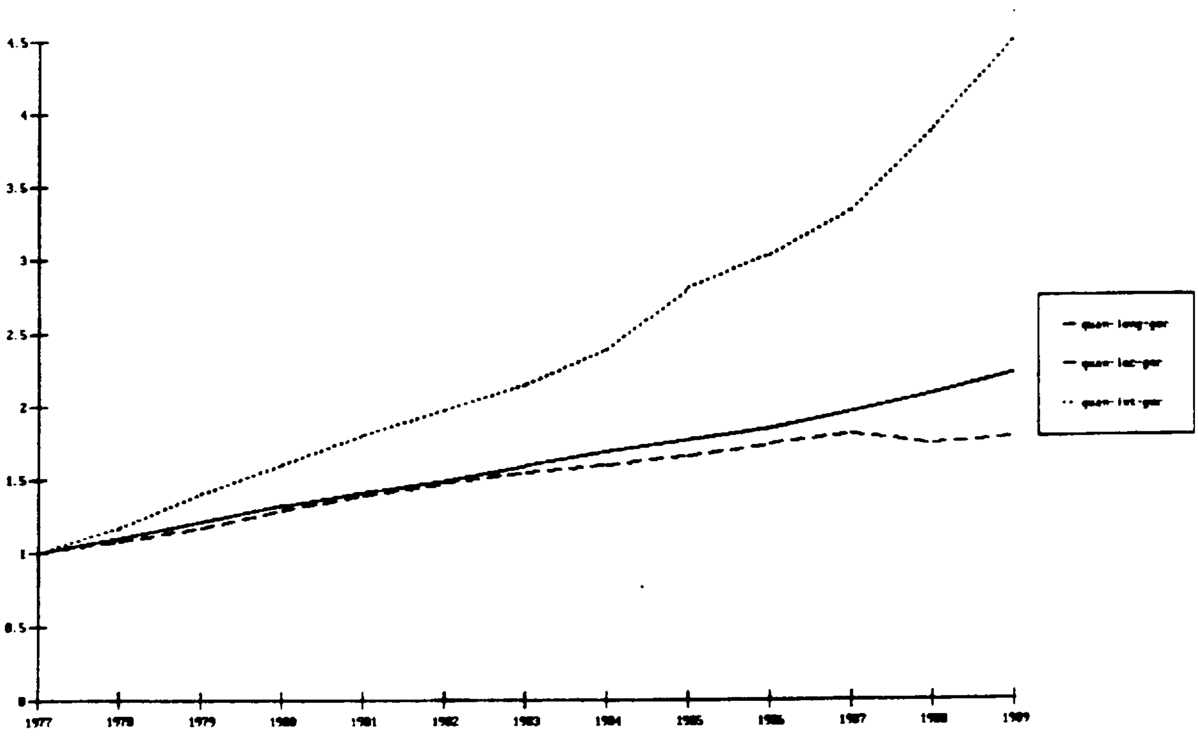

Figure 15.1: *Growth in the number of phone calls made in FR Germany, 1977-1989 (1977 = 100).*

It was argued in some detail in part II and III that over time the burden of cross-subsidisation shifted from national long-distance to international long-distance services.

[23] See: Bundesministerium für Post und Fernmeldewesen, (1988), p.57.

[24] This point was already made for AT&T. For NTT see: Glynn, S. (1992).

But even though there is no major cost difference between the provision of international and national long-distance services, prices for the latter have dropped far more. Added to the fact that according to figure 14.1 international calls are growing much faster than national long-distance calls, the burden of cross-subsidies has decisively shifted towards the former over time.

According to the estimates of part III, due to the present tariff structure price elasticities of demand are held to be highest in the international long-distance market[25]. Thus the present price policy directly contradicts the criteria of Ramsey pricing. Liberalisation of the international long-distance market will therefore offer the greatest efficiency gains. If interstate long-distance prices in the US can be taken as a yardstick, intra-European prices may fall by more than 50%. Apart from the expansionary forces mentioned above, the high price elasticity of demand will additionally spur demand for intra-Community calls if prices come down to costs.

The main economic argument against facility-based competition has been the existence of synergy effects (economies of scope). The concept of partial liberalisation, however, combines efficiency in production with efficiency deriving from competition. Since national TOs remain integrated, unlike the position in the USA, competition at this level will not lead to a sacrifice of economies of scope in Europe.

The experience of Japan also supports the view that the international telecommunications market is more competitive. By 1990 the two domestic entrants had captured 4.2% of the market, after 5 years of competition. In the international Japan-US market 2 firms entered in 1989. However, already two years later their joint share added up to one third of the market.

Aside from the distortions of the tariff structure, the development of entry in the USA has shown that technology supports competition in the "very-long-distance" market. The new transmission technologies which have been the driving force behind competition among common carriers in the USA can substitute for cable only for very long-distances. Economies of scale offered by the new technologies would not materialise in the narrow national markets of the EC. For the inter-state market, satellites could provide an alternative means of transmission to the trunk lines installed by TOs. This leads to the second level of facility-based competition.

The Case for a Separate Satellite System[26]

Employing stage 1) and 2) of network competition hence may already have some competitive impacts without requiring significant investments into the infrastructure. A move towards fully fledged competition in the international long-distance market, however, would imply a move to step 3) and 4). It would be necessary to increase the intensity of

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[25] See in detail chapter 13 and 14.

[26] In the following compare: Stehmann, O. (1992a).

network competition. Apart from reducing costs of production, facility-based competition also supports the goals presently promoted by the Commission and most of the member countries.

Technological progress has had a twofold impact on the relationship of satellite and terrestrial telecommunications networks. On the one hand improvements of satellite earth stations have fundamentally changed the scope for the use of satellite technology in Europe. There has been a continuous reduction in size and cost of earth stations. While traditionally the big earth stations of the satellite network were interconnected into the terrestrial network, the development of "*Very Small Aperture Terminals*" (VSAT) has made possible the establishment of a separate satellite network. VSATs can be operated on the customer's premise and they may be used for point-to-multipoint as well as for point-to-point communication. As a result, a separate satellite network may principally carry out all functions of a terrestrial network.[27] On the other hand technological progress in fibre optics make the latter more cost effective for point-to-point communication if compared to satellites. As a result satellite systems are widely regarded as suitable only for niche markets and they have been mainly used as a backup for the fixed terrestrial network. However, this viewpoint is far too concerned with technical issues, neglecting economic considerations. As will be argued in what follows, specific technological characteristics render a satellite network an optimal means to foster facility-based competition in Europe. Lower sunk costs, higher flexibility and the ability to integrate different product markets may allow a satellite entrant to compete successfully with terrestrial networks. This may offer a solution to European network fragmentation and foster the aim of universal service.

While the international traffic flowing through terrestrial networks is regulated by bilateral agreements, in the case of the space segment of satellites, a multilateral concept has been developed. Having presently 28 member countries, the international organisation Eutelsat is the dominant player in Europe. It operates telecom satellites for telephony, data and video services within the FSS frequency band. As signatories to Eutelsat national TOs have the exclusive right to purchase and resell space segment capacity. Hence, like the terrestrial network, the space network has been transformed into a cartel with the same members. As a result, competition is restricted two ways. First, as signatories, European TOs can preclude or discriminate against private satellite providers. Second, in pooling together their sales of space segment capacity they also restrict competition among themselves. "*Economic harm*" procedures are meant to bind national governments not to authorize other satellite systems which cause "significant economic harm" to Eutelsat. Nevertheless, member countries have not refrained in the past from installing national systems. France launched the Telecom and TDF satellites, Germany the DFS and TV-Sat satellites and Italy and Spain will follow suit with their own systems.[28] However, since these national

[27] Compare chapter 2.1.4.

[28] Furthermore a growing number of non-European satellite systems are emerging which also can be used for services with European coverage. See: Com(90a), p.78.

satellites are installed by Eutelsat signatories, they are not meant as substitute but rather as complementary systems. In fact they do not put Eutelsat under competitive pressure.

Thus, one may conclude that national TOs have succeeded in extending their terrestrial network monopoly to the space network. By so doing, they managed to extend their control to new transmission technologies which could have been a potential threat to their network monopoly. Beside exploiting consumers by setting prices as profit maximising monopolists, the cartel moreover prevents the benefits of a satellite telecom network from being fully reaped. The present regulatory regime keeps Eutelsat from developing independent commercial strategies when selling space capacity. Private service providers are discriminated against. Finally TOs subordinate the usage and pricing of their satellite capacity to the specific targets of their own business strategy. The price setting is distorted since the use of satellite facilities is charged for on the same distance related basis as applied for terrestrial links. The technological advantage of satellites as regards wide-area coverage and insensitivity to distance is not passed on to users. Thus, since their main business is still the operating of the terrestrial network the satellite system is used rather as a backup for the former.

As a consequence, in Europe, demand for satellite equipment lags behind the US, which arguably puts the European satellite manufacturing industry at a competitive disadvantage.[29] Equipment prices for ground stations and satellites as well as tariffs for services exceed considerably those charged in the US. Fragmented markets prevent producers from reaping the benefits of economies of scale which according to an estimate made for the Commission could reduce the costs of a commercial satellite in Europe by 40%.[30]

Moreover, the market fragmentalisation described above handicaps specialized satellite services providers, while the existing monopolists are not able to provide sufficient transponder capacity to allow for a rapid expansion of these services.

Satellite technology now offers the opportunity to start some competition among network providers while still taking into account concerns regarding investment duplication and universal service. This could be achieved by separating the satellite network from the terrestrial network. Up to the early 1980s a satellite network was regarded useful only if an operator had to transmit services over more than a minimum distance. In general for the small European distances, satellite transmission was more expensive than terrestrial cable transmission. Since the satellite network could only be used when linked to the terrestrial, it was not regarded as a substitute technology. In the meantime, however, due to technological progress this concept of a "*break-even distance*" of satellite systems has been given up. Instead the intrinsic advantages of satellites over terrestrial networks have been put forward. In this context it is interesting to note that especially a fully developed satellite

[29] 22,000 two-way dishes are presently installed around the world, thereof 95% can be found in the USA and Canada. Compare: Financial Times, July 17, 1990.

[30] Com(90a) p.2.

network complies with the aim of universal service: one advantage is the *widespread geographical coverage* and a second the possibility to deploy the satellite network *immediately* over a wide area. The latter makes satellites an ideal alternative to the installation of a cable network in peripheral regions.

The appearance of VSATs has made it possible to run a satellite network completely separated from the terrestrial one. Such a network is capable of carrying out all the functions of the latter. Traditionally the large earth stations used with Intelsat and Eutelsat were owned and operated by the national TOs. The messages received were transmitted into the terrestrial network which thereafter distributed them to the user. With the arrival of VSAT earth stations this link to the terrestrial network can be circumvented. VSATs can be installed directly on the customer's premises.

After characterizing three different steps towards the liberalization of the European satellite network the advantages of allowing "satellite entry" will be discussed in more detail.

Broadly speaking, three different steps of liberalisation of the satellite network may be distinguished:

1) Competition for the Eutelsat capacity:

Presently the national TOs control the allotment of Eutelsat capacity. Being signatories they share the investment cost according to their national quota. On the other hand they control the distribution of transponder capacity which is available for domestic carriers. Thus TOs operate as referee and player at the same time. Thereby they may exclude or restrict private competitors for satellite services. Hence, while the network itself remains under the control of TOs, a first step could be to withdraw the right to distribute space capacity from national TOs. Instead a bidding procedure could be introduced in which TOs and private service providers compete on an equal footing. While in step 1) the present cartel of national operators is not challenged, Eutelsat has to allow for equitable, non-discriminatory access on a cost-based basis. This would mainly lead to an efficient use of existing space capacity. In the case of the intercontinental market, this approach was chosen for Cable&Wireless which received direct access to Intelsat, thereby bypassing British Telecom as the designated UK signatory.

2) Competition among a satellite network and the terrestrial network

While step 1) ensures efficient use of established satellite capacity, there is no incentive to reduce network costs since no rival network provider is permitted.

If the Eutelsat system is kept independent from TOs and if its management is moreover free to use it commercially, competition between the terrestrial network and the space network would be fostered. This would lead to considerable pressure to readjust tariffs towards cost. Moreover, incentives would be given to both the TOs and Eutelsat to reduce the costs of the terrestrial and the satellite networks respectively. However, since both networks are already established, step 2) does not render necessary large investments into new installations. Competition can be achieved mainly by an institutional change.

3) Competition among various satellite systems

A complete liberalization of the satellite network would obviously include the licensing of further private satellite systems. By doing so, the competitive pressure could be increased. Satellite systems which have been installed to serve national purposes only could be allowed to enter foreign markets. However, the scope for further satellite operators may be limited by the scarcity of frequency bands. In the US the "open sky" policy successfully introduced step 3) as early as 1972. Therefore it might seem feasible also in the European context.

In most member countries the installation, ownership and operation of receive-only terminals for entertainment broadcasting reception is already largely liberalized. These terminals do not pose a threat to operators since they have no transmission capability. They were included in the Directive 88/301/EEC which liberalized the terminal equipment market by the latest of 30 June 1990. The new VSAT earth stations being capable of sending and receiving, however, have not been liberalized so far.

As was pointed out in chapter 7.2.3.2., to do so is the main aim of the Green Book on satellite telecommunications published recently by the Commission.

As far as the space segment is concerned, the Commission's approach fits into step 1) of liberalization as outlined above. In its *"Guidelines on the application of EEC competition rules in the telecommunications sector"* the Commission has pointed out that agreements between TOs to pool together their sales of space capacity may be regarded as a restriction to competition under Article 85. No exemption under Article 85 (3) of the Treaty of Rome can be expected since the TOs restrict third party's ability to compete and they strengthen their individual and collective dominant position.[31] Competition for capacity is envisaged in order to liberalize the VANs market. As far as service providers can choose between the satellite and the terrestrial network this already implies that both networks become somewhat substitutive. However, since voice service as the main bulk of services is exempted, network competition as described under step 2) is not fostered by the Green Book.

The main problem with this approach is that the investment in the space segment is carried out by the signatories whose investment share depends on their *own* use of the Eutelsat segment. This may lead to underinvestment if their use declines while private operators' share of the space capacity increases. Moreover, as long as national TOs keep control over investment decisions of Eutelsat, they have an incentive to prevent the rise of a full-fledged system competitive to their terrestrial ones. It therefore seems inevitable that Eutelsat's independence from the TOs is not limited to the distribution of capacity. It must comprise the entire range of commercial decision making, thus including investment decisions. Since

[31] Com(91a).

investment decisions into satellite technology involve considerable risk, it, moreover, does not appear reasonable to let TOs carry these risks alone while their private competitors only pay for the capacity they actually rent.

Competition between Satellite and Terrestrial Networks

It has been pointed out before that natural monopoly arguments have been put forward for the terrestrial as well as for the satellite networks. The exemption of the basic telephone service from the service directive by the Commission is based on the same argument. However, only in the case of an unsustainable natural monopoly the financial validity of an incumbent can be put at risk by entry.
The natural monopoly argument traditionally has been applied if the incumbent and the potential entrant use the same technology. As was argued above, there is little empirical evidence of natural monopoly elements for telecommunications networks. If the incumbent and the entrant can choose among different technological solutions, it becomes even less likely to prevail. Moreover, the satellite network has already been installed. Competition between Eutelsat and the terrestrial network of TOs does not lead to additional "wasteful" investments. Thus satellite entry into the telecommunications market as sketched by step 2) can hardly be resisted on grounds of natural monopoly.

However, in the case where the satellite network is kept separate from national terrestrial operators, competition for voice services would lead to pressure towards reducing network costs. Without facing additional costs of network installation a mere split of already existing networks would lead to facility-based competition. Thanks to the fragmentation of the European telecommunications market a satellite entrant, moreover, if compared to an entrant using cable technology, may have a stronger competitive impact on national TOs. Apart from the *direct* competitive effect of having an additional supplier there will be an additional *indirect* one. The latter stems from the specific characteristics of satellite technology. For the case of facility-based competition, due to a second terrestrial network operator, the present market fragmentation cannot be overcome. Mercury may have a competitive impact on the British national and international long-distance market. However, due to regulation and technology it does not put pressure on France Télécom or the Deutsche Bundespost. Moreover, given the high share of sunk costs of terrestrial networks, competitors cannot expect to oust the others from the market by applying an aggressive pricing strategy. Thereby the probability is enhanced that the duopoly eventually evolves into a "peaceful coexistence". The satellite entrant instead is not committed to a certain geographical market. The *short-term reconfigurability* of the satellite allows the entrant to allocate capacity dynamically. Thereby it is possible to choose between several capacity assignment strategies adjusting to changing demand of traffic or price discrepancies in different markets.[32] Thus, the satellite entrant is able to switch capacity to those markets which promise the highest profits. A sole entrant using satellite technology could simultaneously enter several European telecommunications markets.[33] As a result terrestrial network operators will start competing against each other. By lowering ones own price a TO may expect to drive out some of the satellite's capacity which then is directed to other markets. These may differ either geographically or in relation to products.[34] Apart from shifting its capacity from the French to the German long-distance market as a response to a price cut by France Télécom, the satellite entrant may also choose to withdraw capacity from the telecommunications business alltogether. Instead more capacity may be devoted to transmit TV broadcasting. Hence, it is the higher flexibility of capacity of the entrant which invites more competitive behavior from the incumbents. Thus a satellite entrant will not only compete directly against the incumbents but the latter will more and more compete against themselves. Ceteris paribus the incentive to compete in prices is increased. Thus due to the large geographical coverage and the satellite's ability to switch capacity, previously fragmented markets become integrated and the competitive impulse will gain further momentum. The separate satellite system then would have a considerable **market integration effect** and it would function as a **competition device**. This could help to break up the cartel of TOs since the latter will face diverging interests. More competititive ones will be threatened less by the satellite entrant than those which operate at high costs. Especially if the third step is eventually undertaken, some TOs may also find the opportunity to use their national satellite systems for the (international) long-distance traffic of other member countries attractive. This would imply a twofold advantage. First, not all national TOs may be willing to resist the opening of the international telecom market since they may expect to gain individually. The alliance of the international cartel could be broken up. Second, after competition has been introduced *collusive behaviour* of the incumbents is less likely to come about. In the short run, the private satellite system may help to abolish the abovementioned accounting-rate system. Being a sizeable cost factor it equalizes the cost levels of entrants and the dominant firm. Thereby the scope for price cutting and subsequently the scope for entry by cable operators is severely reduced. In those countries which have already liberalised the domestic telecommunications market, the accounting-rate system has sheltered their international markets from competition. Since the private satellite system provides end-to-end services over independent facilities it cannot be handicapped by the accounting-rate procedure. An entrant being able to bypass

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32 The short term reconfigurability takes the size and location of the earth stations as given. For the case of *long-term reconfigurability*, the structure of the network can be readjusted by relocating earth stations or reconfiguring the satellite. See: Jose Casas and Hans Fromm, (1989) p.77.

33 Mobile technology may eventually have similar effects. All member states have agreed to introduce the digital GSM network. This could allow for *roaming*. A Danish mobile telephone could be used in Germany without registration. See: Economist, October 5, 1991.

34 Moreover, the satellite may redeploy its capacity according to different daily or seasonal peaks thereby taking advantage of emerging capacity constraints of the terrestrial links.

this mechanism therefore will impose automatic pressure to abolish the accounting-rate system itself. By taking this step, the telecommunications market would only follow an approach earlier chosen for TV transmission. In Germany, for instance, the DBP Telekom also held the monopoly for TV distribution. After having modernised the cable network, private satellite entry was licensed, which now out-performs the cable since it is able to serve the whole European market. Television transmission via satellite led to normative changes of the regulation of television channel cable distribution. By now several unregulated television diffusion satellites have been launched in Europe. By the mid 1990s it is expected that Europe will have satellite capacity for at least 250 TV channels.[35] Given that in the TV market satellites already compete with cable networks, it is especially unreasonable to block the liberalisation of the satellite market for telecommunications. The integration of the TV and the telecommunications market also reduces the scope for strategic behavior on the side of the incumbent TO. Once the satellite is installed, an entrant may easily switch to other markets as in the case of an aggressive pricing policy. Once the TO raises its prices again, re-entry into the telecommunications market can quickly be carried out.[36]

As has been pointed out, the main reason to exempt the network and basic services from competition has been the need for financially strong TOs being able to carry out investments into the ISDN network. This aim would not be endangered by setting up separate satellite systems. The emergence of optic-fibre cables has allowed them to increase dramatically the capacity of cable networks, while services can be offered at very low marginal cost.[37] Thus, the satellite entrant is not likely to attract too much voice traffic from TOs. Despite 20 years of "open sky" policy in the USA, total satellite communications revenues account for no more than 2-3% of total telecommunications' revenues.[38] Taking the US experience as a yardstick, one can hardly argue that satellite entrants may be able to obstruct the performance of national TOs. However, entry on the fringe may impose some discipline and it may be a better safeguard to ensure cost-based pricing and cost-sensitive investments rather than these which pure regulation could provide.

Finally, the issue of **universal service** and the effects of competition for rural areas has to be reconsidered. In this context it is interesting to note that especially Eastern European countries are considering the use of private satellite systems to improve their underdeveloped communication networks. In Germany private firms have been already licensed to provide VANS and voice service, via satellites, to the territory of the former

[35] Garnham, N. and G. Mulgan (1990), p.10.

[36] One may even argue that once the satellite has been established a policy of hit-and-run entry in different markets may become feasible.

[37] This development is discussed in: José Casas and H. Fromm (1989), pp.75-77.

[38] Com(90a), p. 18, 50.

GDR.[39] This exception of the network and basic service monopoly granted to the Deutsche Bundespost Telekom is regarded as necessary because the set up of the terrestrial network involves many years of development. Due to the large geographical coverage[40] the satellite network is especially apt to provide services to remote areas. Compared to the optical fibre system the satellite systems costs are more capacity dependent. Both the share of capacity of the space segment and the size and complexity of the earth stations are closely related to the capacity of the link being provided. This makes satellites more and more appropriate to serve many thin routes rather than just a few high capacity routes.[41] Thus, satellite networks may offer a low traffic area coverage. In Canada satellite technology already has been successfully used for remote areas. The number of long-distance calls in some Indian villages in northern Canada increased by as much as 800 % after satellite earth stations replaced radio installations. Similar results were obtained in Alaska.[42] In Peru, a satellite-based communications system has been installed to provide a reliable and cost-effective service to the remote region of Eastern Peru. "Thin-route" satellite communication is used as a means for rural development.[43] As a result, satellite systems may be considered to be the adequate technology to close the gap between the developed and less-favoured regions in Europe. Their deployment may counterbalance the trend of advanced services only being provided around high density areas. Satellite technology is therefore seen to be crucial for the integration and the rapid reconstruction of Eastern European countries. However, their state owned TOs do not have the financial means to develop rapidly the terrestrial network and to increase at the same time their investment share in Eutelsat. Hence those countries which have not achieved universal service, have an interest in licensing private satellite systems. This offers the twofold advantage of quickly improving the national network without drawing on the scarce financial resources of the state. Therefore it might happen that central and Eastern European countries will allow private systems while the EC stays behind. However, the arguments put forward also apply for the less advanced countries in the Community. The development of a separate satellite system fosters the universal service goal rather than obstructing it.

Thus one may conclude that the two traditional arguments against facility-based competition in Europe - universal service and natural monopoly - do not apply for separate satellite operators. Quite to the contrary, those countries striving to develop their infrastructure promote the use of private satellite networks.

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39 On March 1, 1991 Preussen Elektra, a regional electricity supplier started its satellite operations including voice service to the GDR territory. The licence allows voice as well as data traffic and interconnection with the public-switched network. See: FinTech - Telecom Markets, 13.12.1990.

40 A satellite's coverage area can be as much as a third of the earth's surface. See: Reed, Tony(1989), p.66.

41 Casas, J. and H. Fromm (1989), p.75/76.

42 Hudson, H.E. and E.B. Parker (1990), p. 197.

43 The project demonstrates that even with relatively low-powered satellites smaller Earth stations can function quite well. In more detail: Mayo, J.K.; G.R. Heold and S.J. Klees (1992), p.67-70.

The wide discrepancies in telephone tariffs for interstate calls contradict the principle of harmonisation and integration which is associated with the single market. For instance, a telephone call from Athens to Bonn costs more than twice as much as from Bonn to Athens (minimum rates always)[44]. While barriers to trade are being dismantled, barriers to communication remain unchanged. As the US long-distance market has demonstrated, competition will lead to unified tariffs on a much lower scale which not only stimulates demand for telecommunications services but also lowers *input costs* for many other goods and therby directly contributes to the aim of promoting intra-Comunity trade. It also supports the Commission's telecommunications policy. The aim to unify tariffs for intra-EC calls has been stated in the EC Guidelines for the harmonisation of tariff principles under the Council directive for ONP in June, 1990. Network competition also fosters the market for VANS which has been a cornerstone of the Commission's telecommunications policy. Lower network costs spill over into lower prices for bearer services which support the development and use of advanced services. Separate network operators allow VANS providers to choose their operator; thus, the scope for uncompetitive behavior is reduced. Network competition reduces the need to ensure that TOs provide certain interfaces. TOs themselves will have the incentive to provide these interfaces in order to avoid losing customers to a competitor. Service providers themselves could also build their own network incorporating the means of access that they require.[45] Furthermore, several VAN services can be offered immediately by satellite systems while they are unlikely to be available on the narrow-band ISDN for many years. However, national regulators may also find the liberalisation of the intra-EC long-distance market acceptable.

Coming back to the four-stage approach mentioned on page at the beginning of chapter 14, the previous reasoning has made it clear that already at stage 2 satellite entry would allow for some competitive pressure. However, an even stronger impact may be expected when TOs directly start competing. By limiting this initially to the intra-Community market, support of national regulators may be won. As has been pointed out already, the TO monopoly is entrenched in domestic markets. National administrators are more likely to support liberalisation measures if their national markets remain untouched. Though competition in the intra-Community market may divert some revenues from the TOs, the loss will be tolerable given the small market size compared to the national long-distance market[46]. Moreover, the more competitive TOs are likely to gain. So unanimous resistance

[44] Compare chapter 12.2.2 and: BEUC (1988), p.33.

[45] Compare: Sandbach, J. (1991), p.481.

[46] To give a rough estimation: The share of international phone calls of all long-distance calls (national and international) was only 4.45% in 1987 for West Germany. Calculation based on data provided by: Bundesministerium für Post und Fernmeldewesen, (1987), p.57.

to partial liberalisation should not be expected. In any case, national TOs could be appeased by continuing to entrust the national long-distance market to internal tariff principles. Thus the "fair *trade-off*" between cost orientation and the aim of universal service called for by the Commission could be achieved. In this way the problem of national sovereignty regarding national tariff schemes could be circumvented. The national operators would be guaranteed sufficient revenues to allow them to go ahead with infrastructural investments. The integrity of a Community-wide network would not be challenged.

The liberalisation of a small part of the market for basic services could be interpreted as a "*peacemeal approach*": The development of the intra-Community telephone market could be studied by national authorities. After a transitional period member states themselves could investigate again whether an extension of competition from the interstate to the national market would be worthwhile. In the meantime the national telecommunications operator would have gained experience from operating in a competitive market. National policy makers are already looking for ways to improve the market performance of their national TOs. Although their monopolies are being maintained, these enterprises are being restructured. Managements are now expected to run their firms as if they were operating under competition. Their participation in a competitive intra-Community market could therefore be regarded as a means of supporting these strategies. Experience with competition would be offered without forcing regulators to take the all-or-nothing decision to liberalise the whole domestic market.

Thus partial liberalisation in the form described above is much more likely to find support among national administrations than a full attack on well protected TOs. This could enhance the possibility that member states will opt for a common strategy aiming towards *facility-based competition* instead of taking unilateral steps.

A Comparison to the Development in the UK and the US

Certain complications have hampered competition in the US and UK, but are less likely to turn up in the intra-Community market. First there is the problem of a dominant firm which has to be regulated lest it abuses its market power. The existence of 12 firmly entrenched incumbents and high *barriers to exit* (sunk cost) have transformed the intra-Community market into a "*natural oligopoly*". A process of concentration is not likely to occur. Neither is it likely that one incumbent will start predatory pricing. Offering a service below cost only makes sense if in the long-run the market can be monopolized. In that case higher prices could make up for the losses incurred before. However, given that each TO has the same source of national revenues to sustain a price war and given high exit barriers predatory pricing is not a feasible profit-maximising strategy for individual TOs. Therefore the participation of national TOs in the competitive framework is beneficial since it is a safeguard against monopolisation.

Thus unlike the position in the US and UK where regulators have to supervise price-setting procedures of their dominant firms, in the envisaged European market price regulation should not be necessary. Also the regulatory control of access charges may become less stringent. Whereas in the UK Oftel had to prevent an abuse of power by British Telecom when bargaining over access charges with Mercury, in the intra-Community market national TOs are on an equal footing. Moreover, the separate satellite system offers an alternative network to service providers.

In the US *bypass* has become a serious problem since common carriers who have to pay for interconnection into the local network build separate facilities in order to avoid these access charges. Consequently, the RHCs are deprived of revenues necessary to keep up their local networks. In the European market there are two safeguards against bypass. The first is the power of the TOs which in cooperation with national authorities can easily prevent the installation of bypass facilities on their territory. The second safeguard is that so far on the European level, there does not exist a regulatory authority. Problems like bypass arose in the US mainly due to the overlapping jurisdictions of regulatory authorities which have different strategies towards the telecommunications industry (FCC, state regulators and antitrust legal interventions). For the Community the jurisdiction of a supranational regulatory agency will be easier to define. Therefore bypass can be ruled out from the beginning. Moreover, the transaction costs of regulation can be reduced considerably.

Institutional and Regulatory Changes

The approach sketched above requires major institutional changes. They refer to Eutelsat and the need for a supranational regulatory body.

If facility-based competition based on different technology is aimed at, Eutelsat has to be protected against the power exerted by national TOs. In order to let Eutelsat emerge as a full-fledged commercial enterprise two strategies may appear feasible. First, one may argue that there are certain economies of scope between running a terrestrial and a satellite network. In order to reap these synergetic effects one might suppose it to be beneficial to let TOs participate in the separate satellite network. Hence national TOs would keep their stake in Eutelsat. Similar considerations, for instance, were put forward by the Commission to allow TOs to enter the non-reserved service market. In the case of the Eutelsat network private service providers have to be offered the same rights and obligations as are presently applied to TOs. Thus they equally receive a certain quota which determines their use of capacity and their investment commitment. As a result they would obtain voting power according to their quota, hence being able to influence the commercial policy of Eutelsat. This, however, in practise would leave probably a dominant position to national TOs. Given their status as incumbents, combined they are likely to keep the major share in Eutelsat. There is likely to evolve a common interest among TOs not to let the satellite network become a serious threat to their terrestrial networks even if they participate to some extent

in the Eutelsat profits. Given this common interest, as a group the TOs finally are likely to dominate Eutelsat even if private service providers are admitted to join. Then the full development of the satellite system could be put on the brink.
The second approach is more radical in that it separates the Eutelsat network completely from the TOs. As a result Eutelsat would emerge as a completely independent enterprise which carries out investment and capacity distribution on its own behalf. In this case all special rights of signatories have to be withdrawn while Eutelsat is transformed into a private enterprise. The revenues stemming from the sale of Eutelsat shares could be used to compensate TOs for the investments already carried out. The latter would be prohibited from acquiring Eutelsat shares. Eutelsat then could either sell its capacity to other service providers (including the TOs) or instead it could provide services itself.
Only the second approach appears feasible for facility-based competition based on technologically different networks. Only by separating TOs from the space operator they could be kept from subordinating the space network under the priority given to their own terrestrial one.
Potential economies of scope from operating a terrestrial and a satellite network, however, should not to be given up. Since some TOs have already established their own national satellite systems they could compete with Eutelsat in the provision of satellite services. This would mean, however, to jump directly to step 3) which raises the need for an independent European regulatory agency which distributes scarce frequency bands.

However, a supranational regulatory authority also becomes necessary in order to supervise the terrestrial international market and to regulate entry. A "*European Telecommunications Commission*" (ETC) should be established, vested with powers similar to those of the FCC. In particular it should be empowered to

- ensure the compatibility of newly installed lines with the integrated ISDN system;
- license new network operators;
- investigate and decide on access charges levied on intra-Community operators;
- specify rules for and supervise the leasing of lines;
- prevent collusive behaviour of TOs;
- distribute scarce frequency bands for satellite and mobile operators.

The lack of an appropriate regulatory body to enforce Community-wide legislation remains a big obstacle to liberalisation. Already it is needed to spur the implementation of existing directives. The need for international regulation is rising fast. For example, interconnection charges between competing service providers have to be arbitrated among countries like GB and France. Once competition emerges, there will be the need for continual regulatory oversight.

On the one hand there should be a liberalising of the telecommunications networks, while on the other one should set up a universal service fund. This fund should operate according to the *principle of subsidiarity*. First, one may observe the level of access already provided by the market on its own. The fund may then target those customers who are likely to cut-off. By doing so, distortions in the service market would be minimised and the efficiency of the universal service policy itself could be increased.

On a smaller scale the Commission could already spur competition in the international market without waiting for member states to move first. As a defensive measure firms like IDT should be protected from TOs efforts to declare private routing as illegal. The Commission could use Article 85 of the Treaty of Rome against horizontal agreements among TOs when trying to prevent routing. The liberalisation of telecommunications routing supports the Commission's goal of harmonising intra-Community telephone tariffs. As a further step in order to introduce network competition, the Commission may propose a directive which asks member states to license private network operators. As was pointed out in chapter 7, the Commission can take a decision on the basic service monopoly. By the time the Commission decided to leave the provision of the network under exclusive rights, alternative means of transmission just started to emerge. Those means have become more developed and a revision of the former decision may be at stake. In the service directive, the provision of the network was not deemed to be a reserved activity. Thus until now, there is no specific regulation concerned with network competition, leaving the latter subject to Article 90 of the Treaty of Rome.

SUMMARY

The supply of telecommunications networks is characterised by economies of scale and scope, high sunk costs and rapid technological progress. On the demand side, customer's needs are quickly changing due to demand diversification. While the former elements support monopoly provision, the latter two factors render a decentralised market solution more efficient. It was argued that the evaluation of this fundamental trade-off between static and dynamic efficiency gains is crucial for the priority given either to public monopoly or network competition in Europe. However, scrutinising the record of European TOs, I found that the extent of "state failure" in telecommunications is rather high. For political reasons, the TO's pricing policy directly contradicts optimal pricing rules. Since my empirical estimates indicated that the price-elasticity of demand is increasing over time, the efficiency losses caused by internal cross-subsididsation are rising. Nework competition would abolish this pricing scheme.

For two other reasons it was argued that over time the trade-off is biased in favour of competition. Technological progress has led to a variety of different networks which can be run separately. As long as there was only a cable network available and communication was confined to plain voice telephony, the planning of the network infrastructure was dominated by static considerations. The emergence of various substitute means of transmission and the diversification of customer's needs have fundamentally changed the telecommunications environment. A new operator does not have to duplicate the incumbent's network. The entrant is likely to choose an architecture which places him in the best unit-cost position vis-à-vis the established operator. Hence, technical and qualitative efficiency goals become more important than mere allocative efficiency. The former, however, are better served in a competitive environment. Secondly, technological development leads to the integration of previously separated markets. In the case of satellite technology, the cable-based geographic fragmentation of different national markets is overcome. As a result, the already installed national incumbents may start competing against each other. The integration of TV and telecommunications signals in the broadband network leads moreover to product market integration. Cable firms may enter the provision of telecomunications services. Both effects render the natural monopoly concept out of date. In the case of the intra-EC market it is more reasonable to speak of a natural oligopoly; competition may become sufficiently strong in this market.

Finally, while having a competitive impact, an independent satellite operator also supports the universal service goal by being able to offer complete coverage of the territory. Thus, technological progress has alleviated the conflict of interests of different customer groups.

On the other hand, the shortcomings of a "mixed regime" were pointed out. Regulation distorts the technical choices made by the incumbent. The possibility exists that incumbents use technology as a strategic weapon against potential competitors. In this respect the ISDN network is not just an upgrade of the coaxial cable network but it has also strong implications for the future scope of network competition. Moreover, a public policy approach introducing ISDN leads to a redistribution of benefits from telecommunications networks which may make residential users worse-off.

Announcing network competition for a future period may generate an investment race amongst incumbents which is detrimental. The rat-race model showed that while the TO's jargon refers to "getting fit for competition", the race is likely to lead to over-investment which binds too many scarce resources. It leads to an evaporation of monopolist profits which, however, are not redistributed to consumers. While entry may be barred, society as a whole is worse-off even when compared to monopoly provision.

The last section contains a concrete proposal for the introduction of network competition in the EC. It was argued that special attention should be given to increasing the intensity of competition by fostering particularly innovative entry. Competition between already established TOs in the intra-EC long-distance market would not generate a loss in economies of scope. However, it would eliminate the worst price distortions which presently exist in the EC's telecommunications market. The Commission's service-based approach towards competition would be fostered by offering VANs providers the choice of different carriers. The TO's scope for anticompetitive behaviour in the service markets would decrease.

APPENDIX

Chapter 3.1.7.

$$S_c = \frac{a-c}{b} \qquad S_{cr} = \frac{a-c-r}{b}$$

$$\pi^m + B^m > \pi^c + \pi^c + B^c \tag{3.12}$$

$$\frac{1}{4} bS_c^2 - F + \frac{1}{8} bS_c^2 > \frac{1}{9} bS_c^2 + \frac{1}{9} bS_c^2 + \frac{2}{9} bS_c^2 - 2F$$

$$\frac{18}{72} bS_c^2 + \frac{9}{72} bS_c^2 > \frac{32}{72} bS_c^2 - F$$

$$F > \frac{5}{72} bS_c^2 \tag{3.14}$$

Chapter 4.3.1.2.

The Monopolist Outcome

$$\pi_I^{mi} = [p(x^m) - (c-i)]\, x^m - 1.5/b\ i^2 - F \tag{4.2}$$

Maximising (4.2) with respect to x^m leads to

$$x^m = \frac{S_c}{2} + \frac{i}{2b}$$

Using x^m and maximising (4.2) with respect to i

$$i = \frac{1}{5} bS_c \tag{4.3}$$

Given the value for i one obtains the monopolist's output

$$x^m = \frac{3}{5} S_c \tag{4.3}$$

Both values of (4.3) then can be inserted into (4.2) to derive (4.4)

$$\pi_I^{mi} = [\frac{2}{5} bS_C + \frac{1}{5} bS_C] \frac{3}{5} S_C - \frac{1.5}{b} \frac{1}{25} bS_C^2 - F$$

$$\pi_I^{mi} = \frac{3}{10} bS_C^2 - F \tag{4.4}$$

The Cournot Outcome

Inserting (4.8) into (4.5) gives the condensed profit function of the incumbent:

$$\pi_I^{ci} = \frac{b}{9} S_C^2 + \frac{4}{9} i S_C + \frac{4i^2}{9b} - \frac{3i^2}{2b} - F$$

Maximisation with respect to i leads to (4.9).

Inserting (4.9) into (4.8) provides for the quantities which both firms produce in period 2. Then one can write for the incumbent's profit:

$$\pi_I^{ci} = [bS_C - b((\frac{9}{19} + \frac{5}{19}) S_C) + i] x_I - \frac{3i^2}{2b} - F$$

Inserting (4.9) leads to

$$\pi_I^{ci} = \frac{3}{19} bS_C^2 - F \tag{4.10}$$

Natural Monopoly

$$\pi_I^{mi} + B^{mi} > \pi_I^{ci} + \pi_e^{ci} + B^{ci} \tag{4.11}$$

Using (4.3) one can determine the consumer surplus in case of monopoly provision and investment:

$$B^{mi} = \frac{(a - p(x^m))}{2} x^m = \frac{9}{50} bS_C^2$$

The consumer surplus in case of entry and investment:

$$B^{ci} = \frac{(a - b(x_I + x_e))}{2} (x_I + x_e) = \frac{98}{361} bS_C^2$$

Using (4.4) and (4.10) one can calculate (4.11), which leads to (4.12).

Entry Deterrence

$$\pi_e^{ci} = [p(x_I + x_e) - c] x_e - F$$

Maximisation leads to:

$$x_I = \frac{Sc}{3} + \frac{2}{3}\frac{i}{b} \qquad x_e = \frac{Sc}{3} - \frac{1}{3}\frac{i}{b}$$

Using these quantities one can determine the entrant's profit. This has to be equal or smaller than zero:

$$\pi_e^{ci} = \frac{b}{9} [S_C - \frac{i}{b}]^2 - F \leq 0$$

The condition $\pi_e^{ci} \leq 0$ is fulfilled for (4.13).

The incumbent will invest as much, if $\pi_I^{mid} > \pi_I^{ci}$.

In order to determine π_I^{mid} one has to determine the monopolist's output at the investment level i_d.

$$x^m = \frac{Sc}{2} + \frac{i}{2b}$$

Inserting (4.13) leads to

$$x^m = S_C - \frac{3}{2} \frac{\sqrt{F}}{\sqrt{b}}$$

which leads to

$$\pi_I^{mid} = 6\ Sc \sqrt{F} \sqrt{b} - \frac{b}{2} S_C^2 - \frac{49}{4} F$$

This has to exceed the value for π_I^{ci} as established for (4.10). This is the case for fixed cost in between the limits of (4.14).

Regulation versus Competition

$$\pi_I^{mi} + B^{mi} < \pi_I^{mid} + B_I^{mid} \tag{4.16}$$

Using the value for the monopolist's output given that he has invested i_d as calculated above one finds for B_I^{mid}

$$B_I^{mid} = \frac{(a - p(x^m))}{2} x^m = \frac{b\ S_C^2 - 3\ Sc\ \sqrt{F}\sqrt{b} + 9/4\ F}{2}$$

Using (4.4) and the values calculated above for π_I^{mi}, B^{mi}, π_I^{mid} one eventually finds the condition (4.17) for (4.16).

Chapter 4.3.2.2.

$$\pi_S = [p(x_s + x_1) - c]\, x_s = 0$$

$$[bS_C - b\,\{\frac{S_C}{3} + \frac{2i}{3b} + \frac{S_C}{3} - \frac{i}{3b}\}]\,(\frac{S_C}{3} - \frac{i}{3b}) = 0$$

$$i = bS_C \qquad (4.19)$$

$$\pi_i^m = [p(x^m) - c + i]\, x^m - \frac{1.5}{b}\, i^2$$

Differentiation with respect to x_S leads to the monopolist's output, depending on his investment:

$$x^m = \frac{S_C}{2} + \frac{i}{2b}$$

Using x^m one can write for the monopolist's profit:

$$\pi_i^m = \frac{b}{4}[S_C + \frac{i}{b}]^2 - \frac{1.5}{b}\, i^2 \qquad (4.22)$$

$$\frac{1}{4}bS_C^2 > \frac{b}{4}[S_C + \frac{i}{b}]^2 - \frac{1.5}{b}\, i^2$$

$$\rightarrow \quad i^a > 0.4\ bS_C \qquad (4.23)$$

The incumbent's profit in the case of Cournot is

$$\pi_I^C = [p(x_1 + x_e) - c + i]x_I - \frac{1.5}{b}\, i^2$$

Maximisation with respect to x_I leads to

$$x_I = \frac{S_C}{2} - \frac{x_e}{2} + \frac{i}{2b}$$

The entrant's reaction function is

$$x_e = \frac{S_c}{2} - \frac{x_I}{2}$$

Using x_e as established above, the incumbent's reaction function with respect to i is

$$x_I = \frac{1}{3}[S_c + \frac{2i}{b}]$$

The entrant's output instead decreases with rising i

$$x_e = \frac{1}{3}[S_c - \frac{i}{b}]$$

Thus the incumbent's profit in case of Cournot is

$$\pi_I^c = \frac{b}{9}[S_c + \frac{2i}{b}]^2 - \frac{1.5}{b} i^2 \qquad (4.28)$$

Limiting Entry

$$B_i^m = \frac{[a - p(x^m)]}{2} x_i^m$$

$$\rightarrow \quad B_i^m = \frac{b}{8}[S_c + \frac{i}{b}]^2 \qquad (4.39)$$

The Mixed-Strategy Equilibrium

Case 1

$$F(i_d) = \frac{(1.5/b)\ i_d^2}{(5/36)\ bS_c^2 + (1.5/b)\ i_d^2} \qquad (4.50)$$

Then

$$h(i_d) = \frac{1.5}{b} i_d^2 \quad \rightarrow h'(i_d) = \frac{3}{b} i_d$$

$$g(i_d) = \frac{5}{36} bS_c^2 + \frac{1.5}{b} i_d^2 \quad \rightarrow g'(i_d) = \frac{3}{b} i_d$$

$$\rightarrow g(i_d)^2 = \frac{25}{36^2} i_d + \frac{15}{36} i_d^2 S_c^2 + \frac{3}{b^2} i_d^4$$

Then $f(i_d)$ can be determined for individual values of i according to

$$f(i_d) = F'(i_d) = \frac{h'(i_d) g(i_d) - h(i_d) g'(i_d)}{g(i_d)^2}$$

For determining i* one has to set $\pi_{ic}^c = \pi_{i*}^m$

$$\frac{b}{9} S_c^2 = \frac{b}{4} S_c^2 - \frac{1.5}{b} i*^2$$

$$\rightarrow i* = 0.304\ bS_c^2$$

Case 2

$$F(i_d) = \frac{\pi_{ic}^c - \pi_{id}^c}{\pi_{id}^m - \pi_{id}^c}$$

This can be determined using (4.56), (4.62) and:

$$\pi_{ic}^c = \frac{3}{19} bS_c^2$$

which is the incumbent's profit in case of entry and the investment $i_c = (4/19)\ bS_C$.

Inserting π_{ic}^c, π_{id}^m and π_{id}^c one obtains for $F(i_d)$

$$F(i_d) = \frac{0.047\ bS_c^2 - 0.44\ i_d S_C + 1.06\ i_d^2/b}{0.139\ bS_c^2 + 0.055\ i_d S_C - 0.194\ i_d^2/b}$$

Similar to case 1) one can determine $f(i_d) = F'(i_d)$.

$$\pi_{ic}{}^{c} = \pi_{i*}{}^{m}$$

$$\frac{3}{19} bS_c{}^2 = \frac{b}{4}[S_c + \frac{i*}{b}]^2 - \frac{1.5}{b}i*^2$$

$$\rightarrow i* = 0.537\ bS_c$$

Overinvestment

$$\pi_i{}^C = [bS_C - bx_I - bx_e + i]x_I - \frac{1.5}{b}i^2$$

Using π_e and $\pi_i{}^c$ as determined above one can determine both firms' output depending on the investment i

$$x_I = \frac{S_C}{3} + \frac{2i}{3b} \qquad x_e = \frac{S_C}{3} - \frac{i}{3b}$$

Inserting x_I and x_e into $\pi_i{}^c$ one finds

$$i_c = 0.211\ bS_C \tag{4.52}$$

The expected investment from rat-race competition is

$$E(i) = \int_{i_C}^{i*} i\ f(i)\ di = F(i)\ i \Big|_{i_C}^{i*} - \int_{i_C}^{i*} F(i)\ di \tag{4.54}$$

Using F(i) as established above for $F(i_d)$ and the values obtained for i_c and i* one can determine (4.88).

For the incumbent's expected profit one can write

$$\int_{i_c}^{i*} \pi_i{}^c\ f(i)\ di = \pi_{ic}{}^c\ [F(i*) - F(i_c)] = 0.16\ bS_C{}^2 \tag{4.56}$$

For the expected total social welfare

$$E(W) = 2\ E(\pi_I) + E(\pi_e) + B^c + B^m$$

$$E(W) = 2\,(0.16\ bS_c^2) + 0.035\ bS_c^2 + 0.33\ bS_c^2 + 0.195\ bS_c^2 = 0.88\ b\ S_c^2 \tag{4.58}$$

Chapter 13

Diagnostic tests

In the following I report the results of the diagnostic tests which I undertook for the empirical estimations of demand elasticities.
Unfortunately I could not carry out all tests provided by PC-Give since the sample of twenty years was too low to generate sufficient degrees of freedom.

Tests

For the residual correlogram the "**Residual Correlogram Sum of Squares**" (Θ) is reported. If 's' is the length of the correlogram then in case of $\Theta > 2s$ this would be an indication of mis-specification.

The OLS test for **residual autoregression** reports the lag coefficients and the standard error. If the coefficient of the lag plus or minus twice the standard error include zero than the hypothesis that $\delta = 0$ is not rejected (thus the hypothesis is not rejected that the lag does not explain the dependent variable).
Furthermore an F-test is carried out for residual autoregression. If the prob value of the F-statistic is above 0.05 then the hypothesis that the lags do not explain the dependent variable is not rejected.

The H_0 hypothesis of the test for **autocorrelated errors** is that there is no autocorrelation (errors are white noise). Again, if the prob value of the F-statistic is above 0.05, then the H_0 cannot be rejected.

The LM-test for autocorrelated squared residuals (Arch: AutoRegressive Conditional Heteroscedasticity) tests the hypothesis that $\delta = 0$, in the model:

$$E(u_t^2 \;/\; u_{t-1}, \ldots u_{t-r}) = c_0 + \Sigma\, \delta_i u_{t-1}^2$$

Thus for $\delta = 0$ there is no heteroscedasticity.
I have carried out the Arch-test as well, though one normally does not expect heteroscedasticity to be a problem in time series models.

The Jarque and Bera test **statistic for normality** is Ch^2 distributed with 2 degrees of freedom and tests the H_0 of normality. For $\alpha = 0.05$ and 2 degrees of freedom the critical value is $Ch^2_c = 5.99$. If the actual value is below Ch^2_c, then the H_0 cannot be rejected.

The **Reset-test** for omitted values adds auxiliary variables and tests for their significance. The H_0 is that $\delta = 0$, thus that the added variables are not significant. If the prob-value of the F-test is above 0.05 then the H_0 cannot be rejected.

Diagnostic tests for Germany

Equation (1): local service

a) autocorrelation
Residual Correlogram Sum of Squares: 9.377 < 2s = 12
Residual Autoregression F(3,8) = 0.22 (0.8786)
Autocorrelated Errors F(2,12) = 1.29 (0.3096)

The test results do not indicate autocorrelation.

b) heteroscedasticity
Arch-test: F(2,10) = 1.18(0.3481)

The Ho that $\delta = 0$ cannot be rejected.

c) normality
test for normality: Ch2(2) = 1.223

The Ho of normality is not rejected.

d) misspecification
Reset-test: F(1,13) = 0.028 (0.8703)

The Reset test does not indicate missing variables.

For the subsamples I could not carry out all tests.

Equation (1a)

a) autocorrelation
Residual Correlogram Sum of Squares: 2.625 < 2s = 8

The Durbin Watson and the RCSS do not indicate autocorrelation.

b) normality

test for normality: Ch2(2) = 0.233

The Ho of normality is not rejected.

c) misspecification

Reset F(1,6) = 22.847 (0.0031)

The prob value of the Reset test is below 0.005. This indicates that equation (1a) is misspecified.

Equation (1b)

a) autocorrelation

Residual Correlogram Sum of Squares: 5,260 < 2s = 8

The Durbin Watson and the RCSS do not indicate autocorrelation.

b) normality

test for normality: Ch2(2) = 0.520

The Ho of normality is not rejected.

c) misspecification

Reset F(1,6) = 3.451 (0.1126)

The prob value of the Reset test does not indicate misspecification of equation (1b).

Equation (2) long distance service

a) autocorrelation

Residual Correlogram Sum of Squares: 8.669 < 2s = 12

Residual Autoregression F(3,8) = 0.05 (0.9833)

Autocorrelated Errors F(2,12) = 0.19 (0.8277)

The test results do not indicate autocorrelation.

b) heteroscedasticity

Arch-test: F(2,10) = 1.17 (0.3562)

The Ho that $\delta = 0$ cannot be rejected.

c) normality

test for normality: Ch2(2) = 0.731

The Ho of normality is not rejected.

d) missspecification

Reset-test: F(1,13) = 0.958 (0.3456)

The Reset test does not indicate missing variables.

For the subsamples I could not carry out all tests.

Equation (2a)

a) autocorrelation

Residual Correlogram Sum of Squares: 5.275 < 2s = 8

The Durbin Watson and the RCSS do not indicate autocorrelation.

b) normality

test for normality: Ch2(2) = 0.056

The Ho of normality is not rejected.

c) misspecification

Reset F(1,6) = 0.231 (0.6512)

The prob value of the Reset test does not indicate misspecification.

Equation (2b)

a) autocorrelation

Residual Correlogram Sum of Squares: 8.725 < 2s = 8

Despite the high Durbin Watson value, the RCSS do not indicate autocorrelation.

b) normality

test for normality: Ch2(2) = 0.264

The Ho of normality is not rejected.

c) misspecification

Reset F(1,5) = 0.004 (0.9551)

The prob value of the Reset test does not indicate misspecification of equation (2b).

Equation (3): calls from Germany to France

a) autocorrelation

Residual Correlogram Sum of Squares: 3.820 < 2s = 12

Residual Autoregression F(3,7) = 0.14 (0.9339)

Autocorrelated Errors F(2,11) = 0.38 (0.6940)

The test results do not indicate autocorrelation.

b) heteroscedasticity

Arch-test: F(2,9) = 0.47 (0.6370)

The Ho that $\delta = 0$ cannot be rejected.

c) normality

test for normality: Ch2(2) = 0.803

The Ho of normality is not rejected.

d) missspecification

Reset-test: F(1,12) = 11.607 (0.0052)

The Reset test indicates misspecification. When the three substitute service variables were excluded the result of the Reset test improved considerably (see equation (3a).

Equation (3a)

a) autocorrelation

Residual Correlogram Sum of Squares: 9.269 < 2s = 12

Residual Autoregression F(3,10) = 0.80 (0.5239)

Autocorrelated Errors F(2,14) = 1.72 (0.2153)

The test results do not indicate autocorrelation.

b) heteroscedasticity
Arch-test: $F(2,12) = 0.04$ (0.9596)

The Ho that $\delta = 0$ cannot be rejected.

c) normality
test for normality: $Ch2(2) = 1.261$

The Ho of normality is not rejected.

d) missspecification
Reset-test: $F(1,15) = 1.975$ (0.1803)

The Reset test does not indicate missing variables.

For the subsamples I could not carry out all tests.

Equation (3b)

a) autocorrelation
Residual Correlogram Sum of Squares: $3.853 < 2s = 8$

The Durbin Watson and the RCSS do not indicate autocorrelation.

b) normality
test for normality: $Ch2(2) = 0.542$

The Ho of normality is not rejected.

c) misspecification
Reset $F(1,7) = 0.005$ (0.9460)

The prob value of the Reset test does not indicate misspecification.

Equation (3c)

a) autocorrelation
Residual Correlogram Sum of Squares: $2.095 < 2s = 8$

The Durbin Watson and the RCSS do not indicate autocorrelation.

b) normality

test for normality: Ch2(2) = 0.469

The Ho of normality is not rejected.

c) misspecification

Reset F(1,7) = 4.553 (0.0703)

The prob value of the Reset test does not indicate misspecification of equation (3c).

Equation (4): calls from West Germany to Great Britain

a) autocorrelation

Residual Correlogram Sum of Squares: 12.368 < 2s = 12

Residual Autoregression F(3,7) = 0.14 (0.9321)

Autocorrelated Errors F(2,11) = 0.45 (0.6472)

The test results are not unabiguous. The DW and the RCSS may hint to positive autocorrelation. The other two tests do not.

b) heteroscedasticity

Arch-test: F(2,9) = 0.7 (0.5213)

The Ho that $\delta = 0$ cannot be rejected.

c) normality

test for normality: Ch2(2) = 0.499

The Ho of normality is not rejected.

d) missspecification

Reset-test: F(1,10) = 10.714(0.0067)

The Reset test indicates misspecification.

Equation (4a):

a) autocorrelation

Residual Correlogram Sum of Squares: 9.261 < 2s = 12

Residual Autoregression F(3,10) = 0.40 (0.7548)

Autocorrelated Errors $F(2,14) = 0.36$ (0.7042)

The test results do not indicate autocorrelation.

b) heteroscedasticity
Arch-test: $F(2,12) = 0.05$ (0.8423)

The Ho that $\delta = 0$ cannot be rejected.

c) normality
test for normality: $Ch2(2) = 0.963$

The Ho of normality is not rejected.

d) missspecification
Reset-test: $F(1,15) = 7.003$ (0.0183)

Again the Reset test indicates misspecification.

For the subsamples I could not carry out all tests.

Equation (4b)

a) autocorrelation
Residual Correlogram Sum of Squares: $4.018 < 2s = 8$

The Durbin Watson and the RCSS do not indicate autocorrelation.

b) normality
test for normality: $Ch2(2) = 1.023$

The Ho of normality is not rejected.

c) misspecification
Reset $F(1,7) = 0.526$ (0.4918)

For the subsample the Reset test does not indicate misspecification.

Equation (4c)

a) autocorrelation

Residual Correlogram Sum of Squares: 3.481 < 2s = 8

The Durbin Watson and the RCSS do not indicate autocorrelation.

b) normality

test for normality: Ch2(2) = 1.745

The Ho of normality is not rejected.

c) misspecification

Reset F(1,7) = 0.210 (0c6607)

The prob value of the Reset test does not indicate misspecification of equation (4c).

Equation (5): calls from West Germany to Italy

a) autocorrelation

Residual Correlogram Sum of Squares: 7.454 < 2s = 8

Residual Autoregression F(3,7) = 1.31 (0.3460)

Autocorrelated Errors F(2,12) = 3.86 (0.0537)

The test results and the Durbin Watson value do not indicate autocorrelation.

b) heteroscedasticity

Arch-test: F(2,9) = 0.33 (0.7295)

The Ho that $\delta = 0$ cannot be rejected.

c) normality

test for normality: Ch2(2) = 4.928

The Ho of normality is not rejected.

d) missspecification

Reset-test: F(1,12) = 0.118 (0.7372)

The Reset test does not indicate missing variables.

Equation (5a):

a) autocorrelation

Residual Correlogram Sum of Squares: 6.414 < 2s = 12

Residual Autoregression F(3,10) = 0.42 (0.7419)

Autocorrelated Errors F(2,12) = 0.98 (0.3995)

The test results do not indicate autocorrelation.

b) heteroscedasticity

Arch-test: F(2,12) = 0.15 (0.8644)

The Ho that $\delta = 0$ cannot be rejected.

c) normality

test for normality: Ch2(2) = 0.590

The Ho of normality is not rejected.

d) missspecification

Reset-test: F(1,15) = 1.679 (0.2147)

The Reset test does not indicate missing variables.

For the subsamples I could not carry out all tests.

Equation (5b)

a) autocorrelation

Residual Correlogram Sum of Squares: 14.383 > 2s = 8

While the Durbin Watson value does not, the RCSS indicates autocorrelation.

b) normality

test for normality: Ch2(2) = 0.745

The Ho of normality is not rejected.

c) misspecification
Reset F(1,7) = 0.244 (0.6366)

The prob value of the Reset test does not indicate misspecification.

Equation (5c)

a) autocorrelation
Residual Correlogram Sum of Squares: 6.359 < 2s = 8

The Durbin Watson and the RCSS do not indicate autocorrelation.

b) normality
test for normality: Ch2(2) = 0.268

The Ho of normality is not rejected.

c) misspecification
Reset F(1,7) = 0.173 (0.6899)

The prob value of the Reset test does not indicate misspecification of equation (5c).

Equation (6): calls form West Germany to the USA

a) autocorrelation
Residual Correlogram Sum of Squares: 6.80 < 2s = 12
Residual Autoregression F(3,7) = 0.65 (0.6094)
Autocorrelated Errors F(2,11) = 1.82 (0.2083)

The test results do not indicate autocorrelation.

b) heteroscedasticity
Arch-test: F(2,9) = 1.62 (0.2511)

The Ho that $\delta = 0$ cannot be rejected.

c) normality
test for normality: Ch2(2) = 0.283

The Ho of normality is not rejected.

d) missspecification

Reset-test: F(1,12) = 1.342 (0.2692)

The Reset test does not indicate missing variables.

Equation (6a)

a) autocorrelation

Residual Correlogram Sum of Squares: 6.468 < 2s = 12

Residual Autoregression F(3,10) = 0.84 (0.5009)

Autocorrelated Errors F(2,14) = 2.23 (0.1445)

The test results do not indicate autocorrelation.

b) heteroscedasticity

Arch-test: F(2,12) = 1.20 (0.3338)

The Ho that $\delta = 0$ cannot be rejected.

c) normality

test for normality: Ch2(2) = 4.055

The Ho of normality is not rejected.

d) missspecification

Reset-test: F(1,15) = 7.489 (0.0153)

The Reset test indicates missing variables.

For the subsamples I could not carry out all tests.

Equation (6b)

a) autocorrelation

Residual Correlogram Sum of Squares: 2.834 < 2s = 8

The Durbin Watson and the RCSS do not indicate autocorrelation.

b) normality

test for normality: Ch2(2) = 0.387

The Ho of normality is not rejected.

c) misspecification

Reset F(1,7) = 0.730 (0.4211)

The prob value of the Reset test does not indicate misspecification.

Equation (6c)

a) autocorrelation

Residual Correlogram Sum of Squares: 2.093 < 2s = 8

The Durbin Watson and the RCSS do not indicate autocorrelation.

b) normality

test for normality: Ch2(2) = 0.415

The Ho of normality is not rejected.

c) misspecification

Reset F(1,7) = 7.179 (0.0316)

The prob value of the Reset test indicates missing variables.

Italy

Table 13.7

The "disinc" variable has been lagged since tests results indicated that the lag is significant. Moreover, without the lag the "*Residual Correlogram Sum of Squares*" value was very high. Test results generally improved with the lag for *disinc*.

Equation (7)

a) autocorrelation
Residual Correlogram Sum of Squares: 4.484 < 2s = 12
Residual Autoregression: F(3,8) = 0.14 (0.9329)
Autocorrelated Errors: F(2,12) = 0.29 (0.7544)

There is no indication of autocorrelation (neither from the Durbin Watson value).

b) heteroscedasticity
Arch-test: F(2,10) = 0.12 (0.8868)

The Ho that $\delta = 0$ cannot be rejected.

c) normality
test for normality: Ch2(2) = 0.784

The Ho of normality is not rejected.

c) misspecification
Reset-test: F(1,13) = 0.984 (0.3394)

The added variables are not significant.

Equation (7a)

For the subperiods the number of observations is to small to carry out most of the tests.

a) autocorrelation
Residual Correlogram Sum of Squares: 4.969 < 2s = 8

Neither the Durbin Watson nor the RSSS indicate autocorrelation.

b) normality

test for normality: Ch2(2) = 0.602

The Ho of normality is not rejected.

c) misspecification

Reset test: F(1,5) = 8.053 (0.0363)

The Prob-value is below 0.05. Thus the Ho that added variables are significant cannot be rejected.

Equation (7b)

a) autocorrelation

Residual Correlogram Sum of Squares: 3.568 < 2s = 8

Neither the Durbin Watson nor the RSSS indicate autocorrelation.

b) normality

test for normality: Ch2(2) = 7.416

The Ho of normality is rejected.

c) misspecification

Reset test: F(1,6) = 0.123 (0.7374)

The Ho that added variables are significant is rejected.

Equation (7c)

a) autocorrelation

Residual Correlogram Sum of Squares: 6.352 < 2s = 8

While the Durbin Watson is in the range where it is not determinated, the RSSS does not indicate autocorrelation.

b) normality

test for normality: Ch2(2) = 2.962

The Ho of normality is not rejected.

c) misspecification

Reset test: F(1,7) = 0.253 (0.6303)

The Ho that added variables are significant is rejected.

Table 13.8

Equation (8)

a) autocorrelation

Residual Correlogram Sum of Squares: 7.541 < 2s = 12

Residual Autoregression: F(3,8) = 0.11 (0.9521)

Autocorrelated Errors: F(2,12) = 0.57 (0.5785)

The test results indicate that the low Durbin Watson value is not caused by autocorrelation.

b) heteroscedasticity

Arch-test: F(2,10) = 0.11 (0.8957)

The Ho that $\delta = 0$ cannot be rejected.

b) normality

test for normality: Ch2(2) = 0.779

The Ho of normality is not rejected.

c) misspecification

Reset-test: F(1,13) = 8.158 (0.0135)

The low Durbin Watson as well as the low Prob-value of the Reset test indicate that variables are missing.

equation (8a)

For the smaller period 1976-1989 again most of the tests could not be carried out.

a) autocorrelation

Residual Correlogram Sum of Squares: 8.278 < 2s = 12

Neither the Durbin Watson nor the RSSS indicate autocorrelation.

b) normality

test for normality: Ch2(2) = 3.226

The Ho of normality is not rejected.

c) misspecification

Reset test: F(1,7) = 0.000 (0.9996)

The high prob value especially when compared to the results for (27) indicates that the telex variable had to be included in the model. All further variables which were added were not significant.

Spain

Table 13.9

Equation (9)

The "disinc" variable has been lagged since the lag had a higher t-value. I could not find indication of misspecification or autocorrelation. However, due to the small sample size the test for autocorrelated errors and the Arch-test could not be carried out.

a) autocorrelation

Residual Correlogram Sum of Squares: 2.424 < 2s = 8

There is no indication of autocorrelation (neither from the Durbin Watson value).

b) normality

test for normality:Ch2(2) = 0.623

The Ho of normality is not rejected.

c) misspecification

Reset-test: F(1.7) = 0.001 (0.9789)

There is no indication of missing variables.

equation (9a)

a) autocorrelation

Residual Correlogram Sum of Squares: 9.123 < 2s = 12

Residual autoregression: F (3,8) = 0.54 (0.6680)

Test for autocorrelated errors: F(2,12) = 0.55 (0.5978)

Though the Durbin Watson value is low the tests do not indicate problems with autocorrelation.

b) heteroscedasticity

Arch - test: F(2,10) = 0.31 (0.7421)

There is no indication of heteroscedasticity.

c) misspecification

Reset F-test: F(1,13) = 0.366 (0.5555)

The result does not indicate that variables are missing.

For the subsamples I could not carry out the diagnostic tests. They therefore can only be taken as a rough estimation of the variables' coefficients.

Table 13.10

Equation (10)

For equation (15) and (16) I could not carry out further tests for autocorrelation, misspecification and heteroscedasticity.

a) autocorrelation

Residual Correlogram Sum of Squares: 10.364 > 2s = 10

The RASS is slightly above the critical value. Thus it might indicate that there isautocorrelation.

b) normality

test for normality:Ch2(2) = 0.770

The Ho of normality is not rejected.

c) misspecification

Reset-test: F(1.4) = 0.473 (0.5296)

There is no indication of missing variables.

Equation (10a)

a) autocorrelation

Residual Correlogram Sum of Squares: 10.976 > 2s = 8

The RASS is above the critical value. Thus it might indicate that there is autocorrelation.

b) normality

test for normality:Ch2(2) = 0.610

The Ho of normality is not rejected.

c) misspecification

Reset-test: F(1,6) = 0.727 (0.4267)

There is no indication of missing variables.

Table 13.11

Equation (11)

a) autocorrelation

Residual Correlogram Sum of Squares: 10.290 > 2s = 8

The RASS is above the critical value. Thus it might indicate that there is autocorrelation.

b) normality

test for normality:Ch2(2) = 0.427

The Ho of normality is not rejected.

c) misspecification

Reset-test: F(1,4) = 31.65 (0.0049)

The Reset test indicates the missing of variables

Equation (11a)

a) autocorrelation

Residual Correlogram Sum of Squares: 5.175 < 2s = 8

The RASS does not indicate autocorrelation.

b) normality

test for normality:Ch2(2) = 0.416

The Ho of normality is not rejected.

c) misspecification

Reset-test: F(1,4) = 26.801 (0.0066)

The Reset test indicates missing variables.

Equation (11b)

a) autocorrelation

Residual Correlogram Sum of Squares: 8.077 > 2s = 8

The RASS is just at the limit of the critical value. The Durbin Watson value also is in the undetermined interval.

b) normality

test for normality:Ch2(2) = 1.157

The Ho of normality is not rejected.

c) misspecification

Reset-test: F(1,4) = 20.390 (0.0107)

The Reset test indicates missing variables.

Table 13.12

Equation (12)

a) autocorrelation

Residual Correlogram Sum of Squares: 8.870 > 2s = 8

The RASS is just above the critical value. The Durbin Watson, however, does not indicate autocorrelation.

b) normality

test for normality:Ch2(2) = 0.537

The Ho of normality is not rejected.

c) misspecification

Reset-test: F(1,4) = 6.483 (0.0636)

Though the prob value is low, it is above the critical value.

Equation (12a)

a) autocorrelation

Residual Correlogram Sum of Squares: 11.402 > 2s = 8

The RASS is above the critical value. Thus it might indicate that there is autocorrelation. However, the Durbin Watson value does not.

b) normality

test for normality:Ch2(2) = 0.810

The Ho of normality is not rejected.

c) misspecification

Reset-test: F(1,4) = 12.27 (0.0267)

The Reset test indicates missing variables.

Equation (12b)

a) autocorrelation

Residual Correlogram Sum of Squares: 15.098 > 2s = 10

The RASS is above the critical value. Thus it might indicate that there is autocorrelation. However, the Durbin Watson value does not.

b) normality

test for normality:Ch2(2) = 0.430

The Ho of normality is not rejected.

c) misspecification

Reset-test: F(1,6) = 9.744 (0.0355)

The Reset test indicates missing variables.

Great Britain

Table 13.13

Equation (13)

a) autocorrelation
Residual Correlogram Sum of Squares: 7.533 < 2s = 12
Autocorrelated Errors: F(1,10) = 0.01 (0.9157)

There is no indication of autocorrelation (neither from the Durbin Watson value).

b) heteroscedasticity
Arch-test: F(2,7) = 0.19 (0.8292)

The Ho that $\delta = 0$ cannot be rejected.

c) normality
test for normality: Ch2(2) = 0.862

The Ho of normality is not rejected.

c) misspecification
Reset-test: F(1,10) = 2.349 (0.1563)

The added variables are not significant.

Equation (13a)

a) autocorrelation
Residual Correlogram Sum of Squares: 4.931 < 2s = 8

The RCSS does not indicate autocorrelation.

b normality
test for normality: Ch2(2) = 0.772

The Ho of normality is not rejected.

d) misspecification

Reset test: F(1,8) = 8.768 (0.0181)

The Prob-value is below 0.05. Thus the Ho that added variables are significant cannot be rejected.

Table 13.14

Equation (14)

a) autocorrelation

Residual Correlogram Sum of Squares: 5.051 < 2s = 8

Neither the Durbin Watson nor the RSSS indicate autocorrelation.

b) normality

test for normality: Ch2(2) = 1.757

The Ho of normality is rejected.

c) misspecification

Reset test: F(1,6) = 0.048 (0.8346)

The Ho that added variables are significant is rejected.

Equation (14a)

a) autocorrelation

Residual Correlogram Sum of Squares: 12.70 > 2s = 12

Autocorrelated Errors: F(1,10) = 0.06 (0.8086)

The Durbin Watson value and the test for autocorrelated errors do not indicate autocorrelation. However, the RCSS is above the critical value.

b) heteroscedasticity

Arch-test: F(2,7) = 0.15 (0.8602)

The Ho that $\delta = 0$ cannot be rejected.

c) normality
test for normality: Ch2(2) = 1.276

The Ho of normality is not rejected.

d) misspecification
Reset test: F(1,10) = 3.156 (0.1060)

The Ho that added variables are significant is rejected.

Equation (13b)

a) autocorrelation
Residual Correlogram Sum of Squares: 5.453 < 2s = 12
Autocorrelated Errors: F(1,9) = 0.72 (0.4168)

Neither the test results nor the Durbin Watson value indicate autocorrelation.

b) normality
test for normality: Ch2(2) = 1.810

The Ho of normality is not rejected.

c) misspecification
Reset-test: F(1,9) = 0.471 (0.5097)

The Ho that added variables are significant is rejected.

Equation (13c)

For the smaller period 1977-1988 again most of the tests could not be carried out.

a) autocorrelation
Residual Correlogram Sum of Squares: 5.056 < 2s = 10

Neither the Durbin Watson nor the RSSS indicate autocorrelation.

b) normality

test for normality: Ch2(2) = 0.425

The Ho of normality is not rejected.

c) misspecification

Reset test: F(1,7) = 4.853 (0.0698)

The Ho that added variables are significant is rejected.

Prices for a telex in West Germany

	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
1 unit in DM	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
internal (seconds for one unit)																					
	30	30	30	30	30	30	30	30	30	30	30	30	15	15	15	15	15	15	15	15	15
external (seconds for one unit)																					
France	8.56	8.56	8.56	8.56	8.56	8.56	8.56	8.56	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50
Italy/GB	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	6.67	6.67	6.67	6.67	6.67	6.67	6.67	6.67	6.67	6.67	6.00	6.00	6.00
USA	0.714	0.714	0.714	0.714	0.714	0.714	0.714	0.714	0.811	0.811	0.811	0.811	0.811	0.811	0.811	0.811	0.811	0.811	2.50	2.50	2.50

Sources: Bundesministerium für das Post- und Fernmeldewesen, Bonn

1970: West Germany: Amtsblatt Nr.149 ; Nr.787/70 ; p:1627
RC Amtsblatt Nr. 74 ; Nr.406/70 p.832
USA Amtsblatt Nr. 29 ; Nr.161/70 p.361

1978: Amtsblatt Nr. 14/78 ; Anlage p.359

1982-1988: Postbuch 1982,1988

Prices for express letters in West Germany

	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
internal																					
letter	0.20	0.30	0.40	0.40	0.50	0.50	0.50	0.50	0.60	0.60	0.60	0.60	0.80	0.80	0.80	0.80	0.80	0.80	0.80	1.00	1.00
express	1.50	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.50	2.50	2.50	2.50	3.50	3.50	3.50	3.50	3.50	3.50	5.00	5.00	5.00
external																					
France																					
letter	0.20	0.30	0.30	0.30	0.50	0.50	0.50	0.50	0.50	0.60	0.60	0.60	0.80	0.80	0.80	0.80	0.80	0.80	0.80	1.00	1.00
express	1.50	1.50	1.50	1.50	2.00	2.00	2.00	2.00	2.00	2.50	2.50	2.50	3.50	3.50	3.50	3.50	3.50	3.50	5.00	5.00	5.00
Italy																					
letter	0.20	0.30	0.30	0.30	0.50	0.50	0.50	0.50	0.50	0.60	0.60	0.60	0.80	0.80	0.80	0.80	0.80	0.80	0.80	1.00	1.00
express	1.50	1.50	1.50	1.50	2.00	2.00	2.00	2.00	2.00	2.50	2.50	2.50	3.50	3.50	3.50	3.50	3.50	3.50	5.00	5.00	5.00
Great Britain																					
letter	0.20	0.30	0.30	0.30	0.50	0.50	0.50	0.50	0.50	0.60	0.60	0.60	1.00	1.00	1.00	1.00	1.00	1.00	0.80	1.00	1.00
express	1.50	1.50	1.50	1.50	2.00	2.00	2.00	2.00	2.00	2.50	2.50	2.50	3.50	3.50	3.50	3.50	3.50	3.50	5.00	5.00	5.00
USA																					
letter	1.10	1.10	1.10	1.10	1.30	1.30	1.30	1.30	1.10	1.40	1.40	1.40	1.60	1.60	1.60	1.60	1.60	1.60	1.60	2.00	2.00
express	1.50	1.50	1.50	1.50	2.00	2.00	2.00	2.00	2.00	2.50	2.50	2.50	3.50	3.50	3.50	3.50	3.50	3.50	5.00	5.00	5.00

letter: Tariff for a standard letter up to 20g.(in DM).

express: extra express delivery charge (in DM).

Sources: Bundesministerium für das Post- und Fernmeldewesen, Bonn. 1971: Amtsblatt Nr.80 ; Verordnung Nr.: 464/71 p.:1191
1978: Amtsblatt Nr.159 ; 5. Verordnung zur Änderung der Auslandsgebührenordnung (2.12.1978) p.:1878 1979: Amtsblatt vom 28.12.1978, p.:2091 1980-1990: Postbücher

Prices for a telegram in West Germany

	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
internal																					
min	2.10	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	5.00	5.00
word	0.30	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.60	0.60	0.60	0.60	0.80	0.80	0.80	0.80	0.80
external																					
France																					
min	2.10	3.50	3.50	3.50	3.50	3.50	3.50	3.50	4.20	4.20	4.20	4.20	4.20	4.20	4.20	4.20	4.20	4.20	5.00	8.00	8.00
word	0.30	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.80	0.80	0.80	0.80	0.80
Italy																					
min	2.52	3.50	3.50	3.50	3.50	3.50	3.50	3.50	4.20	4.20	4.20	4.20	4.20	4.20	4.20	4.20	4.20	4.20	5.00	8.00	8.00
word	0.36	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.80	0.80	0.80	0.80	0.80
Great Britain																					
min	2.80	3.50	3.50	3.50	3.50	3.50	3.50	3.50	4.20	4.20	4.20	4.20	4.20	4.20	4.20	4.20	4.20	4.20	5.00	8.00	8.00
word	0.40	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.80	0.80	0.80	0.80	0.80
USA																					
min	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	8.40	8.40	8.40	8.40	8.40	8.40	8.40	8.40	8.40	8.40	5.00	8.00	8.00
word	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20

min: minimum charge

word: price per word

Sources: Bundesministerium für das Post- und Fernmeldewesen, Bonn

1970: Amtsblatt Nr.95 ; p.:1433 1971: Amtsblatt Nr.75 436/71 p.:1135 1982-1988: Postbuch

Telephone charges in West Germany

	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
one unit	0.18	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
internal																					
local (minutes for one unit)																					
	•	•	•	•	•	•	•	•	•	•	•	•	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
long distance (> 100 km) at day time (seconds for one unit)																					
	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	15	18
external																					
France (seconds for one unit at day time)																					
	5.20[1]	5.20[1]	5.20[1]	5.20[1]	5.20[1]	5.20[1]	5.20[1]	5.20[1]	8.00	8.00	8.00	8.00	12	12	12	12	12	12	12	12	12
Italy / Great Britain (seconds for one unit at day time)																					
	4.80	4.80	4.80	4.80	4.80	4.80	4.80	4.80	7.385	7.385	7.385	7.385	12	12	12	12	12	12	12	12	12
USA (seconds for one unit at day time)																					
	1.333	1.333	1.333	1.333	1.333	1.333	1.333	1.333	1.391	1.391	1.391	1.391	1.882	1.882	2.964	2.964	2.964	2.964	3.762	4.42	4.42

(1) The price for a phone call to France was not available for 1970-1977. I assumed that for this period it developed parallel to the price for phone calls to GB and Italy.

Only normal rates are considered (special rates to two frontier zones in France are neglected here).

Sources: Bundesministerium für das Post- und Fernmeldewesen, Bonn. 1966: Amtsblatt Nr.71 ; Verordnung Nr.: 375/66 p.:648 1970: Amtsblatt Nr.88 ; Verordnung Nr.: 353/64 p.:854

1971: Amtsblatt Nr. 67 ; Verordnung Nr. 375/71 p.: 898/939 1978: Amtsblatt Nr. 14/78 ; Anlage p.:359 1982: Postbuch 1982 1988/89 Amtsblätter

1990: Amtliches Telefonbuch der DBP Telekom, Ausgabe 1990/91

National Services in West Germany: Quantities

	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89
local	6878	7345	7812	8279	8747	9215	9994	10433	11287	12239	13438	14473	15378	16063	16543	17172	18057	18764	18084	18437
long	3277	3568	3858	4149	4439	4730	5172	5678	6258	6846	7507	8028	8478	9015	9515	10012	10463	11046	11737	12578
disinc	430	477	530	578	629	690	731	775	827	896	959	1042	1064	1098	1151	1190	1235	1285	1340	1400
trade	109	121	133	144	150	161	175	188	199	216	226	231	244	255	269	275	285	292	303	

local: number of local phone calls each year (in Mio).

long: total number of long distance phone calls (> 100km) each year (in Mio).

Source: Bundesminister für Post und Telekommunikation, Statistisches Jahrbücher 1986-1988 (Darmstadt).

1989: Data provided by Deutsche Telekom, Dienststelle 823-2 (Herr Mohr)

Disinc: nominal household disposable income (in billion DM). Source: Statistisches Bundesamt, Jahrbücher 1975-1989 and: Deutsche Bundesbank, Statistische Beihefte Reihe 4, Nr. 10 (Oktober 1990

trade: gross product of trade and traffic industry (in billion DM). Source: Statistisches Bundesamt, Statistische Jahrbücher 1975-1989.

National Services in West Germany: Price indices

	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89
P	1.00	1.05	1.11	1.19	1.27	1.35	1.40	1.46	1.50	1.56	1.64	1.74	1.91	1.97	2.00	2.05	2.12	2.15	2.19	2.23
$\frac{PTx}{P}$	1.00	0.95	0.90	0.84	0.79	0.74	0.71	0.69	0.67	0.64	0.61	0.58	1.05	1.02	1.00	0.98	0.94	0.93	0.91	0.90
$\frac{PBL}{P}$	1.00	1.29	1.27	1.19	1.16	1.09	1.05	1.01	1.22	1.17	1.11	1.05	1.33	1.28	1.27	1.23	1.19	1.18	1.56	1.58
$\frac{PTg}{P}$	1.00	1.59	1.50	1.40	1.31	1.23	1.19	1.14	1.11	1.07	1.02	0.96	1.05	1.02	1.00	0.98	1.26	1.24	1.22	1.20
$\frac{PLT}{P}$	1.00	1.11	1.05	0.98	0.92	0.86	0.83	0.80	0.85	0.82	0.78	0.73	1.34	1.30	1.28	1.25	1.21	1.19	1.17	1.15
$\frac{Plocal}{P}$	1.00	1.11	1.05	0.98	0.92	0.86	0.83	0.80	0.85	0.82	0.78	0.73	0.67	0.65	0.64	0.62	0.60	0.59	0.58	0.57

PTx: price index for telex in West Germany. Calculated for a 2 minutes telex (number of units times price of one unit)

PBL: price index for an express letter in West Germany. Calculated by the price for a standard letter (up to 20g) plus the extra express charge.

PTg: price index for a telegram in West Germany. Calculated for a telegram of 20 words.

PLT: price index for a local telephone call in West Germany. Calculated for a 10 minutes phone call.

Plocal: price index for a local telephone call in West Germany. Calculated for a 5 minutes phone call.

PLLT:price index for a long distance call (> 100km) in West Germany. Price index provided by: Statistisches Bundesamt, Jahrbücher 1975-1989.

P : general price index. Provided by: Statistisches Bundesamt: Jahrbücher 1975-1989.

International Services from West Germany to Great Britain: price indices and quantities

	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89
TGB	3.634	4.231	4.905	5.996	6.690	7.741	9,113	11.434	13.905	17.887	20.648	22.349	23.074	24.184	29.528	31.045	37.487	38.157	45.022	53.137
PTx / P	1.00	0.95	0.90	0.84	0.79	0.74	0.71	0.69	0.75	0.72	0.69	0.65	0.59	0.57	0.56	0.55	0.53	0.52	0.57	0.56
PRL / P	1.00	1.01	0.95	0.89	1.16	1.09	1.05	1.01	0.98	1.17	1.11	1.05	1.39	1.28	1.26	1.23	1.19	1.18	1.56	1.58
PTg / P	1.00	1.19	1.13	1.05	0.98	0.93	0.89	0.86	1.00	0.96	0.91	1.15	0.79	0.76	0.75	0.73	0.94	0.93	0.91	0.90
PT / P	1.00	1.11	1.05	0.98	0.92	0.86	0.83	0.80	0.55	0.53	0.51	0.48	0.27	0.26	0.26	0.25	0.24	0.24	0.23	0.23
trade	9.017	9.840	11.495	13.972	17.625	17.828	20.717	24.584	29.334	38.961	45.444	51.836	54.025	60.497	70.588	81.400	71.824	73.954	83.317	94.046

TGB: number of phone calls from West Germany to Great Britain (in Mio). Provided by the "Deutsche Telekom", Dienststelle 823-2, Herr Mohr.

PTx: price index for a telex from West Germany to Great Britain. Calculated for a 3 minutes telex (number of units times price of one unit).

PRL: price index for a standard express letter from West Germany to Great Britain.

PTg: price index for a telegram from West Germany to Great Britain. Calculated for a telegram of 20 words.

PT : price index for a telephone call from West Germany to Great Britain. Calculated for a five minutes call at day time.

trade: value of total trade (exports plus imports) between West Germany and Great Britain (in billion DM). Source: Statistisches Bundesamt (Wiesbanden), Statistische Jahrbücher 1975-1989.

Phone calls from Germany to the US: Price indices and quantities

	70	71	72	73	74	75	76	77	78	79
TUS	0.907	1.214	1.606	2.079	2.503	2.650	3.492	4.779	5.476	7.168
$\frac{PTx}{P}$	1.00	0.95	0.90	0.84	0.79	0.74	0.71	0.69	0.59	0.56
$\frac{PEL}{P}$	1.00	0.95	0.90	0.84	1.00	0.94	0.91	0.87	0.80	0.96
$\frac{PTg}{P}$	1.00	0.95	0.90	0.84	0.79	0.74	0.71	0.69	0.80	0.77
$\frac{PT}{P}$	1.00	1.11	1.05	0.98	0.92	0.86	0.83	0.80	0.82	0.79
Trade	20.909	21.635	22.733	24.273	29.531	26.083	28.804	31.722	35.215	36.760

	80	81	82	83	84	85	86	87	88	89
TUS	8.787	10.502	12.807	15.217	18.396	23.460	26.365	30.326	40.666	46.608
$\frac{PTx}{P}$	0.54	0.51	0.46	0.45	0.44	0.43	0.42	0.41	0.13	0.13
$\frac{PEL}{P}$	0.92	0.86	1.03	1.00	0.98	0.96	0.93	0.91	1.16	1.21
$\frac{PTg}{P}$	0.73	0.69	0.63	0.61	0.60	0.59	0.57	0.56	0.55	0.54
$\frac{PT}{P}$	0.75	0.70	0.47	0.46	0.29	0.28	0.27	0.27	0.21	0.17
Trade	42.255	50.168	52.960	56.013	76.647	89.028	79.614	71.597	74.700	85.400

TUS: number of phone calls from West Germany to the USA (in Mio). Provided by the 'Deutsche Telekom', Dienststelle 023-2, Herr Mohr.

PTx: price index for telex from West Germany to the USA. Calculated for a 2 minutes telex (number of units times price of one unit).

PEL: price index for an express letter from West Germany to the USA. Calculated by the price for a standard letter (up to 20g) plus the extra express charge.

PTg: price index for a telegramm from West Germany to the USA. Calculated for a telegramm of 20 words.

PT : price index for a telephone call from West Germany to the USA. Calculated for a five minutes call at day time.

Trade: value of total trade (exports plus imports) between West Germany and the USA (in billion DM). Source: Statistisches Bundesamt: Statistische Jahrbücher 1975-1989.

1989: Deutsche Bundesbank: Statistische Beihefte.

International Services from West Germany to Italy: price indices and quantities

	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89
TIT	4.774	6.052	8.117	10.638	10737	11.963	13.871	16.564	19.086	23.020	27.225	29.842	31.569	33.500	34.976	37.259	42.391	45.081	50.492	56.544
$\frac{PTx}{P}$	1.00	0.95	0.90	0.84	0.79	0.74	0.71	0.69	0.75	0.72	0.69	0.65	0.59	0.57	0.56	0.55	0.53	0.52	0.57	0.56
$\frac{PBL}{P}$	1.00	1.01	0.95	0.89	1.16	1.09	1.05	1.01	0.98	1.17	1.11	1.05	1.33	1.28	1.27	1.23	1.19	1.18	1.56	1.58
$\frac{PTg}{P}$	1.00	1.32	1.25	1.17	1.09	1.03	0.99	0.95	1.11	1.07	1.02	0.96	0.87	0.85	0.83	0.81	1.05	1.03	1.02	1.00
$\frac{PT}{P}$	1.00	1.11	1.05	0.98	0.92	0.86	0.83	0.80	0.55	0.53	0.51	0.48	0.27	0.26	0.26	0.25	0.24	0.24	0.23	0.23
Trade	21.275	23.249	26.270	28.018	33.230	32.127	36.206	37.791	41.086	49.431	55.855	58.463	61.429	63.229	71.860	81.551	82.801	86.355	95.150	98.387

TIT: number of phone calls from West Germany to the Italy (in Mio). Provided by the "Deutsche Telekom", Dienststelle 823-2, Herr Mohr.

PTx: price index for telex from West Germany to the Italy. Calculated for a 2 minutes telex (number of units times price of one unit).

PBL: price index for an express letter from West Germany to the Italy. Calculated by the price for a standard letter (up to 20g) plus the extra express charge.

PTg: price index for a telegramm from West Germany to the Italy. Calculated for a telegramm of 20 words.

PT : price index for a telephone call from West Germany to the Italy. Calculated for a five minutes call at day time.

Trade: value of total trade (exports plus imports) between West Germany and Italy (in billion DM). Source: Statistisches Bundesamt (Wiesbanden), Statistische Jahrbücher 1975-1989,
1989: Deutsche Bundesbank (Frankfurt), Statistische Beihefte (09/1990).

International Services from West Germany to France: price indices and quantities

	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89
TFr	5.825	6.529	7.721	9.346	10.785	12.193	12.410	14.362	16.557	20.080	22.248	25.504	28.818	31.080	33.856	38.213	39.077	44.751	53.575	57.956
$\frac{PTx}{P}$	1.00	0.95	0.90	0.84	0.79	0.74	0.71	0.69	0.76	0.73	0.70	0.66	0.60	0.58	0.57	0.56	0.54	0.53	0.52	0.51
$\frac{PBL}{P}$	1.00	1.01	0.95	0.89	1.16	1.09*	1.05	1.01	0.98	1.17	1.11	1.05	1.33	1.28	1.27	1.23	1.19	1.18	1.56	1.58
$\frac{PTg}{P}$	1.00	1.59	1.50	1.40	1.31	1.23	1.19	1.14	1.33	1.28	1.22	1.15	1.05	1.02	1.00	0.98	1.26	1.24	1.22	1.20
$\frac{PT}{P}$	1.00	1.11	1.05	0.98	0.92	0.86	0.83	0.80	0.55	0.53	0.51	0.48	0.29	0.28	0.28	0.27	0.26	0.26	0.25	0.25
trade	28.937	31.856	36.571	41.332	46.702	46.229	55.458	55.439	57.935	66.051	72.120	77.307	80.531	81.692	87.125	95.343	95.715	99.051	110.875	127.351

TFr: number of phone calls from West Germany to France (in Mio). Provided by the "Deutsche Telekom", Dienststelle 823-2, Herr Mohr.

PTx: price index for a telex from West Germany to France. Calculated for a 2 minutes telex (number of units times price of one unit).

PBL: price index for a standard express letter from West Germany to France.

PTg: price index for a telegram from West Germany to France. Calculated for a telegramm of 20 words.

PT : price index for a telephone call from West Germany to France. Calculated for a five minutes call at day time.

trade: value of total trade (exports plus imports) between West Germany and France (in billion DM). Source: Statistisches Bundesamt (Wiesbaden), Statistische Jahrbücher 1975-1989, and Bundesbank, Statistische Beihefte zu den Monatsberichten, Reihe 3, November 1990, Nr. 11.

Prices for telex in Italy (Lire)

	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
internal																					
local																					
first min							60	60	60	60	60	80	170	200	220	240	260	260	260	260	260
1 minute							30	30	30	30	30	40	80	100	110	120	130	130	130	130	130
long distance (> 200 km)																					
first min							300	300	300	300	300	400	550	700	750	800	820	820	820	820	820
1 minute							150	150	150	150	150	200	275	350	375	400	410	410	410	410	410
external																					
RC																					
first 10s	180	180	180	180	180	180	180	240	240	260	260	308	336	388	388	426	488	488	488	488	488
every 10s	45	45	45	45	45	45	45	60	60	65	65	77	84	97	97	107	122	122	122	122	122
2 minutes	675	675	675	675	675	675	675	900	900	975	975	1155	1260	1455	1455	1603	1830	1830	1830	1830	1830

first min: price for the first minute.

1 minute: price for each subsequent minute.

first 10s: price for the first 10 seconds.

local: comunicazioni urbane

long: comunicazioni interurbane oltre 200 km

Sources: Ministero delle Poste e delle Telecomunicazioni, Direzione Centrale Servizi Postali, Divisione I - Sezione II, Roma (provided by: Dr. A. Vitale).
Direzione Generale, Ufficio Bilancio e Programmazione Economica, Roma.

Prices for telegram in Italy (Lire)

	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
internal																					
fix	600	600	600	600	1000	1000	1000	1000	1000	1000	1000	1625[1]	2300	2700	2800	2800	2800	2800	3000	3000	3600
word	25	25	25	25	25	25	50	50	50	50	50	50	50	50	100	100	100	100	100	100	100
external																					
EC																					
fix						1452	1452	2970	2970	3177	3177	4632	5040	5808	6396	8610	9135	11571	11571	11571	
min	623	623	621	623	749																
word	89	89	89	89	107	49	49	119	119	127	127	186	202	233	256	345	366	427	427	427	
20 words	1780	1780	1780	1780	2140	2432	2432	5350	5350	5717	5717	8352	9080	10468	11516	15510	16455	20111	20111	20111	

(1) weighted average

fix: fix price for each telegram
min: minimum charge
word: price per word
In 1975 the minimum charge was changed into a fixed charge which applies for each telegram.

Sources: Amministrazione delle Poste e delle Telecomunicazioni, Direzione Centrale Servizi Postali, Divisione I - Sezione II, Roma (Dr. Vitale).
Direzione Generale, Ufficio Bilancio e Programmazione Economica, Roma.

Prices for express letters in Italy (Lire)

	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
internal																					
	200	200	200	200	300	350	462[1]	520	520	520	520	775[1]	1150	1400	1950	2550	3000	3000	3050	3050	3625[1]
external																					
zone 1	230	230	230	230	277[1]	375[1]	478[1]	570	595[1]	620	620	950[1]	1304[1]	1596[1]	1929[1]	2163[1]	2556[1]	3000	3125[1]	3150	
zone 2	270	270	270	270	317[1]	423	548	600	635[1]	670	670	1067[1]	1438[1]	1700	2050	2300	2650	3100	3225[1]	3250	

(1) weighted average for each year since there were several price increases.

zone 1: France, Belgium, West Germany, Luxemburg, Holland

zone 2: Great Britain, Denmark, Greece, Ireland, Portugal, Spain.

Sources: Ministero delle Poste e delle Telecomunicazioni, Direzione Centrale Servizi Postali, Divisione I - Sezione II
Direzione Generale, Ufficio Bilancio e Programmazione Economica, Roma.

Telephone charges in Italy (Lire)

	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
one unit	25	25	25	25	25	37	40	50	50	50	67.5	95	106	106	122	122	127	127	127	127	
internal																					
local (3 minutes phone call)	25	25	25	25	25	37	40	50	50	50	67.5	95	106	106	122	122	127	127	127	127	
long distance ( ) 240 km) at day time (3 minutes phone call)	588	588	588	588	588	672	640	800	800	800	807	1020	1138	1138	1310	1310	1364	1364	1364	1364	1.988
external (price for 1 minute call at day time)																					
zone 1				330	330	330	330	500	500	500	552	786	956	1106	1220	1220	1219	1219	1219	1219	1219
zone 2				412	412	412	412	608	667	667	658	950	1156	1325	1394	1394	1398	1398	1398	1398	1398
zone 3				460	460	460	460	750	750	750	762	1086	1325	1533	1574	1574	1604	1604	1604	1604	1604

zone 1: France, Greece, West Germany, Luxembourg.
zone 2: Belgium, Denmark, Great Britain, Holland, Spain.
zone 3: Ireland, Portugal.

Sources: Società Italiana per l'Esercizio delle Telecomunicazioni (SIP), Direzione Generale, Roma (1987), Decreti del Presidente della Repubblica in Materia di Tariffe Telefoniche Nazionali in Vigore dal 1972.
and: SIP, Direzione Generale (1989), confronto fra le principali tariffe telefoniche in vigore nei paesi della CEE.

Variables for Italy: Quantities

	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Telephone quantities																					
national (million)																					
local	5898[1]	6194[1]	6504	6807	7693	7572	8217	8506	8867	9687	10090	10044	10328	10900	11942	12215	12739	13450	14618[1]	15590[1]	
long	1306	1474	1601	1675	1898	2037	2300	2470	2730	3094	3275	3522	3696	3941	4965	5364	5712	6213	6826	7560	
international (million)																					
EC	11.610	14.112	16.555	18.833	20.043	20.220	21.987	29.179	40.116	50.368	60.309	73.316	83.940	91.629	101.37	112.27	123.07	140.95	164.23		
Germany	14.503	17.603	20.910	23.455	24.292	24.836	27.062	32.893	27.650	60.050	69.402	77.909	89.534	92.992	99.455	108.99	114.63	129.28	142.37		
Disinc[2]	59877	69180	75808	90228	110643	125015	156252	189841	221801	271198	340222	399816	468448	533154	614322	685522	751930	823280	906203	990160	
Trade(G)	21.275	23.249	26.270	28.018	33.230	32.127	36.206	37.791	41.086	49.431	55.855	58.463	61.429	63.229	71.860	81.551	82.801	86.355	95.150	98.387	
Trade(EC)	8808	9639	11454	15045	21286	21968	31752	38465	45817	60607	72408	82890	98585	107769	128223	153611	160252	175552	198960		

(1) data estimated by STET

(2) Values have been adjusted for 1984-1989 since the values for this period differed in different yearbooks

local: quantity of local calls in Italy (million calls).

long: quantity of long distance calls in Italy (million calls).

EC: quantity of calls from Italy to 12 EC countries (million calls).

Germany: quantity of calls from Italy to West Germany measured in million chargeable minutes.

Trade(G): total value of imports and exports from Italy to West Germany (measured in billion DM).

Trade(EC): total value of imports and exports from Italy to 11 EC countries (measured in billion Lire).

Disinc: household disposable income, measured in billion Lire.

Sources:

Quantities of local, long distance and EC calls: Società Finanziaria Telefonica (STET), Direzione Generale Roma, provided by Dr. Chiavini.

Quantity of calls to West Germany: Data provided by: Deutsche Telekom, Dienststelle 823-2 (Herr Mohr).

Disinc(Reddito nazional lordo disponibile): Istituto Centrale di Statistica (Istat), Annuario Statistico, Roma (1976-1989). 1989: Istat, Compendio Statistico Italiano, edizione 1990.

Trade: Statistisches Bundesamt (Wiesbaden), Statistische Jahrbücher 1975-1989. 1989: Deutsche Bundesbank (Frankfurt), Statistische Beihefte (09/1990); And: Istat, Annuario Statistico.

Price indices for Italy

	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
p	1.00	1.05	1.11	1.23	1.46	1.71	2.00	2.34	2.62	3.01	3.64	4.35	5.00	5.73	6.35	6.93	7.34	7.67	8.08	8.59	
PTx(l)							1.00	1.00	1.00	1.00	1.00	1.33	2.78	3.33	3.67	4.00	4.33	4.30	4.30	4.30	4.30
PTx(n)							1.00	1.00	1.00	1.00	1.00	1.33	1.83	2.33	2.50	2.67	2.73	2.73	2.73	2.73	2.73
PTx(RC)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.33	1.33	1.44	1.44	1.71	1.87	2.16	2.16	2.38	2.71	2.71	2.71	2.71	2.71
PRL	1.00	1.00	1.00	1.00	1.50	1.75	2.31	2.60	2.60	2.60	2.60	3.88	5.75	7.00	9.75	12.75	15.00	15.00	15.25	15.25	18.125
PRL(z1)	1.00	1.00	1.00	1.00	1.20	1.63	2.08	2.48	2.59	2.70	2.70	4.13	5.67	6.94	8.39	9.40	11.11	13.04	13.59	13.70	
PRL(z2)	1.00	1.00	1.00	1.00	1.17	1.57	2.03	2.22	2.35	2.48	2.48	3.95	5.33	6.30	7.59	8.52	9.81	11.40	11.94	12.04	
PTg	1.00	1.00	1.00	1.00	1.67	1.67	1.67	1.67	1.67	1.67	1.67	3.25	4.60	5.40	5.60	5.60	5.60	5.60	6.00	6.00	7.20
PTg(RC)	1.00	1.00	1.00	1.00	1.20	1.37	1.37	3.01	3.01	3.21	3.21	4.69	5.10	5.88	6.47	8.71	9.24	11.30	11.30	11.30	11.30
Plocal	1.00	1.00	1.00	1.00	1.00	1.48	1.60	2.00	2.00	2.00	2.70	3.80	4.24	4.24	4.88	4.88	5.08	5.08	5.08	5.08	
Plong	1.00	1.00	1.00	1.00	1.00	1.14	1.09	1.36	1.36	1.36	1.37	1.73	1.94	1.94	2.23	2.23	2.32	2.32	2.32	2.32	
PT(z1)				1.00	1.00	1.00	1.00	1.52	1.52	1.52	1.67	2.38	2.90	3.35	3.70	3.70	3.69	3.69	3.69	3.69	
PT(z2)				1.00	1.00	1.00	1.00	1.46	1.62	1.62	1.60	2.31	2.81	3.22	3.38	3.38	3.39	3.39	3.39	3.39	
PT(z3)				1.00	1.00	1.00	1.00	1.63	1.63	1.63	1.66	2.36	2.80	3.33	3.42	3.42	3.49	3.49	3.49	3.49	

PTx = price index for a telex in Italy. Calculated for a telex of 3 minutes. (l) = local, (n) = national (long distance), (RC) = RC countries.

PRL = price index for an express letter in Italy. (z1) = zone 1 of RC countries, (z2) = zone 2 of RC countries.

PTg = price index for a telegram in Italy. Calculated for a telegram of 20 words.

Plocal = price index for a local telephone call in Italy. Calculated for a 3 minutes call.

Plong = price index for a long distance call in Italy. Calculated for a 3 minutes call at day time.

PT(z1,2,3) = price index for an international call to different zones in the RC. Calculated for a 1 minute call at day time.

p = general price index. Provided by: Statistisches Bundesamt, Statistische Jahrbücher 1975-1989 (Wiesbaden).

Prices for telex in Spain

	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
internal (pesetos for one minute)					6	6	6	12	12	19	21	23	26	28	30	30	30	32			
external (pesetos for one minute to West Germany)					9	9	9	15	15	22	26	32	36	40	50	55	57	60	60		

Source: Minesterio de Transportes, Turismo y Comunicaciones (1974-1988), Boletin Oficial Telecomunicacion, Madrid.

Prices for telegram in Spain

	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
internal																					
Min					10	10	10	15	15	24	30	35	40	45	50	50	50	60			
20 words					20	20	20	20	20	30	40	60	60	70	70	80	80	80			
external (to Germany)																					
Min					140	140	140	210	210	350	420	560	560	700	760	760	800	850	850		
20 words					60	60	60	90	90	110	160	240	300	380	400	500	540	580	580		

Min: minimum charge (in pesetas)
20 words: price for 20 words (in pesetas)

Source: Ministerio de Transportes, Turismo y Comunicaciones, Secretaria General (Gabinete Tecnico). Data provided by: Antonio Lozano.

Prices for express letters in Spain

	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
internal																					
local					3	3	3	3	3	5	5	6	7	7	7	7	7	8			
long					3	3	3	5	5	9	10	12	14	16	17	17	19	20			
express					15	15	15	15	15	25	28	34	40	45	50	60	65	70			
external																					
Germany					12	12	12	12	12	19	22	30	33	38	40	45	48	45	45		
express					20	20	20	25	25	40	45	50	55	60	65	70	75	80	80		

letter: tariff for a standard letter up to 20g.(in pesetas).
express: extra express delivery charge (in pesetas).
local: charge for a national local letter (urbana).
long: charge for a national long distance letter (interurbana).

Source: Minesterio de Transportes, Turismo y Comunicaciones (1974-1988),Boletin Oficial Telecomunicacion, Madrid.

Telephone charges in Spain

	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
one unit	1	1	1	1	1.08	1.1	1.25	1.45	1.45	1.57	2	2.25	2.5	2.8	3.02	3.32	2.96	3.36	3.58	3.90	3.90
internal																					
local (3 minutes call)	1	1	1	1	1.08	1.1	1.25	1.45	1.45	1.57	2	2.25	2.5	2.8	3.02	3.32	2.96	3.36	3.58	3.90	3.90
long distance (Madrid-Barcelona for 3 minutes)	34.5	34.5	41.91	41.91	47.42	58.64	47.42	58.64	68.02	73.64	84	91.38	101.54	114.06	123.02	130.46	118.4	116.2			
external																					
West Germany (3 minutes call)									319.9	324.7	326	324	325	375.2	425.8	444.9	433.7	432	432	374.4	374.4

Only normal rates (day time) are considered.

Sources:

national: Telefónica (Febrero 1988), Indices de Precios de los Servicios de Telefonía en España 1980-1987.

Telefónica (1988), Tarifas Telefonicas con Impuestos y Sobretasas 1925-1987; and: El País, 30 de Abril de 1991, p.38.

external: Data provided by: S.R. Cabrera (Director of the Departamento de Estudios Economicos), Telefónica, Madrid.

Variables for Spain: Quantities

	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
long	441.3	536.3	630.1	725.2	890.1	1060.8	1306.4	1467.5	1645.3	1850.9	2021.0	2111.8	2231.0	2415.8	2565.8	2819.7	2997.6	3320.5			
Germany	2.574	3.790	3.850	3.797	4.233	9.257	15.535	18.177	23.858	25.464	29.577	31.482	37.005	38.019	39.424	43.529	50.540	61.452	72.133		
disinc	2388.4	2704.1	3189.7	3871.8	4708.1	5477.5	6567	8312	10170	11829	13578	14949	17179	19393	21856	24396	28142	31744	35308		
trade					6505	6125	7016	6679	6549	7885	8972	9880	11271	11111	14360	16116	18559	21594	25537 [1]		

1) estimated: total trade of Spain 1988 times the share of trade with West Germany in 1987.

long: total number of long distance phone calls each year (manual and automatic) (in Mio).

Germany: phone calls from Spain to West Germany measured in million chargeable minutes.

disinc: nominal household disposable income in billion pesetas (annually).

trade: total value of imports and exports with West Germany in million DM (annually).

Sources:

Quantity of long distance phone calls:

J.Cabrera, Director de Departamento Estudios Económicos de Telefónica, Madrid.

Maria Luisa Escudero, Jefe de Servicio del Gabinete Tecnico Area Economica, Dirección General de Correos.

Quantities of phone calls to West Germany:

Measured in chargeable minutes of phone calls received from Spain by the Deutsche Bundespost Telekom, Generaldirektion Telekom, Bonn. Data Provided by Mr. Mohr, Dienststelle 823-2

Disposable income:

Banco di Bilbao, Renta Nacional de España y su distribución provencial, 1977, 1981, 1983, 1985.

Eurostat, national accounts ESA, Luxembourg 1982, 1990.

Trade:

Statistisches Bundesamt, Wiesbaden, Statistische Jahrbücher.

Since the *trade* variable is measured in DM for the calculations it was deflated by the DM price index.

Price indices for Spain

	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
P	1	1.08	1.17	1.31	1.51	1.77	2.08	2.58	3.10	3.58	4.14	4.80	5.42	6.09	6.77	7.37	8.01	8.43	8.84	9.43	
national																					
PTx					1	1	1	2	2	3.17	3.5	3.83	4.33	4.67	5	5	5	5.33			
PTg					1	1	1	1.17	1.17	1.80	2.33	3.17	3.33	3.83	4	4.33	4.33	4.67			
PRL(l)					1	1	1	1	1	1.66	1.83	2.22	2.61	2.88	3.17	3.72	4	4.33			
PRL(n)					1	1	1	1.11	1.11	1.89	2.11	2.56	3	3.39	3.72	4.28	4.67	5			
Plocal	1	1	1	1	1.08	1.10	1.25	1.45	1.45	1.57	2	2.3	2.5	2.8	3.02	3.32	2.96	3.36	3.58	3.9	3.9
Plong	1	1	1.21	1.21	1.37	1.70	1.37	1.70	1.97	2.13	2.43	2.65	2.94	3.31	3.57	3.78	3.43	3.37	3.37	4.07	4.07
external																					
PTx(G)					1	1	1	1.67	1.67	2.44	2.88	3.56	4	4.44	5.56	6.11	6.33	6.67	6.67		
PTg(G)					1	1	1	1.50	1.50	2.30	2.90	4	4.30	5.40	5.80	6.30	6.70	7.15	7.15		
PRL(G)					1	1	1	1.16	1.16	1.84	2.09	2.50	2.75	3.06	3.28	3.59	3.84	3.91	3.91		
PT(G)									1	1.02	1.02	1.01	1.02	1.17	1.33	1.39	1.36	1.35	1.35		

PTx = price index for a telex in Spain. Calculated for a telex of one minute.

PTg = price index for a telegram in Spain. Calculated for a telegram of 20 words.

PRL = price index for an express letter in Spain. PRL(l) = local, PRL(n) = national (long distance). Calculated for a standard letter (20g) plus the extra express charge.

Plocal = price index for a local telephone call in Spain. Calculated for a 3 minutes call.

Plong = price index for a long distance phone call in Spain. Calculated for a 3 minutes call at day time.

(G) = indices for services directed to West Germany.

P = general price index. Provided by: Statistisches Bundesamt: Jahrbücher 1975-1989.

Prices for telex in Great Britain (pence)

	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
internal																					
1 unit	1	1	1	1	1.21[1]	1.75[1]	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.56[1]	2.83[1]	3.25	3.44[1]	3.5	3.5	3.5	
local (seconds for 1 unit)	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	
long distance (seconds for 1 unit)	15	15	15	15	17.08[1]	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	
international (EC)																					
1 unit	1	1	1	1	2.5	/	/	/	/	/	/	/	/	/	3.25	2.3	2.3	2.3	2.3	2.3	
West Germany[2]	7.5	7.5	7.5	7.5	7.5	20	20	20	20	20	20	20	20	22	8.57	6	6	6	6	6	
EC[2]	7.33	7.33	7.33	7.33	7.9	18.5	18.5	18.5	18.5	18.5	18.5	18.5	20	22	8.57	6	6	6	6	6	

(1) weighted average for the year (several price changes).

(2) for the period 1975-1983 the price for 1 minute was reported. Otherwise: number of seconds for 1 unit.

local: up to 35 miles (= 56 km)

long distance: 1970-1974: over 75 miles. 1975-1989: over 56 km.

Germany: price for a telex from GB to West Germany.

EC: average of prices provided for each of 11 member countries 1970-1989. No weighing was possible since the share of telex sent to individual countries is not known.

Source: British Telecom Archives. Data provided by: Mr. David Hay.

Prices for telegram in Great Britain (pence)

	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
internal																					
min	24	24	24	28[1]	40.3[1]	50[1]	70	70	70	70	92.5[1]	137.5[1]									
word	2	2	2	2.5[1]	4.42[1]	5.5[1]	7	7	7	7	9.25[1]	13.7[1]									
20 words	40	40	40	50	92.5[1]	110[1]	140	140	140	140	185[1]	275[1]									
BC																					
zone 1																					
min	35	35	35	35	58.92[1]	51[1]	70	70	70	70	100	100	150	200	200	204[1]	225	244[1]	325[1]		
word	5	5	5	5	8.42[1]	9.5[1]	11	11	11	11	15	15	20	20	29[1]	32[1]	32.5[1]	35.85[1]	37.5	39.5	
20 words	100	100	100	100	168.3[1]	190[1]	220	220	220	220	300	300	400	560	580[1]	640	650	715	750	790	
zone 2																					
min	35	35	35	35	58.92[1]	51[1]	70	70	70	70	100	100	150	200	200	204[1]	225	244[1]	325[1]		
word	5	5	5	5	8.42[1]	9.5[1]	11	11	11	11	15	15	20	34	35[1]	38	38.5[1]	41.8[1]	43.5[1]	45.5[1]	
20 words	100	100	100	100	168.3[1]	190[1]	220	220	220	220	300	300	400	600	700	760	770[1]	835[1]	870[1]	910[1]	

(1) weighted average since there were several price changes in one year.

internal: price for an ordinary telegram. The inland telegram was replaced by the "telemessage" service in 1982.

zone 1: Belgium, France, Luxembourg, Netherlands.

zone 2: Denmark, Germany, Greece, Italy Portugal, Spain.

Source: British Telecom Archives. Provided by: Mr. David Hay.

Prices for express letters in Great Britain (pence)

	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
internal																					
RC	10	20	20	20	40	40	60	60	60	80	100	125	150	150	150	150	150	150	165	165	

RC: price of a standard (< 20g) express letter to RC countries.

Source: The Post Office, Public Relations Office, London.

Telephone charges in Great Britain (in pence)[7]

	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
1 unit	1[2]	1	1	1	1.5	1.8[1]	3	3	3	3	3.5	4	4.3	4.3	4.4	4.7	5	4.4	4.4	4.4	
internal																					
local	1.5[2]	1.5	1.5	1.5	1.5	4.2[1]	6	6	6	6	7	8	8.6	8.6	8.8	9.4	10	13.2[3]	13.2	13.2	
long	22.5	22.5	22.5	22.5	22.5[4]	37.8[1]	54	54	54	54	63	72	68.8[5]	64.5	66	56.4	52.63	44	44	44	
RC																					
band A	35.01	35.01	35.01	35.01	36.05[1]	50[1]	75	75	75	75	89.59[1]	101.2[1]	107.5	107.4[1]	107.6[1]	112.8	110.01	110.01	110.01	110.01	
band A2	45.00	45.00	45.00	45.00	48.13[1]	70	105	105	105	105	107.5[1]	117.9[1]	107.5	107.4[1]	121.6[1]	144.9[1]	142.3[1]	122.5[1]	125.7[1]	126.4[1]	
RC[6]	40.00	40.00	40.00	40.00	36.05[1]	50[1]	75	75	75	75	89.59[1]	101.2[1]	107.5	107.4[1]	107.6[1]	112.5	110.9[1]	111.9	114.7[1]	114.9[1]	
USA																					
peak					67.5	84.4[1]	135	135	135	135	143.3[1]	160.2[1]	161.3[1]	161[1]	169.3[1]	188.9[1]	193.5[1]	194.4[1]	200.5	200.5	
standard															146.5[1]	175.1[1]	177.9[1]	177[1]	182.1[1]	182.1[1]	
cheap					45	60[1]	90	90	90	90	107.5[1]	121.5[1]	129	129[1]	135.6[1]	150.2[1]	152.3[1]	151.4[1]	153.8[1]	153.8[1]	

(1) weighted average since there were several price changes in one year.

(2) the price for 1970 was reported in Shilling. In 1971 it was converted at a rate 2,5d = 1p.

(3) in 1987 the price for 1 unit was reduced. The price for a local call rised nevertheless since at the same time the duration of one unit was reduced.

(4) despite the price change for 1 unit the price of local and long distance calls remained constant in 1974.

(5) weighted average. In May 1982 the duration of a phone call of 1 unit was changed (as well the price for 1 unit).

(6) The weighing of the general telephone price index of calls from GB to RC is difficult since countries were switched several times from one band to another. I have chosen the following weight·

pre 1974: 50% band A and 50% band A2

1974 - 1986: 100% band A

1987: 85% band A and 15% band A2

1988 - 1989: 70% band A and 30% band A2.

(7) Only prices of British Telecom are reported here.

Telephone charges in Great Britain (pence)

local: calculated for a local phone call (peak rate) of 3 minutes.

long: long distance phone call (over 35 miles), calculated for 3 minutes (peak rate) direct call (excluding VAT).

RC: international directly called phone calls (IDD). Calculated for 3 minutes (peak rate).

peak: peak rate for 3 minute phone call from GB to the USA (IDD).

standard: standard rate for a 3 minute phone call from GB to the USA (IDD). Until 1984 the standard and the peak rate were identical.

cheap: cheap rate for a 3 minute phone call from GB to the USA (IDD).

Source:

British Telecom Archives, London. Data provided by David Hay.

Variables for Great Britain: Quantities

	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Telephone quantities																					
national (million calls)																					
local	8270	9236	10330	10200	11100	12000	12800	13500	14600	15700	16600	16840	17360	17800	18750						
long	1352	1517	1699	1944	2138	2313	2356	2456	2703	3022	3257	3335	3446	3603	3936						
international (million)																					
Germany	20.380	23.145	25.842	28.511	31.329	35.609	38.356	48.773	58.122	72.999	81.993	85.782	89.795	98.662	107.69	120.53	132.93	145.67	176.47		
EC		16.541	18.480	21.086	23.904	29.577	34.974	42.364	52.689	62.998	75.287	79.467	86.352	93.109	104.065						
disinc	34856	38507	44285	51100	60686	74707	86382	97748	113422	136137	160733	177324	192055	206162	221463	239581	259333	278966	307170		
trade(G)	1093	1241	1469	2180	2987	3360	4641	6135	7599	9996	10722	11457	12188	15734	18572	21621	22607	25107	27189		
trade(EC)	5383	6281	7224	10298	14551	16510	22241	28096	31673	40284	43336	45068	51014	59724	70535	77708	79573	88992	96717		

local: number of local phone calls in Great Britain.

long: number of long distance phone calls in Great Britain (manually controlled and dialled).

continental: number of international phone calls to the European continent.

For the years after 1984 figures were not made available by British Telecom.

Variables for Great Britain: Quantities

Germany: number of phone calls made from Great Britain to West Germany. Measured in chargeable units.

disinc: personal disposable income, measured in million £.

trade(G): total value of imports and exports from Great Britain to West Germany, measured in million £.

trade(EC): total value of imports and exports from Great Britain to the other 11 member countries of the EC, measured in million £.

Sources:

telephone quantities:

local and long distance calls were provided by British Telecom Archives, Historical Information Centre, London, Mr. David Hay.

continental and intercontinental calls: Her Majesty's Stationery Office, Central Statistical Office, Annual Abstract of Statistics, 1980, 1983, 1990 (London).

Germany: Provided by: Deutsche Telekom, Bonn, Referat 823/2, Herr Mohr.

disinc: Her Majesty's Stationery Office, Central Statistical Office, Annual Abstract of Statistics, 1980, 1983, 1990 (London).

trade: Her Majesty's Stationary Office, Central Statistical Office, Annual Abstract of Statistics, 1980, 1983, 1990 (London).

Price indices for Great Britain

	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
P	1.00	1.09	1.17	1.28	1.49	1.85	2.15	2.49	2.70	3.06	3.61	4.04	4.39	4.59	4.82	5.11	5.28	5.50	5.77		
PTx(I)	1.00	1.00	1.00	1.00	1.21	1.75	2.50	2.50	2.50	2.50	2.50	2.50	2.53	2.56	2.83	3.25	3.44	3.50	3.50	3.50	
PTx(n)	1.00	1.00	1.00	1.00	1.06	1.31	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.92	2.12	2.44	2.58	2.63	2.63	2.63	
PTx(G)	1.00	1.00	1.00	1.00	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.75	2.84	2.88	2.88	2.88	2.88	2.88	
PTx(EC)	1.00	1.00	1.00	1.00	2.32	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.44	2.69	2.70	2.81	2.81	2.81	2.81	2.81	
PTg	1.00	1.00	1.00	1.25	2.31	2.75	3.50	3.50	3.50	3.50	4.63	6.00									
PTg(x1)	1.00	1.00	1.00	1.00	1.60	1.90	2.20	2.20	2.20	2.20	3.00	3.00	4.00	5.60	5.80	6.40	6.50	7.15	7.50	7.90	
PTg(x2)	1.00	1.00	1.00	1.00	1.60	1.90	2.20	2.20	2.20	2.20	3.00	3.00	4.00	6.80	7.00	7.60	7.70	8.35	8.70	9.10	
PBL																					
PBL(EC)	1.00	2.00	2.00	2.00	4.00	4.00	6.00	6.00	6.00	8.00	10.00	12.50	15.00	15.00	15.00	15.00	15.00	15.00	16.50	16.50	
PTlocal	1.00	1.00	1.00	1.00	1.00	2.80	4.00	4.00	4.00	4.00	4.67	5.33	5.73	5.73	5.87	6.27	6.67	8.00	8.00	8.00	
PTlong	1.00	1.00	1.00	1.00	1.00	1.60	2.40	2.40	2.40	2.40	2.80	3.20	3.06	2.87	2.93	2.51	2.34	1.96	1.96	1.96	
PT(A)	1.00	1.00	1.00	1.00	1.03	1.43	2.14	2.14	2.14	2.14	2.56	2.89	3.07	3.07	3.07	3.22	3.14	3.14	3.14	3.14	
PT(A2)	1.00	1.00	1.00	1.00	1.07	1.56	2.33	2.33	2.33	2.33	2.39	2.62	2.39	2.39	2.70	3.22	3.16	2.72	2.79	2.81	
PT(EC)	1.00	1.00	1.00	1.00	0.90	1.25	1.88	1.88	1.88	1.88	2.24	2.53	2.68	2.68	2.68	2.81	2.77	2.80	2.87	2.87	
PT(US(p))					1.00	1.25	2.00	2.00	2.00	2.00	2.12	2.37	2.39	2.39	2.51	2.80	2.87	2.88	2.97	2.97	
PT(US(s))					1.00	1.25	2.00	2.00	2.00	2.00	2.12	2.37	2.39	2.39	2.17	2.59	2.64	2.62	2.70	2.70	
PT(US(c))					1.00	1.33	2.00	2.00	2.00	2.00	2.39	2.70	2.87	2.87	3.01	3.34	3.30	3.36	3.42	3.42	

Price indices for Great Britain

PTx(l): Price index for a local telex. Calculated for 3 minutes.

PTx(n): Price index for a long distance telex (national). Calculated for 3 minutes.

PTx(G): Price index for a telex to West Germany. Calculated for 3 minutes.

PTx(RC):Price index for a telex to RC countries. Calculated for 3 minutes.

PTg: Price index for a telegram in Great Britain. Calculated for 20 words.

PTg(z1):Price index for a telegram to RC countries of zone 1. Calculated for 20 words.

PTg(z2):Price index for a telegram to RC countries of zone 2. Calculated for 20 words.

PRL:

PRL(RC):Price index for a standard express letter to RC countries.

PTlocal:Price index of a local phone call in Great Britain. Calculated for 3 minutes.

PTlong: Price index for a national long distance call in Great Britain. Calculated for 3 minutes.

PT(A): Price index for a phone call to RC countries of band A (all RC countries except those of A2). Calculated for 3 minutes.

PT(A2): Price index for a phone call to RC countries of band A2 (Portugal, Spain, Greece). Calculated for 3 minutes.

PT(RC): General price index for a phone call to RC countries. Calculated from prices for zone A and A2 as has been specified above.

PT(US(p)):Price index for a phone call to the USA. Calculated for a 3 minutes call at peak rate.

PT(US(s)):Price index for a phone call to the USA. Calculated for a 3 minutes call at standard rate.

PT(US(c)):Price index for a phone call to the USA. Calculated for a 3 minutes call at cheap rate.

Source:

P : Price index provided by: Statistisches Bundesamt (Wiesbaden), Statistische Jahrbücher 1975 - 1989.

BIBLIOGRAPHY

Acton, J. P. and I. Vogelsang (1989), Introduction to a Symposium on Price-cap Regulation, in: RAND Journal of Economics, Vol, 20, pp. 369-372.

Adams, W.(ed.), The structure of American industry, 7e ed., Londres, Mac Millan.

Agliardi, E. (1990), On the Robustness of Contestability Theory, in: International Journal of Industrial Organization, pp. 485-490.

Allen, D. (1988), New Telecommunications Services: Network Externalities and Critical Mass, in: Telecommunications Policy, pp. 257-270.

Amory, B. (1990), Telecommunications in the European Communities: The New Regulatory Framework, Discussion Paper, DG IV, Brussels (November).

Anania, L. (1990), The Protein Complex: Are Open Networks Common Markets?, paper presented to the VIII annual Congress of the International Telecommunications Society, Venice, March 18-21, 1990.

Antonelli, C. (1984), Multinational Firms, International Trade and International Telecommunications, in: Information Economics and Policy, N° 1, pp 333-343

Artle, R. and C. Averous (1973), The Telephone System as a Public Good: Static and Dynamic Aspects, Bell Journal of Economics and Management Science 4 (Spring), 89-100.

Averch, H. and L. Johnson (1962), Behaviour of the Firm under Regulatory Constraint, in: American Economic Review, Vol 52, pp. 1052-1069.

Azzano, R. and F. Morganti (1990), Forecasting the Residual Telephone Demand, paper presented to the 8th Conference of the ITS, Venice.

Bailey, E. (1981), Contestability and the Design of Regulatory and Antitrusts policy, in: American Economic Review 71, p.178-183.

Bailey, E. (1986), Price and Productivity Change Following Deregulation: The US Experience, in: The Economic Journal, March, pp. 1-17.

Baily, M. N. (1987), Summary of Papers, Brooking Papers on Economic Activity (3).
Bain, J. S. (1956), Barriers to New Competition, Cambridge.

Baron, D. P. and R. B. Myerson (1982), Regulating a Monopolist with Unknown Costs, Econometrica 50, 911-930.

Baron, D. P. (1989), Design of Regulatory Mechanismus and Institutions, in: R. Schmalensee and R.D. Willig (ed.), Handbook of Industrial Organization: Vol. II, pp. 1347-1447, Amsterdam.

Baumol, W. J. and D. F. Bradford (1970), Optimal Departures From Marginal Cost Pricing, in: American Economic Review Vol. LX N° 3, p. 265-283.

Baumol, W. J., Bailey, E., Willig, R. D. (1977), "Weak Invisible Hamd Theorems on the Sustainability of Multiproduct Natural Monopoly," American Economic Review, June, p.350-365.

Baumol, W. J., Panzar, J. C., Willig, R. D. (1982), Contestable Markets and The Theory of Industry Structure, New York.

Baumol, W. J. (1982), Contestable Markets: An Uprising in the Theory of Industry Structure, American Economic Review, Papers and Proceedings, March ,72, 1-15.

Baur, H. (1981), Der Markt für Telekommunikationssysteme, in: Siemens Zeitschrift 55, Heft 6.

Beale, J. (1988), Global Telecommunication Network: National and International Research and Development Strategies, in: Muskens, G. and J. Gruppelaar (ed).

Beesley, M. E., Laidlaw, B. H., Gist, P. (1987), Prices and Competition on Voice Telephony in the UK, in: Telecommunications Policy (September), p. 230-236.

Beesley, M. E. and S. C. Littlechild (1989), The Regulation of Privatized Monopolies in the United Kingdom, in: Rand Journal of Economics, Vol 20, N° 3.

Ben-Akiva, M., McFadden, D. Train, K. E. (1987), The Demand for Local Telephone Service. A Fully Discrete Model of Residential Calling Patterns and Service Choices, in: Rand Journal of Economics, Vol 18, N° 1, Spring.

Benz, O. (1991), Telecommunications after 1992 - What is the best way of proceeding? - The Development of Pan-European Networks, Financial Times Conference: Telecommunications and the World Business Market, July 9 and 10, London.

Benzoni, P. (1990), Le Telecomunicazioni Italiane nel Nuovo Scenario Europeo, Paper presented to the 8th Conference of the International Telecommunications Society (ITS), Venice.

Bergstrom, T. and J. K. Mackie-Mason (1991), Some simple Analytics of Peak-load Pricing, in: Rand Journal of Economics, Vol. 22, No. 2, pp 241-249.

Bernard, K. E. (1990), Doing Business in Europe, in: Telecommunications Policy, August.

Beweley, R. and D. G. Fiebig (1988), Estimation of Price Elasticities for an International Telephone Demand Model, in: The Journal of Industrial Economics, June.

Blankart, C. B. (1983), The Contribution of Public Choice to Public Utility Economics - a Survey, in: J. Finsinger (ed.), Public Sector Economies, New York, pp. 151-170.

Blankart, C. B. and E. Kaufer (1983), Regulation in West Germany: The State of the Debatte, in: Zeitschrift für die gesamte Staatswissenschaft, p. 435-451.

Blankart, Charles, B. (1984) Private und öffentliche Unternehmen im Wettbewerb - ein Effizienzvergleich, in Forschungsinstitut für Wirtschaftsverfassung und Wettbewerb (Hrg.): Der Staat als Wettbewerber und Auftraggeber privater Unternehmen, Heft 208, Köln, p. 15-30.

Blankart, C.B. and G. Knieps (1989), What Can We Learn From Comparative Institutional Analysis - The Case of Telecommunications, in: Kyklos, Vol. 42, No 4, pp. 579-598.

Bocker, P. (1986), ISDN - Das diensteintegrierende digitale Nachrichtennetz; Konzept, Verfahren, Systeme, Berlin.

Bonnetblanc, G. (1985), Les Télécommunications françaises. Quel statut pour quelle entreprise?, Paris, La Documentation francaise, juin.

Bös, D. (1981), Economic Theory of Public Enterprise, Berlin.

Bös, D. (1983), Public Pricing with Distributional Objectives, in Jörg Finsinger (ed.), Public Sector Economics, New York.

Bös, D. (1985), Means-Tested Public Pricing. Discussion Paper No A-22, Projektbereich A, Sonderforschungsbereich 303, Bonn (August).

Bös, D. (1986) Welfare Effects of Privatizing Public Enterprises, Mimeo (University of Bonn).

Bös, D. and C. Seidl (1986), Welfare Economics of the Second Best, Journal of Economics/Zeitschrift für Nationalökonomie.

Bös, D., Rose, M., Seidl, C. (1988), Welfare and Efficiency in Public Economies, Berlin.

Brabant, F. de (1989), Sotto l'Iceberg delle Telecomunicazioni, in: Media Duemila, No 6 (Giugnio).

Braeutigam, R. R. (1980), An Analysis of Fully Distributed Cost Pricing in Regulated Industries, in: The Bell Journal of Economics, Vol. 11, pp. 182-196.

Braeutigam, R. R. (1989), Optimal Policies for Natural Monopolies, in: R. Schmalensee and R. D. Willig (eds.), Handbook of Industrial Organisation, Elsevier.

Branscomb, A. W. (1988), Videotext: Global Progress and Comparative Policies, in: Journal of Communication, Vol. 38, N° 1 pp 50-59.

Brock, W. A. and J. A. Scheinkman (1982), Free Entry and the Sustainability on Natural Monopoly: Bertrand revisited by Cournot, in: Evans, David, S. (ed.), Breaking Up Bell, New York, pp.231-250.

Brock, W.A. and D.S. Evans (1983a), Creamskimming, in: D.S. Evans, Breaking Up Bell, New York, 1983.

Brock, W.A. and David S. Evans (1983b), Predation: A Critique of the Government's Case in US v. AT&T, in: David S. Evans (ed.), Breaking Up Bell, New York.

Brock, W. A. (1983c), Pricing, Predation, and Entry Barriers in Regulated Industries in: David S. Evans (ed.), Breaking Up Bell, New York.

Brown, S. J. and D. S. Sibley (1986), The Theory of Public Utility Pricing, Cambridge.

Bruce, R. R., Cunard, J. P., Director, M. D. (1986), The Theory of Public Utility Pricing, Cambridge.

Buesa, M. (1989), La Difusión de las Tecnologías de la Información en España, in: Información Comercial Española Revista de Economía, N° 665, Enero, pp. 82-101.

Bulow, J., Jeancehopolos, J., Klemperer P. (1985), Holding Idle Capacity to Deter Entry, in: Economic Journal (March), pp. 178-182.

Bundesministerium für Post und Telekommunikation (BMPT) (1987), Statistisches Jahrbuch, Bonn.

Bundesministerium für Post und Telekommunikation (1988), Reform des Post- und Fernmeldewesens, Heidelberg.

Bundesministerium für Post und Telekommunikation (1990), Basic Points for the Definition of the Federal Government's Network Monopoly, September 26.

Bundesministerium für Post und Telekommunikation (1991), Eckpunkte zur Beschreibung des Telefondienstmonopols des Bundes, February 18.

Bureau Europeen Des Unions De Consomateurs, (BEUC) (1985), Telephoning in Europe, BEUC/113, Bruxelles.

Bureau Europeen Des Unions De Consomateurs, (BEUC) (1988), Consumers and the Telephone Services in the EEC, Bruxelles.

Busch, A. (1985), Hat das Fernmeldemonopol der Deutschen Bundespost ausgedient?, in: Wirtschaftsdienst Nr. 2, p. 138-145.

Busch, A. (1986), Die Gebührenpolitik der Deutschen Bundespost im Telekommunikationssektor auf dem Prüfstand, in: Die Weltwirtschaft 1.

Carini, A. (1990), SuperSTET sulla riforma cade la linea, in: La Repubblica, 13 Aprile.

Carreton, R. (1990), Das Fernmeldewesen und die Dienstleistungserbringer in Spanien, Internationales Forschungs- und Informationszentrum für Gemeinwirtschaft, Lüttich.

Carsberg, B. (1987), Regulation of British Telecom - A Reply to Beesley. Laidlaw and Gist, in: Telecommunications Policy (September), p. 237-242.

Casas, J. and H. Fromm (1989), The Role of Satellites in the ISDN Era, in: D. Shorrock (ed.), European Communications, Middlesex.

Castagni, N. (1988), SIP al passo con l'Europa, in. Media Duemila, No 3, Marzo, p. 83.

Castilla, A., Gaitán, R. Battistón, O. (1990), Current View and Future Developments of Spanish Telecommunications, paper presented to the 8th conference of the ITS (Venice), p. 13.

Caves, R.E. and M.E. Porter (1977), From Entry Barriers to Mobility Barriers: Conjectural Decisions and Contrired Deterrence to new Competition, in: Quarterly Journal of Economics, May, pp. 241-261.

Cecchini, P. (1988), The European Challenge 1992, Hants.

Chadwick, E. (1859), Results for Different Principles of Legislation and Administration in Europe; of Competition for the Field as compared with the Competition within the Field of Services, Journal of the Royal Statistical Society XXII.

Cheong, K. and M. Mullins (1991), International Telephone Service Imbalances, in: Telecommunications Policy, April, pp.107-118.

CNEL (1986), Studi e convegni, Italia Multinazionale, Vol 2, pp. 127-170.

Commission of the EC (1987), Towards a Dynamic European Economy - Green Paper on the development of the common market for telecommunications services and equipment, Com (87) 290 final.

Commission of the EC (1990a), Green Book on Satellite Technology, Brussels 20.11.1990, quoted as: Com(90a).

Commission of the EC (1990b), Green Paper on Satellite Technology, Bruxelles.

Commission of the EC (1990c), Backround Note on the Green Paper on Satellite Telecommunications, Bruxelles.

Commission of the EC (DG XIII) (1990d), Indicators of Telecoms Administrations' Performance, Bruxelles.

Commission of the EC (1990e), directive on competition in the markets for telecommunications services (90/388/EEC) 24.07.1990.

Commission of the EC (DG XIII) (1990f), The Market and Key Factors affecting the Nature and Development of pan-European Mobile Communications Post 1995 (April).

Commission of the EC (DG XIII) (1990g), The Market and other Requirements for a Pan-European Trunked Land Mobile Radio System (March).

Commission of the EC (1991a), Guidelines on the Application of EEC Competition Rules in the Telecommunications Sector, September 6, Com 91 (233).

Commission of the EC (1991b), The European Telecommunications Equipment Industry, Communication from the Commission, Bruxelles.

Commission of the EC (DG XIII) (1991c), Telecom Strategies, Brussels, May 17.

Communications Week International (1991) February 4, March 4, April 29, May 27.

Copeland, B. L. and A. Severn (1985), Price Theory and Telecommunications Regulation: A Dissenting View, Yale Journal on Regulation Vol 3, pp 53-85.

Courien, N. (1985) Cost Allocation and Pricing Policy: the case of French telecommunications, in: Cost allocation:Methods, Principles, Applications, Edited by H. Peyton Young. Elsevier Science Publishers.

Courien, N. (1986), Bilan des Etudes Econométriques sur les Coutes des Télécommunications en Amérique du Nord, communication au séminaire d'économie industrielle, direction de la Prévision, février.

Courien, N., Censollen, M. (1986), Economie des Réseaux: la Mutation des Télécommunications, L'Echo des Recherches, 124, p.27-32.

Courville, L., Fontenay, A. de, Dobell (1983), Economic analysis of telecommunications: Theory and applications, Elsevier Science Publishers.

Coustel, J.P. (1986), Telecommunications services in France: The regulated monopoly and the challenge of competition, Telecommunications Policy, 10 (3), p.229-243.

Crandall, R. (1983): Deregulation: The U.S. Experience, in: Zeitschrift für die gesamte Staatswissenschaft, S.419-434

Crandall, R. (1989), Changing the Rules, International Competition and Regulation in Telecommunications, Washington.

Crandall, R. (1991), After the Breakup, US Telecommunications in a more competitive Era, Washington.

Creswell, C. W., Frome, F.S., Kravitz P.S. and J. A. Rotondo (1990), Residential ISDN Services, paper presented to the 8th ITS Conference, Venice (March).

Cultrera, J. (1989), Telefoni e Telematica per l'Italia degli Anni 90, in: Telecommunications Policy (June).

de Cockborne, J. E. (1990), La Liberalisation du Marche Communautaire d'Electricite: Les Telecoms Montrent-Ils la Voie?, in: De Droit des Affaires Internationales, N° 7.

Demsetz, Harold (1968), Why Regulate Utilities, Journal of Law and Economics, April, pp. 55-65.

Deutsche Bundespost (1980), Unterrichtsblätter, 33 Jahrgang N° 12.

Deutsche Bundespost Telekom (1990), Pressemitteilung, May 31.

Deutsche Bundespost Telekom (1991), Pressemitteilung, May 31.

Deutsches Institut Für Wirtschaftsforschung (1986), Die gesamtwirtschaftliche Bedeutung von Deregulierungsmaßnahmen in den USA: Schlußfolgerungen für die Bundesrepublik Deutschland, Gutachten im Auftrag des Bundesministers für Wirtschaft, Berlin.

Deutsches Institut Für Wirtschaftsforschung (1990), Europäischer Mobilfunk verbessert Fernmeldedienste, January 25.

Die WELT (1988) März 10.

Die ZEIT (1989), März 03, 10, 24; (1991) Juni 27, 28.

Dixit, A. (1980), The Role of Investment in Entry-Deterrence, in: Economic Journal (March), pp. 85-106.

Dixon, H. (03/04/1990), Reconnecting Charges with Costs, Financial Times.

Dordick, H.S. and M.D. Fife (1991), Universal Service in post-Divestiture USA, in: Telecom Policy, April, p. 120.

Doyle, P. and S. O'Siochru (1988), Telecoms: Race in the Regions, in: EUI: European Trends, N° 4, p. 64-71.

Drucker M. (1984), Beyond the Bell break up, The Public Interest, 77, p.3-27.

Egan, B. and D. Weissman (1986), The US Telecommunication industry in transition, Telecommunications Policy, 10 (2), p. 164-176.

Einhorn, M. A. (1987), Optimality and Sustainability: Regulation and Intermodal Competition in Telecommunications, in: Rand Journal of Economics, Vol. 10, No. 4, pp. 550-563.

Elixmann, D. (1989), Econometric Estimation of Economies of Scale and Scope in the German Telecommunications Sector,in: Telecommunications Costing in a Dynamic Environment, Proceedings of the Bellcore-Bell Canada Conference on Telecommunications Costing, New York.

Ellgar, R. and D. Witt (1990), International Free Trade in Telecommunications, in: D. Friedmann and E.J. Mestmäcker (eds.), Rules for Free International Trade in Services, Baden-Baden.

El País (1988) Diciembre 30, (1989) Abril 10, (1990) Septiembre 16, Octubre 7, (1991) Abril 30, Junio 26, Julio 7, (1992) Marzo 9.

Emmerich, V. (1983), Nationale Postmonopole und Europäisches Gemeinschaftsrecht, EuR 216-226.

Encaoua, D., Geroski, P., Jacquemin, A. (1986), Strategic competition and the persistence of dominant firms: a survey in: New developments in the analysis of market structure, edited by J. Stiglitz et F. Mathewson, London.

Encaoua, D. and P. Koebel (1986), Réglementation et Déréglementation des Télécommunication: lecons anglo-saxonnes et perspectives d'évolution en France: Document de travail, décembre, a paraitre dans Revue économique.

Ergas, H. and P. Paterson (1990), The Joint Provision of International Telecommunications Services: An Economic Analysis of Alternative Settlement Arrangements, paper presented at the 8th ITS International Conference in Venice.

Ergas, H. and P. Paterson (1991), International Telecommunications Settlement Arrangements, in: Telecommunications Policy, February, pp. 29-48.

Evans, D. (1983), Breaking up Bell. Essays on Industrial Organization and Regulation, Amsterdam, North Holland.

Evans D. and James J. Heckmann (1984), A Test of Sub-Additivity of the Cost Function with an Application to the Bell System, American Economic Review, 74, p.615-623.

Evans, D. and J. J. Heckmann (1982), Natural Monopoly, in Evans, D. (ed.), Breaking Up Bell, New York, pp. 127-156.

Farrell, M.J. (1957), The Measurement of Productive Efficiency, Journal of the Royal Statistical Society 120, 253-281.

Faulhaber, G. (1975), Cross- Subsidization: Pricing in Public Entreprises, in: American Economic Review, December, p. 966-977.

Faulhaber, G. and James W. Boyd (1989), Optimal New-Product Pricing in Regulated Industries, in: Journal of Regulatory Economics, No 1 (4), pp. 341-358.

FAZ (1991) April 25, June 20,29, July 02; (1992) March 30.

Federal Communications Commission (FCC) (1991), Competition in the Interstate Interexchange Marketplace, Docket 90-132 (September 16).

Federal Communications Commission (1992), Trends in Telephone Service, February.

Fin Tech, (1990) March 22, May 31, September 6, December 13, (1991) January 10, February 7, February 21, March 7, March 21, April 18, May 02, May 04, Juny 13, July 04, November 14.

Financial Times (1985) January 14, March 09 ; (1987) October 10, (1990) April 03, April 04, July 13, July 16, November 06; (1991) April 03; (1992) March 31.

Finnie, G. (1991), Network Operators face their Future, in: Communications Week International, April 15.

Foreman-Peck, James and Jürgen Müller (1987), The Restructuring of the European Central Office Switching Market, Communications Policy Research Conference, Windsor, 6-8 July.

Frankfurter Rundschau, 17/11/1990.

Fuhr, J. P. Jr. (1990), Telephone Subsidization of Rural Areas in the USA, in: Telecommunications Policy, June, p. 183/184.

Funkschau, 17/1989, 18/1990, (Spezial) 06/1991, 10/1991.

Gabel, D. (1991), An Application of Stand-alone Costs to the Telecommunications Industry, in: Telecommunications Policy, pp. 75-84.

Gamardella, A. (1990), Output and Investment Dynamics: The Case of SIP, paper presented to the 8th Conference of the ITS, Venice.

Garnham, N. and J. Mulgan (1990), Barriers to the Convergence of Broadcasting and Telecommunications in the European Community, paper presented to the 8th Conference of the ITS, Venice.

Gassman, J. M., Gfeller, A., Wasserfallen, W. (1986), Die Nachfrage nach Telefongesprächen - Erklärung und Prognose. Eine empirische Untersuchung für die Schweiz, in. Zeitschrift für Volkswirtschaft und Statistik, Heft 2, pp. 187-197.

Gebhard, H. P. (1989), Analysis of the Present Situation and Future Trends in Telecommunications Regulation in the Member States, Commission of the EC (DG XIII), September.

Gebhard, H. P. (1990), Aktueller Stand und Entwicklungstendenzen in der Telekommunikationsregulierung der Mitgliedstaaten der Europäischen Gemeinschaft unter Berücksichtigung der Gemeinschaftspolitik, Vorabdruck aus dem Jahrbuch der DBP 1990, p. 16.

Gensollen M. (1986), Mesure des Couts et Déréglementation dans le Secteur des Télécommunications, communication au séminaire d'économie industrielle, direction de la Prévision, février.

Gentzoglanis, A. (1990), Entry and Innovation in the Telecommunications Industry, paper presented to the 8th Conference of the ITS, Venice.

Gershon, R. A. (1990), Global Cooperation in an Era of Derregulation, in: Telecommunications Policy, pp.249-259.

Gilhooly, D. (1990), OECD Measures PTT Performance, in: Communications Weck, February 12.

Gilhooly, D. (1991a), Tariffs: Lagging behind the Revolution, in: Communications Week International, February 18.

Gilhooly, D. (1991b), Interconnection Fees: The Price of Admission, in: Communications Week International, June 24.

Globerman, S. (1985), Predatory Pricing and Foreclosure in Telecommunications, in: Telecommunications Policy, December, pp. 319-328.

Glynn, S. (1992), Japan's Success in Telecommunications Regulation, in: Telecommunications Policy, January/February.

Gnetti, Attilo M. (1990), Dia Anpassung der Unternehmen des Fernmeldewesens in Italien, Internationales Forschungs- und Informationszentrum für Gemeinwirtschaft, März.

Griffin, J. M. (1983), The Welfare Implication of Externalities and Price Elasticities for Telecommunications Pricing, in: The Review of Economics and Statistics, Vol LXIV, No. 1, February, pp. 59-66.

Hahn, W. and E. Singer (1979), Belastung ausgewählter Wirtschaftsbereiche mit Post- und Fernmeldegebühren, München.

Hahn, W. and R. Ratzenberger (1984), Verteilungswirkungen interner Subventionierung der Deutschen Bundespost, in: IFO-Schnelldienst, Bd. 37,19 S.13-25.

Handelsblatt, (1991) May 05, 21; (1992) January 29.

Hansen, S., Cleeveley, D., Wadsworth, S., Bailey, H., Bakewell, O. (1990), Telecommunications in Rural Europe, in: Telecommunications Policy, p. 208.

Hartley, N. and P. Culham (1988), Telecommunications Prices under Monopoly and Competition, in: Oxford Review of Economic Policy, Vol 4, No 2, pp 1-19.

Hayes, D. (1991), Eutelsat holds Ground, in: Communications Week International, April.

Helm, D. and G. Yarrow (1988), The Assessment: The Regulation of Utilities, in: Oxford Review of Economic Policy, Vol 4, No. 2, pp. i - xxx.

Herrmann, E. (1986), Die Deutsche Bundespost, Baden-Baden.

Heuermann, K.-H. (1984), Gebührenpolitik im Telekommunikationsbereich, Baden-Baden.

Heuermann, A., Schnöring, T. (1984), Die Entwicklung des britischen Post-Office - Ansätze zu einem Vergleich mit der Deutschen Bundespost, Oktober, DB: Disskusionsbeiträge zur Telekommunikationsforschung.

Heuermann, A. and H. Neumann (1985), Die Liberalisierung des britischen Telekommunikationsmarktes, Berlin.

Heuermann, A., Neumann, K.-H., Schnöring, T., Wieland, B. (1986), Fernmeldepolitik im Vergleich - Eine problemorientierte Übersicht über die Länder USA, Großbritannien, Frankreich, Niederlande, Schweden und Japan. Sonderdruck aus dem Jahrbuch der Deutschen Bundespost.

Heuermann, A., Neumann, K.-H., Schnöring, T., Wieland, B (1987), Die Fernmeldepolitik in den USA, Großbritannien und Japan - Ansätze zu einem Vergleich mit der Bundesrepublik Deutschland, in: Hamm, W. u.a. (Hrg.): Die Deutsche Bundespost im Spannungsfeld der Wirtschaftspolitik, Heidelberg.

Heus, H.-J. (1986), Vorschauplanung des überregionalen sowie das grenzüberschreitenden Leitungs- und Liniennetzes, in: Nachrichten aus dem Fernmeldetechnischen Zentralamt, Heft 4, 35. Jahrgang (Dezember).

Hills, J. (1989), Universal Service, in: Telecommunications Policy, June, p. 137.

Horning, J. and R.W. Wilson (1979), Testing the Conditions for Natural Monopoly in Local Telephone Service, Charles River Associates Publication, Boston.

Horwitz, R. B. (1989), The Irony of Regulatory Reform, New York.

Huber, P. (1987),The Geodesic Network, Report on Competition in the Telephone Industry, Department of Justice, Washington, D.C.

Hudson, H. and E. Parker (1990), Information Gaps in Rural America, in: Telecommunications Policy (June), pp. 193-205.

Hunt, L.C. and E.L. Lynk (1990), Divestiture of Telecommunications in the UK: A Time Series Analysis, in: Oxford Bulletin of Economics and Statistics, Vol 52, No 3, pp. 229-251.

Hutcheson, R. A. (1985), Trade in Telecommunichations Services: The Current Institutional Framework and the Potential for Change, OECD Committee for Information, Computer and Communications Policy, ICCP , Paris.

Il Sole - 24 Ore (1991) Gennaio 17, Giugnio 18, 27, Luglio 19; (1992) Gennaio 17.

International Chamber of Commerce (1991), Towards Greater Competition in Telecommunications: Basic Services and Network Infrastructure, Position Paper No 17, Paris (December).

International Telecommunications Union (UIT) (1988), Yearbook of Commom Carrier Telecommunications Statistics, Geneve.

Ivorra, F. (1991), Interview, in: European Communications, Vol 4, Issue 1.

Jensen, M. C. (1986), Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers, in: American Economic Review (May), pp. 323-329.

Johnson, E. (1986), Telecommunications Market Structure in the USA, in: Telecommunications Policy, March, p. 57.

Johnson, L. L. (1987), Excess Capacity in International Telecommunications, in: Telecommunications Policy, September.

Johnson, L. L. (1989), Anticompetitive Use of Excess Capacity in International Telecommunications, in: Telecommunications Policy, September.

Johnson, L. L. (1991), Dealing with Monopoly in International Telephone Service: A U. S. Perspective, in: Information Economics and Policy, Vol. 4, N° 3, p. 226.

Jonscher, C. (1986), Telecommunications Liberalization in the United Kingdom, in: M. Snow (ed.), Marketplace for Telecommunications, London.

Joshow, P. L. and N. L. Rose (1989), The Effects of Economic Regulation, in: R. Schmalensee and R. D. Willig (eds.), Handbook of Industrial Organisation, Elsevier.

Joshow, P. L. and R. Noll (1991), Economic Regulation and its Reform During the 1980s, National Bureau of Economic Research, pp. 12-14.

Kahn, Alfred E. (1984), The Road to more Intelligent Telephone Pricing, in: Yale Journal on Regulation Vol 1, pp.139-157.

Kafka, G. (1990), Users Run Rings around West German Regulations, Data Communications International, September, p. 47.

Kay, J. and D. J. Thompson (1986), Privatisation: A Policy in Search of a Rationale, in: The Economic Journal (March), p. 18-32.

Kay, J. (1987), The State and the Market: The UK experience of Privatisation, London.

Kay, J. and J. Vickers (1988), Regulatory Reform in Britain, in: Economic Policy, October.

Knieps, G., Müller, J., and CC. von Weizsäcker (1981), Die Rolle des Wettbewerbs im Fernmeldebereich, Baden-Baden.

Knieps, G. (1986), Entstaatlichung im Telekommunikationsbereich, Tübingen.

Knieps, G. (1987), Entstaatlichung und Wettbewerb im nationalen Telekommunikationsbereich, in: R. Windisch (ed.), Privatisierung natürlicher Monopole im Bereich von Bahn, Post und Telekommunikation, Tübingen, p. 147-201.

Knieps, G. (1988), Theorie der Regulierung und Entregulierung, in: Horn, M., G. Knieps and J. Müller (eds.), Deregulierungsmaßnahmen in den USA: Schlußfolgerungen für die Bundesrepublik Deutschland, Baden-Baden

Kruse, J. (1985), Ökonomie der Monopolregulierung, Göttingen.

Kruse, J. (1991), Ordnungspolitische Probleme der Mobilfunk Liberalisierung, in: Hamburger Jahrbuch, Bd. 36.

Kubicek, H. (1989), Datennetze der Zikunft, Mikropolis.

La Repubblica (1988) Aprile 4; (1990) Marzo 16, Aprile 13, Maggio 18; (1991) Febraio 22.

Lage, G. M. and J. D. Rea (1978), Estimates of Demand Elasticities for International Telecommunications Services, in: The Journal of Industrial Economics, June.

Lake, W. (1991), Competition in the Provision of Terminal Equipment, Basic Telephony and Value-Added Services in the USA, Bruxelles.

Larson, A., T. Makarewicz, and C. Monson (1988), The Effect of Subscriber Line Charges on Residential Telephone Bills, in: Telecommunications Policy, December.

Leibenstein, H. (1966), Allocative Efficiency vs. X-Efficiency, in: American Economic Review No. 56, pp 392-415.

Lenti, F. (1990), Di Fibra Forte e Nell'Ottica del Profitto, La Repubblica (Maggio).

Lera, E. (1988), The EEC Telecommunications Sector, in: Telecommunications Policy, March, p. 8-12.

Lera, E. (1989), La Política Europea de Telecomunicaciones. ¿Pragmatismo o Audacia?, in: Telos Nº 15, pp. 32.

Lera, E. (1990a), Conflicts in the Development of Broadband Communications, in: Telecommunications Policy (August), pp 283-289.

Lera, E. (1990b), Diverging Regulatory Scenarios for Integrating Broadband Communications, in: Dieter Elixmann and Karl-Heinz Neumann (ed.), Communications Policy in Europe, Berlin.

Les Echos (1992) March 20.

Lewin, D., Rogerson D., Johnson, T. (1989), Cost-based Tariffs for Telecommunications: the Position in Europe, Ovum, London.

Lewis, A. (1989), Open Network Provision, in: D. Shorrock (ed.)

Littlechild, S.C. (1970), Peak Load Pricing of Telephone Calls, Bell Journal of Economics, Vol. 1, pp. 191.

Littlechild, S.C. (1979), Elements of Telecommunication Economics, Stevenage, New York.

Littlechild, S.C. (1983), The Structure of Telephone Tariffs, in: International Journal of Industrial Organization, pp. 365-377.

Logica (1991), Tarifica Annual Spain.

Luyken, G. M. (1983), Zum strukturellen und inhaltlichen Neuaufbau in der US-Telekommunikationsindustrie, in: Media Perspektiven.

Makarewicz, T. (1990), The Effectiveness of Low-Income Telephone Assistance Programs: Southwestern Bell's Experience. Southwestern Bell Telephone Co.

Mansell, R. (1990), Cost and Pricicng Issues in Telecommunications: An Analysis of European Trends, paper prepared for the Conferencia Internacional sobre Tarifas Telefónicas y Desarrollo de Nuevos Servicios, 30/01 - 01/02, Madrid.

Marchand, M. Pestieau, P., Tulkens, H. (1984), The Performance of Public Enterprises, North Holland.

Martin, José M.F. and O. Stehmann (1991), Product Market Integration versus Regional Cohesion in the Community, in: European Law Review, pp. 216-243.

Martin, S. (1984), A Note on: "The Dominant Firm: A Study on Market Power by Alice P. White, in: Southern Economic Journal, April, pp. 628-629.

Martin, S. (1989), Sunk Costs, Financial Markets, and Contestability, in: European Economic Review, Vol 33, pp. 1089-1113.

Martin, S. (1992), Advanced Industrial Economics, Basil Blackwell.

Mayo, J. K., Heald, G. R., Klees, S. J. (1992), Commercial Satellite Telecommunications and National Development, in: Telecommunications Policy, January/February, pp. 67-79.

Mc Gee, John S. (1980), Predatory Pricing Revisited, in: Journal of Law and Economics, Vol 23, pp. 289-330.

Media Duemila (1988), Ridisegno con le Reti di TLC la nuova Geografia del Territorio (Gennaio).

Mensi, M. (1991), La Concorrenza Corre sul Filo, in: Europa Forum N° 8, Ottobre, pp. 32-35.

Milne, C. (1990), Universal Telephone Service in the UK, in: Telecommunications Policy, October, p. 365-371.

Ministero delle Poste e delle Telecommunicazioni (1990), Gazzetta Ufficiale, Supplemento, Mercoledì 10.04.1990.

Mitchell, Bridger M. and I. Vogelsang (1991a), Theory of Telecommunications Pricing, in: Wissenschaftliches Institut für Kommunikationsdienste (WIK), Diskussionsbeiträge Nr. 65, Bad Honnef.

Mitchell, B. M. and I. Vogelsang (1991 b), US Practice of Telecommunications Pricing, in: Wissenschaftliches Institut für Kommunikationsdienste (WIK), Diskussionsbeiträge Nr. 66, Bad Honnef.

Mondini, G. (1991), Italian Telecoms and the EEC law, in: Single Market Communications Review (April), pp. 66-69.

Monopolkommission (1981), Die Rolle der Deutschen Bundespost im Fernmeldewesen, Sondergutachten der Monopolkommission, Bd. 9, Baden-Baden.

Morris, M. (1991), Local Calls, in: European Communications, Vol. 4, Issue 1.

Mossotto, C. (1991), Integrated Services Digital Networks: Narrow band Networks, in: European Transactions and Telecommunications (ETT), Vol 2, N° 1, pp. 45-58.

Mulder, R.J. (1991), ISDN: The European Perspective, in: Communications International (June) pp 54-62.

Mulgan, G. (1990), The Myth of Cost-based Pricing, in: Intermedia, Vol. 18, No. 1, January-February, pp. 21-27.

Mullins, S. (1990), Spotlight on Equal Access in the UK and the USA, in: Fin Tech, November 15.

Musgrave, R.A. and P.B. Musgrave (1980), Public Finance in Theory and Practise, 3d ed.

Musgrave, R.A., Musgrave, P.B., Kullmer L. (1984), Die öffentlichen Finanzen, Bd. 1, Tübingen.

Mushasi, T. (1984), Japanese Telecommunications Policy, Cambridge/Mass.

Müller, J. and I. Vogelsang (1979), Staatliche Regulierung, Baden-Baden.

Müller, J. (1982), Staat und Markt: Einige Anmerkungen zur Regulierung des Transport- und Kommunikationswesens, in: Beihefte zur Konjunkturpolitik Nr. 29, Berlin.

Müller, J. et al (1986), Die Gesamtwirtschaftliche Bedeutung von Deregulierungsmaßnahmen in den USA, Berlin.

Müller, J. (1987a), Deregulierung und Privatisierung: Ökonomische Prämissen und integrationspolitische Konsequenzen im Telekommunikationsbereich, in: Scherer, J. (ed.), Nationale und europäische Perspektiven der Telekommunikation, Baden-Baden, pp. 47-68.

Müller, J. (1987b), Competition in the British Telecommunications Market: The Impact of Recent Privatisation/Deregulation Decisions, in: E. J. Mestmäcker (ed.) (1987), The Law and Economics of Transborder Telecommunications, Baden-Baden, p. 250-272.

Müller, J. and J. Foreman-Peck (1987), The Restructuring of the European Central Office Switching Market, Communications Policy Research Conference, Windsor, July 6-8.

Müller J. (1988), The Benefits of Completing the Internal Market for Telecommunications Equipment and Services, Research on the "Costs of non-Europe", Basic Findings 10, Bruxelles.

Müller, J. (1989a), Der Europäische Binnenmarkt im Fernmeldewesen, in: Wirtschaft und Wettbewerb, N° 6, p. 470-477.

Müller, J. (1989b), Telecommunications in the European Internal Market, in: Intereconomics, November/December.

Nachrichtentechnische Zeitschrift (1991), Mai 5.

Nambu, T. (1990), The Optimum Access Charge under Competition, in: D. Elixmann and K.H. Neumann (ed.), Communications Policy in Europe, Berlin.

National Telecommunications and Information Administration (1986), Issues in Domestic Telecommunications, Directions for National Policy, Washington .

Neumann, K.H., Schweizer, U., von Weizsäcker, C.C. (1982), Tarifpolitik im Telekommunikationsbereich, in: Zeitschrift für die gesamte Staatswissenschaft (ZgS), No 138, pp 185-204.

Neumann, K.-H. and B. Wieland (1983), Der Einfluß der neuen Informations- und Kommunikationstechniken auf die Marktstruktur, August 1983.

Neumann, K.H., Schweizer, U., von Weizsäcker C.C. (1983), Welfare Analysis of Telecommunications Tariffs in Germany, in: Finsinger, J. (ed.), Public Sector Analysis, New York, pp. 65-85.

Neumann, K.H. (1984a), Gebührenpolitik im Telekommunikationsbereich, Baden-Baden.

Neumann, K.-H. (1984b) Breitbandverkabelung, Kabel- und Satellitenfernsehen in Großbritannien, März. in: DB: Diskussionsbeiträge zur Telekommunikationsforschung.

Neumann, K.-H. (1984c), Ökonomische Begründung des wettbewerblichen Ausnahmebereichs Fernmeldewesen, Januar, DB: Diskussionsbeiträge zur Telekommunikationsforschung.

Neumann, K.-H. and B. Wieland (1985), Competition and Social Objectives - The Case of West-German Telecommunications, September, in: DB: Beiträge zur Telekom-Forschung Nr. 14, Bad Honnef.

Neumann, K.-H., Schnöring, T. (1985), Das ISDN - Ein Problemfeld aus volkswirtschaftlicher und gesellschaftspolitischer Sicht, November, DB: Beiträge zur Telekommunikationsforschung.

Neumann, K.-H. (1986), The International System of Telecommunication Tariffs, April, DB: Beiträge zur Telekom.-Forschung N° 17, Wissenschaftliches Institut für Kommunikationsdienste der Deutschen Bundespost, Bad Honnef.

Neumann, K.-H. (1987a) Die Neuorganisation der Telekommunikation in Japan, Berlin.

Neumann, K.-H. (1987b), Models of Service Competition in Telecommunications, in: Diskussionsbeiträge zur Telekommunikationsforschung Nr. 28, Bad Honnef, August.

Neumann, K.-H. (1987c), The International System of Telecommunications Tariffs in: E.J. Mestmäcker (ed.), The Law and Economics of Transborder Telecommunications, Baden-Baden.

Neumann, K.-H. (1987d) Die deutsche Bundespost vor den Herausforderungen der europäischen Telekommunikationspolitik, in: Scherer, J. (ed.), Nationale und europäische Perspektiven der Telekommunikation, Baden-Baden, pp. 30-46.

Neumann, K.-H. (1990), The Unification of Telecommunications in Germany, Paper prepared for the Brussels Meeting of the International Institute of Communications'Telecommunications Forum, 16/17.07.1990, p. 6.

Neu, W., Neumann, K.-H., Schnöring, T. (1986), Trade Patterns, Industry Structure, and Industrial Policy in Telecommunications, August, DB: Beiträge zur Telekom.-forschung.

Noam, Eli M. (1983), Local Distribution Monopolies in Cable Television and Telephone Service: The Scope for Competition, in: Eli M. Noam (ed.), Telecommunications Regulation Today and Tomorrow, New York.

Noam, Eli M. (1986), The Political Economy of ISDN: European Network Integration versus American System Fragmentation, paper presented at the XIV Annual Telecommunications Policy Research Conference, Virginia (April).

Noam, Eli M. (1987), The Public Telecommunications Network: A Cocept in Transition, in: Journal of Communication, pp. 30-48.

Noll, R. G. (1983), The Future of Telecommunications Regulation, in: E. Noam (ed.), Telecommunications Regulation Today and Tomorrow, New York.

Noll, R. G. and B. M. Owen (1988), The Anticompetitive Uses of Regulation: US vs. AT & T, in: J. E. Kwoka Jr, and L. J. White (eds.), The Antitrust Revolution, Scott Foresman.

Noll, R. G. (1989), Economic Perspectives on the Politics of Regulation, in: R. Schmalensee and R. D. Willig (eds.), Handbook of Industrial Organisation, Elsevier.

Noll, R. G. and B. M. Owen (1989), United States vs. AT & T - An Interim Assessment, in: S. Bradley and L. Hausman (eds.), Future Competition in Telecommunications, Harvard Business School Press.

Noll, R. G. (1991), The Economics and Politics of Deregulation, The European Policy Unit at the European University Institute, San Domenico.

Northern Business Information (1991), Central Office Equipment Market.

Pacey, P. L. and L. Singell Jr. (1984), Local Measured Telephone Service in the USA, in: Telecommunications Policy, September, p. 249-255.

Palm, A. (1987), La Performance Technique de 21 services Posteaux: une Comparaison Internationale, CIRIEC Working Paper no. 87/01.

Palmer, M. and J. Tunstall (1988), Deregulation and Competition in European Telecommunications, in: Journal of Communication, Vol. 38 N° 1, p. 60-69.

Panzar, J. C. and R. D. Willig (1977a), Free Entry and the Sustainability of Natural Monopoly, Bell Journal of Economics, Spring, p.1-22.

Panzar, J. C. and R. D. Willig (1977b), Economies of Scale in multi-output Production, Quarterly Journal of Economics, XCI, p. 481-491.

Panzar, J. C. and R. D. Willig (1981), Economies of Scope, American Economic Review, papers and proceedings, LXXI pp.268-278.

Pappalardo, A. (1980), Die Stellung der Fernmeldemonopole im EWG-Recht, in: Mestmäcker, E. J. (ed), Kommunikation ohne Monopole, Baden-Baden, pp. 203-205.

Pellegrini, U. (1989), Evoluzione delle Telecomunicazioni negli Anni 80, Tecnetra, Edizione Sarin.

Pepper, R. and N. Brotman (1987), Restricted Monopolies or Regulated Competitors? The Case of the Bell Operating Companies, in: Journal of Communication.

Perl, L. (1983), Residential Demand for Telephone Service, National Economic Research Associates, New York (December).

Perl, L. (1985) Social Welfare and Distributional Consequences of cost-based Telephone Pricing. National economics research associates, April.

Perl, R. J. (1986), The Consequence of Cost-Based Telephone Pricing, in: Miller, J. (ed.), Telecommunications and Equity, Policy Research Issues, Amsterdam.

Pfeiffer, G. and B. Wieland (1990), Telecommunications in Germany. An Economic Perspective, Berlin.

Phlips, L. (1983), The Economics of Price Discrimination, Cambridge.

Phlips, L. (1987), Predatory Pricing, Commission of the EC, Luxembourg.

Phlips, L. (1988), The Economics of Imperfect Information, Cambridge.

Pindyk, R. S. and D. L. Rubinfeld (1987), Econometric Models and Economic Forecasts, Singapoore, 2nd edition.

Plaza, C. (1989), La Compañía Telefónica, in. Papeles de Economía Española, N° 38, p. 390-408.

Pogrol, G. (1986), L'Europe des Télécommunications: un concept pertinent?, Communications au séminaire FERE-Plan, Arc et Senans, octobre.

Poskett, P. and P. Mc Dougal (1990), WARC 92 - The Case for Mobile Satellites, in: Telecommunications Policy, October, pp. 355-363.

Posner, R. (1975), The Social Costs of Monopoly and Regulation, in: Journal of Political Economy, Vol 83, pp. 807-827.

Protetti, C. (1989), Il Telefono del Futuro anche per Chi va a Spasso, in: Media Duemila, N° 7, Luglio-Agosto.

Pye, R. and G. Lauder (1987), Regional Aid for Telecoms in Europe, in: Telecommunications Policy (June).

Ramsey, F. (1927), A Contribution to the Theory of Taxation, in: Economic Journal, pp. 47-61.

Rapporto Assinform (1989), Sulla situazione dell'Informatica in Italia, Milano.

Ravaioli, P. (1991), La Communauté Européenne et les Télécommunications: Développements Récents en Matière de Concurrence, in: Revue Internationale de Droit Economique, N° 2.

Rea, J. D. and G. M. Lage (1978), Estimates of Demand Elasticities for International Telecommunications Services, The Journal of Industrial Economics, June, 363-381.

Reed, T. (1989), Where Will Satellites Win in the 1990s?, in: D. Shorrock (ed.) European Communications, Middlesex.

Rees, R. (1985), Principal-Agent Theory and Public Control of Production, Mimeo.

Renshaw, E. (1983), A Note on Equity and Efficiency in the Pricing of Local Telephone Services, in: American Economic Review, Vol. 75, No. 3, pp. 515-518.

Robinson, P. (1991), The International Dimension of Telecommunications Policy Issues, in: Telecommunications Policy, April, p. 99.

Rogers, E. M. (1990), The Critical Mass in the Diffusion of Interactive Technologies, paper presented to the 9th Conference of the ITS, Venice.

Rohlfs, J. (1974), A Theory of Interdependent Demand for a Communications Service, Bell Journal of Economics and Management Science 5 (Spring), 16-37.

Rohlfs, J. (1990), Economic Issues Relating to Privatization of Telecommunications, paper prepared for the 8th ITS Conference, Venice March 18-21.

Roseman, D. (1988), Towards a Gatt Code on Trade in Telecommunication Equipment, in: World economy, Vol 11, Oxford N°1, S. 135 ff.

Roulet, M. (1988), France Telecom, in: Telecommunications Policy, June, pp. 109-113.

Ruthkowski, A. (1985), Integrated Services Digital Networks, Dedham.

Samarajiva, R. and R. Mukherjee (1991), Regulation of 976 Services and Dial-a-Porn, in: Telecommunications Policy, April, pp. 151-164.

Samuelson, P.A. (1947), Foundations of Economic Analysis, Havard.

Salso, L. (1989), The EC Telecommunications Sector, in: Telecommunications Policy, March, p. 10-12.

Sandbach, J. (1991), Network Competition and Value-Added services, in: Telecommunications Policy, December, pp. 479-484.

Schneider, V. and R. Werle (1988), Regime oder korporativer Akteur? Die EG in der Telekommunikationspolitik, Discussion Paper 88/4, Max-Planck-Institut Köln, pp. 17-46.

Scherer, J. (1985), Telekommunikationsrecht und Telekommunikationspolitik, Baden-Baden.

Scherer, J. (1987), Nationale Ordnung der Telekommunikationsstrukturen: Ein Integrationsgeheimnis?, in: Scherer, J. (ed.), Nationale und europäische Perspektiven der Telekommunikation, Baden-Baden, pp. 7-17.

Scherer, J. (1990), Regulatory Instruments and EEC Powers to Regulate Telecommunications Services in Europe, in: Elixmann, D. and K. H. Neumann (ed.) Communications Policy in Europe, Berlin, p. 235-255.

Schmidt, S. K. (1991), Taking the Long Road to Liberalization: Telecommunications Reform in the Federal Republic of Germany, in: Telecommunications Policy, June.

Schnöring, T. (1986), Wachsende Importkonkurrenz auf dem amerikanischen Telekommunikationsmarkt und die außenhandelspolitischen Reaktionen der USA, Juni, DB: Beiträge zur Telekommunikationsforschung.

Schön, H. and K. H. Neumann (1985), Mehrwertdienste in der ordnungspolitischen Diskussion, in: C. Schwarz-Schilling (ed.), Jahrbuch der Deutschen Bundespost, Bad Weidsheim.

Schulte-Braucks, R. (1986), Das "British Telecom" Urteil: Eckstein für ein Europäisches Fernmelderecht?, WuW, 202-215.

Schulte-Braucks, R. (1988a), Europäisches Telekommunikationsrecht für den gemeinsamen Telematikmarkt, in: Scherer, J. (ed.), Telekommunikation und Wirtschaftsrecht, Köln, pp. 1-39.

Schulte-Braucks, R. (1988b), Ordnungspolitische und gemeinschaftsrechtliche Aspekte der europäischen Telekommunikationspolitik, in: Scherer, J. (ed.), Nationale und europäische Perspektiven der Telekommunikation, Baden-Baden, pp. 82-102.

Schumpeter, J.A. (1950), Capitalism, Socialism and Democracy, New York.

Schwartz, M. and R. J. Reynolds (1983), Contestable Markets: An Uprising in the Theory of Industry Structure: Comment, American Economic Review, Vol. 73 No. 3 (June), pp. 488-490.

Scicon Networks (1989), The Market for Value Added Services in Europe, report prepared for the Commission of the EC, London.

Scicon Networks (1989), Analysis of the European Market of Value Added Services, Report to the Commission of the EC, London.

Selten, R. (1978), The Chain Store Paradox, in: Theory and Decision, Vol 9, pp. 127-159.

Sessions, M. (1991), PSTN Tariffing Issues in Europe, in: Telecommunications, Vol. 25, N° 1, January, p. 29.

Sharma, P. (1991), Spain: The Quiet Revolution, in: Telecommunications, Vol. 25, No. 1, January.

Shepherd, W. G. (1983), Concepts of Competition and Efficient Policy in the Telecommunications Sector, in: Eli Noam (ed.), Telecommunications Today and Tomorrow, New York.

Shepherd, W. G. (1984), "Contestability" vs. Competition, American Economic Review Vol 74, pp. 572-587.

Shooshan, H. M. (1984), Disconnecting Bell. The Impact of the AT%T Divesture, New York.

Shorrock, D. (1989a), Intelligent Networks: Technology and Markets, in: D. Shorrock (ed.) European Communications, Middlesex.

Shorrock, D. (1989b), Optical Fibre versus Satellite: Tradeoffs in Transmission Media, in: D. Shorrock (ed.), European Communications, Middlesex.

Shorrock, D. (1989c), The Evolution of Optical Fibre: Broadband to the Local Loop, in: D. Shorrock (ed.), European Communications, Middlesex.

Siemens (1985), Study on National Telephone Tariffs Worldwide. A detailed comparison, München.

Siemens (1988), Study an National Telephone Tariffs Worldwide, München.

Silvano, F. (1988), Cambiamo la Rete per Eliminare il Gap, in: Media Duemila, No 5 (Maggio).

SIP (1988), Analisi dello Sviluppo Telefonico nelle Aree Regionali dell'Europa Occidentale, Roma.

SIP (1990), Rapporto Semestrale sulla Qualità del Servizio, Roma (Settembre).

Snow, M. (Hrg) (1986), Telecommunications Regulation and Deregulation in Industrialized Democracies, New York.

Snow, M. (1987a), The International Telecommunications Satellite Organization (INTELSAT), Baden-Baden.

Snow, M. (1987b), Natural Monopoly in INTELSAT: Cost Estimation and Policy Implications for the Separate Systems Issue, in: Telematics and Informatics, Vol. 4, No. 2, pp 133-150.

Snow, .M. (1990), Evaluating Intelsat's Performance and Prospects, in: Telecommunications Policy, February, pp.15-25.

Soltwedel, R. u.a. (1986), Deregulierungspotentiale in der Bundesrepublik Deutschland, Kieler Studien Bd. 202, Tübingen.

Spence, M. A. (1977), Entry, Capacity, Investment and Oligopolistic Pricing, in: Bell Journal of Economics, pp. 534-544.

Spence, M. A. (1983), Contestable Markets and the Theory of Industry Structure: A Review Article, Journal of Economic Literature Vo. 21 (Sept.), pp. 981-990.

Squire, L. (1973), Some Aspects of Optimal Pricing for Telecommunications, Bell Journal of Economics and Management Science 4, 515.

Stanley, V. B. (1988), The Balance of Payment Deficit in International Telecommunications Services, Industry Analysis Division, Common Carrier Bureau, FCC, December 12.

Staple, G. C. (1991), International Tariffs and Accounting Rates: What Lies Ahead? in: Single Market Communications Review, April.

Stehmann, O. (1990), Competition for Basic Telephone Services: A Strategy for Europe, 8th Conference of the International Telecommunications Society (ITS), Venice, March 18-21, 1990.

Stehmann, O. (1991a), Excess Capacity as a Strategic Device for an Incumbent, paper presented at VII Jornadas de Economia Industrial, Madrid, 26 - 27 Septiembre, published in: Fundación Empresa Publica (ed.): Investigaciones Economicas (Supplemento 1992).

Stehmann, O. (1991b), Liberalizing the Intra-EC Long-Distance Market, in: Telecommunications Policy, April, pp. 129-136.

Stehmann, O. and J. M. Fernández (1991), Product Market Integration versus Regional Cohesion in the Community, in: European Law Review, June 1991, pp. 216-243.

Stehmann, O. (1992a), Facility-Based Competition in Europe: The Case for a Separate Satellite System, in: Telecommunications Policy, March, pp. 135-146.

Stehmann, O. (1992b), Network Competition for European Telecommunications, paper accepted for presentation for the 9th ITS Conference in Sophia Antipolis, June 14-17, 1992.

Steinfield, C. W. and L. Caby (1990), Strategic Organizational Applications of Videotext among Varying Network Infrastructures, paper representes to the 9th Congress of the ITS, Venice.

STET (1988), Programma Quadriennale 1989-1992 (Dicembre).

Stevers, E. (1990), Telecommunications Regulation in the European Community, EUI working paper N° 89/4212, San Domenico.

Stigler, G. J. (1968), The Organization of Industry, Homewood,Ill.: Irwin.

Stigler, G. J. (1971), The Theory of Economic Regulation, in: The Bell Journal of Economics.

Taylor, B. (1986), Telecoms: Towards an EC Strategy, in: EIU: European Trends N° 4, p. 52-58.

Taylor, B. (1987), Telecoms: Competition and Regulation in the 1990s, in: EIU: European Trends N° 3, p. 57-64.

Taylor, B. (1988), Telecoms Liberalisation: National Measures and the Building of a European Strategy, in: The Economist Intelligent Unit (EIU): European Trends, London N° 1, p. 45-47.

Taylor, L. D. (1980), Telecommunications Demand: A Survey and Critique, Ballinger.

Temin, P. and L. Galambos (1987), The Fall of the Bell System, Cambridge.

Tenzer, G. (1985), Aspekte der Endgerätepolitik, in: Perspektiven der Fernmeldepolitik, Sonderdrucke einer Aufsatzreihe aus dem Jahrbuch der Deutschen Bundespost.
Tenzer, G. (1991), The Introduction of Optical Fiber in the Subscriber Loop in the Telecommunications Networks of DBP Telekom, in: IEEE Communications Magazine, March pp 36-49.

The Economist (1989) January 21, February 25, September 6, October 28; (1990) March 10, May 12, July 7, November 17; (1991) January 12, March 31, June 01, July 06, August 03, October 05.

Thiemeyer, T. (1964), Grenzkostenpreise bei öffentlichen Unternehmen, Köln.

Tirole, J. (1988), The Theory of Industrial Organization, Cambridge M.A.

Tirado, C., Granger, J. R., Nieto, M. (1990), New Telecommunications Applications for Reducing Regional Differences. With specific Reference to the Spanish Case, paper presented to the 8th conference of the ITS, Venice (March).

Trezise, P. H. (1987), Intelsat and Competing Private Satellite Systems, in: E.J. Mestmäcker (ed.), The Law and Economics of Transborder Telecommunications, Baden-Baden, pp.33-345.

Tulkens, H. (1986), La Performance Productive d'un Service Public: Définitions, Méthodes de Mesure et Application á la Régie des Postes en Belgique, L'Actualité Economie, Revue d'Analyse Economique 62, 306-335.

Tulkens, H. (1986), The Performance Approach in Public Enterprise Economics, Annals of Public and Co-operative Economy 74, p.429-443.

UN (1987), The Telecommunication Industry - Growth and structural Change, .

Ungerer, H. (1988), Telecommunications in Europe, Brussels.

Ungerer, H. (1990), Challenges in the Harmonization of Telecommunications Tariffs in Europe, Conference Paper for Fundesco International Conference, Madrid, 30/01 - 01/02/1990.

US Council for International Business (1990), Telecoms Tariffs in the United States of America, July, New York.

Usher, J.A. (1983), Telecommunications, Public Undertakings and the Competition Rules of the EEC, J. Business Law, 330 ff.

Varian, Hal R. (1980), A Model of Sales, in: American Economic Review, Vol 2 (September), pp. 651-659.

Vergnano, F. (1991), Italy - Deregulation and the Green Paper, in: Single Market Communications Review (April).

Vergnano, F. (1991), Radiomobili: Al Termine il Monopolio della SIP, Il Sole - 24 Ore, Aprile 26, 1991; Febraio 13, 1992.

Vickers, J. and G. Yarrow (1985), Privatization and the Natural Monopolies, London.

Vogelsang, I. (1990), Public Enterprise in Monopolistic and Oligopolistic Industries, in: Fundamentals of Pure and Applied Economics, Vol. 36, Chur.

Wall Street Journal (1991), December 02.

Waverman, L. (1974), The Demand for Telephone Services in Great Britain, Canada and Sweden. University of Aston, Birmingham 29.5.1974.

Wavermann, L. (1989), US Interexchange Competition, in: R.W. Crandall (ed.), Changing the Rules, International Competition and Regulation in Telecommunications, Washington.

Weitzman, M. L., 1983, Contestable Markets: An Uprising in the Theory of Industry Structure: Comment, American Economic Review, Vol 73 No 3,,pp. 486-87.

Weizsäcker, C. C. von (1980), A Welfare Analysis of Barriers to Entry, in: Bell Journal of Economics, Vol.11, No 2 (autumn), pp. 399-420.

Weizsäcker, C. C. von (1984), Free Entry into Telecommunications?, in: Information Economics and Policy N° 1, pp. 197-216

Weizsäcker, C.C. von , Knieps G., Ungen-Sternberg, T., Weiland, B. (1987), The Economies of Value Added Network Services, Köln.

Weizsäcker, C. C. von and B. Wieland (1988), Current Telecommunications Policy in West Germany, in. Oxford Review of Economic Policy, Vol. 4, N° 2, p. 20-39.

Wenders, J. T. (1987), The Economics of Telecommunications: Theory and Policy, Cambridge Massachusetts.

Wenders, J. T. (1988), The Economic Theory of Regulation and the US Telecoms Industry, in: Telecommunications Policy, March, pp. 16-26.

Wenders, J. T. (1992), Unnatural Monopoly in Telecommunications, in: Telecommunications Policy, January/February.

Wieland, B. (1983), Die ökonomische Theorie des natürlichen Monopols, August, in: Diskussionsbeiträge zur Telekommunikations forschung der Deutschen Bundespost.

Wieland, B. (1984a) Problems of Gradual Deregulation - What can European Authorities Learn from US-Telecommunications Policy, August, DB: Diskussionsbeiträge zur Telekommunikationsforschung.

Wieland, B. (1984b): Die AT&T Entflechtung und ihre wirtschaftstheoretischen Leitbilder, Bad Honnef (Oktober).

Wieland, B. (1985), Die Entflechtung des amerikanischen Fernmeldemonopols, Berlin.

Wieland, B. (1985), Probleme bei der schrittweisen Deregulierung eines natürlichen Monopols - Das Beispiel AT&T, WuW, 93-98.

Wieland, B. (1988), Regulierung der Telekommunikation, in: M. Krakowski (ed.), Regulierung in der Bundesrepublik Deutschland, Hamburg, p. 195-286.

Wigand, Rolf J. (1988), Integrated Services Digital Networks: Concepts, Policies, and Emerging Issues, in: Journal of Communication, Vol. 38, N° 1 (Winter), pp. 29-49.

Willig, R.D. (1979), The Theory of Network Access Pricing, in: H.M. Trebing (ed) Issues in Public Utility Regulation. Proceedings of the Institute of Public Utilities Tenth Annual Conference, East Lansing, pp. 109.

Windisch, R. (1987), Privatisierung natürlicher Monopole: Theoretische Grundlagen und Kriterien, in: R. Windisch (ed.), Privatisierung natürlicher Monopole im Bereich von Bahn, Post und Telekommunikation, Tübingen.

Wirtschaftswoche (1991) Juni 21, Dezember 07.

Witt, D. (1987), The Impact of National Deregulation Policies on the Structure and Activities of the ITU, in: E.J. Mestmäcker (edd.), The Law and Economics of Transborder Telecommunications, Baden-Baden.

Witte, E. and M. Dowling (1991), Value-Added Services, in: Telecommunications Policy, October, pp. 437-452.

Wöhlbier, G. (1986), Grundlegende Angelegenheiten der Gestaltung des Fernmeldeleitungs- und Liniennetzes, in: Nachrichten aus dem Fernmeldetechnischen Zentralamt, Heft 4, 35 Jahrgang (Dezember).

Wollenberg, R., Witten, R. Nadler, J. (1990), California vs. FCC: After the Earthquake, Life goes on, in: The Computer lawyer, Vol. 7, N° 8, August, p. 25.

Yarrow, G. (1985), Strategic Issues in Industrial Policy, in: Oxford Review of Economic Policy, Vol. 1, No 3.

Yarrow, G. (1986), Privatisation in Theory and Practise, Economic Policy 2.

Zietz. J. (1985), Nichttarifäre Handelshemmnisse in der EG - Der Bereich der Telekommunikation, in: Die Weltwirtschaft 2, S.149-165.

Zietz. J. (1986), Mehr Marktwirtschaft für den Telekommunikationssektor der EG, in: Wirtschaftsdienst N° VIII, Hamburg, p. 418-423.

Zimmermann, J. (1991), Neue Wege nach der Postreform, in: Funkschau, May 3.