Thünen-Series of Applied Economic Theory

Thünen-Reihe Angewandter Volkswirtschaftstheorie

Working Paper No. 5

Direct Banking – A Demand Pull and Technology Push Innovation

by

Doris Neuberger

Universität Rostock

Wirtschafts- und Sozialwissenschaftliche Fakultät
Lehrstuhl für Volkswirtschaftslehre

1997

Direct Banking -
A Demand Pull and Technology Push Innovation

Doris Neuberger[*]

Abstract

Since 1994, the German banking market is confronted with an entry wave of direct banks. This banking innovation may be explained by developments on the supply side as well as on the demand side. It is pushed by developments in telecommunication technologies during a period of rising cost competition and pulled by a change in the demand for selling efforts by banks. Within a model of monopolistic competition with endogenous selling efforts we show that in the long run, a direct banking market supports a larger number of firms which offer their products at lower prices than a branch banking market. If customers are heterogeneous, both banking types will survive.

1. Introduction

Direct banking is an innovation concerning the place of sale or the distribution channel of banking products. They are no longer channelled through a branch network, but through telecommunication (fax, telephone, personal computer) and mail. Branch banks which just ad phonebanking to their traditional distribution channel are not considered as direct banks (Pischulti 1995, p. 4). The products sold by direct banks are mainly standardized retail services which are not advisory in nature. They range from financial investments (e.g. savings certificates, time deposit accounts, stock exchange brokerage) to loan transactions (e.g. consumer credits) and payment transactions (e.g. current account, credit card).

In the United States, direct banking is common in the brokerage business since 1975[1] , but is still in its infancy in other retail banking services (Schütt 1995, N.N. 1996i). From the beginning of the 1990s, European banking markets are affected by the innovation, too, with

[*] Prof. Dr. Doris Neuberger, University of Rostock, Faculty of Economic and Social Sciences, Parkstraße 6, D-18057 Rostock, telephone: +49 (0)381 498 2905, fax: +49 (0381) 498 2904, e-mail: dneu@wiwi.uni-rostock.de

[1] In 1995, about 15% of the total charges levied in the U.S. securities business were obtained by discount brokers, which offer their services without advice to customers by way of telecommunication (Schütt 1995, p. 102, Dahlhausen/Siebald 1995).

the pioneer First Direct in the United Kingdom (see Kinahan 1995). Although in Germany, the first direct banks[2] were founded as early as in the 1960s, the innovation takes place on a large scale only since 1994.[3] In this year, the Santander Direct Bank entered the German market and the Direkt Anlage Bank and ConSors were founded as the first German imitations of the U.S. discount brokers. Since then, there is a wave of followers entering as subsidiaries of German banks, where more and more direct banks offer a broad scope of financial services beyond the discount brokerage (see N.N. 1996c, Lasch/Röder 1995, Hübner 1996).

Although direct banks have gained much attention in the public and in banking journals (e.g. Lasch/Röder 1995, Schütt 1995, Pischulti 1996), they have hardly been discussed from a theoretical point of view. To our knowledge, only phonebanking has been analyzed theoretically by Bouckaert and Degryse (1995). In a model of spatial competition in the market for deposits they show that offering phonebanking creates two opposing effects. By lowering transaction costs, it induces an increase in demand, but also tougher competition. The competitive effects cause a tendency to underinvest in phonebanking.

In the present paper, we try to explain direct banking by adopting a broader approach: the distribution channel may be any type of telecommunication and the product may be any type of a standardized financial service which can be sold without a branch bank. On the demand side, we introduce heterogeneity of the banks' customers in terms of their need of selling efforts by branch banks. On the supply side, we consider a reduction in processing costs which increases the attractiveness of founding a direct bank. Bouckaert and Degryse (1995) view phonebanking as a technological innovation brought about by a reduction in the transaction costs on the demand side. They argue that it makes depositors more willing to accept lower deposit rates (Bouckaert/Degryse 1995, p. 230). In reality, however, the services of direct banks are offered at lower prices, e.g. higher deposit rates, than the services of branch banks. This points to a reduction in the processing costs which is passed through to the market price. Direct banking may then be viewed as a technology push and a demand pull innovation. As a technology push innovation, it would be the reaction to an exogenous increase of knowledge about lower cost distribution channels and as a demand pull innovation it would be the reaction to an increased preference of customers for impersonal selling efforts.[4]

To analyze the incentives to introduce this innovation, we consider that the demand for selling efforts by a bank arises from their provision of information to buyers, as has been shown for the demand for advertising by Ehrlich and Fisher (1982). Selling efforts by banks may affect the demand for financial services because they lower the gap between the market price received by a bank and the full price borne by its customer. This gap exists because of the buyer's cost of obtaining information about varieties of financial products, transaction

---

[2] Augsburger Aktienbank (1963), Allgemeine Deutsche Direktbank (1965).

[3] The entrance of the VAG Bank in 1988 and the Quelle Bank in 1990 did not induce immediate followers. The success of the Citybank as first universal bank which introduced telecommunication as a distribution channel in 1989 provided large impulses to the recent direct banking boom (Pischulti 1996).

[4] The terms technology push and demand pull innovation go back to Schmookler (1962, 1966). See also Kamien and Schwartz (1982, pp. 57) and Scherer (1982).

costs and adjustment costs in the case of disappointing purchases. It induces a demand for cost-saving information or selling efforts by the seller (Ehrlich/Fisher 1982, p. 366). Alternatively, the production of information may be brought about by the buyers themselves. If in the case of a financial product there is a perfect substitutability between selling efforts by a branch bank and search for information by a buyer, this product may be sold directly, without a personal contact in a branch bank. We argue that this applies to the standardized products of direct banks which use a different technology to provide the necessary selling efforts. We examine the demand, the supply and the pricing of those products along the lines of Ehrlich and Fisher (1982).

In chapter 2, we analyze the demand for selling efforts as provided by branch banks in order to find out which group of customers would profit from direct banking. In chapter 3, we examine the effects of direct banking within the model of monopolistic competition. Departing from the long-run equilibrium of branch banking (3.1), we discuss the short-run profits obtainable by the direct banking pioneer and the resulting long-run equilibrium (3.2). Then, the effects of the innovation on the equilibrium selling efforts and market price are examined more closely (3.3). Finally, in chapter 4, we draw conclusions and confront the hypotheses with empirical evidence.

2. Demand for Selling Efforts by Branch Banks

We consider a set of heterogeneous financial products which are offered by different branch banks and are close substitutes in consumption. Let p_i be the nominal price received by a bank for the provision of a financial service of variety *i*. It may represent the fee for a security transaction, a custodian fee, a deposit rate reduction or a loan rate premium vis-à-vis the market interest rate. A buyer of the service pays this price plus transaction and information costs which are due to shopping costs and his imperfect knowledge about the characteristics of product varieties offered by the different banks. Following Ehrlich and Fisher (1982, S. 368), we assume that these costs consist in the foregone value of time which the buyer expects to spend to realize the desired transactions. If *l* denotes the expected length of time spent per unit good and *w* represents the buyer's opportunity cost of time, the full price of variety *i* borne by buyer *j* is given by

$$\pi_{ij} = p_i + w_j l_{ij} \tag{1}$$

Let *l* be a decreasing and convex function of the following variables:

$$l_{ij} = l_{ij}(E_i, A_i, K_{ij}, x_{ij}) \tag{2}$$

The first two variables represent information-producing activities by the bank i in the form of selling efforts E_i within a branch (e.g. personal advice about an investment in securities or deposits) and media advertising A_i. The variable K_{ij} denotes the knowledge about the financial service *i* acquired by the customer *j* from all other sources (e.g. education, experience, search). It may also include the knowledge about a special telecommunication technology to

obtain product *i* directly. Finally, a reduction in the length of time *l* spent per unit product may be brought about by an increase in the number X_{ij} of the product i purchased by customer *j*.

The demand for branch bank i's selling efforts E_i depends on their relative efficiency of reducing information and transaction costs and on their substitutability vis-à-vis the alternative information-producing or cost-reducing activities. To derive further determinants of this demand, we consider the decision of a buyer to minimize the information and transaction costs of the financial product by purposive search for knowledge. It is an optimal investment decision, where in any period of time *t* knowledge may be acquired at a fixed unit price of time *w* in order to minimize the total time costs of acquiring the financial product. If the time horizon of the buyer is infinite, we may formulate the problem as follows

$$\min_{\{I(t)\}} \int_0^\infty e^{-rt} \left\{ xwl\left[K(t), E(t), A(t), x(t)\right] + wI(t) \right\} dt \tag{3}$$

subject to

$$\dot{K} = I(t) - \delta K(t)\,, \tag{4}$$

where *r* denotes a fixed discount rate, *I(t) (I(t) > 0)* is the investment in knowledge done in period t in units of search time, *K(t)* is the accumulated stock of knowledge in period *t* which negatively affects the shopping time *l* in that period. *K* accumulates over time with the rate $\dot{K} := dK/dt$, depreciating at the fixed rate δ per unit time. The number of purchases *x* is assumed to remain constant over time.[5] If *I(t)* > 0 in any period, we obtain[6] as condition for a cost minimum

$$-xwl_K\left[K^*(t), E(t), A(t), x(t)\right] = w(r+\delta)\,, \tag{5}$$

where l_K denotes the first partial derivative of *l* with respect to *K*. It is necessary and sufficient, because *l* has been assumed to be convex in *K*, l_{KK} *(K*)* > 0. Equation (5) indicates that an optimal stock of knowledge *K** in any period *t* is reached if the marginal return given by the reduction in shopping costs (net of the costs of purposive search) equals the marginal costs of knowledge accumulation (Ehrlich/Fisher 1982, pp. 368).

The optimal stock of knowledge depends positively on the scale of purchases *x* and on the buyer's search efficiency l_K, whereas it depends negatively on the discount rate r and the depreciation rate δ. It is independent of the opportunity cost of time *w* which raises the marginal cost of knowledge accumulation in the same way as its marginal benefits. Nevertheless, the optimal stock of knowledge should be positively affected by an increase in the buyer's income (wage or nonwage), which allows a larger scale of purchases. Buyers with a higher level of education should have more incentives to invest in knowledge, because their

[5] For simplicity, we drop the indices *i* and *j* for the bank *i* and its customer *j*.

[6] The problem may be solved by the Maximum principle of optimal control (see e.g. Chiang 1992).

search productivity is likely to be higher. They may not only have a comparative advantage in obtaining knowledge about special financial services, but also in learning to use more complex telecommunication channels such as the personal computer. Finally, we expect that younger people are more willing to invest in knowledge than older people. Since they are more acquainted with modern methods of telecommunication, their productivity of providing the necessary investments is likely to be higher.

What are the implications for the demand for personal selling efforts by a branch bank? Let us assume that $l_{EK} := \partial^2 l / \partial E \, \partial K > 0$, which indicates that E and K are substitutes. The efficiency of reducing information and transaction costs by selling efforts E is reduced by an increase in the stock of knowledge K. Hence, the demand for selling efforts by branch banking should be the lower, the more knowledge the buyer has accumulated by purposive search. It should be lowest for young persons with high income and a high level of education.

3. Monopolistic Competition with Selling Efforts

3.1. The Case of Branch Banking

As to the supply side, we consider a market for a banking service which is characterized by monopolistic competition. There is a large number of banks, each offering a different product variety or brand.[7] The brands are close substitutes in consumption. Initially we assume that the buyers may differ with respect to personal preferences for different varieties, but not to their opportunities to acquire the product. The average cost curves of established and potential banks are identical and decreasing or U-shaped. We differentiate between production costs which accrue in the back office and costs of selling efforts in the front office. The production costs comprise variable processing costs and fixed costs which are mainly due to investments in a data processing system and advertising expenses to send messages to customers and create a brand. In the case of branch banking, the costs of selling efforts are to a large degree fixed. They consist in the costs of the branch network such as rents for the buildings, costs of transporting the transfer slips and labor costs. In the traditional branch banking system the latter are high, because the sales personnel must be qualified not only to transact services, but also to give personal advice to uninformed customers. Since for a given branch network these selling efforts are independent of the scale of output, we assume that their costs are fixed. Then, the total costs may be expressed by

$$T(x,E) = C(x) + eE, \tag{6}$$

where $C(x)$ are the production costs, x is the scale of output and E are selling efforts with constant costs e per unit (e.g. per branch). We focus on selling efforts as a means of banks to

[7] The creation of brands is especially relevant for service industries, where image and trustworthiness of the suppliers are important for demand (see De Bandt 1996, p. 20). In banking markets, an image is usually not directed to the products, but to the suppliers who seek to create consumer preferences in this way (Sondhof 1989, pp. 108).

reduce the information costs or transaction costs of buyers. Advertising as another means to reduce these costs primarily serves to inform potential customers about the innovation of direct banking, differentiating it from branch banking products and brands.[8]

Although each bank is a kind of natural monopoly in its brand, it must take the prices of its rivals as given. In the market equilibrium, they are determined by the level of zero profits. If the seller of brand *i* charged a market price above the equilibrium level, it would risk losing its customers to a competing bank which could enter the market by offering a substitute. In the same way, the competitive level of the full price is determined by the zero profit condition. Hence, a bank cannot charge a market price that exceeds its average costs or a price differential for selling efforts that exceeds the indirect cost saving to customers (Ehrlich/Fisher 1982, pp. 370).

If all banks face the same demand function, the market equilibrium with branch banking is characterized by Chamberlin's tangency solution of a representative bank *i* which maximizes its profit by equating marginal revenue and marginal costs (see Chamberlin 1933). This equilibrium is shown for the case of linear demand in figure 1.[9] The line D represents the demand curve for brand *i* with market price p_i, if all other banks hold their market prices constant. Because of incomplete information and transaction costs on the demand side, its location depends on the selling efforts of branch banking E_b. It shifts in parallel to the right, if the full price π_i is reduced by selling efforts. Simultaneously, the increase in the selling efforts leads to a vertical shift in the bank's average cost schedule AC and hence to an increase in the market price. The long-run equilibrium L_b with selling efforts E_b^* is reached when the full price of the brand can no longer be reduced by an increment in selling efforts (Ehrlich/Fisher 1982, p. 373). It depends on the properties of the full price demand function and the average cost function. The higher ceteris paribus the full price elasticity of demand at a low level of selling efforts $\left(E_b^o\right)$, the more pronounced is the shift in the conventional demand function D if the full price is lowered by an increment in E_b and the higher are x_i^* and $\left(E_b^*\right)$.[10]

[8] For the case of telephone banking in the U.S.A. it has been shown that advertising in the initial periods of the innovation accelerated its diffusion, but was gradually reduced as the product moved through its life cycle (Horsky/Simon 1983).

[9] For simplicity, the marginal revenue and marginal cost curves are not drawn in figure 1.

[10] See Ehrlich and Fisher (1982, p. 373), who, however, take the number of brands offered as determined, implying and intersection of a bank's demand curve and average cost schedule in equilibrium.

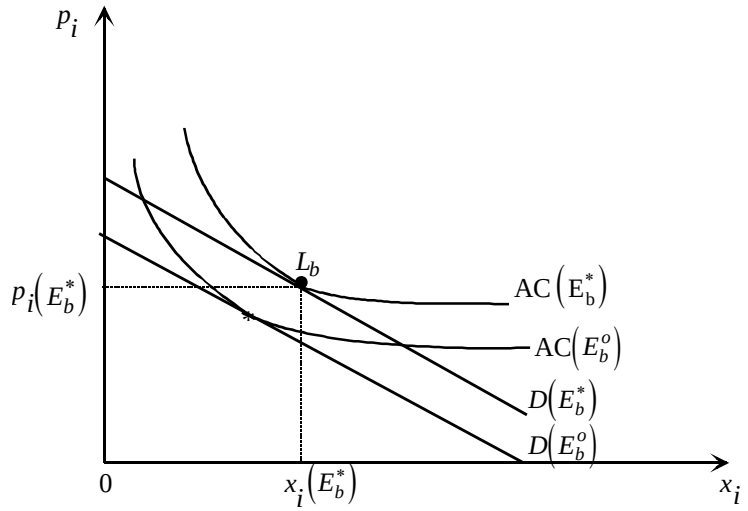


Figure 1: Equilibrium selling efforts and sales of a representative branch bank

3.2. The Innovation of Direct Banking

Direct banking is a new technology of selling efforts by banks. The personal contact between the sales personnel and customers in a large number of branches is replaced by impersonal mail or telecommunication between a single banking office and the customers. Hence, the high capital and wage costs of the branch network are substituted by lower costs. The building expenses are lower, because the bank must not be located in a densely populated area to be close to the customers and the wage costs are lower due to both a reduction in the volume and the wage rate of the staff. Direct banking does not need financial experts who give advice about the products sold, but rather sales personnel who just receive and transact orders by way of mail or telecommunication. The cost savings are mainly due to a decrease in fixed costs. Moreover, the costs of the selling efforts should become more variable. In Germany, branch banks cannot react flexibly to changes in demand. Wages and labor capacities are fixed by umbrella agreements and capacities cannot be shifted between different branches. If, however, a direct bank is established out of a parent bank („stand-alone solution“), it is not tied to the strict rules of the umbrella agreements. It can obtain labor up to 20% cheaper and at more flexible working hours (Steltzner 1996).

We assume that the production costs in the back office are the same for branch banking and direct banking. Directs banks, too, need a data processing system for providing their services and advertising expenses to create their brands. Although these expenses should be higher when the innovation is introduced, we expect that in the long run they are not significantly different from those of the traditional branch banks.

The innovation of direct banking could be introduced by a new entrant which offers a substitute to the products sold or by an established bank which offers its old brand with the new sales technology. If both depart from the zero profit equilibrium, their incentives to reap profits by the innovation should be the same. However, profits can arise only temporarily, since the technology of direct banking is not patentable. This reduces the incentive to

innovate. The expectation of temporary profits may be driven by an expected cost reduction and by an expected exogenous increase in demand. In the first case, we speak of a technology push innovation, in the second case of a demand pull innovation. To examine both incentives, let us depart from the long-run branch banking equilibrium L_b in figure 2 and assume that bank *i* substitutes the direct banking technology for the branch banking technology. Figure 2 shows two effects. On the supply side, the average cost curve shifts downward and becomes flatter if the selling efforts of branch banking E_b^* are replaced by low selling efforts of direct banking E_d^o. On the demand side, the change of the sales technology leads to a shift in the demand function, depending on the relative efficiency of both technologies to reduce the full price. If we maintain the assumption that all customers are homogeneous with respect to their opportunities to acquire the product, there is a latent demand for direct banking if the buyers have accumulated the knowledge which makes the new technology superior to the old one. If this is the case, the introduction of direct banking leads to a rightward shift in the demand function and a corresponding shift in the average cost function, as long as the full price can be reduced by an increment in selling efforts of direct banking more than it was reduced before by branch banking. The shift in the demand function of bank *i* is the higher, the higher the full price elasticity of demand when the innovation is introduced. It is highest if all customers of the competitors are attracted by the reduction in the full price of brand *i* at given full prices of the other brands. In this case, the rival banks would be driven out of the market. In figure 2, the short-run demand function of the direct bank's selling efforts is denoted by $D(E_d^s)$.

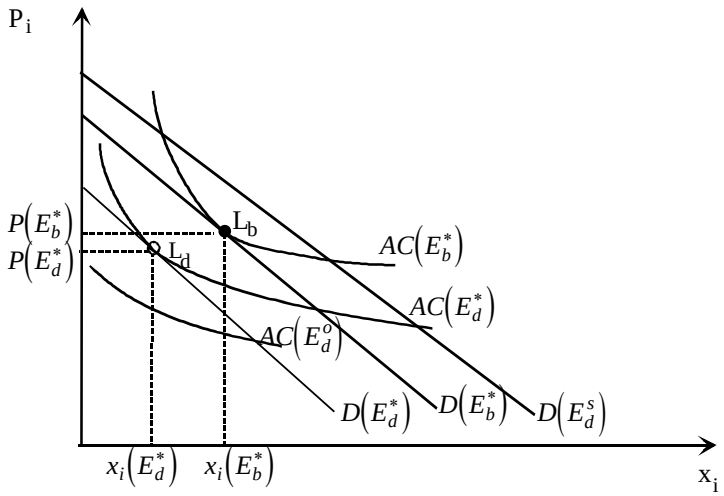


Figure 2: Short run and long run effects of direct banking

We see that there are two incentives to innovate which cannot be isolated from each other. Bank *i* obtains positive profits by a cost reduction accompanied by an increase in demand.[11] If

[11] The profits could be illustrated in figure 2 by drawing the marginal revenue and marginal cost curves which have been omitted for simplicity. Each bank is maximizing profit such that marginal cost equals marginal revenue along the individual demand curve D. The volume of profits is determined by the difference between the price on the short-run demand curve $D(E_d^s)$ and the average cost on the short-run cost curve at the

there was no latent demand for direct banking, the demand curve would shift to the left as the personal selling efforts by branches are reduced to zero. The innovation would not be accepted, since the increase in the full price would induce the customers to buy substitutes from branch banks.

If there are no entry barriers and all banks have equal access to the new technology, the profits of bank i will induce the adoption of direct banking by rivals and new banks which enter the market by offering new brands. The increase in the number of competitors leads to a parallel downward shift in the demand curve of bank i, which is a representative bank again, if all rivals have adopted the new technology (see e.g. Neumann 1994, pp. 200). A new long run equilibrium is reached at the point of zero profits, where the average cost curve $AC(E_d^*)$ and the demand curve of bank i $D(E_d^*)$ are again tangent, as illustrated by point Ld in figure 2. If we compare this long-run equilibrium of competition between direct banks to the long-run equilibrium of competition between branch banks, we see that the output of a single bank is lower and hence the number of viable banks larger in the case of direct banking. This is caused by two effects: a reduction in fixed costs and an increase in demand by more efficient selling efforts.12 Hence, the direct banking equilibrium is more competitive than the branch banking equilibrium. This could cause an underinvestment in direct banking, if the equilibrium number of branch banks was low enough to enable collusion. In this case, the branch banks would maximize their joint profits along the market demand curve and obtain profits, which they would lose by switching to direct banking.13 This result supports the finding of Bouckaert and Degryse (1995) that there is a tendency to underinvest in phonebanking because of increasing competition, which they have derived for an exogenous number of banks.

On the other hand, it may be advantageous to be the first mover of direct banking, because the pioneer can reap the largest profits by attracting the customers from rival banks. The incentive to innovate should be the higher, the Lower are the expected Losses due to 'cannibalization' of own customers in branch banking and the higher are the expectations that direct banking is introduced by rivals. Hence, although direct banking is not profitable in the long run, it may pay to move first in order to reap short-run profits and prevent losses from the switching of customers to rivals banks.

---

optimal output level. The short-run cost curve $AC(E_d^s)$ lies somewhere between $AC(E_d^*)$ and $D(E_d^s)$, when the short-run equilibrium level of selling efforts E_d^s is reached.

[12] This does not mean that the volume of selling efforts is larger in the case of direct banking, because selling efforts are substituted by the buyers' search for information (see chapter 3.3).

[13] This collusive equilibrium could be illustrated in figure 1 by drawing the market demand curve for brand *i* if all banks match price changes. It is steeper than the individual demand curve where only bank *i* changes its price. The banks would maximize profits by equating marginal cost to the marginal revenue derived from the market demand curve, which leads to a lower equilibrium output and a higher price (see Neumann 1994, p. 201).

We have assumed that the production costs in the back office do not differ in the long run. If, however, the introduction of direct banking requires higher expenses in advertising and a data processing technology, the temporary profits as an incentive to innovate are reduced.

If we drop the assumption that buyers are homogeneous with respect to their shopping opportunities, we can differentiate between two customer groups. The first group comprises all 'traditional' buyers who need personal contact and advice in a branch bank. The second group contains all those buyers who have accumulated enough knowledge to profit from impersonal transactions. The incentive to introduce direct banking should increase with the expected customer share of the second group. If it is high enough, the two customer groups will be separated in a branch banking equilibrium and a direct banking equilibrium. It may go along with a separation of the sellers, too. As has been mentioned above, in Germany the stand-alone solution to direct banking permits lower and more flexible labor costs. Moreover, a separation may be necessary to create different images by different advertising messages or to establish a lower-cost information system (Krupp 1996, p. 713). Actually, the new direct banks in Germany have been founded by traditional banks as separate, independent entities with a different name. They may, however, profit from their relation to a parent branch bank, which could have accumulated reputation for safety and which could share some investments with the direct bank (e.g. automatic teller machines).

3.3. Equilibrium Selling Efforts and Market Price

Figures 1 and 2 demonstrated the equilibrium values of output and market price under the assumption of optimal selling efforts which minimize the information and transaction costs on the demand side. To gain further insight into the effects of direct banking on selling efforts and market price, let us derive the optimum values of these variables from the maximization of a representative bank's profit function. The problem may be formulated as follows

$$\underset{\{E\}}{Max}\, N(E,p) = px - C(x) - eE \tag{7}$$

subject to the equilibrium conditions

$$N = 0 \tag{8}$$

$$x = \phi(\pi^*) = D(p^*,E^*) \tag{9}$$

$$d\pi^* = 0 = p_E(E^*) + wl_E(E^*) \tag{10}$$

(see Ehrlich/Fisher 1982, p. 373). Equation (8) is the zero profit condition. Equation (9) states that in equilibrium demand depends on the full price which is a function of the market price and selling efforts. Equation (10) requires that the equilibrium full price cannot be reduced through more selling efforts. The necessary conditions of profit maximization subject to equations (8) and (9) yield a "supply-side" equilibrium schedule in p and E (denoted by S), whereas equation (10) yields a "demand-side" equilibrium schedule in p and E (denoted by F). The equilibrium values of p and E are determined by the point of tangency of both curves

$$\frac{e}{x} = -wl_E \qquad (11)$$

The left hand side of equation (11) describes the slope of the S-schedule at the full price minimum and the right hand side the slope of the F-schedule. The S-schedule is at least locally convex and the F-schedule is concave (see appendix).

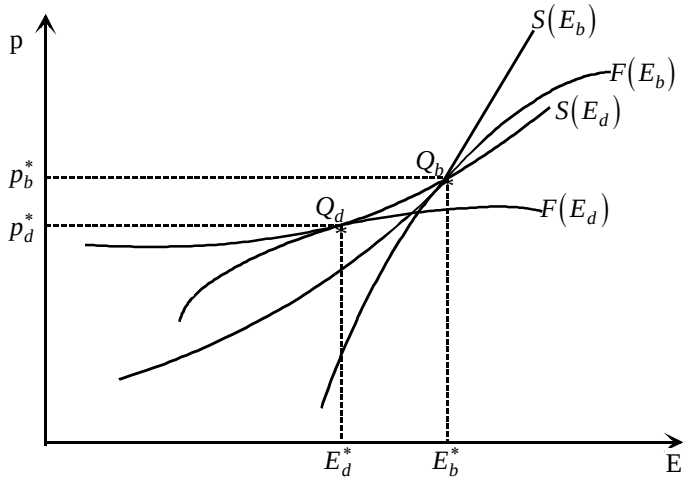


Figure 3: Selling efforts and market price for branch banking and direct banking

In figure 3, the equilibrium market price and selling efforts in the case of branch banking are determined by the point Q_b. The slope of the S(E_b)-curve is high because of high costs of selling efforts e. The slope of the F(Eb)-schedule is high for customers in need of personal selling efforts, for whom the productivity of selling efforts $\left|l_{E_b}\right|$ is high. For customers who do not demand personal selling efforts because they have accumulated the relevant knowledge, the slope of the F(Eb)-schedule would be lower. However, they cannot move down along the S(Eb)-curve because they have to pay the same market price as the other customers and because they still have to go to a branch to acquire a financial product. If direct banking is introduced, the S-schedule becomes flatter due to lower fixed costs of selling efforts e. It would get linear at the point of tangency with the F-curve, if the selling costs became totally variable with respect to output x.[14] Simultaneously, the F-schedule will become flatter, since for the informed customers, the productivity of selling efforts to reduce the information costs is lower. In figure 3, the direct banking equilibrium Qd implies a lower level of market price and selling efforts than the branch banking equilibrium.

The actual change of market price, however, depends on the properties of the cost and demand functions and on the simultaneous change in output *x*. Let us consider only a reduction in e brought about by direct banking. Given the cost function (6), the equilibrium price is given by

[14] In this case, the slope at the point of tangency is *e* instead of *e/x*.

$$p^* = \frac{C(x) + eE}{x} \tag{12}$$

By differentiating equation (12) with respect to e we obtain

$$\frac{dp^*}{de} = -\left[\left(\frac{C/x - C'}{x}\right) + \frac{eE}{x^2}\right]\frac{\partial x}{\partial e} + \frac{\mathrm{E}}{\mathrm{x}} + \frac{\mathrm{e}}{\mathrm{x}}\frac{\partial E}{\partial e} \tag{13}$$

The first term on the right hand side indicates the price reduction brought about by an induced increase in demand, $\partial x / \partial e < 0$. It is the higher, the higher is the price elasticity of the full demand curve, the higher are the fixed costs of production (causing a higher differential between average costs C/x and marginal costs C') and the higher are the fixed costs e of selling efforts. The second term describes the price reduction caused by the lower selling costs at given output. The third term indicates a price increase by an expansion of the optimal selling effort along the unchanged demand schedule *F*. In the case of direct banking, however, the reduction in *e* goes along with a change in the demand schedule due to a substitution of selling efforts *E* by the customers' production of knowledge *K*. If this substitution effect dominates the expansion effect $\partial E / \partial e$, the market price is reduced unambiguously.

4. Conclusions and Evidence

We conclude that direct banking is the result of two interactive developments, technological progress in communication technologies and an exogenous change in demand for personal selling efforts by banks. The incentive to introduce this innovation depends on the expected cost reduction, the expected demand for direct banking and the expected change in the intensity of competition in the banking market. Under the assumption of monopolistic competition, the market for direct banking should support a larger number of firms with a lower market price than the branch banking market in the long run. Nevertheless, in the absence of collusion, there is an incentive for a branch bank to establish a direct bank early, in order to reap short run profits and prevent a loss of market share by the switching of customers to earlier movers. This does not imply that branch banking is obsolete in the long run. Direct banking is no alternative for uninformed customers and customers who prefer the personal contact in a branch bank. As long as customers are heterogeneous, the banking market supports two separating equilibria.

The results are confirmed by the events in the US stock brokerage market after regulatory constraints on commissions had been relaxed in 1975: "Discount firms have thus entered and been financially successful, but even though their rates are less than half those of the full-service brokers, they have not in any sense taken over the market from the full-line firms. Both groups have prospered" (Bailey 1986, p.10).

In chapter 2, we concluded that the customers should be segmented according to age, income and level of education. Indeed, the customers of direct banks tend to be younger, wealthier and more highly educated than branch banking customers (Pischulti 1995, p. 7, Hübner 1996,

p. 15). For example, the German direct bank Bank 24 reports that 70% of its customers are of age between beginning of 30 and end of 40, have a net income of household amounting to at least 4000 DM/month and are self-employed or professional workers. More than 80% own a personal computer, compared to only 18% of the whole population (Drosten 1996, p. 60, Krupp 1996, p. 713). German bank customers have become more emancipated in the last decade, being less loyal towards their traditional house banks, more price-sensitive and tending more towards a do-it-yourself mentality (Morschhäuser 1995, p.24). Dahlhausen and Siebald (1995, p.31) suggest a segmentation of customers in the discount brokerage business according to sociodemographic and psychological features and to features of investment behavior (see table 1).

Sociodemographic features	**Psychological features**	**Investment behavior**
age: • 25 - 40 years profession: • executive employees/public officials • other salaried employees/ public officials • professionals • self-employed net income (per month): • household: ≥ 5000 DM • person: ≥ 3000 DM volume of securities account: • > 30000 DM (per year)	• open-minded towards new communication technologies • own initiative • willingness to learn	• high turnover rate • high market knowledge • high product knowledge • comparison of offers • low bank loyalty • preference for security investments

Table 1: Criteria for customer segmentation in discount brokerage

In 1996, about a million people use a direct bank in Germany, which corresponds to a market share of 1% in the retail banking market (Raab 1996, Krupp 1996). Most of the Germans still wish to be adviced personally when acquiring financial services. They fear that the channelling of financial services by telecommunication is less safe than by personal contact (N.N. 1995b). Nevertheless, the German direct banking market is growing. To increase their attractiveness for less informed customers, some direct banks provide informations about the stock exchange (e.g. ConSors) or even investment advice (Advance Bank) by way of telecommunication (Prandl 1996, N.N. 1996d). In the discount brokerage business, most of the orders are already sent by PC (N.N. 1996a). The number of potential direct banking customers in Germany is estimated to reach 10 millions and in the longer run 15 millions

(N.N. 1996f). Market experts expect that in 10 to 15 years 20% of customers will carry out about 80% of their banking transactions by computer (Steltzner 1996).

The main motive to use a direct bank are lower prices or higher deposit rates (N.N. 1995b). On average, direct banks offer their services at fees 40-50% below the fees of the traditional branch banks (Lasch/Röder 1995, p. 342). The price advantage of discount brokers as compared to full brokers is even 50-90% (Studer 1995, N.N. 1996d). The low prices are due to the low costs of direct banking. In the United States, the transaction of a standardizable banking product costs 1.07 US$ when carried out in a branch bank, 0.73 US$ when done per mail, 0.35 US$ when done per phone and only 0.27 US$ when carried out at a self-service terminal (Morschhäuser 1995, p. 22).

In Germany, the comparative cost advantage of direct banks vis-à-vis branch banks is obvious from a comparison of the ratio of the staff costs and other administrative costs to the business volume. This is shown in tables 2 and 3, where we differentiate between three groups of branch banks (large private banks, savings banks, credit co-operatives) and the three oldest direct banks in Germany.

Year	Branch banks			Direct banks		
	Large private banks	Savings banks	Credit cooperatives	Augsburger Aktienbank	Allgemeine Deutsche Direktbank	Quelle Bank
1994	1.36	1.34	1.54	0.88	0.56	0.52
1995	1.30	1.34	1.52	0.84	0.46	0.42

Table 2: Staff costs of branch banks and direct banks in percent of business volume[13]

Year	Branch banks			Direct banks		
	Large private banks	Savings banks	Credit cooperatives	Augsburger Aktienbank	Allgemeine Deutsche Direktbank	Quelle Bank
1994	0.78	0.80	1.00	0.78	0.78	0.96
1995	0.75	0.84	1.00	0.83	0.71	0.74

Table 3: Other administrative expense of branch banks and direct banks in percent of business volume[15]

For German banks, there has been no pressure to reduce costs by the innovation of direct banking until the 1990s. The German retail banking market was characterized by presence competition with an enlargement of branch networks until 1980 and by quality competition with an improvement of customer services (especially personal advice) in the period 1980-

[15] Sources: Monthly reports of the Deutsche Bundesbank, October 1995, August 1996; annual reports; own calculations.

1990. Since the possibilities to increase market share by improved quality have been exhausted, banks reduce prices (increase deposit rates) in the 1990s. Finally, the reduction of price-cost margins pushes the banks to reduce their costs, creating cost competition. In the market segment of standardizable security transactions, price and cost competition were introduced by the establishment of discount brokers in 1994 (Schütt 1995).

Nevertheless, the incentive to move first is likely to be low because of the non-patentability of the innovation. Moreover, by adopting a follower strategy a bank may profit from the investments of the innovator by learning or spill-over effects. If, however, the investments of the first mover imply sunk costs (e.g. by advertising), he could build up a permanent leadership position. In this case, competition in the direct banking market would be less intense as indicated by the model of monopolistic competition above.16

Actually, the intensity of competition in the direct banking market is high. Since the informed customers of direct banks are especially price sensitive, the price elasticity of demand is high. To restrain it, direct banks increase the customers' switching costs by invoicing high fees on the transfer of a securities account to a rival bank (Lasch/Röder 1995). Competition between differentiated banks is higher than between a direct bank and a branch bank belonging to the same parent company. The new direct banks attract their customers mainly from rival banks and hardly from the branch banks of their parent bank (Lasch/Röder 1995, p. 342, Drosten 1996, p.60, N.N. 1995e). However, the "cannibalization effect" seems to have increased in the last year (N.N. 1996b, h).

The establishment of a direct bank requires high investments, especially in data processing infrastructure.17 To reach the break-even point, a direct bank needs a large growth in its business volume at low margins (N.N. 1996f). Hence, there is an intense competition for new customers which goes along with high investments in advertising to inform customers and differentiate products. Therefore, the costs of gaining a new customer are high[18] and it takes about 4-5 years, to reach the break-even point (N.N. 1995c, 1996f, Steltzner 1996). The high advertising expenses of the new direct banks do not seem to harm the pioneers. The Allgemeine Deutsche Direktbank, which exists since 1965, reports that to the contrary, it profits from those investments, without having to increase its own advertising expenditures (N.N. 1995d). The Quelle Bank, which also has been founded before the beginning of the direct banking boom, still profits from its advantage to belong to a retail establishment providing a large customer base (Steltzner 1996). However, the pioneer of discount broking in

[16] The implications for market structure can be derived from a two-stage game, where a bank can enhance the demand for its products at stage 2 by incurring greater advertising outlays at stage 1. Then, an increase in the size of the market cannot lead to a fragmented market structure, because competition between incumbent banks raises the equilibrium level of sunk costs at stage 1 of the game. The higher the degree of demand responsiveness faced by a bank to increases in its fixed advertising outlays in the first stage of the game, the higher will be the industry’s minimum concentration level (Sutton 1992, p.11).

[17] For the Deutsche Bank subsidiary Bank 24, these investments amounted to 40 million DM in the first year, which where mainly due to investments in data processing (N.N. 1995a). Market experts estimate the total start-up costs (without advertising expenses) to reach 100-200 million DM (Steltzner 1996).

[18] For the German market, the advertising costs in the first year are estimated to 30-40 million DM and the costs of attracting a new customer to 300-700 DM (Jünemann 1995, N.N. 1996f, Steltzner 1996).

Germany, the Direkt Anlage Bank, could not maintain its leadership position. This is obvious from figures 4 and 5.

Actually, competition by the entrance of new direct banks is tougher than expected. Therefore, the Direkt Anlage Bank had to postpone its break-even expectation for two years (N.N. 1996b, h). In view of these experiences, Jürgen Sarrazin, the chairman of the Dresdner Bank, is glad about not having entered the direct banking market yet: „You should lead the cow to the pasture only after the grass has grown“ (N.N. 1996e, p. 77). Therefore, he decided to erect a direct bank subsidiary of the Dresdner Bank not before the second half of the year 1997 (N.N. 1996g). Until then, the grass should grow further and the Dresdner Bank hopes to feed its yet unnamed cow by offering a much broader scope of retail banking products than its rivals (N.N. 1996j).

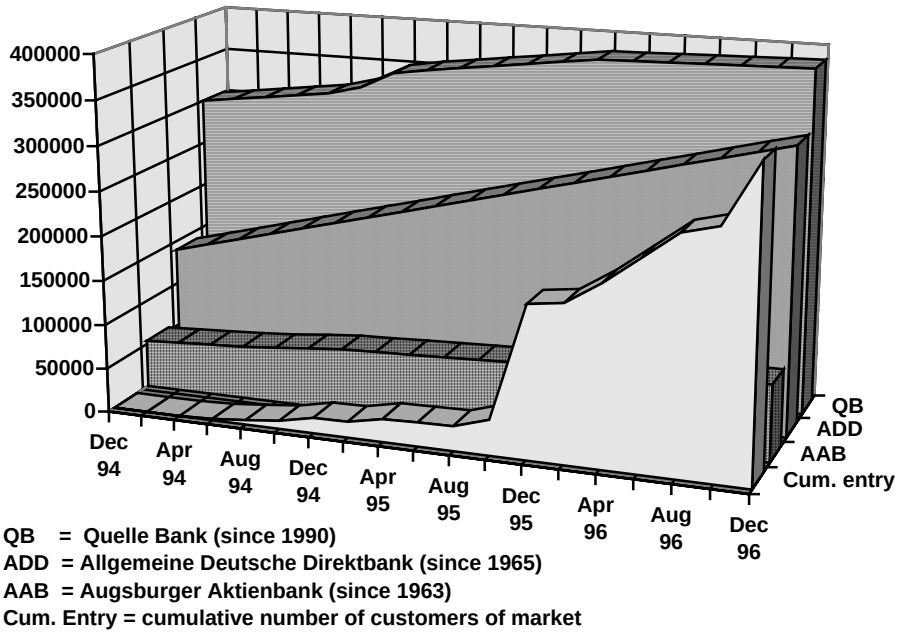
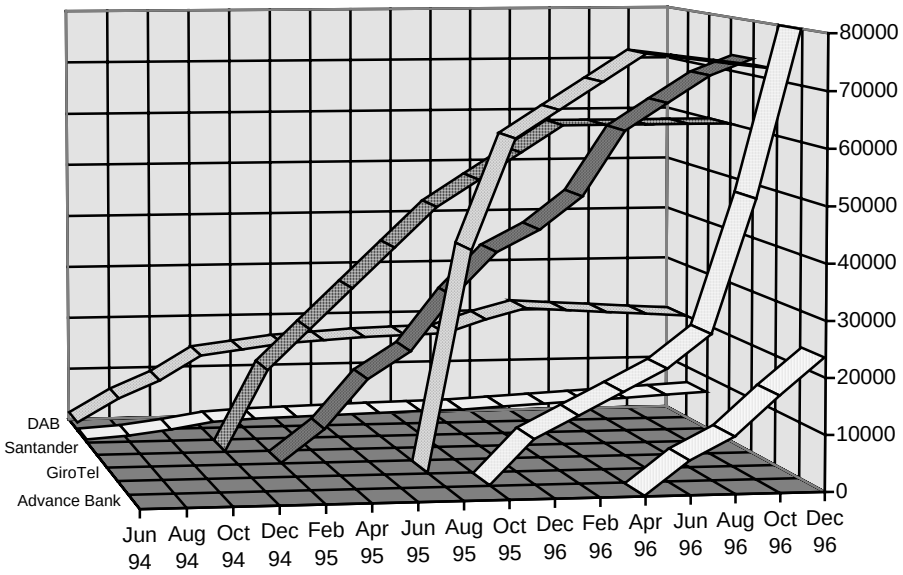


Figure 4: Development of the number of customers of incumbents and market entries in the German direct banking market[16]



Market entries: Direkt Anlage Bank (May 1994), Consors (June 1994), Santander Direkt Bank (Sept 1994), ComDirekt (Febr. 1995), GiroTel (July 1995), Bank 24 (Sept. 1995), Advance Bank (March 1996)

Figure 5: Development of the number of customers of market entries in the German direct banking market since 1994[16]

[16] Sources: Annual reports; newspaper reports; own calculations.

Acknowledgements

I am grateful to Erik Lehmann for valuable research assistance and to Monika Lindner-Lehmann, Michael Rauscher and Thusnelda Tivig for helpful comments.

References

Bailey, Elizabeth (1986), Price and Productivity Change Following Deregulation: The U.S. Experience, Economic Journal 86, 1-17.

Bouckaert, Jan and *Hans Degryse* (1995): Phonebanking, European Economic Review 39, 229-244.

Chamberlin, Edward H. (1933), The Theory of Monopolistic Competition, Cambridge, MA / Harvard University Press.

Chiang, Alpha C. (1992), Elements of Dynamic Optimization, McGraw-Hill, Inc, New York et al.

Dahlhausen, Volker and *Ralph Siebald* (1995), Discount-Broking in den USA und in Deutschland, Bank und Markt 4, 28-33.

De Bandt, Jacques (1996), Business Services: Markets and Transactions, Review of Industrial Organization 11, 19-33.

Drosten, Michael (1996), Direktmarketing heißt permanentes Testen, absatzwirtschaft 8, 60-63.

Ehrlich, Isaac and *Lawrence Fisher* (1982), The Derived Demand for Advertising: A Theoretical and Empirical Investigation, American Economic Review 72, 366-388.

Horsky, Dan and *Leonard S. Simon* (1983), Advertising and the Diffusion of New Products, Marketing Science 2, 1-17.

Hübner, Ralph (1996), Reiten auf dem Kamm der dritten Welle, Geldinstitute 6, 14-17.

Jünemann, Bernhard (1995), Direktbanken. Teuer erkauft, Wirtschaftswoche No. 40, 74-75.

Kamien, M. and *N. Schwartz* (1975), Market Structure and Innovation: A Survey, Journal of Economic Literature 13, 1-37.

Kinahan, Peter (1995), First Direct, in: Allgemeine Deutsche Direktbank AG (ed.), Direktbanken. Die moderne Bankverbindung, Frankfurt a.M., 28-32.

Krupp, Georg (1996), Erfolgsstrategien für parallele Vertriebskanäle im Privatkundengeschäft, Die Bank 12, 712-718.

Lasch, Rainer and *Klaus Röder* (1995), Das Börsenangebot der Direktbanken. Eine Analyse des deutschen Marktes, Zeitschrift für Bankrecht und Bankwirtschaft 7/4, 342-356.

Morschhäuser, Berthold (1995), Ganz direkt oder doch stationär?, in: Allgemeine Deutsche Direktbank AG (ed.): Direktbanken. Die moderne Bankverbindung, Frankfurt a.M., 19-27.

Neumann, Manfred (1994), Theoretische Volkswirtschaftslehre III. Wachstum, Wettbewerb und Verteilung, 2. Aufl., München.

N.N. (1995a), Bank 24 peilt eine halbe Million Kunden an, Börsen-Zeitung, 26.9.1995, 5.

N.N. (1995b), Direkt-Banking noch in der Anlaufphase, Börsen-Zeitung, 28.11.1995, 17.

N.N. (1995c), Neue Direktbank am deutschen Markt, Frankfurter Allgemeine Zeitung, 23.2.1995.

N.N. (1995d), Dem Primus ist vor Newcomern nicht bange, Frankfurter Allgemeine Zeitung, 11.10.1995.

N.N. (1995e), Vorreiter behauptet Marktführerschaft, Handelsblatt, 17./18.6.1995.

N.N. (1996a), ConSors erzielt nur die „rote Null“, Börsen-Zeitung, 24.5.1996, 21.

N.N. (1996b), Direkt Anlage Bank: Erst 1999 Gewinn, Börsen-Zeitung, 27.6.1996, 6.

N.N. (1996c), N.N.: Direktkonto mit Zinsvorteil, Capital 2/96, 38-45.

N.N. (1996d), Wertpapiere: Bis 97% billiger, Capital 6/96, 182-185.

N.N. (1996e), Ansprüche unterschätzt, Der Spiegel No. 34, 77-80.

N.N. (1996f), Direktbanken kämpfen in einem kräftig wachsenden Markt um Kunden, Frankfurter Allgemeine *Zeitung, 9.8.1996, 18.*

N.N. (1996g), Die Dresdner Bank will das Privatkundengeschäft profitabler machen, Frankfurter Allgemeine Zeitung, 1.11.1996, 17.

N.N. (1996h), Verlustphase soll erst 1999 zu Ende sein, Handelsblatt, 26.6.1996.

N.N. (1996i), Deregulierung und neue Technik formen Amerikas Bankgewerbe um, Frankfurter Allgemeine Zeitung, 15.11.1996, 28.

N.N. (1996j), Dresdner Bank will mit Direktbank einen neuen Banktypus schaffen, Frankfurter Allgemeine Zeitung, 14.11.1996, 23.

Pischulti, Helmut (1995), Direktbank - Bank der Zukunft, in: Allgemeine Deutsche Direktbank AG (ed.): Direktbanken. Die moderne Bankverbindung, Frankfurt a.M., 4-11.

Pischulti, Helmut (1996), Produktpolitik bei Direktbanken - ein systematischer Überblick, Bank und Markt 5.

Prandl, Paul (1996), Börsenwelt per Doppelklick, Capital 6/96, 114-119.

Raab, Hans-Jürgen (1996), Die filiallosen Konkurrenten kommen, Frankfurter Allgemeine Zeitung, Verlagsbeilage „Finanzdienstleistungen“, 4.11.1996, B 14.

Scherer, F.M. (1982), Demand-Pull and Technological Innovation, Schmookler Revisited, Journal of Industrial Economics 30, 225-237.

Schmookler, J. (1962), Economic Sources of Inventive Activity; Journal of Economic History 22, 1-20, reprinted in: Rosenberg, N. (ed.): The Economics of Technological Change, Harmondsworth/ England 1971.

Schmookler, J. (1966), Invention and Economic Growth, Cambridge / Mass.

Schütt, *Henrik* (1995), Discount-Broking: Die neue Konkurrenz, Die Bank 2, 101-105.

Sondhof, Harald W. (1989), Finanzdienstleistungsmärkte im Wandel, Schriften zur Unternehmens-planung 20, Frankfurt/Main et al.

Steltzner, Holger (1996), Bankgeschäfte auf der Datenautobahn, Frankfurter Allgemeine Zeitung No. 210, 9.9.1996, 15.

Studer, Margaret (1995), Low Fees, No Frills Mark the Invasion of Discount Brokerage Houses in Europe, Special to the Wall Street Journal Europe, 14.9.1995, 13-14.

Sutton, John (1992), Sunk Costs and Market Structure, Third printing, Cambridge, Mass. - London.

Taler, Andreas (1996), Die Konkurrenz ist groß, Süddeutsche Zeitung No. 146, 27.6.1996, Beilage, 43.

Appendix

The necessary and sufficient conditions for the solution of problem (7) subject to (8) are:

$$\frac{\partial N}{\partial E} = \frac{\partial p}{\partial E} x + \left(p - C'(x)\right)\frac{\partial x}{\partial E} - e = 0 \tag{A1}$$

$$\frac{\partial^2 N}{\partial E^2} = \frac{\partial^2 p}{\partial E^2} x + 2\frac{\partial p}{\partial E}\frac{\partial x}{\partial E} - C''\left(\frac{\partial x}{\partial E}\right)^2 + (p - C')\frac{\partial^2 x}{\partial E^2} < 0 \tag{A2}$$

From (A1) we obtain

$$\frac{\partial p}{\partial E} = \frac{e}{x} - \frac{\left(p - C'(x)\right)e_{xE}}{E}, \tag{A3}$$

where $\frac{\partial x}{\partial E} = \frac{\partial x}{\partial \Pi}\frac{\partial \Pi}{\partial E}$ and $e_{xE} = \frac{\partial x}{\partial E}\frac{E}{x}$.

According to (8), the equilibrium price equals average cost

$$p^* = \frac{C(x) + eE}{x} \tag{A4}$$

Substituting (A4) into (A3) yields the slope of the *S*-schedule

$$\frac{\partial p}{\partial E} = \frac{e}{x}\left(1 - \varepsilon_{xE}\right) + \frac{\left(C'(x) - C/x\right)e_{xE}}{E} \gtrless 0 \tag{A5}$$

By differentiating (A5) with respect to *E* we obtain the curvature of the *S*-schedule

$$\frac{\partial^2 p}{\partial E^2} = -\left(1 - \varepsilon_{xE}\right)\varepsilon_{xE}\frac{e}{Ex} + \left(C'' x + \frac{C}{x} - C'\right)\left(\frac{\varepsilon_{xE}}{E}\right)^2 \tag{A6}$$

$$+\left(\frac{c}{x} - C'\right)\frac{\varepsilon_{xE}}{E^2} + \left(\frac{C' - C/x}{E} - \frac{e}{x}\right)\frac{\partial \varepsilon_{xE}}{\partial E} \gtrless 0$$

The slope and the curvature of the *F*-schedule are derived from the minimization of the full price Π which leads to the equilibrium condition (10).

From this we obtain

$$\frac{\partial p}{\partial E} = -wl_E > 0 \text{ since } l_E < 0 \tag{A7}$$

and hence

$$\frac{\partial^2 p}{\partial E^2} = -wl_{EE} < 0 \text{ since } l_{EE} > 0 \text{ because of the convexity of } l(E, \cdot). \tag{A8}$$

Since the minimization of the full price requires $\frac{\partial \Pi}{\partial E} = 0$, it implies $\frac{\partial x}{\partial E} = \frac{\partial x}{\partial \Pi}\frac{\partial \Pi}{\partial E} = 0$.

Hence $\varepsilon_{xE} = 0$ and $\frac{\partial \varepsilon_{xE}}{\partial E} = \frac{\partial x}{\partial \Pi}\frac{\partial^2 \Pi}{\partial E^2}\frac{E}{x} < 0$ because of $\frac{\partial x}{\partial \Pi} < 0$ and $\frac{\partial^2 \Pi}{\partial E^2} > 0$.

Thus, at the point of tangency with the demand schedule *F*, the supply schedule *S* has the slope

$$\frac{\partial p}{\partial E} = \frac{e}{x} > 0 \qquad \text{(A9)}$$

and the curvature

$$\frac{\partial p}{\partial E^2} = \left(\frac{C' - C/x}{E} - \frac{e}{x}\right)\frac{\partial \varepsilon_{xE}}{\partial E} > 0, \qquad \text{(A10)}$$

which ensures convexity at least at this point.