A statistical analysis of television audience measurement systems and their implications

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Abstract

This thesis focuses on the identification of measurement errors in television audience measurement systems and their implications to the television industry. BARB in the UK and Médiamat in France are the case studies selected. Measurement errors are identified by assessing the sampling and non sampling operations implemented in these sample surveys but also by integrating the uses that are made of the estimates yielded and the meaning of the concept measured.

The thesis argues that the commodities traded on the television market are not audiences but statistics: namely, television ratings, and that this commodity production function is a distinctive feature of these sample surveys. The means by which these commodities are produced by broadcasters, and priced and bought by agencies on behalf of advertisers are examined. It is shown that prices attached by buyers to these commodities rely on factors that are grounded in economic rather than statistical considerations, and that the commodities are not known at the moment they are priced but need to be projected.

It is argued that television audience measurement systems are based on a construct of the audience that relies entirely on assumptions and operational definitions. The consequences of this approach to measurement on the uses to which the data are currently put and on the capacity of the industry for making predictions are examined. It is suggested that the data collection technique implemented in these measurement systems is of decisive importance to the sampling design and the economy of the medium. The validity of the people-metering data collection technique currently in use is assessed. It is argued that this technique imposes the use of samples that are not valid from a statistical viewpoint. Components of variance for audience estimates are identified and a method for searching for patterns in standard errors for audience estimates is proposed. The implications of the findings in the new television environment are developed.

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Some professional terms...

ENGLISH	FRENCH
Audience measurement system	Etude d'audience
Coverage	Couverture
Data collection	Recueil des données
Day-after-recall	Audience veille
Digital	Numérique
Establishment survey	Etude de calage
Exposure	Exposition
Frequency	Répétition
Joint Industry Committee	Comité Interprofessionel
People-meters	Bouton-poussoirs
Rating	Taux moyen d'audience
Reach of viewing	Audience cumulée
Set-meter	Audimètre
Share of viewing	Part d'audience
Target audience	Audience cible
Viewing diary	Carnet d'écoute

...and abbreviations

AMS	Audience measurement systems
BARB	Broadcaster's audience research board
CPP	Cost per point
CPT	Cost per thousand
DAR	Day-after-recall
ESOMAR	European Society for Opinion and Market Research
FMT	Frequency monitoring technique
GRP	Gross rating point
JIC	Joint industry committee
TVR	Television rating

Introduction

Audience measurement systems - abbreviated by the initials AMS – aim to measure the size and composition of media audiences. They are one of the best known sample surveys. One can hardly open a newspaper without reading that such or such publication has x million readers, that such or such programme had y million viewers etc. In English speaking countries the figures they yield in television are commonly referred to as '*ratings*[1]'; in France they are widely known as '*Audimat*[2]'.

Audience measurement systems in the media are almost as old as sampling practice. Sampling theories emerged at the beginning of the century. Print and radio audiences first started being measured via survey sampling in the USA in the late 1920s-early 1930s and such surveys have been run continuously since then. Audience measurement systems are thus, together with opinion polls, the earliest form of sample survey conducted in the private sector. Nowadays they are to be found in five media industries: print, radio, television, cinema and outdoor, and at the end of the century a new class of AMS is currently emerging with the measurement of Internet audiences. In most European countries there has been an evolution towards one audience measurement system per medium so that in most cases one sample survey sets the measurement standard for each of those media audiences at a national level.

Audience measurement systems in broadcasting have a status that is not well taken into account by their standard market research classification. Indeed, broadcast AMS have a unique feature: they have long been the exclusive source of indicators establishing a link between industry and market. Although radio and television AMS are strongly related, television AMS dominate media audience measurement systems by the scale of the samples and the sophistication of the data collection techniques used. To illustrate this point suffice to say that television audience measurement systems in Europe generate from

[1] It has to be established at the outset that the term 'rating' in the media is not the same as the common usage of the word. As it will be seen, audience measurement systems do not provide any qualitative evaluation of how much a particular medium is 'liked'.

[2] From the name of the first television audience measurement system that introduced the set metering data collection technique in France in 1981 (cf. chapter 4).

1 500 observations per second for the small systems up to 14 000 observations per second for the large ones. This thesis focuses on these measurement systems.

Television audience measurement systems are in the paradoxical situation of being both a controversial and yet little known object of research. On the one hand, media professionals and practitioners often describe AMS as an objective measurement that provides a form of democratic system on which programming decisions can be made in the light of what people want. On the other hand, television audience measurement systems have been accused by public lobby groups and intelligentsia in Europe to be responsible for the decrease in quality of the television output. By contrast with this public debate, television audience measurement systems have attracted very little attention in the three academic fields of research most directly concerned, i.e. statistics, media economics and media and communication. This thesis attempts to fill in this academic gap and, in so doing, to bring new elements to the public debate on television audience measurement systems.

The research questions this thesis seeks to address are: (a) what measurement errors can be identified in television audience measurement systems? And, given (a), (b) what are the implications of these sample surveys to the economy of television? This thesis falls within the perspective of early statistical work in the field of survey research. It attempts to revive the tradition of analysing survey practice within a theoretical framework in order to assess the social data yielded by sample surveys, here television audience measurement systems. But as opposed to most design-based analyses that limit themselves to an assessment of the sampling and non sampling operations, this thesis is based on a less traditional definition of measurement errors in sample surveys. It is also concerned with the uses to which the data are being put on the one hand, and with the audience concept defined by the measurement on the other. In the case of sample surveys having statistical but also economic dimensions such as television audience measurement systems both of these aspects are complex and call for analysis, as it will be seen.

Such an analysis requires the selection of case studies. BARB in the UK and Médiamat in France can be regarded as an interesting purposive sample given our research questions because they exhibit key differences in their measurement designs and in the features of the domestic television industries that set them up. However, it is important to emphasise that these two case studies do not cover fully the diversity of the national situations that can be found in Europe and even more so outside Europe.

In chapter 1 public and academic debates with regard to television audience measurement systems are overviewed, the distribution of audience measurement systems in the media industry is presented and the research procedure is set out. In chapter 2 the role of television AMS in the economy of television is analysed and the distinctive uses of the data they yield by the industrial players is shown. In chapter 3 the different theories of the television audience are examined and compared with the audience construct defined in television AMS; the properties and issues brought up by this industrial construct are analysed. In chapter 4 the observation operations implemented in BARB and Médiamat are assessed and their implications on the economy of television is examined. In chapter 5 sampling biases and non response effects are studied and the statistical validity of the samples used is assessed. Finally, in chapter 6 sampling variability issues are tackled and their consequences for the television industry are examined.

This thesis can be regarded as interdisciplinary. Although statistics appears as the main body of literature because it provides the theoretical framework and criteria against which this class of sample surveys is assessed, media economics and audience research literatures are also drawn upon. It is one of the contributions of this thesis to develop links between bodies of literature that have been hitherto partitioned. In choosing such an approach, this thesis tries to show how applied statistics can contribute to an understanding of some current and much debated issues that are traditionally located within other academic fields of research. In the case of television audience measurement systems, it is hoped that this thesis shows that applied statistics is a useful approach to understand current issues pertaining to the economy of television. This thesis supports the view that issues pertaining to the media, especially in the current media environment, lead to questions that are interdisciplinary in nature, and thus particularly complex to address. As with any interdisciplinary research work, it must be accessible to specialists in different academic fields and, consequently, it has been felt sometimes necessary to develop certain concepts which some might find rudimentary. It is hoped that this unavoidable problem is offset by the interest of the analysis.

1. Television audience measurement systems as an object of research

This chapter looks at the whole question of television audience measurement systems. In section 1.1 an overview is given of current issues, both public and academic in this area. The paradoxical situation of this class of sample surveys as both a controversial and yet little known object of research is made clear. In section 1.2 audience measurement systems are then defined and located throughout the media industry; their uneven distribution and their specific dimension in broadcasting in general and in television in particular are emphasised. The method used in this thesis to research television AMS is developed in section 1.3. Research questions are put forward and the theoretical framework within which these questions are investigated is set out. Issues as to the selection of case studies and the professional sources of information that can be accessed are finally discussed.

1.1. Literature review

Over the last twenty years or so television audience measurement systems have given rise to a wide-ranging public debate in many European countries. Discussions originate from the perceived impact of the ratings on television programmes and typically divide media professionals and practitioners on the one hand, public lobby groups and intelligentsia on the other. In contrast, the subject of television audience measurement systems has largely been overlooked in the three academic fields of research which are most directly concerned: statistics, media economics and media audience research. Television audience measurement systems are thus in the paradoxical situation of being both a controversial topic in the public sphere and yet a little analysed object of research in the academic sphere.

1.1.1. Public debate

Television audience measurement systems are a controversial object of research which has given rise to a heated public debate in most European countries. In France this debate has been particularly intense because of the privatisation of the biggest public channel (TF1) combined with the substantial decline of the French public television that followed (Cluzel, 1993). On the one hand it is argued that television AMS are what is commonly called in France *'une démocracie cathodique'*[1]; on the other hand television AMS are held responsible for the decline in the quality of television programming, what is summarised by the other widely used French expression *'la dictature de l'Audimat'*[2].

The television industry has long defended the view that audience measurement systems provide a form of democratic system in which programming decisions can objectively and accurately be made in the light of people's wishes. It is epitomised by the idea that ratings-led programming 'gives to the people what they want'. Nielsen (1999), the leading provider of television ratings in the world[3] and whose name has in fact become synonymous with television ratings, considers that *"the TV rating is only the simplest and most democratic measure of the audience [...] The role of Nielsen Media Research in estimating the viewers is somewhat like the role of the board of election in counting the votes"* (p. 5-6) and concludes that *"Nielsen Media Research produces TV ratings, the independent estimates which help the television industry operate their business and serve the American public"* (p. 12). Along similar lines Médiamétrie (1995), the provider of television as well as radio ratings in France, claims that *"La mesure d'audience est devenue son* [le public] *meilleur moyen d'expression. Parce qu'elle analyse en continue les goûts et les réactions, non seulement de l'ensemble mais de chaque segment de ce public, elle est un référendum permanent dont les résultats ne peuvent qu'être pris en compte pas les professionels dont la mission est de satisfaire leurs clients. Ainsi la mesure et la caractérisation de l'audience, qui offrent à chacun la possibilité d'exprimer ses choix, donc son avis, ne sont-elles pas les outils de la dictature mais bien ceux de la démocratie"*[4] (p. 6).

The practitioners' view that ratings are *"in a meaningful way, an expression of democracy in action"* (Beville, 1985, p. 240) and that a ratings-led television industry is undistorted by elitism, politics or special interests is regularly endorsed by television professionals and advertisers (e.g. Menneer, 1978; Haselhurst, 1994) and beyond. Indeed, by the late 1930s the public interest criterion of the American Communication Act became increasingly identified with

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[1] A cathodic democracy [from the cathode ray, the technical feature of television sets].

[2] The dictatorship of the ratings.

[3] Nielsen is the leading market research company in the world and its core business is the provision of television ratings both in the USA and in Europe.

[4] Audience measurement has become its [the public] best means of expression. Because it analyses continuously the public's tastes and reactions, not only as a whole but also for each of its component, it is a permanent referendum whose results can only be taken into account by the professionals that have the mission to satisfy their clients. Thus the measurement and composition of the audience, which gives to every one the possibility to express one's choices, hence one's opinion, far from being the tools of dictatorship are those of democracy.

those broadcast earning the largest audience and thereby the highest ratings (Rowland, 1983). It is also the assumption on which many economic models are based. For instance, Atkin and Lintman (1986) proposed a model to ascertain the *'critical mass'* required in order for a commercial broadcaster to renew prime time network programmes. In this model, the public interest is compromised when low-rated programmes are renewed while high-rated programmes are cancelled. Noam (1991) analysed the outcome of different broadcasting structures in terms of programme choice and concluded that the allocations of an advertised-supported market system are not different from the political outcome in a *'populist democracy'*.

Conversely, concerns about programming being increasingly ratings-led are regularly expressed, especially by public lobby groups and the intelligentsia. The debate is not about disputing the comparison between television audience measurement systems and democratic systems, but rather on the desirability of applying economic criteria and mechanisms to what is a cultural output. Proponents of public service broadcasting in France and in the UK typically deplore that *"the yardstick of quality has become the size of the audience"* (Wolton, 1992, p.148) because they consider that *"in ratings-driven commercial broadcasting systems, powerful influences subvert and dilute distinctive meanings of 'quality' programming"* (Blumler and Hoffman-Riem, 1992, p.212). Along similar lines, the philosopher Karl Popper (1993) reported a discussion with the Chief Executive Officer of a big commercial television channel who argued that his job was in conformity with the democratic principles: *"Comme si l'on pouvait savoir ce que les gens veulent, simplement en s'appuyant sur les statistiques de l'Audimat. Tout ce que l'on peut recueillir eventuellement, ce sont des indications sur les préférences des télespectateurs devant les programmes qui leur sont offerts. Ces chiffres sont bien incapables de nous dire ce que nous devons proposer [...] Rien dans la démocracie ne justifie la thèse de ce directeur de chaîne, pour qui le fait de présenter des émissions de plus en plus médiocres correspond aux principes de la démocratie"*[5] (p. 24). Identical concerns are developed by Baudouin (1993), Meschonnic (1999) etc. The sociologist Pierre Bourdieu (1996) goes further in putting television ratings at the centre of an expanding and invisible censorship mechanism: *"On peut et on doit lutter contre l'audimat au nom de le démocracie. Ca paraît très paradoxal parce que les gens qui défendent le règne de l'audimat prétendent qu'il n'y a rien de plus démocratique [...] La télévision régie par l'audimat contribue à faire peser sur le consommateur supposé libre et éclairé les contraintes du marché, qui n'ont rien*

[5] As if one can know what people want simply by looking at television ratings. All that can be collected are indications of viewers' preferences among what is offered to them. These figures are incapable of saying what we should offer [...] Nothing in a democracy can justify the thesis of this CEO, for whom offering programmes of mediocre quality corresponds to democratic principles.

de l'expression démocratique d'une opinion collective éclairée, rationnelle, d'une raison publique, comme veulent le faire croire les démagogues cyniques"[6] (p. 77-78).

The public debate on television audience measurement systems is thus encompassed in a larger debate on 'popularity' versus 'quality' of cultural productions. It should be pointed out that such a debate is largely anterior to audience measurement systems. For instance, in face of the flood of popular literature at the end of the 19th century a comparable debate opposed Sir Walter Scott, who considered that an author writes for large audiences and for the money that could be earned thereby, to Stendhal who proclaimed that real literature should be closed to large audiences in order to persist (Brown, 1963). Such a debate is beyond the scope of this thesis. What is of direct relevance is the industry's claim, conspicuous in the vote analogy, that television audience measurement systems are an objective measurement on which allocation decisions can reliably be made. This point is developed in section 1.3.1.

1.1.2. Statistics

Television audience measurement systems are a little known object of research. Since they are sample surveys, the academic field of research for which they should present a chief interest is applied statistics, more particularly survey research. The statistical literature on these systems is however remarkably sparse.

Although television AMS started running in 1930 in the USA and in 1948 in the UK, how television audiences have been measured in the industry is a research topic that was only first introduced to the Royal Statistical Society in the late 1960s (Ehrenberg and Twyman, 1967). At that occasion Stuart (1967), who developed an earlier interest in these systems (Stuart, 1960), observed: *"It is surprising that this society has waited over ten years for a paper on*

6 One can and must fight the ratings in the name of democracy. It seems paradoxical because people who defend the ratings pretend that there is nothing more democratic [...] The control of television by the ratings contributes to the forcing of market constraints upon a supposedly free and knowledgeableconsumers that have nothing to do with a rational, knowledgeable democratic opinion as cynical demagogues want us to believe.

television audience research which covers the procedures used in commercial practice" (p.48). Thirty years later the measurement of television audiences has changed dramatically but the interest of applied statisticians for these measurement designs has remained marginal. Academic contributions are scarce and deal with some specific issues e.g. the setting of multichannel home targets in people-meter panels based on two-phase probability sampling (Jephcott and O'Muircheartaigh, 1998). As a result, how inferences are made on television audiences is still an opaque topic outside the industrial circles directly involved.

In contrast with the scarcity of the statistical literature on television AMS designs, viewing patterns have been studied since the late 1960s for marketing purposes. The London Business School in particular has contributed to the analysis of audience flows based on data yielded by television audience measurement systems (Ehrenberg and Twyman, 1967; Goodhardt, Ehrenberg and Collins, 1975; Barwise, Ehrenberg and Goodhardt, 1982; Ehrenberg and Wakshlag, 1987; Barwise and Ehrenberg, 1984; 1988). Quantitative analyses of *'audience duplication'*[7] and *'repeat viewing'*[8] phenomena have been leading to empirical generalisations on television consumption behaviours and marketing theories on broadcasting e.g. low involvement audiences, Double Jeopardy or Natural Monopoly theories (Barwise and Ehrenberg, 1984). It should be emphasised that this body of literature is not really concerned with the measurement procedures implemented themselves. For instance, in their influential book *Television and its audience* Barwise and Ehrenberg (1988) reviewed the main findings of audience flow analyses but how the data thus analysed are generated i.e. how television audiences are actually measured in the industry is only summarily described and appendiced. Furthermore, most of these audience flow analyses have been conducted prior to the mid-1980s i.e. on data generated by surveys based on a very different measurement design from the one prevailing nowadays and operated in a different television environment (cf. section 1.2.4). Interestingly, audience flow analyses conducted more recently have not fully corroborated previous findings (Ehrenberg and Wakshlag, 1987). The key findings of this literature will be used to help identifying components of variance for audience estimates (cf. section 6.2.2). It is revealing that although academic marketing research on viewing patterns presents a chief interest for media professionals, it is far from being widely known in industrial circles (Ehrenberg, 1996). It shows how much academic and commercial research are partitioned bodies of literature on the subject of audiences.

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[7] Extent to which viewers of one programme are also viewers of another programme.

[8] Extent to which viewers watch several episodes of the same programme.

The lack of interest for the measurement of audiences in the academic literature may be considered in parallel with the evolution of the field of survey research. Survey research really emerged at the beginning of the century with Kiaer and Bowley's works in the 1910s, followed by Neyman's in the 1930s[9]. It has long dealt with applied social science and with an understanding of measurement grounded in actual measures on population elements, as opposed to social theory - including statistical theory - that does not have such requirements. Sample survey theorists such as Stuart or Kish have also long been survey practitioners, trying to fit survey practice into a theoretical framework and confirming, extending or correcting that practice. By contrast with earlier work, many recent contributions to the literature designated as theory of sample survey do not have their foundation in survey practice. Such papers deal with the principles, philosophies and complexities of sampling from finite population. This may explain why the field of survey research has drifted away from applied social science and survey practice has become somewhat neglected in academic work.

Assessing data available for analysis is however a core subject in any scientific field of research, and assessing social data often necessitates assessing the social measurement that yield these data. Such assessments are all the more crucial to the social sciences as a whole as they are complex since randomisation is difficult to achieve and concepts i.e. phenomena that are not directly observable and have no natural occurring metrics are the objects of many measurements (cf. section 3.1.1). Many controversies about social data – and theories supported by or related to such data – often stem from a lack of rigor in defining what is precisely reflected by a given measurement. This thesis is grounded on the belief that a key role of applied statistics in the social sciences is not only to make clear practical problems of selection and estimation but also to show how some social data relate/do not relate to a particular concept and to consider the uses that can/cannot be made of the data thus collected.

The thesis falls within the perspective of early statistical work in the field of survey research. It attempts to revive the tradition of analysing measurement practice within a statistical theoretical framework in order to assess the social data yielded, audience data in this particular case. In contrast with most statistical works which concentrate on measurement operations only, this piece of research is also concerned with analysing the implications of (a) the uses these social data are currently being put and (b) the definition of the concept being measured. This methodological point is developed in section 1.3.1. In

[9] On the early history of statistics see O'Muircheartaign and Wong (1981)

so doing, this thesis tries to show how an applied statistics approach can contribute to an understanding of some current and much debated issues that are traditionally located within other academic fields of research.

In this perspective, television audience measurement systems appear as an interesting object of research because:

- They are characterised by complex measurement operations, combining ultra-sophisticated data collection techniques with complex longitudinal sampling scheme, which have not been assessed in the statistical literature.
- They yield data which have a determinant and (as it is argued in chapter 2) a distinctive function in the allocation of resources within an economic sector that has become prominent (cf. section 1.1.3).
- They can be regarded as models linking a social phenomenon that cannot directly be measured and has no natural occurring metrics with economic indicators.

1.1.3. Media economics

Television audience measurement systems are also a little known object of research because their statistical dimension has not been approached in the context of a second academic field of research for which these sample surveys present however an obvious interest: media economics. Media economics is traditionally regarded as one sector within culture economics[10], which is a very recent field of research. Three factors have strongly contributed to the growing importance of culture as an economic field of research (Benhamou, 1996): (a) the upward trend of the cultural sector in the generation of financial flows and employment, (b) the growing demand for economic competence on state subsidised cultural policies and (c) the development of new approaches of economic problems such as imperfect competition, game, information and agency theories.

Because the media are an industrialised sector of culture, their study is somewhat older. Research on audio-visual media in general and television in particular appears as the crux of media economics. In the late 1950s-early 1960s television goods attracted the interest of influential economists such as Samuelson but only insofar as they illustrated the economic issue of public goods (cf. sections 2.1.1 and 2.1.2). Television economics emerged as a field of research only in the late 1970s in the USA mainly with Beebe (1977) and Owen's (1975;

[10] Together with performing arts, patrimony, cultural industries and the art market.

1978) contributions and is still largely from an American origin nowadays. In contrast, television economics is a much younger field of research in Europe, and subsequently a less developed one. In the UK the report of the Peacock committee (1986) can be regarded as the first significant contribution to this field. Some recent phenomena have strongly impacted the attention paid to television economics: (a) the expansion of the television industry, supported by deregulation and privatisation policies all over Europe, (b) the strategic links between the television industry and new key technologies such as digital and (c) the increasing interactions between the television industry and some long studied industrial sectors such as telecommunications and computing. Television economics appears today as both a little known and privileged sector for the study of contemporary economic issues: *"The communication and audio-visual sector [...] is a very important field for Europe because of its visibility among citizens, and also because it constitutes the reference market for multimedia services, on which much hype is conceived as a future driving force for the community's economy"* (EUROSTAT, 1996, p. 99)

In a precursor paper on economic research and the mass media, Gerald (1958) mentioned the market research practices of the media as being among the most important research topics in the field of media economics. Yet the study of those practices has remained largely neglected. In early economic models (Steiner, 1952; Beebe, 1977)), the television ratings then in use were simply ignored and replaced by other measures based on various ranking systems of the programmes offered. In modern analyses dealing with television economics, it is considered that audiences are the commodities exchanged on the market (Vogel, 1986; Spence and Owen, 1977; Owen and Wildman, 1992) and the estimates yielded by television AMS are equated with economic facts. This is a crucial point which is discussed in section 2.2.2. The economic debate rather focuses on whether audiences can be regarded as measures of demand. Views on the matter are divergent:

1) A first trend, mainly from an American origin, considers that audiences are measures of consumer sovereignty. In textbooks on media economics (Picard, 1989; Albarran, 1996), it is considered that in media markets consumers indicate the intensity of their preferences through an exchange either of money in the case of magazines and newspapers, or of time in the case of radio and television. In other words, circulation figures are considered an assessment of the demand for print media and ratings an assessment of the demand for broadcast media. It is also the assumption on which modern American economic models are based (e.g. Atkin and Litman, 1986; Noam, 1991) (cf. section 1.1.2).

2) A second trend, mainly from a European origin, expresses the view that audiences are imperfect signalling systems of consumers' willingness to pay (e.g. Wiles, 1963; Collins, Garnham and Locksley, 1988). In the report of the Peacock committee on financing the BBC (1986), broadcast AMS are regarded as *"mimicking a true market"* (p.131) but at the same time, as presenting an absence of true consumer sovereignty because the intensity of consumers' preferences for broadcast products can only be established by viewers and listeners' payments.

Whether ratings can be regarded as measures of demand is approached in section 3.5.2.

With the emergence of new technologies making possible the extraction of payment for television goods in the 1980s and forecasts that direct payment would be the most important source of television funding by the year 2000 (Congdon et al, 1992), television audience measurement systems have seemed a rather obsolete object of research. However, these systems have dominated the period in which the European industry has moved from public service broadcasting to commercial broadcasting. This thesis attempts to show that analysing these sample surveys is important to understand the recent evolution of the economy of television and to gain some insight into its evolution in the new era. An overview of audience measurement systems in the media industry (cf. sections 1.2.3 and 1.2.4) shows that not only do AMS persist in the new digital age but that they have particularly developed in the television industry and are extending to a new audio-visual medium: the Internet. In focusing on the sample surveys which yield television audience estimates, this thesis attempts to bring a better understanding of the microeconomic needs for which audience data are being collected and the uses to which they are currently being put by the industry. It also attempts to show that treating statistics generated by a measurement process as commodities i.e. as economic facts has direct and serious implications on the functioning of the markets in which such commodities are exchanged.

1.1.4. Media and communication

Television audience measurement systems are finally a little known object of research because they have been largely dismissed by a third academic field of research: media and communication, and more particularly media audience research. The study of media processes has long been media oriented rather than audience oriented and is far from being homogeneous. Contributions have diverse origins - sociology, psychology, semiology, philosophy etc. - and many approaches of the media audience can be regarded as 'retrospective creations' combining the work of scholars who dealt with this issue indirectly, while pursuing different ideas and objectives e.g. Neo-Marxist contributions (Marcuse, 1964; Althusser, 1970; 1971). It is only recently that audience research has really become a field of research in its own right with the emergence of the '*audience activity*' concept[11]. The present field of audience research appears as a framework of not very compatible positions, combining older theoretical traditions and a scattering of new theories.

Nowadays academic and commercial audience research are largely partitioned bodies of literature so that it is sometimes forgotten that it has not always been the case. In the early days of media research, academic and commercial research used to be inter-related (Rowland, 1983; Sproule, 1991). Until the 1950s prominent figures in American media research such as Stanton, Cantril or Lazarsfeld were social scientists applying academic research techniques and theories to the broadcasters' marketing needs. And *vice versa*, the American broadcast industry used to fund heavily academic media research programmes, which then focused on the behavioural and social effects of broadcasting.

As opposed to this early phase, commercial media research has become discarded in modern academic audience research, and *vice versa*, so that the two research traditions have evolved almost independently since the late 1960s. Many scholars interested in television audiences dismiss television audience measurement systems without even discussing them. In his influential study of *The 'Nationwide' audience*, Morley (1980a) reviewed the main audience research trends and traditions. It is revealing that nowhere in this review is the audience research tradition developed by the industry mentioned, if only because it is the oldest and best known form of audience research. In another audience research review Lewis (1991) simply evaded the subject of television audience measurement systems: *"progam makers are the modern cultural equivalent of Dr Frankestein: they have created a monster* [television AMS] *that, once unleashed into the outside world, they can no longer control or comprehend"* (p. 21). Such dismissals have sometimes been criticised by other scholars. For instance, Jordin and Brunt (1988) pointed out that they only result in the industrial approach of the audience continuing to function unperceived in the works that are the most critical of it.

[11] The concept of audience activity has different meanings, which complicates the task of specifying the universe of content of the television audience as developed in section 3.1.3.

Although few scholars have been interested in television audience measurement systems, views expressed on the matter are divergent and range from conclusions of neutrality to accusations of institutional control. McQuail (1987) and McQuail and Windhal (1993) understood television AMS as a neutral and unproblematical approach of television audiences based on a 'display-attention' model. According to them, television audience measurement systems aim to measure attention and success of media communication as attention display is assessed by the relative share of each channel in the total amount of attention gained by the medium.

As opposed to this approach, other scholars have denounced television audience measurement systems as a misleading and self-legitimising process adopted by the media to justify their own activity (Altheide and Snow, 1979; Meehan, 1990; Streeter, 1994; 1996). Ang (1991; 1996) has particularly developed such a political/institutional critique[12]. According to her, the television audience is not an object with researchable attributes and features that can definitely be known. The knowledge of the television audience has long been *'colonised'* by institutional audience research, which has turned it into a well-organised consumption and a disciplined practice consisting of viewing habits and routines. But this *'objectified knowledge'* is driven by the objective of making the audience visible and easily manageable in order to use it as a symbolic foundation for industrial negotiations and transactions. One of Ang's contributions is to clearly oppose the industrial television audience seen as static, behavioural and measurable on the one hand, to the practice of watching television which is seen as dynamic, experiential, complex and unforeseen on the other hand. She argues that until the early 1980s audience measurement was a relatively stable and quiet business but that, with the recent technological mutations, television audience measurement systems have entered a situation of crisis. She considers that the increasing complexity of television viewing practices – what she called *'the revolt of the viewer'* - will make it no longer possible to unproblematically typify and classify the audience so that its control by the industry will become precarious and provisional. She predicts that it will lead to the questioning and eventually the collapse of television audience measurement systems.

This thesis contributes to the field of media and communication research insofar as it deals with how television audiences are measured in the industry and, in so doing, it attempts to make clear how commercial audience research precisely relates/does not relate to the

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12 Such a critique entails a Foucauldian approach of power in the production processes and of its subjection mechanisms, what Foucault (1976) called "la fonctionnalité économique du pouvoir" [the economic functionality of power].

different positions existing within academic audience research. From this viewpoint, it can be located within Ang's line of work. But as opposed to Ang's perspective, television audience measurement systems are here assessed against statistical criteria rather than against a specific and conflicting theory of what a television audience is. This thesis is therefore not meant to be a political/institutional critique but rather an independent assessment of the social data yielded by a specific class of sample surveys and of their implications for the industry that generates and uses them.

1.2. Classification of audience measurement systems

Examining the distribution of AMS within the media industry requires the use of an analytical grid of media activities in order to define a media sector increasingly difficult to delimit. Audience measurement systems are to be found in five media industries: print, radio, television, cinema and outdoor. In the broadcast industry AMS have a status which is not precisely defined by their standard market research classification. Indeed, broadcast audience measurement systems have a unique feature: they have long been the exclusive source of indicators establishing a link between industry and market. In most European countries there has been an evolution towards one audience measurement system per medium and a new class of AMS is currently emerging with the measurement of Internet audiences. Although radio and television AMS are strongly related, television audience measurement systems dominate media audience measurement systems by the scale of the samples and the sophistication of the data collection techniques used.

1.2.1. Typology of the media industry

Introducing audience measurement systems requires examining their distribution within the media industry. However, the media sector happens to be increasingly complex to define and delimit. The use of an analytical grid of media activities is thus necessary in order to move onto a discussion on audience measurement systems in the media. Any individual economic unit whose activity is the mass reproduction of texts and/or sounds and/or pictures can be regarded as participating in the media sector. Media are thereby any output possessing these observable characteristics. Newspapers, magazines, book and music publishing, cinema, radio, television, video production, outdoor, prospectus, direct mailing etc. can all be classified as media activities. It is therefore not surprising that definitions of the media industry differ:

- In official statistics (EUROSTAT, 1996), the media sector is usually composed of two sub-sectors covering two types of media output: (a) audio-visual services, covering film production and distribution, radio and television broadcasting and music publishing; and (b) printing and publishing activities, covering books, daily and periodical press as well as maps and directories. In this first definition, posters and billboards are classified as direct marketing services, not as media output.
- In the advertising industry the term media refers to any output that is at least partially financed by advertising revenues and compete as an advertising outlet. It includes press publishing, cinema exhibition, radio, terrestrial, cable and satellite television, posters, billboards and prospectuses. In this second definition book, video and music productions are not regarded as media.

In the late 1990s the boundaries of the media sector have become all the more blurred as the so-called 'new media' have been expanding. The term 'new media' refers to a recent class of services defined by technical and access criteria. It usually covers:

- Multimedia publishing such as editorial content published on CD-ROM or CDI;
- Services delivered via analogue or digital technologies: pay-per-view, interactive television, teletex, Video-On-Demand (VOD) or Near-Video-On-Demand (NVOD) etc.;
- Telematic and on-line computer information services such as the Internet.

The current complexity of the media sector and the various definitions it leads to explain why consistent and comparable economic data on the media industry are scarce. Indeed, the office for official publications of the European community regards the media as one of the most difficult sectors to define and monitor statistically and, as a result, one of the least known (EUROSTAT, 1995).

In this context, the analytical grid of media activities proposed by Flichy (1980) appears as pertinent because it combines two prominent dimensions of the media: the type of media output and the sources of financing of this output. Two sub-classes of media industries are thus distinguished: (1) '*les marchandises culturelles*'[13] and (2) '*la culture de flot*'[14]:

[13] Cultural goods.

[14] Flow culture.

1) *Les marchandises culturelles.* This first media output consists of edited or published products that are sold on the market to consumers. They have a specific value of use tied to the personality of their creators or editors. The economic function of the industrial units is to transform this unique value of use into multiple and effective values of exchange, standing for and promoting the creators (singers, directors, writers etc.). Music, book and multimedia publishing, film production and distribution industries fall into this first sub-class of media industries.

2) *La culture de flot.* This second media output consists of continuous and widely disseminated products, at the intersection between culture and information. Some of these products are cultural goods whose life cycle can be long[15] whereas others are obsolete as soon as delivered[16]. They can either be sold to consumers or proposed free of charge to users. It is the organisation proposing a selection presented as unified which is promoted in this second case. The press industry (newspapers and periodicals), the broadcast industry (radio and television) with its different forms of distribution (terrestrial, cable, satellite, digital), and also new media services such as the Internet are to be found in this second sub-class of media industries.

Within the media sector, Flichy located flow culture industries at the centre of the global distribution of resources. Because of their content and distribution features, flow culture industries contribute greatly to the notoriety of cultural as well as non-cultural goods. They economically dominate cultural goods industries because they are a condition of access to the consumer markets. Within the flow culture industries, print and broadcast industries are not equally influential. Broadcast media dominate print media because they not only are a pre-requisite for the promotion of cultural goods but they also are themselves a key market for cultural goods industries. The television industry is a key outlet for the media industry as a whole, in particular for the cinema industry. Television dominates the other media from an economic viewpoint and is regarded as *"the strategic bottleneck for the media industry"* (Litman, 1993).

A third sub-class should be added to Flichy's analytical grid of media activities because the output of these industries meets the general definition of media and because of its fast-

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[15] Stock productions such as drama, documentaries, series etc.

[16] Studio productions such as news, talk shows, quizz shows etc.

expansion since the late 1980s. In the advertising industry, they are often referred to as *contact media*. These media have in common an output exclusively made up of advertising messages that are packaged and delivered under various forms and always proposed free of charge to users. Outdoor posters, billboards, prospectuses and free press are to be found in this additional sub-class of media industries. This typology of the media industry is used to analyse the distribution of audience measurement systems in the media in section 1.2.3.

1.2.2. Market research in the media industry

Audience measurement systems are traditionally classified as commercial/market research, as opposed to governmental/official research and academic/social research. However, broadcast AMS have a status that is not commonly encountered in the private sector of the economy and therefore not precisely defined by their standard market research classification. The classification of broadcast AMS raises the question of the needs for which audience data are being collected, and thereby the issue of the concept of error in sample surveys. This issue is developed in section 1.3.1.

In the classification of industrial sectors used by the European Commission (EUROSTAT, 1996) media research is considered one distinct area of the market research business[17]. In the code of practice of the European Society for Opinion and Market Research (ESOMAR, 1996) market research is defined as follows: *"It links the consumer, customer and public to the marketer through information which is used to identify and define marketing opportunities; generate, refine and evaluate marketing actions; improve understanding of marketing as a process and of the ways in which specific activities can be made more effective"*. Audience measurement systems are classified as media research. They are consequently understood as sample surveys linking media organisations to consumers with the purpose of identifying marketing opportunities and improving the efficiency of marketing actions. The fact that audience measurement systems are operated by market research companies adhering to ESOMAR contributes to support this standard market research classification.

It should be stressed that AMS are not the exclusive form of media research. Indeed, media research covers a wide range of studies commissioned by media or advertising organisations such as programme or layout testing, image and positioning tracking,

[17] Other areas being warehouse and shop auditing, consumer behaviour and attitudes research.

branding and price testing etc. Audience measurement systems are nonetheless undoubtedly the dominant form of media research. Indeed, no other form of research within the media industry is subject to such a level of financial investment (cf. section 1.2.4) and of close scrutiny from the industry as a whole. AMS set the standards that other sample surveys, within media research but also beyond it, seek to reproduce or adapt.

It is important to observe that audience measurement systems are not evenly distributed within the media industry (cf. section 1.2.1). They are the dominant form of research in flow culture industries (print and broadcast industries) followed by contact media industries (outdoor industry). In the cultural goods industries only the cinema industry has its audience measurement system; video, music, book and multimedia publishing industries do not use any audience measurement system at all.

Among those media audience measurement systems, it should be emphasised that broadcast AMS have a unique feature: these sample surveys have long been the exclusive source of indicators establishing a link between industry and market. The print industry has two series of indicators at its disposal: (a) circulation figures corresponding to the number of copies sold per issue[18] and (b) readership figures yielded by readership measurement systems. Similarly, the cinema industry has always had at its disposal two series of indicators: (a) admission figures corresponding to the number of tickets sold per film, theatre, week etc. and (b) viewing figures yielded by cinema AMS. Circulation figures differ from admission figures in the sense that in the first case the number of buyers is distinct from and almost always inferior to the number of users[19] whereas in the second case number of buyers and number of users are equal. Hence, the cinema industry is provided with a more complete set of figures than the print industry.

In contrast with these two media industries, the broadcast industry has long had no sales figures at all at its disposal but only the listening/viewing figures yielded by radio and television AMS. This is an unusual feature since sales figures are generally key indicators establishing a link between suppliers and consumers in the private sector of the economy. In such a traditional context, the purpose of market research is to supplement sales figures in providing suppliers with strategic information about what the consumers' differing demands are, how best to meet these demands, how the nature of the goods or services offered can be most effectively communicated to the consumers etc. The very fact that

[18] Circulation figures are controlled at the national level by professional organisations such as the Audit Bureau of Circulation (ABC) in the UK or the Organisme de Justification de la Diffusion (OJD) in France.

[19] Since one publication bought can be read by more than one individual.

broadcast goods have long been privately supplied without the availability of any sales figures already suggests that audience measurement systems in the broadcast industry are meant to fulfil atypical microeconomic needs. Hence, that their standard market research classification does not adequately reflect their microeconomic function. It should be emphasised that because the television industry is a key outlet for other media industries (cf. section 1.2.1) the economic impact of viewing figures is not restricted to the television industry. The functioning of the syndication marketplace makes obvious the impact of viewing figures on the economy of the cinema industry. This is discussed in section 2.4.2.

However, since the mid-1980s sales figures (more precisely subscription figures) have been made available in the television industry to the suppliers delivering programmes via new technologies such as cable, satellite and digital. To what extent those sales figures reflect consumption and compare with sales figures in the print and cinema industries is an important point to consider when assessing whether television audience measurement systems will continue to be of a key significance in the new television environment. This issue is examined in sections 2.5.1 and 2.5.2.

1.2.3. Audience measurement systems in the media industry

Audience measurement systems in the media can be classified according to three dimensions presented in exhibit 1: (1) the medium audience measured, (2) the geographical coverage and (3) the type and size of the universe of reference. Audience measurement systems in the European media industry are outlined in exhibit 2 using the classification variables proposed in exhibit 1. The main audience measurement systems currently in use in France and in the UK are listed in exhibit 3. Outdoor and cinema AMS are more recent and less developed than print and broadcast AMS, either because the expansion of the medium itself is recent (outdoor) or because only the medium audience composition needs to be measured and this composition happens to be stable overall (cinema) (cf. exhibits 2A and 2B). AMS in the print and broadcast industries thus appear as the crux of media audience measurement systems (cf. exhibits 2C and 2D).

Audience measurement systems whose universes are domestic and large are the most prominent ones. It is essentially in the print industry[20] that AMS are diversified and measure international as well as specific (business, affluent or professional) universes (cf. exhibit 2C). In the broadcast industry, audience measurement systems are primarily

[20] On readership measurement systems in Europe, see Meier (1995; 1997).

domestic sample surveys using large universes of reference (cf. exhibit 2D). In contrast, the Internet audience measurement systems that are currently emerging have international universes (cf. exhibit 2E).

All AMS are run by large market research companies but the role of these companies varies greatly, from the full specification of the measurement design to the mere running of the measurement operations. Indeed, AMS designs can directly reflect either a formal industrial consensus or the business decisions of private entrepreneurs on the measurement regimen to be applied. Three structures can be distinguished: (1) Joint Industry Committee (JIC), (2) own service or (3) mixed service. These different structures responsible for the specification of AMS are overviewed in exhibit 4. In most European countries AMS are technically specified and overseen by JIC bodies whereas in North America AMS belong to market research companies that own the data and sell them to the industrial players.

There has been an evolution towards only one national and general audience measurement system per medium in most European countries (cf. exhibit 2). This AMS sets the domestic measurement standard for that medium. International and specific AMS should be regarded as sub-sections or extensions of this one. In contrast, there are different national audience measurement systems per medium in the USA where private entrepreneurs compete in the promotion of their own surveys. The European evolution has been motivated by a strong need of domestic media organisations to pool their money and experience as well as to establish a single source of audience estimates agreed by all parties beforehand (cf. exhibit 4). For instance, in the UK there were so many arguments as to which television ratings were the 'correct' ones at the time when two television AMS were operated (Paulu, 1981) that the Annan committee (1977) recommended the development of a single AMS for the British television industry. The letter of agreement for a television AMS operated jointly by the BBC and ITV cited as a *"significant advantage"* the fact that *"the danger would be removed of our organisations appearing to differ in public on matters which many say should not be open to more than one interpretation"* (BBC handbook, quoted in Paulu, 1981, p.36).

An overview of audience measurement systems in the media would not be complete without emphasising that a new class of AMS has recently developed in the USA and is currently emerging in Europe: the measurement of Internet audiences[21]. Cybermonito.Pro, launched in France in January 1999, was the first Internet AMS in Europe. It was followed by Media Metrix, launched in October 1999 in France, Germany and the UK (cf. exhibit

21 On Internet audience measurement systems see Coffey and Johnson (1998).

2E) and Nielsen is expected to introduce its own Internet measurement system in Europe before the end of 2000. The structures responsible for these AMS are own services (cf. exhibit 4). Interestingly, this new class of audience measurement systems is developing in relation to a medium that also falls into the flow culture industry (cf. section 1.2.1), i.e. the in media sub-sector within which audience measurement systems are already the most developed (cf. section 1.2.2). It should be pointed out that the measurement design of this new and still little known form of medium audience is close to the design currently used to measure television audiences (cf. exhibits 2D and 2E).

1.2.4. Audience measurement systems in the broadcast industry

Broadcast audience measurement systems comprise two sub-classes: radio and television AMS. Radio and television audience measurement systems currently have different measurement designs but they are strongly related so that it is not possible to completely isolate television AMS as an object of research from radio AMS[22]:

1) *Radio and television AMS have a common origin and have developed jointly.* Radio audience measurement systems can be regarded as an early form of television audience measurement system. Indeed, radio AMS appeared in the United States in 1930 and the technical sophistication of modern broadcast AMS can be regarded as refinements of methods set up some fifty years ago in the USA. The evolution of radio and television audience measurement systems in the USA is overviewed in exhibit 5[23]. Crossley introduced the Day-After-Recall (DAR) data collection technique in 1930; Nielsen launched the first AMS based on a metering data collection technique in 1942; and Hooper pioneered the diary data collection technique in 1948. These three techniques are still in use in modern broadcast AMS and they strongly constrain sampling designs as it is shown in section 4.2.1. Television audience measurement systems appeared in the late 1940s. The same techniques used to measure radio audiences were applied to television audiences. The first television AMS was based on a diary collection technique

[22] On radio audience measurement systems in Europe see Menneer (1995) and Cooper (1996); on radio AMS in the UK see Gane (1992) and in France see Médiamétrie (1995).

[23]The history of American audience measurement systems is a much better documented topic than the history of European audience measurement systems thanks to the works of Beville (1985) and Buzzard (1990).

designed by Seiler in 1949. The first television AMS based on a metering technology, the Nielsen Television Index (NTI), was introduced in 1950.

2) *Radio and television AMS report the same set of indicators.* Radio and television AMS aim to produce comparable sets of data over time. Like most national AMS, they are continuous surveys i.e. they are not confined to the study of one or a few typical periods but rather they involve longitudinal sampling designs (cf. section 4.2.1). Although the term '*rating*', coined by Crossley in 1930 (cf. exhibit 5), is commonly used in English speaking countries to designate any audience data yielded by broadcast AMS, radio and television AMS reports in fact three sets of indicators:
   - 'Reach' defined as an estimate (also expressed as a proportion) of the total population who listened/viewed a station/channel or a combination of stations/channels at all at any time across a set time interval.
   - 'Share' defined as an estimate (also expressed as a proportion) of the total listening/viewing population accounted for by a station/channel across a set time interval.
   - 'Rating' defined as an estimate (also expressed as a proportion) of the average population who listened/viewed a programme across a set time interval. Hence, a programme rating is an estimate of the average population who listened/viewed across the broadcasting time of this programme.

   The basic relationships between these three indicators are introduced in section 2.3.1 and their calculation is detailed in section 3.3.2.

3) *Radio and television audience measurement designs may converge in the future.* The difference between radio and television AMS designs (cf. exhibit 2D) is in fact a recent phenomenon. In the early 1980s, television AMS designs were comparable to current radio AMS designs i.e. *"a hotchpotch of incompatible systems"* (Gane, 1994) based on a range of data collection techniques and sampling designs. It is only since the introduction of the people-metering data collection technique in 1984 by Audits of Great Britain (AGB) that television AMS designs have become relatively homogeneous across Europe. The reasons of this homogeneity are analysed in section 4.2.2. However a major current line of commercial television audience research is the experimentation of passive metering technologies, which make it possible that radio and television will share again similar measurement designs in the future. Passive metering technologies are introduced in section 4.5.

Despite these points of contact between radio and television audience measurement systems, they present key differences. Just as the television industry dominates the media industry (cf. section 1.2.1), television audience measurement systems dominate media audience measurement systems. Television AMS are the largest by the scale of the samples and the sophistication of the data collection techniques used. The basic characteristics of television AMS across Europe are outlined in exhibit 6 and will be referred to in the rest of this thesis. 'Viewing panels', which provide the data on which ratings are calculated, yield from about 1,500 observations by second for the smallest ones e.g. in Norway, Portugal, Ireland, Finland to about 14,000 observations per second for the largest ones e.g. in Germany and the UK. Furthermore, these panels are always coupled with so-called 'establishment surveys' whose sample sizes range from about 10,000 a year e.g. in Belgium, Finland, the Netherlands to more than 40,000 a year e.g. in France, Spain, Germany. These features are to be compared with the features of other media AMS (cf. exhibit 2). Viewing panel and establishment survey designs are presented in section 5.2.

Unsurprisingly therefore, television AMS are the most expensive class of sample surveys conducted not only in the media but also in the private sector in general. Media AMS are usually financed by two sources: media owners on the one hand, and media buyers represented by advertisers and advertising agencies' associations on the other hand. The total market for television AMS in Europe has been estimated to be circa £60-80 million per annum, 75-80% of the sum being born by media owners alone (Hulks and Santini, 1994). The annual cost of a television AMS is related to the sample size of the viewing panel. Menneer (1998) estimated the cost per annum to vary from c. £1.5 million for the small panels to c. £8 million for the large ones. The British television AMS is said to cost c. £11 million a year (Broadcast, 1999).

The radio industry and, to a lesser degree, the print industry have been much more financially constrained in the funding of their AMS than has the television industry. Indeed, radio and television have different statuses as advertising vehicles and this is made clear in exhibit 7. Television is typically the second advertising vehicle, attracting a third of the total advertising expenditure - from about 20% e.g. in the Netherlands, in Denmark to more than half in Italy. By contrast, radio has an average advertising share of 6% only - between 2% e.g. in Denmark and 9% e.g. in Austria and Spain. This has a dual consequence on the financing of radio AMS: (a) the financial contribution of advertisers and advertising agencies is much more restricted; indeed, most of the national radio AMS in the European industries are exclusively funded by broadcasters e.g. the British radio AMS, whereas a quarter of television AMS funding comes from advertising sources - a third in the case of the British television AMS (GAH Group, 1993). And (b) revenues media owners draw individually from advertising are much lower so that the budgets made available to finance AMS represent a much higher share of the advertising turnover of each media owner in the case of radio than in television. The print medium is an important advertising vehicle since it attracts about half of the total advertising expenditure in many European industries (cf. exhibit 7). However, the print medium is fragmented between many publications that share this total amount, which is a funding limitation for AMS since it brings us back to point (b) above.

1.3. Research method

The purpose of this thesis is to assess television ratings via the assessment of the sample surveys that yield these data within a classical theory of inference framework i.e. a Mean Square Error (MSE) framework (cf. section 4.1.1). But in so doing, this thesis is also concerned with the implications of both the function of these systems in the economy of television and the audience concept defined by the measurement. The research questions this thesis seeks to address are put forward in this section. The theoretical frame of reference within which these questions are to be researched and the procedure followed are then set out. Finally, the case studies selected and the sources of information used are discussed.

1.3.1. Research questions, theoretical framework and procedure

The research questions this thesis seeks to address may appear to be basic but in fact are not at all straightforward to analyse. In the case of television audience measurement systems the issues brought up are further complicated by the fact that these systems have statistical but also, and importantly, economic dimensions. The research procedure proposed is based on a theoretical framework which is adapted to this research problem.

The research questions this thesis seeks to address are as follows:

(a) What measurement errors can be identified in television audience measurement systems?

(b) Given (a), what are the implications of these sample surveys to the economy of television?

Question (a) may appear as rather basic in the field of survey research. The concept of quality of any data yielded by sample surveys must refer to the concept of error, which is a central element in statistical analysis. It is typically used to indicate the difference between an actual value and its expected value. In survey research it also refers to faults that arise from imperfect means of observation whether mechanical or human. Any estimate is thus error prone. This 'error' approach of survey data is characteristic of statisticians. O'Muircheartaigh (1997) pointed out that the terminology used in commercial research is different from the one used in academic research. For instance, the term 'error' is hardly used explicitly in market research; the terms 'reliability' and 'validity' are preferred and this is revealing of a different approach to measurement.

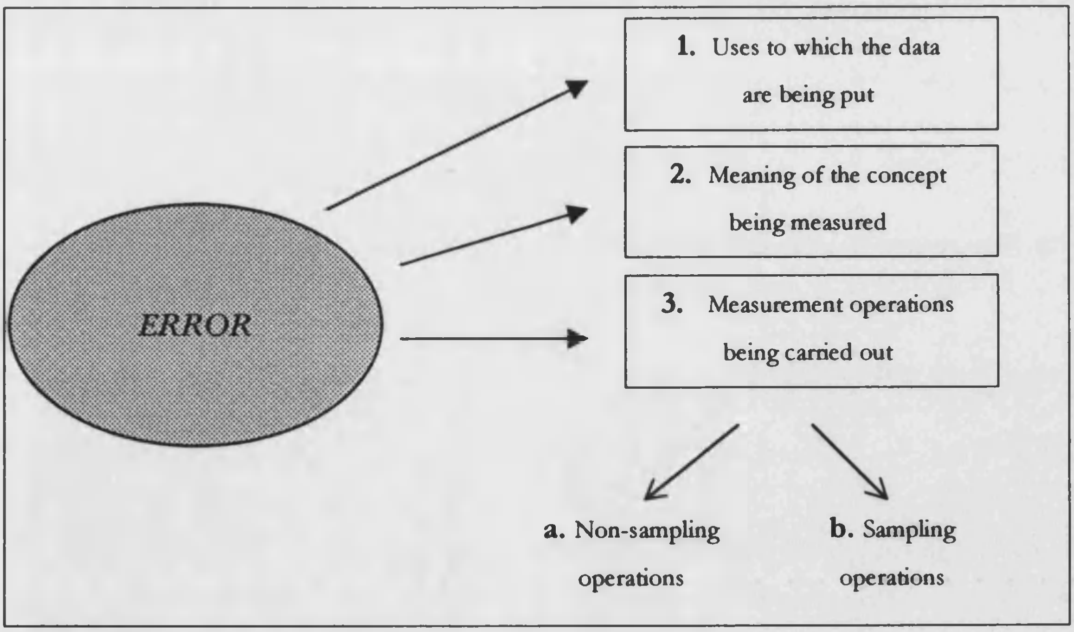
The professional documentation on television audience measurement systems supports the above. AMS are typically described rather than appraised; it is generally argued that television ratings are valid and reliable i.e. are objective and accurate measures of the television audience, hence the comparison with voting systems or referenda (cf. section 1.1.1). As an illustration, publications from professional contributors such as Beville (1985) or Kent (1994) are essentially descriptive as opposed to analytical. Market research companies typically argue that the AMS they are responsible for *"permet justement de dégager de façon scientifique, objective et comparable dans le temps les composantes d'un score d'audience"*[24] (Médiamétrie, 1995, p. 6). Médiamétrie introduces itself as an independent company whose function is *"to provide a scientific measurement of the audience of the main broadcast media"* (Médiamétrie, 1999, p.1). In its presentation of the American television AMS, Nielsen (1999) acknowledges that *"No measurement system is perfect, whether it measures the entire population or just a sample. Errors are always a possibility"* (p. 10). The fundamental difference between this business orientation and a statistical orientation stems from the fact that in the latter case errors are a certitude rather than a possibility, and that the validity and reliability of data i.e. their accuracy are a matter of degree rather than a property the data have or do not have.

Question (b) is much less traditional in the field of survey research. Statistical analyses focusing on the identification of measurement errors in sample surveys traditionally limit

[24] Allows the provision of television ratings in a way that is scientific, objective and comparable over time.

themselves to the assessment of the measurement operations i.e. the sampling and non-sampling procedures implemented. However, such an analysis would be rather restrictive in the case of television audience measurement systems. Indeed, this class of sample surveys has a statistical but also, and importantly, an economic dimension: television AMS are specified and used by economic organisations comprising the television industry in order to measure the size and composition of a complex social phenomenon, the television audience, by means of inferences drawn from samples. This thesis resolves therefore to be based on a larger definition of measurement errors in sample surveys. O'Muircheartaigh (1997) proposed the following definition of error: "*work purporting to do what it does not do*" (p. 1). This definition is interesting because it suggests that the meaning of error varies with the extent to which the context of the survey varies and the objectives of the survey vary. Thereby it forces consideration on the uses to which such data are being put on the one hand, and on the definition of the object of the measurement on the other. In the case of television audience measurement systems both of these aspects happen to be complex and call for analysis. The dimensions of the concept of measurement error are outlined in figure 1 below.

Figure 1. Dimensions of measurement error in sample surveys



Source: AE.

The research procedure followed in this thesis is in line with the dimensions of the term 'error' broken down in figure 1:

1) The microeconomic needs for which audience data are being collected and the uses to which they are being put is first examined (chapter 2). It requires placing these systems within the economy of broadcasting, which is characterised by extreme forms of

externality and non convexities in the production process. The evolution in the modes of production of broadcast goods and the uses of television ratings by different types of economic organisations in the current television environment is particularly developed. The question of the persistence of television audience measurement systems in the new television environment is examined.

2) The concept of television audience and the industrial construct which is the object of these measurement systems is then considered (chapter 3). The various possible constructions of the television audience and the corresponding models developed in media communication theories are first analysed using a causal modelling approach. These theoretical constructs are then compared with what the object of the measurement is in television AMS. The different properties and direct implications of the industrial audience construct thus defined are examined.

3) The measurement operations carried out are finally assessed within a classical theory of inference framework in three parts:
   - Non sampling systematic errors due to observation are analysed first. The choice of the data collection techniques is primordial in AMS because it strongly constraints both non sampling and sampling errors (chapter 4).
   - Sampling systematic errors are then assessed together with non response effects (chapter 5).
   - Sampling variable errors are analysed last (chapter 6).

   Each of these parts dealing with the measurement operations has a comparable structure: (a) the theoretical elements to be considered are introduced first, (b) the measurement operations implemented are then presented, (c) the different sources of error associated with these measurement operations are identified and (d) the economic implications of these sources of error given the uses the data are currently being put in the industry are finally discussed.

1.3.2. Selection of case studies

An analysis of television audience measurement systems such as the one specified in section 1.3.2 requires a selection of case studies. The two television AMS on which this thesis focuses are, firstly, BARB in the UK and, secondly, Médiamat in France. Pasquier (1990) developed the thesis that the history of the American broadcast industry is merged with the history of the American broadcast AMS. In Europe also, links can be observed between television AMS and the industries that set them up. BARB in the UK and Médiamat in France are a pertinent purposive sample because they present key differences at the level of their measurement designs:

1) *The scale of these two television audience measurement systems differ.* All television AMS across Europe – and elsewhere - are based on the same type of data collection technique i.e. people-meters (cf. section 4.2.2) and use roughly similar universe definitions, but the sample sizes of the viewing panels in operation vary greatly. Menneer (1998) considered that, as a principle, television AMS in large European countries are based on large sample sizes and *vice versa.* However this view is not supported by an overview of television AMS in Europe (cf. exhibit 6). The size of a country is not the only determinant of the size of the samples used in the viewing panel. Other parameters related to the structure of the domestic television industry also come into play. If the size of the viewing panel is read as an indication of the scale of the AMS in use, three groups of television AMS can be clearly distinguished in Europe (cf. exhibit 6): (a) By far the largest AMS are run in the UK and in Germany with panel sizes of over 4,000 households. With a 4,700 household gross panel size BARB is the largest television AMS in Europe and the second largest in the world after the US Nielsen panel (5,000 households). It is therefore sometimes presented in the professional literature as 'the most accurate' service in Europe and, as such, is regularly taken by the industry as the European reference; (b) Television AMS run in a second group of countries comprising France, Italy, Netherlands, Spain and Switzerland are of a much more restricted scale, with panel sizes ranging between 1,500 and 2,500 households. The basic cost of Médiamat in France can be estimated to be c£6 million p.a., with media owners contributing c.80% of the balance of funding (GAH group, 1993); (c) in the other European countries panel sizes are well under 1,000 households, samples of 600 households and less being commonly encountered e.g. in Belgium, Denmark, Norway, Ireland etc. Since BARB emerges as the European reference it is interesting to focus primarily on this particular television AMS in the analysis, but at the same time the scale of BARB appears as rather uncommon in Europe. By comparison, the scale of Médiamat is typical of the scale of television AMS in many prominent European industries. It is thus important to include Médiamat in the analysis in order to be able to draw conclusions beyond the British case at the European level.

2) *The structure responsible for the specifications of these two television audience measurement systems are of a different nature.* In most European cases the television industry uses one audience

measurement system that can be specified by three different structures (cf. section 1.2.4 and exhibit 4). BARB is a good example of an audience measurement system whose design is specified by a JIC body. BARB features reflect an industrial consensus between public and commercial British broadcasters on the one hand, and the Institute of Practitioners in Advertising (IPA) on the other hand (cf. exhibit 8). By contrast, Médiamat is specified by an organisation that is intermediate between a JIC body and an own service since it is designed and run by a media research company, Médiamétrie, whose capital is shared between different media organisations (cf. exhibit 8). The selection of these two case studies makes it possible to draw comparisons between television AMS designed by structures commonly found in Europe that do not pursue exactly the same objectives (cf. exhibit 8) since BARB is designed by a non profit making organisation and Médiamat by a private company.

3) *These two television audience measurement systems are located within different industrial audience research traditions.* As opposed to the American AMS (cf. exhibit 5), the first broadcast AMS in Europe were set up by public broadcasters. The evolution of the British and French broadcast audience measurement systems is overviewed in exhibits 9 and 10 respectively. The British industrial audience research tradition is the oldest in Europe and has been closely associated with British public broadcasting. Audience measurement systems emerged very early in the history of British broadcasting (cf. exhibit 9). The BBC began operations in 1927 and in 1930 the necessity for some sort of systematic research into regular radio listening was already felt (Briggs, 1965). The first pressures for audience research came from officials who wanted to develop educational programmes as well as to rationalise the use of public funds: *"It must be a source of considerable disquiet to many people besides myself to think that it is possible that a very great deal of our money and time and effort may be expended on broadcasting into a void"* (Gielguld [1930] quoted in Briggs, 1965). The first audience research conducted by the BBC in 1937 was interested in audience appreciation[25]. The first audience measurement system was operated in 1948 by the BBC and designed by Silvey (cf. exhibit 9).

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[25] The UK is one of the few European countries where an audience appreciation service, the British Audience Reaction Service (cf. exhibit 9), is currently run. The data yielded by this sample survey are confidential and only accessible to the BBC and ITV since Channel 4 dropped out in 1998. BARB (1997a) describes the service as *"a valuable tool by which broadcasters evaluate the performance of programmes and assists in the planning of future schedules"* (p. 5). But in practice it is difficult to precisely know to which uses audience appreciation data are being put in the late 1990s. On the design of audience reaction services in the UK see Barwise et al. (1979), Meneer (1987), Johnson (1992), Windle and Landy (1996). An audience reaction service has recently been introduced in Italy, see Bossi, Loppolo and Ziglioli (1998). As in most European countries there is no audience reaction service in France and the few recent attempts to set up such a service have failed so far.

In contrast, the first French broadcast AMS only emerged in 1967, when the public broadcasting institution Organisation de Radio-diffusion Télévision Française (ORTF) created its first audience research department (cf. exhibit 10). Before that some data about audience behaviour, tastes and general views on broadcast media had existed since 1949 but only in the context of sporadic opinion polls (Bourdon, 1994). The fact that French AMS started so late compared with the British AMS has to be related to the financial and legal situation of French broadcasting. Public broadcasting started being funded by advertising revenues in 1968. From 1935 until 1969 public broadcasting activities were under the direct supervision of the Conseil Supérieur de Radio Diffusion, officially in charge of controlling programming content: *"Je n'admets pas qu'on mette la radio television française à la disposition d'un critique ou d'un auteur ou d'un autre politicien prenant De Gaulle pour sujet, sans que j'aie donné mon assentiment"* [26] (Général De Gaulle, quoted in Bourdon, 1990, p. 285). Without claiming that the BBC charters shielded it from any inference from the government, it seems justified to oppose the British *'paternalistic system'* to the French *'state-controlled system'* (Carveth et al, 1993).

Since this thesis involves analysing the implications of television AMS to the economy of television in the new television environment, it is important that the case studies selected also account for key domestic industrial structures that can be found across Europe. In this respect also the British and French cases present key differences and similarities:

4) *The sources of financing of public television differ in these two industries.* Organisations composing the national television industries in Europe can be classified according to typologies based on criteria such as legal status, sources of financing, distribution technologies, size of the distribution area and type of programming content (European Audiovisual Observatory, 1997). But the crucial criterion to take into account when assessing national industrial structures is the source of financing. It is a variable that summarises a great deal of information, other variables being associated with it. Production modes and sources of financing are examined in details in section 2.2.1. There are three major sources of financing for a broadcaster[27]: (a) licence fee, (b) advertising and (c) subscription.

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[26] I do not accept that the French television be at the disposal of a critic or an author or a politician discussing De Gaulle without my consent.

[27] Minor sources of financing are mainly programme sales, sponsoring, merchandising and public subsidies.

The British television industry is characterised by the existence of the biggest public broadcaster in Europe, the British Broadcasting Corporation, whose financing is independent from advertising revenues since it is financed at 75% by the licence fee (other sources being minor). In the late 1990s, public broadcasters of this type exist in few European countries[28].

In most European industries public television is now financed by both licence fee and advertising. It is the case of France Télévision. Advertising was introduced on the French public television in 1968. Subsequently, with the 1982's Communication Law France became the first European country in which the main public television channel, TF1, was privatised and the revenues of the channels remaining in the public sector were made more dependent on advertising revenues. TF1 is nowadays the biggest advertising supported channel in Europe and the bigger French public channel, France 2, draws about 42% of its total revenues from the advertising source versus 46% from the licence fee. This mixed financing of public television is typical of many European industries[29].

5) *The penetrations of new technologies in these two industries are intermediate.* Another structural aspect closely related to the sources of financing is the penetration of new technologies such as cable, satellite and digital. European industries are very different from this viewpoint in the late 1990s. Cable and satellite reception abilities in Europe are presented in exhibit 11. Three groups of industries can be distinguished: (a) More than 60% of the households can receive cable or satellite television in Germany and in countries with a national language little spoken elsewhere or with different national languages e.g. Belgium, Switzerland, the Netherlands, (b) in Southern Europe, cable and satellite technologies are just taking up and penetrations are under 15% e.g. Spain, Greece, (c) the British and French industries are intermediate in Europe with a penetration of cable and satellite television ranging between 25% and 35% of the households.

The French industry has also two additional characteristics that make it an interesting industry to study: (a) With about 4 million subscribers in France only, Canal+ is the biggest pay television channel in Europe; (b) the French industry is often regarded as an example when it comes to digital television (Stamp, 1998; Michaud, 1999)). Whereas most digital platforms started at the end of 1998 in Europe, digital

[28] For instance, SVT in Sweden, NRK in Norway, YLE in Finland DR in Denmark.

[29] For instance, RAI in Italy, TVE in Spain, ARD/ZDF in Germany and Nederland in the Netherlands.

television was first introduced in France in 1996 with two platforms Canal Satellite Numerique (CSN) and Télévision Par Satellite (TPS). With about 1,5 million subscribers, France appears as the leading European country for digital technology.

It is important to emphasise that even though the French and UK cases present the interesting differences developed in this section, they do not represent the total population of the world's audience measurement systems and television industries. Industries where the scale of the television audience measurement system is small (cf. point 1) or where several television AMS are in competition (cf. point 2) or where the penetration of new technologies is either much higher or much lower than average (cf. point 5) are not appropriately covered e.g. Belgium and Portugal combined these features. Furthermore television AMS and industries in Europe present some important differences with television AMS and industries in North America. This is particularly important to bear in mind when discussing industrial changes and associated audience phenomena (cf. section 2.3.3), operational definitions (cf. section 3.3), sampling operations (cf. section 5.2) and variability of audience estimates (cf. section 6.3). Some obvious differences are pointed out in these sections and appendiced: annual shares of viewing of the leading channels in other European countries (exhibit 26), annual shares of viewing of the three American networks (exhibit 27), operational definitions and criteria in European countries and the USA (section 3.3.1 and exhibit 6), sampling operations of viewing panels outside Europe (section 5.2.1), top ten programme ratings across Europe (exhibit 42A and 42B).

However, the relationship between measurement systems and industries outside Europe would deserve an analysis. In this respect, the research procedure followed in this thesis to analyse BARB and Médiamat can be borrowed. The statistical, economic and audience considerations developed are the same whatever the AMS under study. The analysis of the evolution of the production system for broadcast goods, audience constructs and properties, and sources of error that have to be investigated in the context of such measurement systems provides essential guidelines that can be adapted to other cases in Europe and elsewhere. The components of variance identified and the method for searching for patterns of standard errors proposed are relevant to audience estimates yielded by other television AMS than BARB and Médiamat.

1.3.3. Note on professional sources

Information from professional sources is required in the context of this thesis. The daily uses to which television ratings are being put by media owners and buyers in the 1990s industry is a topic that is insufficiently documented in the academic literature. In this respect, the trade press comprising titles such as ADMAP, Broadcast, Campaign, Media Week, Stratégies etc. prove useful in acquiring a more precise understanding of current advertising and commercial programming practices. More importantly, information on the design and implementation of television audience measurement systems is from a professional origin. Indeed, any piece of work dealing with audience measurement systems is reliant on the information made accessible by the industry. As the number of professional conferences on the television medium has increased over the last decade so has the amount of information released on the subject of television AMS. Most of the professional documentation consists of papers given at professional symposia. Of a particular interest are the biannual seminars on industrial audience research organised by ESOMAR (1994; 1998a) often jointly with the Advertising Research Federation (ARF/ESOMAR 1992; 1994; 1996; 1998).

As developed in sections 1.1.1 and 1.3.1, documentation on AMS from professional sources is mostly descriptive and overall tend to argue the accuracy of television ratings. Indeed, it is important to bear in mind that for market research companies television audience measurement systems are a profitable business and for media owners, who largely fund them, far-reaching business interests are at stake (cf. section 1.2.4). It is thus normal that, through the communication of experiments and results, practitioners and media professionals defend their own businesses, clients or strategic industrial decisions. In the context of a thesis concerned with the 'error' aspects of television AMS, a difficult task is first to access, then to extract from this documentation the information made available by the industry and to subject it to an independent critical assessment. For instance, data collection techniques are an aspect over-developed in the professional literature on television AMS whereas other aspects such as non response and panel controls are clearly under-developed. It is claimed that people-meters are highly valid data collection methods (cf. chapter 4) and that viewing panels are representative of the total population (cf. chapter 5). Yet this thesis does not support these claims. It should also be mentioned that although professional papers focusing on BARB and Médiamat are mainly used, professional contributions from other origins – especially from an American origin - are also used insofar as they bring new or complementary elements to the analysis.

Even though an increasing amount of information on television AMS has been released by the industry over the last decade, accessibility to the data yielded by these systems is strictly restricted. In Europe, television ratings are mostly communicated to the industry in the electronic form of aggregated databases[30] that are updated daily (cf. exhibit 6). Access to these databases is only available to those broadcasters and agencies that underwrite the service on an annual basis and, in some cases, to a handful of registered subscribers (often referred to as 'third parties'). Registration and access fees are set up according to criteria such as client's annual expenditure (for advertisers, agencies, bureaux etc.), annual billings (for commercial broadcasters), annual revenues (for independent programme producers, trade press). These databases are particularly vast and complex and require being equipped with costly software especially designed for this purpose and commercialised by the organisation operating the service. Raw databases[31] are usually not accessible, even to the annual subscribers. BARB and Médiamat reporting procedures are detailed in exhibit 12. Calculating the standard errors of audience estimates requires not only accessing raw databases but also being equipped with the adequate hardware and software able to handle such a volume of data. These practical problems are detailed in section 6.3.1. Should an adequate research programme be set up, the components of variance for audience estimates are theoretically identified (cf. section 6.2) and a research method for searching for patterns of standard errors is recommended in section 6.3.1 However, this thesis attempts to show in section 6.3.2 that statistical theory, together with the analysis of audience phenomena associated with structural changes currently taking place in the industry, provide enough elements to demonstrate that television ratings have become dramatically prone to sampling variable errors in the late 1990s and that some types of ratings are more affected by this instability issue than others.

[30] Aggregated databases comprise audience estimates for time units, programmes and commercial spots by sub-group of the population.

[31] Raw databases comprise socio-demographic details of households and household members, unedited viewing records of individual panel members and households as well as individual weights.

2. Microeconomic functions and industrial uses

Television audience measurement systems and the research procedure followed in this thesis are introduced in chapter 1. This second chapter focuses on the economic role of these measurement systems. In order to gain an understanding of the distinctive uses to which television ratings are being put, it is necessary to place these sample surveys within the economy of television, which is characterised by extreme forms of externality and non convexities in the production process. In section 2.1 economic theory is used to clarify the features of the television sector. In section 2.2 the microeconomic function of television audience measurement systems is stated. How television ratings are handled by the players participating in the industry is shown: advertising and media agencies in section 2.3, commercial and public broadcasters in section 2.4. The drastic evolution in the production modes of television goods since the mid-1980s and their impact on the way television ratings are used are emphasised in these sections; the 'audience' phenomena associated with this evolution are developed. Finally, the role of television audience measurement systems in the new technological environment characterised by the emergence of pay television is considered in section 2.5.

The uses of television ratings shown in this chapter are then integrated in the analysis of measurement errors in AMS in the following chapters of the thesis. The implications of the industrial audience construct (chapter 2), data collection techniques (chapter 4) and sampling designs (chapters 5 and 6) used in these measurement systems on the economy of the medium are then assessed. It should be added that the terms 'audience', 'viewing' and 'viewers' used in the industrial discourse are taken up in this chapter. The meaning of those terms is analysed in chapter 3.

2.1. Theoretical considerations (I)

In section 2.2 it is stated that compared with sample surveys conducted in both the private and public sectors of the economy, television audience measurement systems have distinctive microeconomic functions. These functions are closely related to the unusual economic features of broadcast goods. It is thus necessary to be acquainted with those features to have an understanding of the role of these sample surveys in the television market allocation mechanisms. Public good and market efficiency theories are used for this purpose in this section.

2.1.1. Taxonomy of public goods

Allocative Efficiency or Pareto Efficiency[1] is the theoretical framework within which economists generally evaluate market allocations. Within this framework, public goods appear as a severe violation of the conditions for Pareto Optimality. Indeed, public goods are an extreme form of externality causing the price system of allocation through the market to fail. As a result, 'ordinary' markets do not exist for such goods.

In his *Pure Theory of Public expenditure*, Samuelson (1954) exposed the fundamental difference between private goods and public goods:

- Private goods ($X_1,\ldots,X_n$) can be parcelled out among different individuals ($1,2,\ldots i,\ldots,s$) according to the relation:

$$(2.1) \quad X_j = \sum_{1}^{s} X_j^i$$

  Each individual has a utility function $u^i(X_1,\ldots X_n)$ with $u^i_j > o$. Because they can be parcelled out, private goods enter one person's utility function only. For a given price, individuals want to maximise their utility subject to their budget constraint so that the individual's action of choosing a quantity of the good reveals information about the consumer's demand. Each consumer's marginal rate of substitution can thus be compared to the positive marginal cost of producing the good. The total production of private goods thus depends on the addition of the consumption of all individuals and a competitive equilibrium is reached when supply equals demand for each good.

[1] On Pareto efficiency and economic organisations see Milgrom and Roberts (1992).

- Public goods ($X_{n+1},\ldots,X_{n+m}$) are goods that are indivisible in consumption. Each individual's consumption of such a good leads to no substraction from any other individual's consumption of that good so that:

$$(2.2) \qquad X_{n+j} = X^{i}_{n+j}$$

Public goods enter simultaneously each and every *i*th individual's utility function. Examples of public goods are provision of law and order, defence, public health, education, environmental protection etc.

Because of this fundamental difference public goods possess unusual economic properties (Preston, 1972):

(a) *Non-excludability.* Total production and individual consumption are related by equality. The provision of any quantity of the good to one individual implies the provision of the same quantity to a group of individuals.

(b) *Non-rivalry.* The consumption to the full of a particular quantity of the good by one individual does not impede the consumption of that same quantity by other individuals. All units of the good produced can enter simultaneously and identically into each individual's utility function.

(c) *Zero marginal cost.* It is not optimal to restrict the consumption of the good to particular individuals since the marginal cost for an additional consumer is zero.

(d) Related to (b), a public good is one that is impossible to charge for.

(e) Related to (c), a public good is one that is not optimal to charge for. All individuals should be allowed to consume the good until they are satisfied i.e. until their own marginal rates of substitution are zero.

(f) Given that the good is provided for one or several people, it can be freely or virtually freely provided for others as well.

Public goods present therefore a severe economic case of market failure. On the one hand, the production function for public goods is not convex and smooth, and not subject to the generalised law of diminishing returns since the marginal cost of production for an additional consumer is zero (or virtually zero). On the other hand, given a quantity of public good the demand function is non-observable. It is in the selfish interest of each consumer not to reveal his/her true marginal rate of substitution and his/her demand price since each individual is able to consume the good without having to contribute to its production ('free riding' problem). As a result, 'ordinary' markets do not exist for public goods in the sense that when there are such markets, they resemble private goods markets in some, but not all, of their characteristics.

These unusual properties have led to a theoretical debate on the most efficient way to provide this category of goods. Some economists (Samuelson, 1954; Stretton and Orchard, 1994) consider that the public sector has a key role to play in correcting externalities and that it brings an efficient solution to the provision of such goods. Other economists (Thomson, 1968; Demsetz, 1970; Schmanske, 1991) argue that the public sector does not have the correct incentives to assess the demand for such goods and that in most cases public goods can be more efficiently produced in competitive markets. The current heated discussion on public service broadcasting in many European countries appears as an extension of this theoretical debate (cf. section 2.2.1) Such a debate is beyond the scope of this thesis.

2.1.2. Taxonomy of television goods

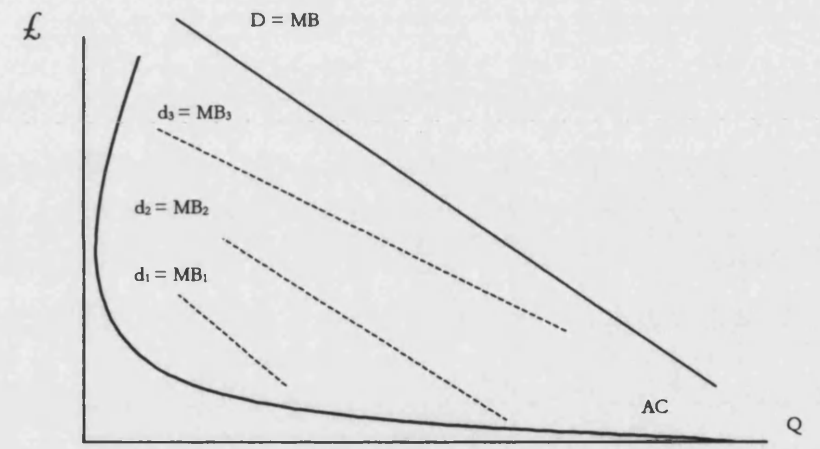
In the 1950s, radio and television goods used to be regarded by economists as examples of 'pure public goods' (e.g. Samuelson, 1954). In the 1990s the argument that new technologies have turned broadcast goods from public goods into private goods is put forward by some economists (e.g. Veljanovski, 1990; Noam, 1991) whereas others (e.g. Graham and Davies, 1997) consider that new technologies do not fundamentally question the public good nature of television goods. In order to compare how present goods compare with previous ones, it is important to establish at the outset that television goods – and audiovisual goods more generally – are composed of two goods: (1) the message i.e. the programme and (2) the material carrier i.e. the technology carrying the programme, and that the economic features of these two goods differ.

1) *Programmes are public goods.* Television programmes have the (a) initial-indivisibility and (b) increasing-returns aspects that are the features of public goods (cf. section 2.1.1).
   a) *Initial- indivisibility aspect.* Television programmes meet the non-excludability and non-rivalry criteria common to all public goods. Like other cultural goods, television programmes have an immaterial use value. *"It is the message not the medium that provides value to the user and the message is immaterial or intangible"* (Collins et al, 1988, p. 7). Because of this immaterial nature, television programmes are not destroyed by the act of consumption. The provision of a television programme to one individual

implies its provision to a group of individuals (*non-excludability*). A television programme can enter into everyone's utility function simultaneously and identically (*non-rivalry*) and the marginal cost of consumption for an additional person is zero.

b) *Increasing returns aspect.* From (a) it follows that the production function for a television programme is not convex but rather characterised by a high initial production cost and then by a quick drop in the average cost due to the zero marginal cost of allowing additional users. In other words, the total production cost X of a programme Y is a constant whether it is consumed by one or by n individuals[2]. Figure 2.1 shows the cost and demand functions for television goods.

Figure 2.1. Cost and demand functions for television goods



The marginal cost of production for a television programme is 0 so that the average cost (AC) tends to 0 as the number of consumers increases. D is the vertical summation of the individual demands d_1, d_2, and d_3 corresponding to the marginal benefits MB_1, MB_2 and MB_3. When a programme is carried out by analogue technology it is typically not possible to segregate between these different marginal valuations of the programme at affordable costs. When a programme is carried out by new technologies some degree of segregation can be reached at affordable costs

Source: AE.

This has a dual consequence that should be emphasised: on the one hand, economies of scales for television programmes are virtually unlimited and this favours economies of scope and concentration of ownership; on the other hand, the production of television programmes is intrinsically risky. Indeed, each new

[2] The same economic features apply to films. An economic explanation of the domination of Hollywood studios in the film industry is that high production costs and large domestic market sizes are competitive advantages for public goods such as films whereas it is not necessarily the case for private goods. On film trade flows see Wildman (1994).

programme is a prototype because a programme is never identical to another one and the demand for a new good is always uncertain. Economic uncertainty is thus built into broadcasting activity.

2) *New technological carriers allow exclusion form consumption..* The technology that carries the programme is of a crucial theoretical importance for the economy of television. Since the mid-1980s, two types of carriers can be distinguished in Europe:

   a) *Free to air broadcasting.* Electromagnetic signals are also public goods that satisfy both non-excludability and non rivalry criteria. Once a programme is on air and the capital cost of the transmitting equipment is covered, it reaches simultaneously all the consumers and one person's consumption does not reduce anyone else's. Distribution costs are usually totally unaffected by the number of consumers so that the marginal cost of consumption of the signal for each additional consumer is zero. For television programmes carried out by analogue technology it is costly and difficult to allow exclusion from consumption via price discrimination so that private firms have no incentive to supply television goods unless some degree of exclusion is made feasible by a technical device at affordable costs (e.g. scrambled signals), or unless it is possible to tie the consumption of a second product with the consumption of the television programme itself. This point is developed in section 2.2.1.

   b) *Pay for broadcasting.* Cable, satellite and digital technologies can deny access to programmes to any household that has not made a payment. The principles, characteristics, development and penetration of these new technologies are summarised in exhibit 13. These technologies make some degree of exclusion from consumption feasible through a price system at low transaction costs – corresponding to the costs of reaching and keeping an extra-consumer (cf. figure 2.1). Cable, satellite and digital technologies have thus brought up a new type of incentive for private firms to supply programmes. It should be stressed that these new technologies do not transform television goods into private goods because the public features of the programmes carried out remain unchanged whatever the material carrier is. Indeed, given that indivisibility and increasing returns in the production process persist and that the marginal cost of the consumption of the programme remains virtually zero, Pareto optimality conditions are still violated under pay television (Minasian, 1964; Samuelson, 1964; 1968). It has also been argued that these technologies involve a welfare loss because some people are deprived of access to programmes they could have consumed at no additional cost to themselves or others (Murroni et al, 1996). How accurate the exclusion system is an essential point to consider when analysing the role of television AMS in the new technological environment. This point is tackled in section 2.5.1.

2.1.3. Baumol's cost disease

Broadcast goods are also affected by a cost disease that creates a further incentive for suppliers to continuously increase market sizes, and this whatever the type of technology used. In an early analysis of performing arts, Baumol and Bowen (1966) showed that the technique of live performance is stagnant because both labour productivity and total factor productivity are inherently resistant to change. It implies that performing arts are predestined to be victims of a cost disease condemning their production costs to rise persistently faster than the economy's rate of inflation.

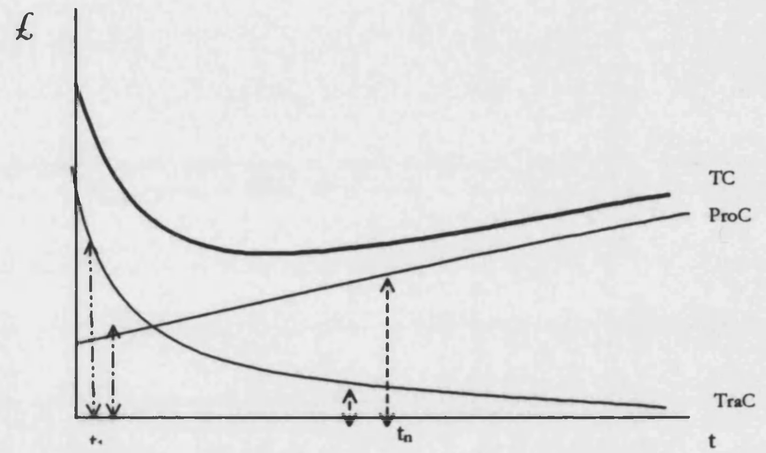
In later work, Baumol and Baumol (1984) analysed broadcasting as an activity based on the fixed proportion of two components with opposite productivity growths:

- Programmes consist of activities such as writing, design, construction and performance. This activity is extremely stagnant and its productivity growth is virtually identical to live performance.
- Technologies that deliver programmes are high-tech in character and, by contrast, very rapid in their productivity growth.

Baumol and Baumol's model is presented in figure 2.2. It predicts that the destiny of the broadcasting activity is dictated by the relationship between these two components. Since technology is a progressive input, its cost will tend to decline or at least not to rise in real terms, reducing its influence on the overall cost of the broadcasting activity. At the same time, the stagnant character of the programming input will rise in unit cost at a faster rate than the general price level. It will constitute an ever-increasing share of the overall budget of the supplier of the activity, and ultimately the entire budget.

By extension, the introduction of new technologies in television (cf. exhibit 13) can be expected to be translated into an initial period of high technological costs followed by a stagnant period in which technological costs decline or at least do not rise and programming costs represent an ever-increasing share of the activity. As a result total costs increasingly behave in a manner more and more similar to those of a purely stagnant activity.

Figure 2.2.Baumol and Baumol's model of broadcast goods



Transmission costs (TraC) tend to decline over time and to reduce their influence on the overall cost (TC) of the broadcasting activity, whereas programming costs (ProC) constitute an ever-increasing share of the overall cost of the supplier of the activity.

Source: Baumol and Baumol (1984).

The model emphasises further that there is a built-in incentive for suppliers in such a market to achieve economies of scale and that new technologies do not provide the cure for the disease. The fact that a programme can have many consumers without any significant addition in stagnant inputs may be able to offset the consequences of the cost disease provided the number of consumers per view rises cumulatively at a sufficiently rapid rate. If it rises at a faster rate than the programming input, then their real unit prices may even actually fall.

2.2. Production systems for television goods

The growing complexity of the television industry stems from the fact that since the early 1980s there has been an evolution from two to three not mutually exclusive modes of production for television goods. In the late 1990s the advertising mode of production has become dominant in Europe. In this context, television audience measurement systems have become a key factor in the allocation of resources by the market because they yield the commodities that are the object of the economic system. In this section it is argued that the commodities traded on the television market are not audiences but statistics and that this is a distinctive use of statistics.

2.2.1. Evolution of the production modes

As mentioned in section 1.3.2, there are currently three different modes of production for television goods: (1) licence fee, (2) advertising and (3) pay production modes. The complexity of the current television industry structure in Europe stems from the fact that not only do these three production modes coexist but also that many suppliers use mixed modes.

1) *Licence-fee production mode.* This mode of production used to be the exclusive one in Europe from the outset until the mid-1950s. It was justified by economic (cf. section 2.1.1) as well as social considerations[3]. In the UK, the Sykes Committee established in 1923 that the BBC was to be funded by a licence fee born on the basis of the receiving set. In France, public broadcasting was funded according to the same principle from 1933 until the late 1960s. In 1968 the licence fee started being supplemented by advertising revenues.

   The economic rationale for public television is that since the process of competition forcing prices to reflect costs and efficient modes of production cannot be achieved for television goods (cf. section 2.1.2), a non-price system has to be used to produce this category of goods. The licence-fee can thus be regarded as a state-controlled price of television goods based on the principle that consumers are willing to pay for the fixed costs of programming and analogue transmission. The efficiency issue brought up by public television is how to ensure that the fixed charge is the minimum compatible with the provision of a given quantum of good since the incentives provided by competition are lacking. Since the early 1980s the public provision of television goods has been put under close scrutiny in Europe with the emergence of the criterion of accountability to the market for public services and under the pressure of new technologies making the extraction of payment from consumers technically feasible (Collins and Purnell, 1995) (cf. exhibit 13).

[3] The belief that broadcasting was a powerful instrument to influence and persuade also used to be an important argument for public broadcasting e.g. Pilkington Report (1960) (cf. section 3.2.2).

2) *Advertising production mode.* The private production of television goods was first introduced in 1955 in Europe with ITV in the UK . In contrast, American broadcasting has been produced privately from its beginning[4]. As seen in section 2.1.2, the economic features of analogue technology do not make price discrimination feasible, which means that private firms have no incentives to supply television programmes. But this non-excludability feature ceases to be a barrier for private firms to enter the market if it is possible to tie in the consumption of a second product with the consumption of the television good itself. There are two groups of economic players who happen to be willing to pay for the costs of television goods:

- Set producers who need to have programmes broadcast in order to sell hardware. This first economic system ties in the consumption of hardware with the consumption of broadcast goods.
- Advertisers who have an interest in getting their commercial messages to consumers This second economic system ties in the consumption of commercial messages with the consumption of broadcast goods.

In the early 1920s, radio stations were initially funded by radio manufacturers. It is the case of the BBC funded by a consortium of radio manufacturers. The second system rapidly superseded the first one. For instance in the mid-1920s AT&T proposed to use its chain of radio stations to bring listeners to the message of any person or company that would pay a 'toll' for transmission (Meehan, 1990). The private production of television goods developed along the same lines.

The advertising production mode does not require any form of direct payment from consumers and the consumption of broadcast goods thus produced is not restricted. However, it is not obvious whether such systems provide free broadcast goods. Indeed, the costs induced are extremely difficult to assess (interference with the enjoyment of programme consumption, price of broadcasting passed on the price of the products advertised etc.) and the effects of advertising on welfare are the subject of a controversial economic debate (creation of barriers of entry, monopoly entrenchment issue etc.). It is argued in this thesis that the advertising production mode also leads to issues of another nature that inherent to the use of statistics as commodities (cf. sections 3.5, 4.4, 5.4 and 6.4)

[4] The only American public channel is the small channel PBS, which is financed by donations.

3) *Pay production mode.* A new private mode of production of television goods has emerged since the mid-1980s in Europe. This third mode has been made possible by the emergence of distribution and transmission technologies. Cable and satellite technologies are not new (cf. exhibit 13) but it is only in the late 1980s that they developed and pay television became a significant mode of production in Europe. As seen in 2.1.2, these technologies allow the exclusion of individuals from the consumption of programmes through a price system for a large number of firms at affordable transaction costs. Two exclusion systems can be distinguished:
   - Pay-Per-View (PPV) or Video-On-Demand (VOD) that require payment to access a particular programme.
   - Subscription that require payment (usually on a monthly basis) to access a particular package of channels sold together (bundles). In the late 1990s a standard practice is the selling of a basic bundle composed of about 20 to 30 channels, at the top of which smaller extra-packages (the so-called premium tiers) are proposed at different prices.

   These technologies go beyond the simple delivery of programmes. They also enhance the quality of the transmission and make possible the development of new applications, which are often referred to as interactive television or iTV. These new applications are presented in exhibit 14. It should also be added that licence-fee and advertising supported programming are increasingly transmitted via these technologies so that new technologies should not be equated with pay television as is sometimes the case.

Deregulation and the emergence of new technologies have resulted in a rapid re-configuration of the production system for television goods in the 1990s, with an explosion of private suppliers and a blurring of national boundaries (cf. section 2.3.3). Out of these three production modes, the advertising mode has come to dominate the television industry. The main television channels in France and the UK, together with their modes of production, are listed in exhibit 15. There are two sets of reasons that explain this domination of the advertising production mode:

a) advertising is the essential source of financing for most prominent suppliers of television goods in Europe e.g. commercial channels such as RTL in Germany, ITV in the UK, TF1 in France.
b) advertising supplements the other sources of revenues for most of the other major suppliers of television goods:

- licence-fee only supported television has now become a scarce mode of production in Europe (cf. section 1.3.2). In the overwhelming majority of cases public broadcasters draw their revenues from a combination of licence fee and advertising sources, e.g. Channel 4 in the UK or France Télévision in France, although the ratio between these two sources varies greatly across Europe. For instance, advertising is a small source of financing for the German public television ARD/ZDF whereas it contributes the bulk of the revenues for the Spanish public television RTVE.
- Many pay television suppliers are also financed by a combination of sources (subscriptions and advertising). It is for instance the case of the two biggest pay broadcasters in Europe, BSkyB and Canal Plus. The financing of pay broadcasters is a crucial point to take into consideration when discussing the role of television audience measurement systems in the new digital age. The evolution of the financing of the pay television industry is analysed in section 2.5.

As a result, in the late 1990s very few major broadcasters are financed solely by the licence fee or by subscriptions. The BBC in the UK or The Disney Channel in Europe are atypical in this respect. Almost all the broadcasters that do not participate at all in the advertising market play a minor part in the industry so far (cf. exhibit 15).

2.2.2. *Statistics as commodities*

All large-scale continuing surveys are used to supply statistics on the basis of which major decisions are made. For instance, statistics yielded by governmental surveys often provide the only means of estimating crucial variables for economic and social policy decisions (unemployment, housing etc.) because they yield information on the characteristics of populations and their evolution between censuses. Important budget allocations (e.g. education) are regularly made on the back of such data. However, the use that is made of the statistics yielded by television audience measurement systems is of another nature. The foremost function of these surveys is not, as their standard market research classification suggests (cf. section 1.2.2), to supplement sales figures for the purpose of identifying marketing opportunities or improving the efficiency of marketing actions. Rather, the primary function of television audience measurement systems is distinctive as well as central in the economy of television: they produce the very commodities that are traded on the market.

When television goods are pure public goods, private firms have no incentive to enter the market unless it is possible to tie in the consumption of a second product with the consumption of television goods (cf. section 2.2.1). If the consumption of television goods is tied in with the consumption of commercial messages advertisers are willing to pay for the costs of broadcasting and indeed television goods have been produced privately from the outset in some countries (cf. section 2.2.1). The central question to answer is: what are the commodities traded on the television market? Different hypotheses have been put forward:

- *Airtime.* Television industries predominantly financed by advertising are commonly referred to as airtime markets (e.g. Cluff and Harper, 1996), which implies that what is traded on the market is broadcasting time. But there is little relationship between the duration of an advertising message and the price that an advertiser has to pay for the message to be broadcast. In fact, most advertising messages have a standard 30 second format nowadays. If airtime were the product sold on the television market, all 30-second spots should be priced equally and this is obviously not the case.
- *Programmes.* In an early paper on television economics, Rothenberg (1962) described the product sold to advertisers as being the programme: *"A TV program presumably benefits the listening audience, yet the market transaction is one where the station sells the program not to this audience but to advertisers. The buyer benefits to the extent that the product (i.e. the program) gains the attention of third parties* (p. 46). There is a basic contradiction in this analysis because if something other than the programme itself benefits advertisers, then it is this other thing that must be bought by advertisers and traded on the market.
- *Audiences.* In his extension of Marx's labour theory of value, Smythe theorised in the 1970s that the product sold by commercial broadcasters is the audience - the so-called Blind Spot Theory - (Streeter, 1996). Watching television is regarded as a kind of productive labour conducted in the interest of media organisations. In all the current analyses dealing with television economics, audiences are considered the commodities traded on the market: *"The first and most serious mistake that an analyst of the television industry can make is to assume that advertising-supported television broadcasters are in the business to broadcast programs. They are not. Broadcasters are in the business of producing audiences"* (Owen and Wildman, 1992, p. 3). *"The product is the audience and the buyer is the advertisers"* (Young, 1990, p. 20). Vogel (1986) is more specific: *"What is sold is access to the thoughts and emotions of people in the audience"* (p. 155).

However, the prevailing assumption in television economics that audiences are the commodities traded on the television market is not correct. Television audiences are not comparable in economic character with manufactured objects. A media audience is a concept (cf. section 3.1.1) and a concept cannot be a commodity. In fact when economists use the terminology 'television audiences' they mean 'television ratings' and thus equate a concept with statistics which are regarded as economic facts. But from a statistical viewpoint there is a fundamental difference between the statistics generated by a given measurement process and what the object of the measurement process is. Concepts are unobservable phenomena with no naturally occurring metrics, so statistics do not reflect a concept but rather a possible construction of this concept. Furthermore, since statistics are estimates yielded by a given measurement design, they are necessarily subject to errors (cf. section 1.3.1). Hence, it is not accurate to equate television ratings with audiences and with economic facts. It has a dual significance for the economy of television: since statistics are the commodities traded on the television market (a) prices that are thrown up on this market are attached to those statistics and not to any other quantity as is commonly assumed; (b) there is inevitably a gap between the commodities that are priced and the want-satisfying goods that are the real object of the trade. Assessing the nature and the size of this gap in the late 1990s television environment is the purpose of this thesis.

The television industry illustrates a case in which sample surveys perform an specific microeconomic function: the transformation of an unobservable and abstract phenomenon into tangible commodities that can be produced, priced, bought and sold by industrial players like any manufactured product. In so doing, the statistics yielded by these surveys become the object of the economic system. Such a function exists because television goods present unusual characteristics preventing private firms from entering the market (cf. sections 2.1.1 and 2.1.2). Television audience measurement systems are thus meant to solve a severe economic case of market failure in making the private production of television goods possible, and the solution they bring up favours an advertising production mode. It explains why television audience measurement systems originate from the USA as opposed to Europe and are among the earliest and largest classes of sample surveys conducted in the private sector of the economy (cf. section 1.2.4). Since the mid-1980s the advertising production mode has become dominant in Europe (cf. section 2.2.1). The direct effect of this industrial evolution has been to reinforce considerably the role of those measurement systems in the economy of television. In the late 1990s, the allocation of resources within the industry is closely dependent on the estimates yielded by these sample surveys. It explains why their scale and sophistication have expanded over the last fifteen years or so (cf. section 1.2.4).

2.3. Advertising practices

The 'commodification' process of statistics in the television industry argued in section 2.2.2 is made apparent by the uses to which television ratings are being put by the industrial players in the late 1990s. How television ratings are priced and bought is shown in this section; how they are produced and sold is shown in section 2.4.

A first category of players in the television market is composed of advertisers and advertising and media agencies. The study of advertising planning, buying and accounting principles shows that prices planners and buyers are prepared to pay for television ratings do not depend on statistical considerations but rather on the observable economic characteristics of the statistics that are put on the market. As for any manufactured product the value placed on television ratings depends on their 'quantity' and 'quality'. But as opposed to other manufactured products television ratings are not known at the moment they are priced and need to be projected.

The late 1990s are characterised by new phenomena of 'audience' erosion and fragmentation that are partly associated with structural changes brought on by deregulation policies in Europe and the emergence of new technological reception abilities. By contrast with the pre-1980s industry, an increasing number of firms supply television ratings and compete for their production and their selling. In this industrial environment, prices advertisers are prepared to pay have become closely related to their economic valuation of the television ratings put on the market by each supplier.

2.3.1. Planning, buying and accounting principles

In advertising television ratings are referred to as *TVRs* or 'rating points'. This terminology is used in the context of this thesis to distinguish between television ratings as commodities (TVRs) and television ratings as estimates. TVRs are involved at three stages of advertising practices: (1) at the planning stage the characteristics and costs of the TVRs sought for a given advertising campaign are decided and projected; (2) at the buying stage TVRs are what commercial broadcasters sell and what agencies purchase; (3) at the post-campaign stage, it is the value of the TVRs delivered given the budget spent for which agencies are accountable to advertisers.

TVRs are not really involved at the earlier stages of the advertising decision making process i.e. the decision for a manufacturer to advertise and the selection of media vehicles.

- The decision for a manufacturer to advertise is fundamentally motivated by sales targets and usually taken at board level. Industrial objectives and financial constraints are considered. Almost £9000 million and about FF52000 million were invested in the UK and in France in the media by manufacturers in 1996. The evolution and distribution of the advertising expenditure in these two countries since 1983 are presented in exhibits 16A and 16B. Organisational structures for controlling advertising decisions vary greatly: they may involve marketing directors, brand managers, advertising managers etc. Once the decision to advertise is made, advertisers commission advertising agencies to compose the commercial message. In most cases a department within the advertising agency is also in charge of the media planning and buying of the campaign although since the mid-1980s there has been a steady growth in media agencies that specialise in those services (cf. section 4.4.1). Media investment represents the bulk of the total advertising investment for a company and often exceeds 80% (Laborie and Charton, 1994).

- The selection of the media vehicles which will carry the advertising message (the so-called 'media mix') is usually made prior to the creative work. Media mix decisions are based on general perceptions of the different media vehicles, each vehicle being perceived as having a different positioning and degree of substitutability. Inter-media competition by reach and targeting abilities and by reach and frequency of contacts are mapped out in exhibit 17. Media mix decisions are also made on the basis of beliefs e.g. whether a media mix is better than a single medium approach, whether a large number of vehicles is better than a concentration on a few media etc.

  The television medium is considered the optimal vehicle for brands with broad prospects and emotional appeal, as opposed to the print medium for instance which is perceived as more appropriate for brands targeting narrower markets through factual, rational messages (Smith, 1994). But television is also an expensive vehicle and messages are short lived whereas print is more selective, flexible, cost-effective etc. Since the mid-1980s the share of the television vehicle in the total advertising expenditure has increased steadily at the expense of the print medium (cf. exhibit 16).

With about US$4,500 million and US$3,500 million in 1996 respectively, the British and French television advertising markets are the biggest in Europe after the German market. The volume of television advertising expenditure and its evolution in France and in the UK are presented in exhibits 18A and 18B.

Beliefs in the different persuasive capacities of each medium are strong and consequently advertising demand can be relatively inelactic. It explains why when the price of prime time television increases the large share of the advertising expenditure tends to be shifted to cheaper day time television rather than to print (Ephron, 1998) or why some major advertisers have mono-medium portfolios (e.g. Procter & Gamble). Media portfolios by economic sector of activity are mapped out in exhibit 19. The portfolios of the top ten advertisers in France and in the UK are detailed in exhibits 20A and 20B. These exhibits show that the television medium is the main advertising vehicle for major advertisers.

By contrast with those early stages in which beliefs and perceptions have a large part, the later stages appear as grounded on numbers. This is where TVRs come into play. Planners and buyers handle television ratings as well defined commodities produced by programming decision processes.

Some basic relationships between the three audience indicators reach, share and rating (cf. section 1.2.4) are introduced below. Detailed calculations of are given in section 3.3.2.

$$(2.3) \quad \mathrm{Re}\,ach = \frac{Rating}{Share}$$

$$(2.4) \quad Share = \frac{Rating}{\mathrm{Re}\,ach}$$

$$(2.5) \quad Rating = (\mathrm{Re}\,ach)(Share)$$

1) *Planning stage.* Planners define the economic characteristics of the TVRs that are sought for a given campaign and at what maximum price. How TVRs are valued and priced by agencies is a point detailed in section 2.3.2. Planning consists in calling for specific rating points to be achieved within a given target, budget and time span by the use of a key indicator - the so-called 'Gross Rating Points' (GRPs).

At this first stage the TVRs that will be effectively delivered by advertising spots are unknown and have to be anticipated. In order to identify trends and project future TVRs, planners accumulate data yielded by AMS. The TVRs delivered by a particular spot within a particular programme are estimated by making assumptions on the reach and share the programme within which the spots are inserted is likely to achieve (cf. equation 2.3). Expectations on the reach and share of a programme are made on the basis of past performances achieved by the same programme and/or by similar broadcasting time, channel, competition, programme genre, programme format etc. GRPs are set according to optimisation models of 'coverage' and 'frequency' (Parodi and Stehlé, 1991). To illustrate briefly planning practices, let us assume a 30-second spot for a product whose target is defined as 30-50 female ABC1s[5]. A combination comprising four television programmes A, B, C, D is tried. Given past performances, the rating points on this target that will be achieved by an advertising spot within each of these programmes are anticipated to be A = 12%; B = 8%; C = 6%; D = 6%; hence, total TVRs = 32%. GRPs are the sum of the rating points achieved by a series of programmes. In this example GRPs=32.

But GRPs must be optimised because nothing is known about the number of different people reached at least once ('unduplicated' TVRs or 'coverage') and how many times people are reached ('duplicated' TVRs or 'frequency'). If programme B adds 4 unduplicated TVRs to A (in other words if half of the people who watched B did not also watch A), C adds 2 TVRs to A+B and D adds 2 TVRs to A+B+C, then the average frequency of contact is 1.6 and the coverage of the campaign is 20:

$$(2.6)\quad \text{Frequency} = \frac{\text{GRPs}}{\text{Coverage}} = \frac{32}{20} = 1.6$$

$$(2.7)\quad \text{Coverage} = \frac{\text{GRPs}}{\text{Frequency}}$$

$$(2.8)\quad \text{GRPs} = (\text{Coverage})(\text{Frequency})$$

The optimum coverage for an advertising schedule is easily defined: it is the maximum number of net rating points on the target audience that can be bought within the budget constraint. But the optimum frequency for an advertising schedule is a matter of belief and depends on which effective frequency model is used (Mc Donald, 1995a). Some models are based on *S* shaped response curves and maximises coverage under

[5] A, B, C1, C2, D and E is the standard social grading classification used in the British advertising industry. It was first introduced in the context of the National Readership Survey (NRS) (cf. exhibit 2C). It is a hierarchically ordered system, with A being the top group of the most senior managers and the professional elite, and E being the bottom group of people depending solely on estate. This classification makes a division between manual and non-manual occupations, the dividing line being between C1 and C2. On the similarities and differences between social grades and SEC codes used in censuses see Meier and Moy (1999).

frequency constraint[6] (Speetzen, 1994). Other models are based on convex response curves and maximises frequency under coverage constraint (Kamin, 1992). Whatever the frequency model chosen, various combinations are tried and costs between combinations are estimated and compared using the standardised indicators of Cost Per Thousand (CPT) or Cost Per Point (CPP) defined in section 2.3.2.

2) *Buying stage.* It is at this second stage that the real prices of TVRs are established by marketplace negotiations. TVRs are valued at the planning stage by the estimation of GRPs the plan is expected to deliver. Buyers then enter intricate price negotiations with the sales representatives of broadcasters that supply and sell TVRs. The specificity of the British market is that, like the American market, it is an auction market with sealed bids where only the auctioneer (i.e. the broadcaster) knows the prices that have been offered and sells to the higher bidder (Broadbent and Jacobs, 1984). The basic functioning of the market is as follows: each 30-second spot put on the market by a broadcaster is rated on an official rate card, which is issued every year by the auctioneer. This rate card is only used as a basis for negotiations. In the UK, standard rates start at about £15,000 up to £100,000 (Broadcast, 1998a). The buyer announces his/her price on a given day at a given time depending on the TVRs planners expect to be delivered. If a second buyer makes higher estimations and expects more TVRs to be delivered or if the valuation of the TVRs expected is higher, then a higher price is announced. The first buyer must then propose more if he/she wants to secure the spot. As soon as the top rate on the card is reached, the buyer who offered the rate has the spot for certain. In France, as in most of the other European markets, the buying system is slightly different. Buyers negotiate with sellers on an annual basis. All TVRs are then initially booked at the rate card price but later negotiations in the light of recent TVRs delivery determine whether discounts off this price should apply (Cluff and Harper, 1996). However, an auction system similar to the one used in the UK was introduced by France Télévision in 1999 and may well supersede the current one.

Regardless of the negotiation system, uncertainty in transaction is a feature of the TVRs because the commodities traded are not known but only projected by planners at the moment of the transaction (cf. section 2.3.2). Buying and selling practices are diverse and complex. For instance, some exceptional programmes produce closed

[6] Each individual within the target has to be reached M times. At M – (1,2,...n) the frequency is regarded as not high enough to induce effectiveness; at M + (1,2,...n) the frequency is too high and induces diminishing returns. In many optimisation models M = 3.

negotiations in which the buyer is faced with a 'take it or leave it' price e.g. ITV auctioned World Cup football matches at an average price of £90,000 for a 30-second prime time slot (Media Week, 1998b), some broadcasters offer packages of slots with a guaranteed number of TVRs and a compensation system is used if the TVRs sold are not delivered etc. Advertising and media agencies are paid by broadcasters and receive a commission (usually 15%) on the gross cost of what is bought.

3) *Accountability stage.* At the last stage, the TVRs effectively delivered determine the performance of the advertising campaign. Once every spot has been transmitted and the TVRs generated are known, the end-point of execution is for the agency to show to its client i.e. the advertiser that the campaign achieved its objectives. GRPs delivered and budget allocated are then compared with GRPs and budget objectives as initially defined in the plan. The effectiveness of the advertising campaign for the advertiser is usually assessed via models integrating parameters such as brand awareness, level of advertising pressure in the media for the brand and its competitors, number of spots in the advertising break, position of the spots bought within the advertising break etc. (Boillot and Lasocka, 1991). Some of these results are then used to feed into the planning decisions of subsequent campaigns.

2.3.2. Valuation and pricing of TVRs

Prices planners and buyers are prepared to pay for television ratings depend on the expected value of the TVRs put on the market by each broadcaster (cf. section 2.3.1). TVRs are valued and priced like any other commodity i.e. depending on both their 'quantity' and 'quality'. In order to compare costs, planners use standardised indicators such as 'Cost Per Thousand' (CPT) or 'Cost Per Point' (CPP), which can be defined as follows (GRPs are defined in equation 2.8):

$$(2.9)\quad \text{CPT} = \frac{\text{Cost of n spots}}{\text{GRPs of n spots}}(1000)$$

$$(2.10)\quad \text{CPP} = \frac{\text{Cost of n spots}}{\text{GRPs of n spots}}$$

where *n* is the number of advertising spots considered for the campaign.

In modern economics, the value placed on a good can be objectively measured only in terms of its exchange i.e. its price. Three series of factors traditionally influence the economic valuation of a good (Bates, 1993): (1) the attributes of the item being valued, (2) the particular situation and needs of the potential purchaser and seller and (3) the conditions of the exchange and the context in which it occurs. Prices of TVRs are impacted by these same economic factors:

1) *Attributes of TVRs valued.* As for any other good, prices placed on TVRs by planners and buyers reflect both their 'quantity' and their 'quality', except that in this particular case TVRs are not observable at the moment of the transaction and prices are set according to expectations. Advertisers that choose the television medium are interested in putting a large audience in contact with their commercial messages within a short time pan (cf. section 2.3.1). Large TVRs, i.e. 'quantity', are therefore what is chiefly sought. But advertisers are not equally interested in all the components of the population[7]. Groups of individuals who influence consumption or who have a higher purchasing power are the market segments that are the most highly valued. e.g. younger or business people as opposed to older or unemployed people. TVRs delivered on targets characterised by highly valued socio-demographics are of a higher 'quality', hence command higher prices. As an example, TVRs on 16-24s or ABs command a premium of 10-30% and sometimes more in the UK (Broadcast, 1998a).

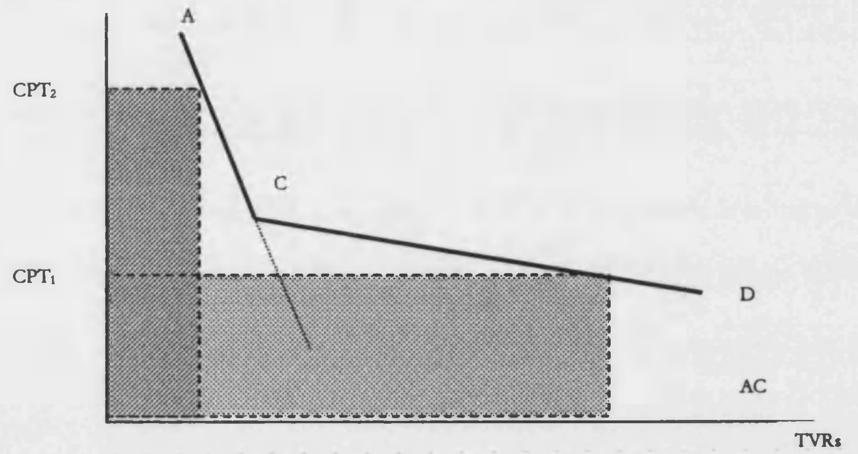
   It should be pointed out that there is a correlation between 'quantity' and 'quality' of TVRs. Indeed, the most highly valued targets correspond to groups of individuals who tend to watch less television than the average population and are the most irregular in their viewing habits (the so-called 'light viewers') e.g. teenagers, businessmen. Programmes that deliver large TVRs are also the most likely to deliver high quality TVRs and conversely (Goodhardt, Ehrenberg and Collins, 1987). In fact, it is precisely because these programmes also manage to attract a higher proportion of light viewers that the TVRs they deliver are large. As a result, 'prime time'[8] TVRs are the most valued and usually are 30-40% more expensive than mornings or mid-

[7] The socio-demographic profile of the TVRs sought has been increasingly precisely defined over time. For instance, in the 1990s 'women' is hardly a definition for an advertising target. A media plan would rather focus on 'mature women' (and in this case TVRs expected from programmes such as Coronation Street or Who Wants To Be A Millionaire? may be considered by planners), 'upmarket women' (A Touch of Frost, Inspector Morse), 'young professionals' (Ally McBeal, Friends, Sex And The City), 'young women' (Hollywoaks, The Brit Awards); or even on 'mature upmarket women' etc.

[8] Prime time designates the broadcasting time during which the largest number of people watch television. In the UK this corresponds to 7.00 pm-10.00 pm and in France to 8 pm-10.30 pm.

morning TVRs, and 'access prime time'[9] and late evening TVRs are 20-25% more expensive (Broadcast, 1998a). Figure 2.3 shows that the selling of large TVRs maximises the profit of commercial broadcasters.

Figure 2.3. Profit maximisation from the selling of large TVRs



Large TVRs allow the supplier to segment its market in selling both to advertisers valuing a coverage of the total population (CD) and to advertisers valuing the coverage of certain upmarket groups of the population (AC). Profits from the pricing of 'quantity' (lighter shaded rectangle) can thus be further enhanced by profits from the pricing of 'quality' (darker shaded

Source: AE.

2) *Situation and needs of the seller/buyer.* Premiums apply to the TVRs put on the market by the leading channels, e.g. ITV in the UK, TF1 in France (Sharp, 1997) (cf. figure 2.3). Premiums also apply to the TVRs put on the market by channels that are expected to deliver high 'quality' TVRs such as TVRs on young adults e.g. Channel 4 in the UK, M6 or Canal + in France. It is argued in section 6.4 that these premiums correspond also to different levels of risk of a statistical nature born by the buyers. Exceptional programmes such as live big football matches also command premiums because they are expected to deliver TVRs of both exceptional 'quantity' and 'quality'. It is however argued in section 4.4.2 that the TVRs generated by those programmes are under-estimated by the measurement systems currently in use.

3) *The conditions and context of the exchange.* The way TVRs are priced has changed dramatically since the mid-1980s. The European television industry has shifted from a

[9] Access prime time designates the broadcasting time before prime time. In the UK this corresponds to 5.30 am-7 pm and in France to 6.30 pm-8 pm.

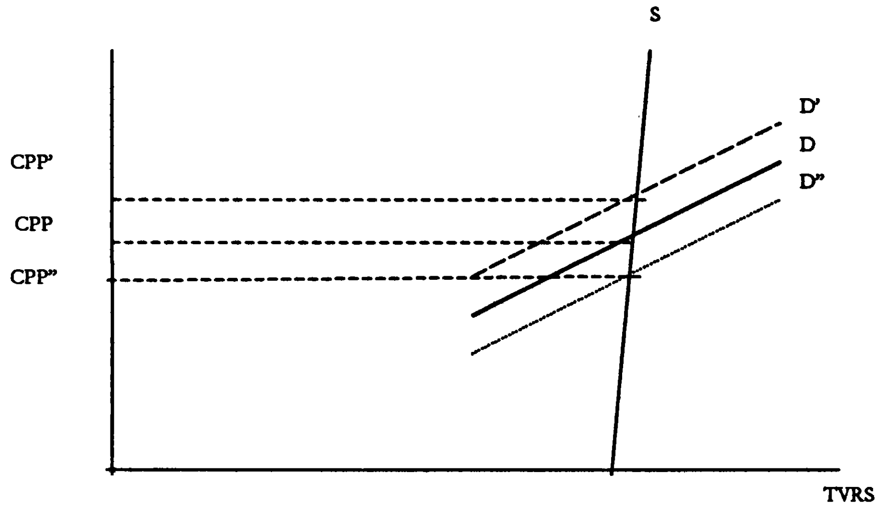
pre-1980s monopolistic structure in which the supply of TVRs was fixed and prices varied with the advertising demand, to a 1990s competitive structure in which an increasing number of firms supply TVRs and compete for their production and their selling. In the 1990s the CPP advertisers are prepared to pay under the auction systems has become closely related to fluctuations in the observable 'quantity' and 'quality' of the TVRs produced. This point is developed in section 2.3.3.

2.3.3. Industrial changes and associated 'audience' phenomena

In the pre-1980s the industrial structure was monopolistic and the supply of TVRs was fixed. Moreover, the 'quantity' and 'quality' of the TVRs delivered was similar between suppliers and relatively stable. Consequently, prices of TVRs tended to vary with the level of the advertising demand. The structure of the television industry in most European countries was simple. It was characterised by a public supplier financed mainly by a licence fee which typically provided two or three channels. In some cases television goods were also supplied privately and an advertising mode of production co-existed with the licence fee mode (cf. section 2.2.1). The commodity production function of television audience measurement systems was exercised within this monopolistic market: TVRs[10] were typically produced and sold by a single economic organisation. In France, since advertising supplemented licence fee revenues the three public channels used to put TVRs on the market. In the UK, the BBC did not participate in the advertising market and TVRs were sold by ITV, whether they were produced by ITV or - after 1980 - by Channel 4. This explains why the British situation was called "*a comfortable duopoly*" by the Peacock committee (1986). Not only was there no competition for the production and selling of TVRs but this economic activity was also closely regulated so that the TVRs that could be put on the market by the supplier was fixed and independent of the advertising demand. In such an industry, fluctuations in the 'quantity' and 'quality' of TVRs had little effect and prices were largely a function of advertising demand. Figure 2.4 shows how the CPP was set on the television market in the pre-1980s.

[10] In the pre-1980s industry the TVRs traded on the market were quarter-hour ratings (cf. section 4.2.1).

Figure 2.4. Determination of CPP in the pre-1980s television market



The structure of the television industry was monopolistic, the supply of TVRs was fixed and stable. Therefore, prices were largely determined by the level of the advertising demand.

Source: AE.

Since the mid-1980s this traditional system has been progressively superseded by a complex structure made possible by deregulation policies under the joint pressure of the financial weakening of public broadcasters and the emergence of new technological options. In this new industry, the production and selling of TVRs has become a highly competitive economic activity. This competition is best understood by observing the evolution of the annual shares of viewing of the main suppliers of television goods. The combination of two factors, (1) an inflation in the number of suppliers and (2) a stabilisation of the total viewing time, has been leading to (3) phenomena of 'audience' erosion and fragmentation.

1) *Inflation in the number of suppliers.* In the new television environment, there is not such a thing as a definite number of channels which are nationally available. The number of television channels available to users varies greatly and depends on the reception ability of each household. Since the early 1990s the penetration of cable and satellite technologies has dramatically increased. The development of cable and satellite television in the UK and France is presented in exhibit 21. In 1992 about 2 million British households (cf. exhibit 21A) and 1 million French households (cf. exhibit 21B) had access to cable or satellite television. By 1999 these figures had quadrupled. A direct consequence is an explosion of private suppliers using a pay production mode (cf. section 2.2.1). The current spectrum of channels available is large: at the one end, households with television sets receiving analogue signals have access typically to five or six channels only; at the other end, households equipped with digital set top boxes and subscribing to premium tiers can have up to 200 channels to choose from (cf.

exhibit 13E). As an indication, the standard number of channels reported in the *BARB Astra Satellite Panel Weekly Audience Report* (cf. exhibit 12) is currently forty but the number of channels that can be commonly received is much higher (cf. exhibit 15A).

2) *Stabilisation of the total viewing time.* This trend has appeared for the first time in the 1990s. Until then figures showed that the time individuals spent watching television was positively correlated with television equipment and the range of programming choice offered (Robinson, 1969; 1981). As these two variables increased over time so did the total viewing time. In the 1990s, this changed as the total viewing time seemed to reach a maximum threshold. The evolution of the daily viewing hours per individual in the UK and in France is given in exhibit 22. In France, television is watched for about 3.2 hours a day and has risen remarkably little over the last decade (cf. exhibit 22A). The UK even saw a fall in the average number of viewing hours: from 3.8 hours in 1991 to 3.4 hours in 1998 (cf. exhibit 22B). Moreover, a comparison between total viewing time in analogue television only households and cable/satellite television households from 1992 to 1996 in the UK shows that the extra choice offered by cable and satellite channels has not been followed by a significant increase in viewing time in multi-channel households, the estimated differential being of about two more minutes a week from 1994 to 1996 (cf. exhibit 23). Total viewing time may further decrease in the future as personal computers and the Internet become more widespread. Indeed, recent research suggest that time tends to be shifted among computer and Internet users away from television (Svennevig, 1998).

3) *'Audience' erosion and fragmentation phenomena.* From (1) and (2) it follows that about the same total viewing time has been shared by an increasing number of channels in the 1990s and time is the basic unit used for the calculation of audience indicators (this point is the object of section 3.3). The evolution of the annual daily reach of viewing in the UK and in France is presented in exhibit 24. There has been little evolution in the percentage of the population that has viewed at all each of the main channels in each country. By contrast, the evolution of the annual shares of viewing in the UK and in France is shown in exhibit 25. The decline of the viewing share of public service broadcasters is often contrasted with the success of commercial broadcasting (e.g. Collins, 1998). However, it is important to stress that the decline of public service broadcasters fits in with a more global trend. Indeed, there has been a shifting of viewing shares from older and bigger channels, whether public or private, to younger

and smaller channels. Exhibits 25A and 25B shows this dual trend in the UK and in France:

- On the one hand, the oldest and biggest channels – based on licence fee or on an advertising production mode - have been suffering from an 'audience erosion' phenomenon. In France, TF1's audience share was 42% in 1990 and not quite 35% in 1998; France 2's share was particularly low between 1990 and 1993 and, after a short period of improvement, has been following a downward trend bringing it back to less than 25% (cf. exhibit 25B). The British situation is even clearer: ITV's share shrank from 44% in 1990 to less than 32% in 1998 and, within the same time interval, BBC1's share also dramatically decreased from 37% to less than 30% (cf. exhibit 25A). This decrease in share has been inevitably accompanied by a decrease in the average ratings delivered by those broadcasters (cf. equation 2.5). The statistical implications of this phenomenon are the object of section 6.4.

- On the other hand, the rest of the total viewing time has been increasingly parcelled out between smaller broadcasters. The decrease of the viewing shares of the big broadcasters has benefited two types of channels:
  a) smaller analogue channels based on the traditional production modes, e.g. France 3's share increased from about 11% to more than 17% and M6's from about 7% to more than 12% (exhibit 25B); Channel 5's share doubled within two years to reach 4% (cf. exhibit 25A);
  b) channels delivered via new technologies, e.g. in the UK, the share of the new channels combined has more than trebled, from 4% in 1991 to almost 13% in 1998 (cf. exhibit 25A). This increase in share has been inevitably accompanied by an increase in the average rating delivered by those broadcasters (cf. equation 2.5) but the average programme ratings of these channels remain low, which raise both statistical and economic issues (cf. section 6.4).

The result has been a phenomenon of 'audience fragmentation', with a few channels still representing most of the viewing time - four channels share 83% of the total viewing time in the UK (cf. exhibit 25A) and 87% in France (cf. exhibit 25B) – but progressively whittled away by an increasing number of new channels as the reception abilities of the households evolve. The annual shares of viewing of the leading channels in other European countries are presented in exhibit 26. It shows that situations differ: at one extreme, audience fragmentation is well under way in Germany and the Netherlands where the shares of the biggest channels, RTL and RTL4, are just above

15%; at the other extreme, audience fragmentation is still limited in Ireland and Norway where the share of the leading channels, RTE1 and NRK, is still between 34% and 40%. The future distribution of the total viewing time between channels is uncertain and an object of speculation in the industry. The American situation is interesting in this respect because 'audience erosion' and 'audience fragmentation' phenomena are much older. The evolution of the annual shares of viewing of the three big American networks from 1989 until 1998 is presented in exhibit 27. It shows a fall, from 66% in 1989 to 43% in 1998. However, these three networks keep on representing a large share of the total viewing time. Two hypotheses as to the future of are put forward in the industry (McIntosh and Wheble, 1997):

a) An intensification of the audience fragmentation phenomenon: viewing time would be split into tiny fragments caused by competing offers;
b) The emergence of an 'audience segmentation' phenomenon: certain channels would always account for large sized chunks of the total viewing time whereas the other channels would share the rest.

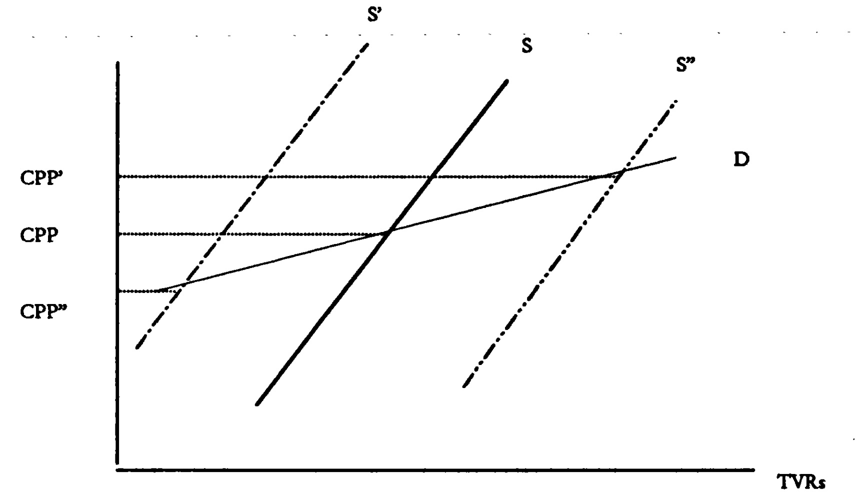
The view that technology will fragment further the market and that public service broadcasting has to contribute towards the maintenance of a common national culture is argued by some proponents of public service broadcasting (e.g. Graham and Davies, 1997). However, the extent of this fragmentation phenomenon is uncertain.

The structural changes and associated 'audience' phenomena that are characteristic of the 1990s industry together with the fact that advertising has become the dominant production mode (cf. section 2.2.1) has resulted in an increasing number of firms competing for the production and selling of TVRs. As an illustration, in 1985 71,977 advertising spots were offered to French advertisers by three channels versus 223,570 offered by six channels in 1989 (Médiamétrie, 1991). This competition is all the more intense as the advertising expenditure in television has grown by about 20% in the 1990s (cf. exhibits 18B), which is less than the growth of the supply of TVRs. In such an industrial context, prices advertisers are prepared to pay have become closely dependent on their valuation of the TVRs put on the market i.e. on the expected 'quantity' and 'quality' of the commodities on offer. Figure 2.5 shows how the CPP is determined in the 1990s television market. Therefore, the impact of television audience measurement systems in the setting of price has become determinant, and their role has become key in the allocation of resources.

This change in the uses made of the estimates yielded by television AMS is crucial when identifying measurement errors. Given the definition of error taken in this thesis (cf.

section 1.3.1), the meaning of measurement errors in television AMS differs if the setting of prices is loosely related to the estimates yielded by these systems or if it is closely dependent. The implications of measurement errors on the economy of television also differ. This thesis also attempts to show in chapter 4 that changes in the measurement operations implemented have had an important economic impact. In particular, changes in the data collection technique selected have had the effect of making the market highly responsive to variations in television ratings, which has been translated into fluctuations in prices and uncertainty in revenues (cf. section 4.4.1). The consequences of 'audience fragmentation' phenomena on the reliability of the estimates yielded are analysed in chapter 6. This thesis attempts to show that these phenomena have been translated into an increasing uncertainty as to the commodities produced for sellers and higher levels of risks for buyers (cf. section 6.4.1).

Figure 2.5. Determination of CPP in the 1990s television market



The supply of TVRs has expanded and the market has become highly competitive. Prices advertisers are prepared to pay vary with their valuation of the TVRs put on the market by each supplier. TVRs that are expected to be larger or to have a higher 'quality) are more highly priced (CPP') and vice versa (CPP").

Source: AE.

2.4. Programming practices

From an industrial viewpoint television ratings are produced by the broadcasting of television programmes. Consequently, the study of their production involves the study of the programming practices of broadcasters. These practices are developed in this section. They are more complex to analyse than advertising practices, which are examined in section 2.3, because they are closely regulated. Two types of practices have to be distinguished: commercial and public programming practices. Commercial practices are characterised by schedule-driven programming in which the television ratings obtained by previous programmes are crucial for the selection and design of new programmes and re-commissioning decisions can be made entirely on the basis of the TVRs previously delivered. Public practices are heterogeneous and vary greatly depending on the sources of financing. However, television ratings have an impact on licence-fee only supported programming. This impact stems from a second economic function that has long been attributed to television audience measurement systems: a demand revelation function. In the 1990s industry, this additional function has put pressure on public broadcasters such as the BBC that do not participate in the advertising market.

2.4.1. Commercial programming

The supply of TVRs implies two interdependent activities: (1) their selling and (2) their production.:

1) *The selling of TVRs.* TVRs are what commercial broadcasters auction on the market and from this viewpoint the use of television ratings is clear: commercial broadcasters sell TVRs to advertising and media agencies; their revenues depend on the CPP of the TVRs generated, which in turn depends on anticipations regarding their 'quantity' and 'quality' (cf. sections 2.3). Representatives within the sales departments of broadcasting organisations handle TVRs in the same way as the buyers with who they trade and revenues are forecast according to comparable methods. This similarity in the handling of TVRs between commercial broadcasters and agencies can be considered an additional argument for the classification of commercial broadcasting as "*a subsidiary activity of the advertising industry*" (Veljanovski and Bishop, 1983, p. 61).

2) *The production of TVRs.* From an industrial viewpoint, TVRs are an output that has to be produced via the programming input. Commercial broadcasters undertake the programming activity only insofar as it allows the selling of TVRs (cf. section 2.2.1). For a commercial broadcaster programming is thus a productive activity implying the selection of the programme the most likely to deliver the highest CPP. Because of the nonconvexities involved the production function of television goods (cf. section 2.1.2), there is a built-in incentive for any commercial broadcaster to try to deliver the largest

TVRs: incremental revenues from the production of large TVRs become almost pure operating profit (cf. figure 2.3) whereas low TVRs accentuate a dramatic decline in profitability. The crucial point to investigate is how the TVRs delivered by past programmes are used to select the programmes that will be broadcast in the future.

It is difficult to draw general conclusions on commercial programming in Europe because this economic activity is heavily and diversely constrained by national regulations: broadcasters have purposes other than the strict production of TVRs imposed on them. The mechanisms involved in the production of television ratings are easier to analyse in less regulated industries, such as the American television industry. Studies of the use of television ratings in the programming decisions of the American networks are not numerous (Cantor and Cantor, 1992; Gitlin, 1983; Brett, 1994) but they are consistent in their findings. They converge in showing that:

1) *Programmes are schedule-driven.* The sales departments of ABC, NBC or CBS are involved in scheduling decisions. Programme genres that generate high ratings on a regular basis are key to the schedules e.g. soap operas (Kilborn, 1992), 'tent poling'[11], 'hammocking'[12] practices.
2) *Programmes are designed to produce well defined TVRs.* Programmes are designed for particular time-slots and for audiences defined by socio-demographic characteristics. Decisions regarding the commissioning of new programmes are based on the sales of TVRs of the previous season. Programmes that achieved the right ratings are picked up as a basis for the creation of new programmes designed to replicate the same TVRs e.g. 'spin off'[13] and 'crossover'[14] practices. Programmes for those with a lesser purchasing power - such as 55+ - are not desirable, hence not produced.
3) *Programmes are cancelled or renewed on the basis of the TVRs they generate.* Nielsen (1999) describes the role of television ratings as helping programmers to keep the popular shows on TV and to make the difficult decision to cancel unpopular shows. Indeed, television ratings are a key parameter in deciding whether a programme that has already been on the air will be cancelled after the initial run or whether more scripts

[11] Inserting a successful series in between two new programmes of a compatible genre in order to promote them.

[12] Inserting a new programme in between two successful programmes of a compatible genre in order to promote it.

[13] Creation of a new series using the supporting characters of a successful series in order to duplicate the TVRs.

[14] Apparition of the star of a successful series in another one in order to boost the TVRs.

will be ordered. Although there are some exceptions, writers, actors and producers must achieve the right ratings to remain in production and after its third season a programme is regarded as a long-running series. The "*critical mass*" in primetime rating points required by the networks to renew a programme has been modelled by economists such as Atkin and Litman (1986). They showed that increased revenues from the selling of TVRs place a downward force on the cancellation threshold of a programme while programme cost increases provide an upward force.

The use of television ratings by broadcasters in Europe cannot just be extrapolated from the situation of the American networks. Two categories of European broadcasters that supply TVRs under legal constraints can be distinguished:

a) Broadcasters for which the production and selling of TVRs represent at least 70% of the total revenues. In this first case, commercial broadcasting is constrained by regulations on the amount of advertising airtime, programming content, genres, broadcasting times etc.
b) Broadcasters for which the production and selling of TVRs cannot represent more than a set proportion of the total revenues. This is the case for public broadcasters that draw their revenues from both licence-fee and advertising sources such as Channel 4, France 2 and France 3.

However, the gradual lifting of legal constraints since the mid-1980s in Europe has led to a global evolution in programming practices. Souchon (1990) analysed this evolution as a shift from a "*supply model*" to a "*demand model*": in the former, programmes are first considered and then scheduled so as to bring the largest 'audience'[15]; in the latter, the audience is first considered and scheduling consists in deciding what programmes have to be produced to fit the schedule. In both cases it is necessary to know the 'audience' but in the second case it becomes a determinant factor.

It should be emphasised that programming decisions are not solely dictated either by legal regulations or by television ratings, including in the case of the American industry. Some decisions are sometimes attributed to personal preferences or whims of network barons (Tunstall, 1993), and in such cases the television ratings achieved may also be used as post-hoc justifications. Others are motivated by image concerns ('branding'). Indeed, with the inflation of new channels in the late 1990s (cf. section 2.3.3), broadcasters have developed marketing strategies whose objective is to promote the identity of the channels (Sorel, 1998). This has been translated into decisions to broadcast programming genres or

[15] By 'audience' television ratings should be understood.

styles that are riskier from the viewpoint of the TVRs they are likely to deliver but aim to reinforce the positioning of the channel as a brand. 'Branding' concerns are to be considered in order to understand the scheduling decisions of certain broadcasters such as Channel 4 in the UK or M6 in France.

There are no published studies which concentrate on the use of television ratings by commercial broadcasters in the UK or in France. The point has however been indirectly approached in academic studies of other areas. For instance, the ethnographic study of British television producers conducted by Tunstall (1993) is very helpful in this respect. These studies indicate that the programming practices of European broadcasters have evolved to integrate mechanisms that are characteristic of the American model to some extent:

1) *Since the mid-1980s, commercial broadcasters have become more schedule-driven.* This is made apparent by how programmers describe their job. Platt[16] (1994) described the first objectives of scheduling as: (a) *"capturing the largest possible audience"* and (b) *"attracting the most desirable demographics"*. *"Keeping a balanced schedule reflecting the community needs and cultural roots"* is also an objective but appears in the ninth and last position on the list. David Liddiment[17] defined his function as follows: *"I am charged with identifying which components of the ITV schedule are key to its future competitive advantage, and what should stay and what should go"* (Media Week, 1998a, p. 10). The reorganisation of the late evening time slot made possible by the suppression of News at Ten was the most publicised element of this commercial strategy. There is a general agreement among British television producers that the main planning task is to commission and buy the best programme to fit the needs of the schedule and the preferences of the audience as indicated by the ratings. The current internal organisation of commercial broadcasters reflects the importance of scheduling. The ITV central scheduling system has a Chief Executive to whom report a network director as well as heads of finance and marketing & sales. Commissioning editors in charge of major programme areas do not directly participate to central scheduling decisions. In France, schedule-driven policies have been observed from 1984-1985 onwards (Le Diberder and Coste-Cerdan, 1988).

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[16] Then Director of programmes at Meridian Television.

[17] ITV's Director of programmes.

2) *Television ratings have become important parameters in the selection and design of new programmes.* At ITV, planning committees meet each week to look at the latest ratings achieved in order to see how the existing programmes are performing and to review the ratings of particular programming genres. Trends in the ratings of every programme and its competitors are closely examined (Tunstall, 1993). Similarly, in France since the late 1980s the opinion of professional committees, juries, critics etc. have become secondary in the assessment of programming in favour of television 'audience' analysis (Bourdon, 1994). Some programming formats and genres have been intensively developed at the expense of others. For instance, series – especially detective series - have expanded as opposed to one-off dramas because they offer better guarantees of achieving the ratings expected (Dutheil, 1997; Chirot, 1999). Expensive contracts have been secured with stars whose programmes attract the right ratings for the design of new programmes (Mamère, 1988; Chirot, 1999).

3) *Some re-commissioning and scheduling decisions are made entirely on the basis of television ratings.* Any ITV producer whose series is high in the ratings or is winning the ratings battle in its time-slot is very likely to have the series renewed for the next season (Tunstall, 1993). At TF1, programmes that do not achieve the right ratings are rapidly re-scheduled outside primetime or cancelled (Cluzel, 1988). New programmes are increasingly commissioned for a very short time so as to test the ratings they achieve. As an illustration, France 2 initially commissioned only three runs of the programme Les Beaux Joueurs with the star presenter Christophe de Chavanne in access prime time, the re-commissioning of the programme being conditional on the achievement of a 28% rating with a higher penetration on the 15-34s target. Jean-Pierre Cottet[18] commented: *"J'attends de Christophe de Chavanne qu'il contribue à une amélioration quantitative de l'audience avec une attention particulière pour les 15-34 ans. On connait bien le mechanisme: en général la première émission est portée par l'effet de curiosité, la deuxième a tendance a baisser, la troisième se stabilise mais la quatrième doit fidéliser"* [19](Stratégies, 1997a, p. 22)

A way to assess the use of television ratings in a given industry is to examine the programming output which reflects strategic decision processes. American economists (Owen, 1975; 1978; Owen and Wildman, 1992) have shown that the logical output of the

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[18] Then France 2's network director.

[19] I expect from Christophe de Chavanne that he contribute to a quantitative improvement of the ratings with a special attention to the 15-34s. The mechanism is well known: in principle, the first programme is supported by a curiosity effect, the second tends to decrease, the third tends to be stable but the fourth must produce a loyal audience.

American industry is systematically biased against programmes achieving low ratings and a tendency towards programming schedules of similar composition. The analysis of the programming output of European broadcasters provides also essential information as to the degree of ratings-led decisions. Chaniac (1994) scrutinised the programming offer of the five analogue channels in France – TF1, France 2, France 3, La 5, M6 - from 1983 to 1993. Some of her findings are illuminating:

- The supply of certain programming genres (news, children's programmes, art and science magazines) decreased dramatically to the benefit of others (series, soap operas, talk shows, sport)
- The rerun of series and films became a generalised practice and represented an important proportion of the total airtime.
- The same programme genres were broadcast at the same time slots on the different channels (quiz shows at lunch time and access prime time; soap operas in the afternoon and access prime time; all news programmes are broadcast between 1.00 and 1.30 p.m. and 8.00 and 8.30 p.m.; documentaries after 10.00 pm etc.).
- The programming schedule of the public channel France 2 between 1983 and 1989 was more balanced in terms of genres than TF1's but it was essentially due to late evening programming. The change of orientation undertaken between 1989 and 1991 (in particular documentaries broadcast at primetime) was translated into low ratings and France 2 promptly came back to its previous policy after 1991.

These different points reveal an evolution of French programming practices towards a rating-driven model in which broadcasters attempt to deliver the TVRs expected and valued by advertisers at a minimum risk.

2.4.2. Public programming

There are two categories of public broadcasters (cf. section 2.2.1):

(a) Public broadcasters that draw their revenues from both advertising and licence fee, and thus participate at different degrees in the advertising market;

(b) Public broadcasters that are only financed by the licence fee, and thus do not participate at all in the advertising market.

The impact of television ratings on the programming practices of public broadcasters that belong to the first category is not easy to assess because situations are likely to vary greatly depending on the proportion of advertising revenues within the total revenues. The case of France Télévision tends to show that the programming decisions of public broadcasters depending for about half of their revenues on the production and selling of TVRs differ from commercial programming decisions only by the difference in the constraints imposed by their public service contract. French analysts (Paul, 1991; Brochand, 1996; Cluzel, 1993) consider that although legal constraints are a limitation to the pursuit of profitable programming activities they do not fundamentally question the commercial orientation of France Télévision, *"which regards itself not as a public service but rather as a private company with public service missions"* (Brochand, 1996, p. 119).

In contrast, the impact of television ratings on the programming practices of public broadcasters that belong to the second category should be nil because in this case revenues are independent from the selling of TVRs. Yet the use of television ratings within the BBC is a controversial matter. Proponents of privatisation have traditionally argued that BBC's programming is not markedly different from ITV's and that television ratings weigh heavily in deciding whether a programme stays on the air or is cancelled (e.g. Bracken and Fowler, 1993). Television ratings appear as important indicators even for public broadcasters that do not participate in the advertising market for two reasons: (1) revenues those broadcasters draw from the selling of programmes are linked to the rating performances of those programmes, and even more importantly (2) television ratings have long been regarded as measures of demand for television goods:

1) *The selling of programmes for public broadcasters are linked with rating performances.* The second source of financing for the BBC after the licence fee, which represents 75% of the total revenues, is the selling of programmes, 10% in 1995 (European Audio-visual Observatory, 1996). As there has been constraints on increasing the price of the licence fee, public broadcasters have been encouraged to develop this other source of revenues. However, in the market for programmes the overwhelming majority of buyers are broadcasters that are in the business of selling TVRs, either because it is their main source of revenues or because this activity supplements other sources (cf. sections 2.2.1). Unsurprisingly therefore, on the syndication[20] marketplace the size and socio-demographic composition of the ratings already achieved by the programmes on sale are important considerations for the valuation and pricing of those programmes (Fletcher, 1993). The highest prices are always achieved by programmes that have proven to be regular winners of the ratings battle. *"Un film battu à l'Audimat par son conccurrent se vendra beaucoup moins cher lorsqu'il s'agira de négocier les tarifs de rediffusion*

[20] Place where audio and video programmes are sold to media outlets and broadcasting rights are negotiated.

ultérieurs'[21] (Pascal Rogard, Chambre Syndicale des Producteurs de Films, Les Dossiers du Canard, 1994, p. 510). Even though other strategic considerations are taken into account in the buying of programmes (e.g. 'branding' concerns, cf. section 2.4.1), there is a link between rating performances and revenues from the selling of programmes.

2) *Television ratings have long been regarded as measures of demand for television goods.* As opposed to the American situation (cf. section 2.2.1), television audience measurement systems have been set up by public broadcasters in Europe, by BBC officials who wanted to develop educational programmes in the UK (cf. section 1.3.2). Indeed, the ambiguity of the situation for public broadcasters stems from the fact that the same measurement systems that yield TVRs also provide measures of performance for public broadcasting. This point needs to be developed.

The provision of pure public goods by publicly financed services inevitably faces the issue of the non-existence of correct incentives to deliver the goods required (cf. section 2.1.1). Since no decentralised pricing system can serve to determine optimally the individual levels of collective consumption, other measures of demand need to be used. Schmanske (1991) suggested that two systems could elicit truthful information and reveal the demand for pure public goods: (a) market-generated data if there are some commodities technically linked to the consumption of the public good or (b) survey data if such commodities do not exist. In the case of television goods both systems have been in use. Although the British audience research tradition differs from the American one by an interest in audience appreciation (cf. exhibit 9), the measurement of audience size along the lines pioneered in the USA was developed by the BBC in the late 1940s. As long as television goods were provisioned solely by the BBC, system (a) prevailed: the ownership of receiving sets provided market-generated data allowing the estimation of the demand for BBC goods. But the end of this monopoly in the mid-1950s caused the link between licence fee revenues and demand for BBC programmes via demand for receiving sets to loosen. The need for some other observable demand function lead system (a) to be superseded by system (b) and television audience measurement systems became prominent as demand-revealing systems through their estimation of the BBC's share of viewing. In the late 1950s, the BBC Audience Research Department was the largest of its type maintained by any broadcasting

[21] A film that has lost the ratings battle against a competitor will be sold at a much lower price when its television broadcasting rights are negotiated.

organisation, whether public or private, in the world and provided the ratings for both BBC and IBA programmes (Paulu, 1981).

The viewing share of the BBC became of political importance with the introduction of ITV (Hood, 1980). As estimates yielded by television AMS became used as measures of performance, statements of BBC officials started being ambiguous. For instance, Sir Ian Jacob was concerned that BBC's share would *"diminish beyond that level at which the Corporation could continue to claim that it was the national broadcasting authority"* (Sir Ian Jacob [1958] quoted in Briggs, 1995 p. 16), and at the same time he emphasised that success in the battle for television ratings should not be *'the sole aim of the BBC'*. The BBC historian Briggs (1995) dates the impact of television ratings on BBC's programming from 1957: *" It was in the light of statistics, however they were measured, that BBC programming policies changed through a deliberate and well-planned counter-attack on the part of the BBC"* (p. 21). He describes how new programmes especially designed to appeal to a young audience were introduced e.g. Six-Five Special, and how the BBC's senior staff at the Television Programme Board began to believe that *'serious and intelligent programmes'* should be moved to the end of the evening.

Nowadays the idea that television ratings reveal the demand for television goods is widely spread in media economics (cf. section 1.1.2). Many proponents of public service broadcasting consider that share of viewing cannot be ignored by public broadcasters on the grounds that they are indicators of the value of public programming to licence-fee payers (e.g. Foster, 1992; Cluzel, 1988). Others (Collins and Murroni, 1996) argue that the licence fee should not be regarded as a subscription but rather as a tax paid by individuals for the BBC, whether they watch it or not. Graham and Davies (1997) consider however that *"there would be real danger for the quality of UK broadcasting if the BBC were to be pushed down to, say, 25-30% of the market"* (p.61), and in the television industry the accepted measure of market share is viewing share. As section 2.3.3 showed, in the late 1990s the BBC's share of viewing - as the share of the other big broadcasters in Europe, whether public or not - has decreased regularly: from 47% in 1990 to 41% in 1998 (cf. exhibit 25A). Legitimising the licence-fee by maintaining the BBC's viewing share without pursuing ratings objective is contradictory because share and rating are inter-related measures (cf. equations 2.4 and 2.5) yielded by the same measurement system. It explains why statements from authorities and BBC officials are ambiguous and contradictory. For instance, asked about how he intended to run BBC1, Alan Yentob[22] replied that his: *"primary ambition is not to pull up BBC1's ratings*

[22] Then BBC1's director of programmes and later on BBC's director of programmes.

but to make BBC1 more interesting to the popular audience' (quoted in Spangenberg, 1997, p. 135). However, no widely accepted measure of 'popularity' other than television ratings exists in the television industry and beyond.

There is no published detailed ethnographic study focusing on the use of television ratings within the BBC that would make it possible to show how BBC public programming practices relate to commercial programming practices. But there are nonetheless indications that certain practices that are typical of commercial programming have recently been in use at the BBC. Spangenberg (1997) made a distinction between the programming policies of BBC1 and BBC2. He argued that from 1993 to 1996 BBC1's policy was concerned with ratings improvement and characterised by:

a) The maintenance and expansion of large rating programmes (new third weekly episode of the series EastEnders; five weekly episode of the imported soap Neighbours)
b) Long-term deals secured with stars whose shows prove to attract large ratings (Noel Edmonds, Dawn French and Jennifer Saunders)
c) The cancellation of programmes that failed to achieve the right ratings (Eldorado; That's Life; Trainer; A Year In Provence)

By contrast, over the same period of time BBC2's policy was characterised by programme innovation with new formulas and genres run at prime time. According to Spangenberg, this programming strategy was made possible by the fact that BBC2's share of viewing was fairly stable so that less pressure was put on the channel's controller to generate large ratings. Tunstall's study (1993) corroborates Spangenberg's analysis. Television producers saw BBC1 as broadly similar to ITV but somewhat less ratings-driven whereas they considered that '*whimsical*' decisions prevailed on BBC2. It emphasises that since there is no other agreed measure of valuation of the programmes supplied by the BBC and since it is now increasingly accepted that the BBC should be accountable to the market, then decisions on grounds other than those based on programme ratings are regarded as subjective.

2.5. Pay production mode

It has been widely believed in media economics that television audience measurement systems become obsolete in the new television environment characterised by the emergence of a pay production mode of television goods. However, it is argued in section

2.1 that the publicness features that are inherent to television programmes remain in this new production mode. In this section it is argued that the pay exclusion system is inaccurate so that the economic functions of television audience measurement systems are likely to persist in the new digital age. In support of this view the current sources of financing of the pay television industry is analysed.

2.5.1. Publicness of pay television goods

The current television industry structure is characterised by the emergence of new technologies (cf. exhibit 13) that bring a new solution to the case of market failure presented by television goods. By making some degree of exclusion feasible and allowing the extraction of payment, these technologies provide an incentive for private firms to enter a television market that resembles other markets by the observability of a demand function (cf. section 2.2.1). If new technologies are turning television markets into private goods markets, as it has been argued (Veljanovski and Bishop, 1983; Veljanovski, 1989, 1990; Sawers, 1996), it implies that television audience measurement systems will become obsolete soon. The idea that television audience measurement systems will not be necessary any more in the new broadcast industry was one of the conclusions of the Peacock Committee (1986).

First, it is argued in section 2.1.2 that the claim that new technologies have turned television goods into private goods is misleading. The initial indivisibility and increasing returns aspects of television programmes are entrenched in a pay production mode in the same way as they are entrenched in a licence fee or an advertising production mode. Furthermore, pay television programmes are also affected by Baumol's disease (cf. section 2.1.3) so that there is also a built-in incentive for those broadcasters to achieve economies of scales. Secondly, two elements, which are linked to the publicness of pay television goods, point in the direction of the persistence of television audience measurement systems in this new economy: (1) an imperfect relationship between payment and consumption of television goods and (2) an increasing pressure on programming costs.

1) *Imperfection of the relationship between payment and consumption.* The practice of selling of programmes as bundles[23] of channels dominates in the current industry (cf. section 2.2.1) and despite the developments in the USA with some suppliers, the selling of programmes by unit (i.e. Pay-Per-View) remains marginal so far (Goddard, 1997). The exclusion system is imperfect for two reasons:
   a) Consumers are not charged for each channel they want to buy but forced to buy packages of channels, whatever their valuation of each channel in the package is;
   b) Consumers are not charged for their individual consumption of programmes but for the programmes made available on a household basis.

   If it is feasible to change (a) by 'unbundling' regulations it is not possible to fundamentally change (b) because the exclusion system is imperfect. Indeed, although it is technically possible to monitor effectively and securely access and consumption of programmes on a household basis, it is not possible to monitor, hence to charge for, the consumption of programmes on an individual basis. In other words, whether the programme is being consumed at all can be known, and households that do not pay for it can be excluded, but the number of consumers i.e. individuals who consume the programme remains unknown.

   The imperfect exclusion of consumers is not specific to the television industry. In the print industry also the number of copies paid for is an inaccurate indication of the number of readers (cf. section 1.2.2), which explains why readership measurement systems are so developed in the print industry (cf. section 1.2.3 and exhibit 2C) as opposed to the cinema industry for instance where the exclusion system is accurate (cf. exhibit 2B). In 1996, the UK cable industry commissioned its first proprietary audience measurement system *"for financial negotiations between cable operators; to assist in the maximisation of subscription revenue potential; to assist in the development of the cable operator channel packages and their pricing; to assist in the development of channel programme content, scheduling and promotion strategy""*(Harrison, 1996, p. 47). In 1999, most prominent pay broadcasters are regular subscribers to BARB in the UK or Médiamat in France. Big pay broadcasters such as TPS in France make decisions on the channels composing their offer on the basis of their contributions to the subscriptions, the satisfaction of subscribers and on rating levels (Posch, 1998). The inaccuracy of the exclusion system suggests that the demand revelation function of television audience measurement

[23] Bundling practices raise a number of problems as to the level of responsiveness of suppliers to consumers' marginal valuation (Sawers, 1989). These problems are at the origin of the ITC investigation into bundling in the UK (Bateman, 1998).

systems (cf. section 2.4.2) should still be needed in the new television environment. Some economists such as Paul (1991) consider that: *"La mesure quantitative de l'audience est le seul critère sérieux d'appréciation de l'impact d'un média, que celui-ci tire ses ressources, en tout ou partie, des recettes publicitaires ou de la vente directe de son programme"*[24] (p. 49)

2) *Increasing pressure on key programming costs.* As opposed to print goods, television goods are characterised by unusually high costs of input combined with stagnant productivity growth and marginal costs close to zero (cf. sections 2.1.2 and 2.1.3). The costs of key programme genres in the new television environment have increased dramatically. Two types of channels should be distinguished: (a) premium channels and (b) basic channels.
   a) Premium channels have the largest turnover and are specialised in two programming genres[25] that are key in their schedules: movies (especially recently released movies) and sports (especially live sports). Canal+ and BSkyB, which are the biggest pay television broadcasters in Europe are good examples of the strategy of premium channels. But movies and sports are also the programming genres that produce the largest TVRs, hence are key for the revenues of broadcasters using an advertising production mode (cf. section 2.4.1). The resulting intensified competition to access such programmes has been translated into a dramatic inflation of the prices of the broadcasting rights of these programmes. Exhibit 28 shows the evolution of the prices paid for the broadcasting rights of the Premier League football matches in the UK between 1987 and 1997. These have evolved from £5 million to £670 million over ten years. Exhibit 29 shows the evolution of movies and sports broadcasting rights spending for BSkyB and Canal + from 1994 to 1998. The costs of movies and sport programming have doubled and tripled respectively in less than five years for those channels.
   b) Basic channels are those which specialise in news, music, series etc. programming genres. They rely on much lower cost programming and are much less constrained by increasing pressure on broadcasting rights. But for these channels also an offer based on unique and exclusive programmes is the best guarantee to attract

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[24] The quantitative measurement of audiences is the only serious criterion to assess a medium's impact, whether the medium draws its revenues, entirely or partly, from advertising or from the selling of programmes.

[25] Pornographic programming is also developed by certain premium channels e.g. by ABsat in France.

subscriptions. Market power in key content has implications for market power elsewhere in the broadcast chain (Cowie and Williams, 1997).

Thus for any pay channel there is pressure to try to secure the programmes that are the most valued by consumers. As the costs of key programming increase dramatically, many pay television channels are increasingly constrained to attempt to maximise their revenues in a short period of time; and for a supplier of television goods an obvious means to increase rapidly revenues at virtually no extra cost is to tie in the consumption of a second product with the consumption of the programme itself i.e. to enter the advertising market, and it is where the commodity production function of television audience measurement systems intervenes (cf. section 2.2.2). This view is supported by the analysis of the current pay television industry presented in section 2.5.2.

2.5.2. Pay television channels and the advertising market

One of the main arguments in favour of the deregulation of the television market is that new technologies would correct a major imperfection in catering for minority tastes i.e. programmes highly valued by few consumers because they make possible a pay production mode. However, the current situation suggests that pay channels do also participate or are willing to also participate in the advertising market, and hence to compete for the selling of TVRs. The commodity production function of television audience measurement systems persists in the current pay television industry.

Many pay television channels do participate in the advertising market in the late 1990s. The American situation is interesting in this respect because pay television has existed for longer than in Europe and is more prevalent. The evolution of American pay channels towards a mixed mode of production in which advertising represents a growing part was already observed by Gitlin (1982) in the 1980s and more recently by Howard and Carroll (1993). In 1997 the advertising revenues of the American cable channels increased by 22% versus 3% only for the three big networks (Mulard, 1998). In 1990s Europe on the other hand, premium channels obtain most of their revenues from subscription and little advertising is often used as a selling point in their marketing. But, as for the American channels, advertising increasingly represents profits (N.E.R.A, 1992). In the UK, even the introduction of Pay-Per-View in 1997[26] included advertising. The selling of TVRs contributed to about 5% of Canal+'s total revenues in 1995 and 11% of BSkyB's revenues in 1996 (European Audio-visual Observatory, 1997). Premium channels have progressively developed new commercial practices on the advertising market e.g. no interruption of programmes, shorter advertising screens (Collard, 1998). Given the investment both in technologies and premium programming currently required in the industry, it is not clear to which extent these channels will keep being financed by subscriptions. They may be driven to resort more massively to advertising revenues in order to secure programming and be profitable.

In contrast, advertising accounts already for a large proportion of the total revenues of many basic channels (cf. exhibit 15):

- Some of these channels are explicitly targeted to the 'niche' markets that are the most valued by advertisers with the primary objective to produce and sell TVRs e.g. ITV2 targeted to 15-34 males; Fashion TV targeted to 24-35s; The Arts Channel targeted to 35+-ABC1s (Sutherland, 1999).
- Other channels cater for broader segments of the population and the selling of TVRs largely contribute to their total revenues. Children's channels are a good example of this category of channels. In the UK, The Cartoon Network, Nickelodeon, Fox Kids and TCC are in direct competition with advertising-supported free-to-air channels on the advertising market. In 1997, the advertising share of these pay channels combined was of about half of the total £169 million spent by toy and games manufacturers on television (Media Week, 1998c). As a result of this expanded offer the market for children TVRs has become one of the most competitive in the television industry. It is argued in section 4.4.2 that this programme genre is not correctly valued by buyers.
- Finally, there is the issue of channels targeted to ethnic minorities. The ethnographic study conducted by Ismond (1997) into the management practices of two Asiatic pay channels in the UK, AsiaVision and AsiaNet, is illuminating in this respect. One of the main findings is that in both cases programming content is largely influenced by the incentive to maximise audiences in order to attract advertising and sponsorship. It is translated by an orientation of these channels towards entertainment and broad-based programming rather than controversial or political programming. The conclusion of this study is that the struggle to obtain advertising revenues discourages the fulfilment

[26] The Tyson-Bruno boxing match offered by Sky television and paid for by 660,000 households was the first PPV event in the UK and the most successful so far on either side of the Atlantic.

of these channels' narrowcasting role. The marketing strategy of the Indian channel Zee TV supports these findings. With 180,000 subscribing households in the UK, Zee TV has been developing a well-defined positioning on the advertising market: the selling point is that Zee TV generates TVRs on individuals that are present in local retail distribution, such as newsagents and pharmacies (Bentley, 1999).

Not only is advertising already a significant source of revenues for many pay television channels (cf. exhibit 15) but it can also be expected to grow. So far, the TVRs produced by pay television channels have not been very attractive to advertisers by both their 'quantity' and their 'quality' (cf. section 2.3.2). For instance, in the UK, not only are those TVRs low but also they are higher on C2DE targets (Syfret, 1997). As a result, the share of cable and satellite channels in the total television advertising expenditure is estimated to be only 7.5% (Sharp, 1997). But with the growth of multi-channel homes, the TVRs produced by pay channels can be expected to grow in size and improve in socio-demographic profile, therefore their share of the television advertising expenditure should logically grow. Carat, the leading media agency in Europe, goes further and anticipates that most pay channels will evolve towards an advertising production mode. René Saal[27] considered that *"On peut imaginer que les opérateurs ne paieront plus à terme que les chaînes dont ils auront vraiment besoin et qu'ils se contenteront d'héberger les autres, dont la seule source de financement sera alors la publicité [...] Notre pronostic est que le financement par les abonnements va sans doute décroitre fortement et être compensé par de nouvelles formes de financement: publicité, merchandising, commerce interactif sous toutes ses formes [...] L'avenir est à des chaînes plus éphémère avec des recettes publicitaires plus importantes"*[28] (quoted in Zimeray-Beyerdorf and Gratiot, 1998, p-25/26). The increasing participation of the pay television industry in the advertising market suggests that the measurement of audiences should still be necessary in the new television environment. In this respect it should be pointed out that audience measurement systems have already entered the economy of a new audio-visual medium such as the Internet (cf. exhibit 2E). It is argued in section 6.4 that basic pay channels have to bear higher risks in the advertising market and that these risks are induced by the measurement system.

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[27] Director of Carat Expert.

[28] It is possible that in the future operators pay only for the channels they really need and just keep the others, whose only source of financing would then be advertising [...] Our forecast is that the subscription source is going to fall dramatically and be compensated by new sources of financing: advertising, merchandising, interactive commerce [...] The future is to more short-lived channels with more important advertising revenues.

2.6. Conclusions

The economy of television has an unusual feature that has not been adequately defined: the commodities traded on the market are statistics (television ratings), not audiences as it is commonly assumed in media economics. Television audience measurement systems provide a solution to a severe case of market failure by transforming an unobservable and abstract phenomenon into tangible commodities that are traded like any manufactured object. Prices that are set on the television market by agencies on behalf of advertisers are attached to these statistics, which are regarded as economic facts by sellers and buyers. The value placed on those statistics by buyers depends on economic considerations of 'quantity' and 'quality', not on statistical considerations. Large statistics are the most highly valued because the 'quantity' and 'quality' of television ratings are partially correlated. But, as opposed to many other markets, those commodities are not known at the moment they are priced and need to be projected. Since the mid-1950s in Europe, television audience measurement systems have also been attributed an additional microeconomic function: the statistics they yield have also been used as measures of demand for television goods. Hence, television audience measurement systems are important even to public broadcasters that do not participate at all in the advertising market.

Over the last fifteen years or so, the setting of prices in the television market and therefore the allocation of resources within the industry have become closely dependent on television ratings. In the late 1990s, the television industry is characterised by an inflation of suppliers of television goods and by 'audience erosion' and 'audience fragmentation' phenomena that are partly associated with it. The shares of the oldest and biggest channels have been falling steadily at the benefit of smaller or more recent channels. To what extent this fragmentation process will intensify in the future is open to debate.

As more suppliers provide television ratings the competition for their production and selling has become intense. It has been increasingly translated by commercial practices characterised by schedule driven programming, leading to the selection and design of new programmes based on the ratings achieved by past programmes, and re-commissioning decisions of programmes already on air on the basis of the ratings they deliver. The consequences of such programming practices are systematic biases against programmes that achieve low ratings and a tendency towards sameness in schedules. In the current industry structure, the policy that consists of legitimising the licence fee by maintaining the share of public broadcasters without pursuing rating purposes is inherently contradictory. Share and rating are interdependent statistics yielded by the same measurement systems so that it is not possible to pursue one objective without pursuing the other one. The situation between commercial and public broadcasters has become blurred: on the one hand commercial programming is concerned with maximising the ratings delivered as well as their predictability under programming costs and regulation constraints; on the other hand, public programming increasingly is about trying to meet regulation requirements under programming costs and rating constraints.

Television audience measurement systems do not become obsolete in the current pay television age and are likely to continue to be of importance in the economy of television. The imperfection of the relationship between payment and consumption of programmes means that there is still a need for measures of demand. The increasing pressure on programming costs means that there is a built-in incentive for pay broadcasters to participate in the advertising market. In the late 1990s many pay television channels have already evolved towards a mixed production mode, drawing their revenues from both subscriptions and advertising, and the contribution of advertising revenues can be expected to rise in the near future.

3. Television audience concept and constructs

Chapter 2 deals with the dual function of audience measurement systems as commodities and measures of demand and examines the uses to which estimates of the 'television audience' are being put by the industrial players. In this chapter the meaning of the 'television audience' itself is analysed. In other words, what are television AMS actually measuring? In section 3.1 it is shown that the television audience is a concept formulated at a high level of abstraction and open to different interpretations. This must cast doubt on the content validity of these measurement systems. In section 3.2 the different constructs of the television audience that can be identified in the media and communication literature are analysed using a causal modelling approach. In section 3.3 these constructs are compared with the 'exposure' construct, which is how the television audience is defined in television AMS. In section 3.4 the properties and issues brought up by the approach to measurement used in the industry are analysed. Finally the implications of using television ratings as commodities and as measures of demand are examined in section 3.5. The industrial audience construct defined in this chapter is then taken as the true value television AMS aim to estimate and the measurement operations implemented are then assessed against this true value in chapters 4, 5 and 6.

3.1. Theoretical considerations (ii)

In this section the measurement of concept issue is introduced. It is a key issue in the social sciences because many social objects that have been formed for use in the social science discourse are not directly observable. As Bartholomew (1995) pointed out *"In the social sciences [...] the question of what to measure and how to measure it assumes a much more important role"* (p. 8). Assessing the content validity of a measurement consists in analysing the extent to which empirical indicators represent a given concept. It involves specifying the different dimensions of the concept which is claimed to be measured and determining to what extent each of them is compatible with the definition used in the measurement process.

3.1.1. Measurement of concepts

Measurement is traditionally defined as the assignment of numbers to objects or events according to rules. Two categories of social objects or events can be broadly distinguished (Turner and Martin, 1984): (1) objective and (2) subjective phenomena.

1) Objective phenomena are those that can be known by evidence and in principle directly observable. Quantities can be measured in a simple and direct manner and, although measurement operations induce measurement errors, there is little doubt about the definition of the variables that are being measured. Age, household size, region of residence, income distribution, television set ownership etc. are objective phenomena.

2) In contrast, subjective phenomena are those that are not observable and cannot be directly known. They are concepts that often refer to abilities and attitudes that individuals are supposed to have to a greater or lesser degree e.g. co-operation, domination, alienation, discrimination, poverty, power, health etc. To measure such concepts observable characteristics having predictive value need to be identified. From such variables individual measures can be constructed and it is then possible to pass from the individual level to the aggregate level. With these social objects measuring entails therefore a triple relationship between concept, observable variables and physical operations. Hence, measuring is a way of defining.

In statistical analyses focusing on the identification of measurement errors in sample surveys the issue of the distance between objective and subjective phenomena is under-developed (Hox, 1997). Such analyses are usually only concerned with inference to a finite population given the variables to which values are assigned and the measurement operations – sampling and non sampling procedures - used to assign these values. As opposed to this traditional approach, this thesis is based on a definition of measurement errors that forces consideration on the meaning of the social object being measured (cf. section 1.3.1 and figure 1). In this respect, model-based analyses provide elements to understand the measurement of concept issue from a statistical viewpoint (Bartholomew, 1987; 1995; 1998).

The concept C is not directly observable but something must be inferred about its value from other variables on which it is believed to exert some influence. These are observable indicators denoted by the vector $\gamma = (y_1, y_2, \ldots y_p)$. If there is some population of individuals in which γ may be observed then γ will have some p-variate distribution and C will likewise vary in the population. This joint distribution of γ and C can be denoted by $f(\gamma, C)$ with density $f(C/\gamma)$; $E(C/\gamma)$ is the prediction of C and var (C/γ) is the precision of C. All the information about C is contained in a linear combination of the form:

$$(2.1) \qquad \gamma = \sum_{i=1}^{p} \alpha_i y_i$$

γ is a monotonic function of $E(C/\gamma)$ so that any ranking of individuals based on γ is the same as ranking based on $E(C/\gamma)$. γ is therefore as a proxy for the unobservable C. The traditional measurement operations problem consists to obtain estimates of the unknown parameters αs.

The television audience that AMS claim to measure is a concept intrinsically blurred because it is formulated at a high level of abstraction. In the discussion that followed the introduction of television audience measurement systems to the Royal Statistical Society by Ehrenberg and Twyman (1967), Emmett raised the point that defining an audience was a subject that deserved more than an appendix. Indeed, the vector γ measured in television AMS is linked to the concept of audience C by what can be regarded as an industrial agreement $f(C,\gamma)$ based on assumptions about the influence of C on γ that defines C. In this chapter, what is effectively measured in television AMS is clarified by assessing the content validity of the systems (cf. section 2.1.2).

3.1.2. Content validity and causal modelling approach

A number of methods exist for validating a measurement[1] (Carmines and Zeller, 1979) and each one has a somewhat different approach in assessing the extent to which a system

[1] Other validation methods are criterion validity, convergent validity, discriminant validity, nomological validity etc. On validation methods see Schwager, 1988.

measures what it purports to. Bohrnstedt (1983) made an analogy between the content validity approach and the stratified sampling rationale: the content validity of a measurement is the extent to which a given measure 'samples' a universe of content about which conclusions are to be drawn. Yet this definition has been rightly criticised on the ground that content validity is a form of judgement sampling because it is assessed by expert judgement and thus cannot bring sufficient evidence of measurement adequacy (Schwager, 1988). Indeed, the content validity approach provides no precise method or procedure to determine the extent to which the content goal is achieved in practice. It is therefore inevitably an imprecise standard against which to evaluate the validity of empirical indicators. It is nonetheless difficult to avoid using the content validity approach to measurement when assessing systems whose explicit purpose is to measure the television audience because it is a concept that can be theoretically understood and operationally defined in very different ways.

The approach followed in this thesis consists in bringing out the different possible models of the television audience concept and examining how what is measured in television AMS relates to each of them. The first difficulty of this approach is to specify the full universe of content of a concept as large and complex as the television audience. The media and communication literature is used for this purpose. As mentioned in section 1.1.4, academic audience research is a heterogeneous and contradictory field of research. Some key terms are ambiguous and hide different meanings. For instance, the meaning of 'audience activity' shifts considerably between different research traditions but also between scholars within the same research tradition: *"The notion of the active viewer can no longer be sustained because it no longer has (if it ever did) a clear enough reference. Activity can, and does mean too many different things to too many people. These differences are not only obvious [...] but also complex"* (Silverstone, 1994, p. 157-158). It complicates the task of trying to make as precise as possible different theoretical constructions of the same concept. A second difficulty stems from the fact that there are no universally adopted criteria for determining the extent to which a construct 'samples' a particular dimension of the concept or is consistent with another construct.

Causal modelling provides a simple framework that can be used as a tool to clarify how the observable and non observable variables in a given model are related and therefore how different constructions of the same concept differ or relate to each other. Blalock's (1968; 1971; 1982; 1984) Auxiliary Measurement Theory emphasises that the processes of theory construction and measurement are not essentially different. The links between the theoretical and the operational definition of a given concept are established by a common agreement Some variable C cannot be measured directly but only indirectly, via a variable that causes a set of indicators Y_is to be related to C by the postulation of causal models. These causal models also include unmeasured variables U,V,W...Z that may be linked to C or may be confounding factors so that for instance in two settings *A* and *B*,

(3.2A) $Y_{iA} = f_{iA}(U,V,W,...Z, \mathcal{E}_{iA})$ and (3.2B) $Y_{iB} = f_{iB}(U,V,W,...Z, \mathcal{E}_{iB})$

f_{iA} and f_{iB} are the general functions relating the Y_is to a number of other variables and $\mathcal{E}_{iA}$ and $\mathcal{E}_{iB}$ are the stochastic measurement error terms. Y_{iA} and Y_{iB} are identical if the two functional equations are identical and if the stochastic error terms have equal variance and the same covariance matrix with all other disturbance terms and the other variables that appear in f_{iA} and f_{iB}. If Y_{iA} and Y_{iB} differ only with respect to the measurement error variances the two measures are tau equivalent. By extension, each distinct construction of the audience concept identified in the literature on media and communication, A, B,...N, will be analysed as a distinct causal model of the same concept C in the sense that a set of variables U,V,W,...Z are joined together and to C by a particular theory so that $Y_N=f_N(U,V,W,...,Z)=C$.

3.2. Audience constructs in media and communication

Although it can be broadly defined by opposition to other concepts with which it is sometimes mixed up, the television audience entails a communication process whose nature is complex. In this section three different models of media processes are distinguished: the 'mass audience', the 'selective audience' and the 'interpretative audience'.

3.2.1. Features of the television audience

When media audiences appeared is not clear-cut and depends on how one defines 'media'[2]. If 'media' are defined as 'mass media', then media audiences emerged in the eighteenth century in England, when the reading public became the population at large instead of being limited to scholars and members of the privileged class (Brown, 1963) and television audiences emerged in the late 1930s in Europe and the USA.

2. Some scholars consider that there were media long before there were mass media e.g. talking drum, town crier etc. (e.g. Schramm, 1973).

It should be established at the outset that the concept of television audience is not to be mixed up with the neighbouring concepts of crowd, group or public:

1) *Crowd.* The concept of crowd also refers to large numbers, but to still restricted numbers within observable boundaries in a particular space. Furthermore, although a crowd usually has no structure, it may possess a high degree of identity and be capable of concerted collective actions.
2) *Group.* As opposed to a television audience, a group is socially structured. Members of the group know each other, are aware of common membership, have a certain structure of relationships that is stable over time and interact to achieve some purpose.
3) *Public.* The distinction between television audience and public is subtler and indeed the two terms are often used interchangeably. Public is a loose concept that usually refers to widely dispersed multitudes that form around an issue to advance an interest or an opinion. Herbst and Beniger (1994) showed how the meaning of public has evolved from an elite composed of the most influential members of society – the French salons in the mid-eighteenth century – to competitive groups vying for members and offices in the nineteenth century and to audiences with the expansion of the mass media in the twentieth century. As societies grow larger and more complex, communication technologies and television in particular provide a modern means by which interests and opinions are shared so that 'television audience' and 'public' can overlap. Yet they are not equivalent concepts since a public is not necessarily a television audience.

The television audience differs from other forms of audience by the non-reciprocal nature of the communication process. Face-to-face communications are characterised by a quick exchange of information, the fact that each participant exerts some control on the exchange taking place and that this form of communication can be multiplied only with great effort. Performing arts also belong to this allocutory mode of communication. The participatory nature of stage audiences is observable (spontaneous vocal responses) and the speed, amount and nature of feedback from the audience to the performers are central in this cultural form of expression. Interposing a medium in the communication process introduces distance, impersonality and restricts feedback. Billings (1986) however showed that the participation of cinema audiences influenced the repertoire and the social organisation of film production. But there is a fundamental difference between cinema audiences and television audiences: cinema audiences are public gatherings of spectators whereas television audiences are delocalised in place and increasingly in time[3]. This

[3] With the use of the VCR and more recently with services such as Video-On-Demand (VOD).

delocalisation induces the suspension of an immediate relation of reciprocity, which has sometimes been considered a serious issue for democratic principles (Angus, 1994).

In the late 1990s, the concept of television audience can thus be delimited as large numbers, delocalised in place and time, not socially structured and in a relation of non-observable reciprocity with the broadcasting organisation. But this delimitation cannot be accepted as a definition because it does not describe the nature of the social phenomenon. A theory expressing the relationships between audience members and television content in the real world is needed to define what a television audience is. It should be added that with the emergence of interactive television (cf. exhibit. 14) the concept of television audience may evolve in the near future because interactive television allows some degree of feedback to take place from the audience to the broadcaster or advertiser. But so far the future of interactive television and its appropriation by audience members is uncertain (cf. section 3.4.4) so that how the television audience concept may evolve in the future is also uncertain.

3.2.2. Mass audience construct and hypodermic needle model

The oldest theoretical construction of the television audience is the 'mass audience', which is grounded on historical events and socio-economic theories. The mass audience is embodied in the urban-industrial social order appearing at the end of the nineteenth century and linked to the construction of society as a mass developed by Le Bon (1896). 'Mass society' refers to a large number of individuals perceived as being in a situation of psychological isolation with each other. By extension, 'mass audience' refers to heterogeneous, separate and anonymous individuals whose psychological nature is thought to be fairly uniform. Media processes are seen as:

(a) A collection of designed stimuli that reach every individual member of the audience.

(b) Each individual is personally and directly subjected to the same stimuli, which leads to the share of some common psychological reality in which differences between individuals become blurred.

(c) Mass media strongly impact the attitudes and behaviours of audience members.

Some specific historical events provided an empirical basis to the mass audience construct:

- Panics such as the famous 'Invasion from Mars' incident on the 30th of October 1938 in New York (Cantril, 1940) or the impact of a radio programme on radioactive decay on the 5th of February 1946 in Paris (Clausse, 1951).
- War propaganda during the two World Wars; for instance, Hitler and Goebbel's common view of radio listeners as a mass audience was translated into audio materials designed to make audience members participants in the Nazi ideological war: precepts of repetition and emotionalism, transformation of the political universe into a conflict of persons, creation of myths etc. (Gombrich, 1970).

The Marxist and Neo-Marxist movements provided theories that established the mass audience construct:

- Ellul (1962) proposed a typology of modern propaganda into eight major forms made possible by the existence of the mass media. Each form differs by the reaction intended, the persuasion technique used or the organisation it originates from[4].
- Marcuse (1964) regarded advanced industrial societies as systems in which mass media technologies serve to institute new, more effective and more pleasant forms of social control and cohesion. The entertainment output is regarded as irresistible and carrying with it prescribed attitudes and habits: *"Can one really distinguish between the mass media as instrument of information and entertainment, and as agents of manipulation and indoctrination?* (p. 8)
- Althusser (1970; 1971) added to the Marxist concept of State Apparatus (SA) the concept of Ideological State Apparatus (ISA). SAs refer to the superstructure that enables the ruling classes to ensure their domination over the working classes in the process of surplus-value extortion e.g. police, army, prisons etc. ISAs also contribute to the reproduction of the capitalist relations of production but the repression method used is more concealed and functions by ideology e.g. religion, law, education, culture. ISAs include the communication apparatus, *"by cramming every 'citizen' with daily doses of nationalism, chauvinism, liberalism, moralism etc. by means of the press, the radio and television"* (1970, p. 28; 1971, p. 146)

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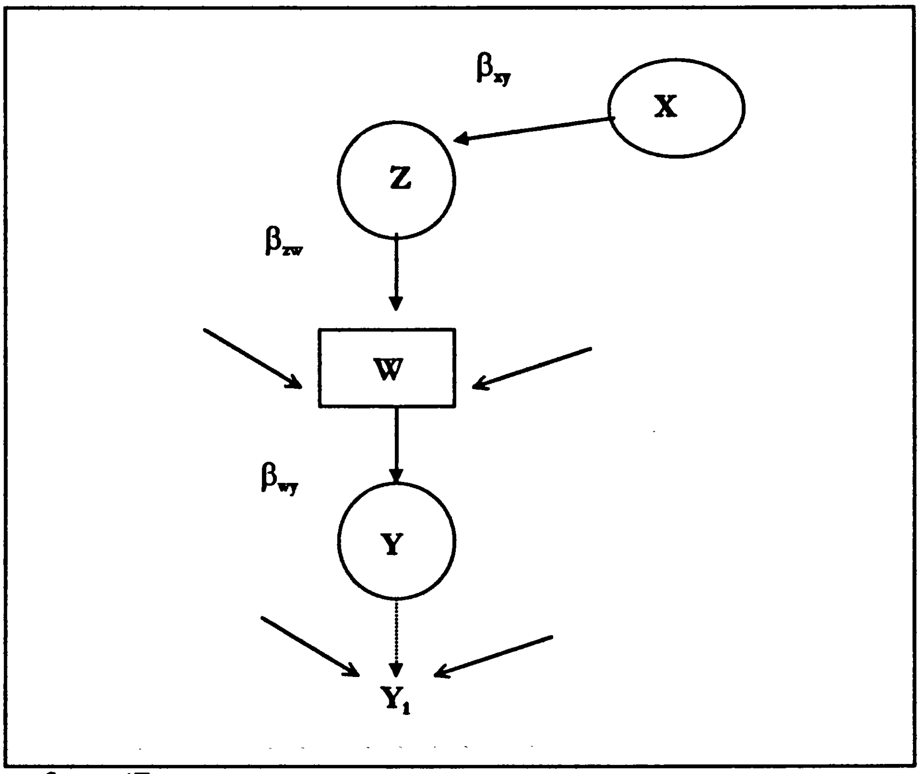
[4] Forms of propaganda put forward are 'agitation propaganda', 'integration propaganda', 'rational propaganda', 'irrational propaganda', 'horizontal propaganda' etc.

More recently, the mass audience has been the underlying construct in some influential academic works such as Gitlin (1983)'s analysis of the American networks or Noelle-Neuman (1991)'s Spiral of Silence theory. Interestingly, the emergence of new communication technologies has been leading to a modern reformulation of the mass audience. Neuman (1991) identified six main arguments representing the new media as powerful weapons against defenseless audiences: (a) the quantity argument: pervasive and irresistible flow of media messages, (b) the targeting argument: ability to adjust messages to the particular interests and background of audience members, (c) the modality argument: new formats and techniques leading to vivid and persuasive forms of communication, (d) the scope argument: increasing global communication flows and break down of traditional communities, (e) the addiction argument: dominance of commercial entertainment oriented media and (f) the subtlety argument: increased subtlety and sophistication of persuasive communication.

The mass audience construct can be summarised by a simple recursive model. Figure 3.1 gives a causal model of the mass audience construct where Z, the television message, is represented by an observable (circled in the graph) exogenous variable; W is a non-observable (squared in the graph) exogeneous variable that represents the internal state (attitudinal dimensions or level of motivational arousal) of the individual i; Y is an observable endogeneous variable that symbolises behaviours and Y_1 is a selected empirical indicator of Y. X is a background variable that modifies W through Z (it can be an event such as a war or a new technology such as digital transmission) so that Z is enhanced by X. The influence of a variable i on another variable j is represented by the coefficient β_{ij}. The model implies that Z directly affects the internal state W, which in turn affects the behaviour Y via a psychological process that is not spelled out. Feedback mechanisms are unknown and assumed to be negligible. Errors which affect the measurement (side arrows) are assumed to be random and not connected with the other variables in the system.

Figure 3.1 Causal model of the mass audience construct



Source: AE.

$$(3.3) \quad Y_1 = \beta_{WY} W + \varepsilon_1$$

$$(3.4) \quad W = \beta_{ZW} Z + \varepsilon_2$$

$$(3.5) \quad Z = \beta_{XZ} X + \varepsilon_3$$

Such a model lends itself to measurement because it implies that exogeneous variables can be controlled by the measurement design, either by selection procedure or by estimation techniques. The 'media effect' measurement tradition in social sciences is based on such an underlying model. The *Y₁s* selected in this research tradition are rarely indicators of passive behaviours - probably due to the difficulty of designing indicators of passivity – but rather indicators of violent behaviours, in particular among children in contact with violent television programmes. All in all, the results of media effect studies have been contradictory and do not lead to clear-cut conclusions. Media content has been found as reinforcing - rather than to causing - existing internal states and behaviours (Klapper, 1960). The theory that individuals are uncritical about media messages and ready to accept whatever they bring has not been supported by psychological studies (Brown, 1963). For instance, Gombrich (1970) showed how the techniques of the Hitlerian propaganda had to be revised as Germany's fortune changed in the third year of the war. It is the questioning of the theoretical relationships between the different variables specified in this model that led to the second audience construct developed in section 3.2.3.

3.2.3. Selective audience construct and uses and gratifications model

The origin of this second audience construct is to be found in the failure of empirical research to corroborate the existence of a hypodermic needle model (cf. section 3.2.1) (Katz, Blumler and Gurevitch, 1974). The uses and gratifications tradition appears more as an umbrella for different research trends than as a coherent whole (Jensen and Rosengren, 1990). However it does represent a shift from a media-centred approach of media processes, implying that the media choose their audiences, to an audience-centred approach in which audience members choose the media. It is based on the theory that:

(a) Audience members have needs that are influenced by their psychological feature, social group membership and environment;

(b) The uses audience members make of the media are motivated by their expectation as to the fulfilment of those needs;

(c) Audience members derive gratifications from media uses, which in turn feed later decisions and attitudes towards the media.

Katz and Lazarsfeld were the first scholars to understand audience members from the perspective of their interaction between media and social relations in the mid-1940s. In the Two-Step-Flow model the hypothesis that political ideas flew from the media to opinion leaders and, from them, to less active sections of the population was put forward. Audience members were thus not isolated but rather members of social groups, interacting with other individuals. Media messages were regarded as one kind of input in competition with others and media responses were seen as being influenced by social relationships. Further research conducted on opinion leaders in other arena e.g. fashion, public affairs, marketing etc. supported the hypothesis of a voluntarist orientation of media content by opinion leaders (Katz and Lazarsfeld, 1955).

In the uses and gratifications research tradition, media uses entail an individual choice between media institutions[5] and media content[6] described as *'contact'* (Weilbull, 1985). This dual choice is analysed in terms of *'media preference*[7]' and *'use profile*[8]'. Media use patterns are driven by the perception of the alternatives the most likely to meet the audience member's

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[5] Also called *'media consumption'*.
[6] Also called *'use volume'*.
[7] Media that are the receiver's main media.
[8] Combination of various types of media content.

needs. They are motivated by individual expectancy about media institutions and content (Palmgreen and Rayburn, 1985). Gratifications thus obtained appear as an outcome – cognitive, affective or behavioural – of media uses.

Social and environmental circumstances impact media uses. Social situations produce tensions and conflicts that lead to pressures, awareness problems or values that are eased, met or reinforced by media consumption (Katz, Blumler and Gurevitch, 1974). Hence, factors impacting general patterns of media uses may be individual - sex, age, intelligence, place in the life cycle, moods, levels of physical and mental fatigue etc.- or macro-social - social class, marital status, group viewing etc. (Levy and Windahl, 1985). It should be stressed that, by contrast with Katz and Lazersfeld's early approach, social interactions have not been an important consideration in the uses and gratifications research tradition. Although social variables are introduced in the model, media processes tend to be treated in isolation from other social processes[9] (cf. section 3.4.3). Another important point is that much more attention has been given to the 'uses' side of the 'uses and gratifications' label. This orientation has been justified by the idea that 'uses' cannot be truly distinguished from 'gratifications' since 'gratifications' derive from 'uses': *"Any individual researcher may in practice concentrate upon one of the two components and yet aiming, more or less explicitly, at both of them [...] Indeed, the two concepts of uses and gratifications, although analytically distinct, are empirically so intimately intertwined that even when the researcher is explicitly setting out to measure one of them, elements of the other may slip"* (Rosengren, 1974, p. 281)

Within this theoretical framework, behaviour towards television that had been regarded as evidence of the mass audience theory have been given a conflicting interpretation:

- Watching escapist material used to be seen as getting disengaged from other social roles and seeking relief from problems by reality distortion. McQuail, Blumler and Broum (1972) argued that this type of viewing is goal directed and that satisfactions motivating this behaviour may be affective, cognitive or instrumental: diversion, personal relationship, personal identity, surveillance.
- Watching a lot of television used to be compared to the function played by drugs and alcohol and interpreted as the maintenance of viewers in a relation of mindless dependency. Kubey (1986) argued that personality traits are more likely to dictate viewing habits than television viewing is to alter personality.

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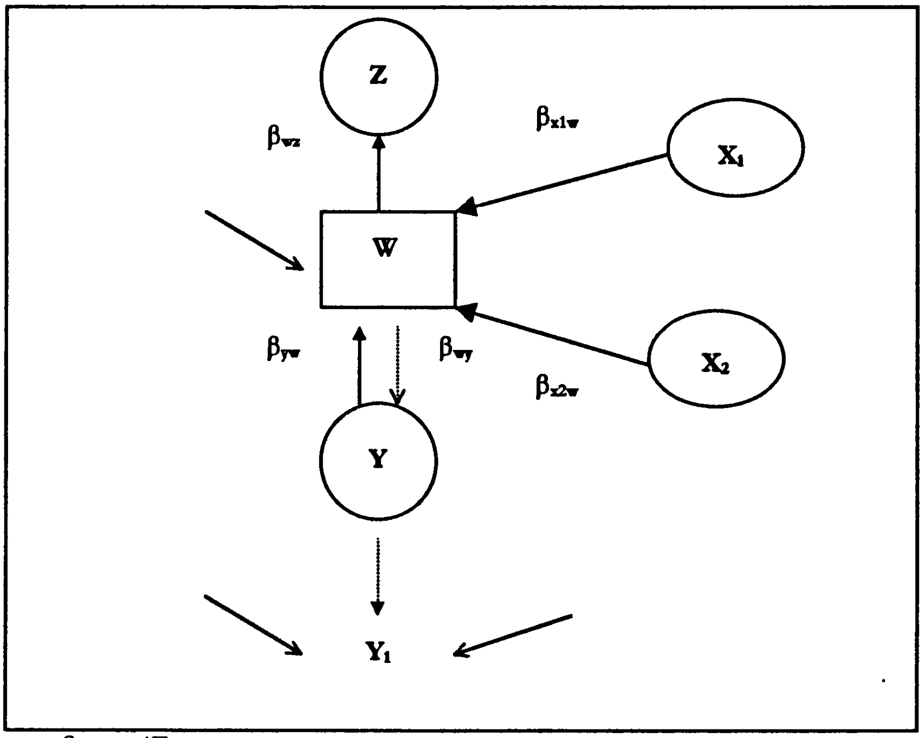
[9] What Elliot (1974) referred to as *'static-abstraction'*.

- Agenda-setting viewing used to override the theory of selective media users. McCombs and Weaver (1985) put forward that the need for social orientation is at the origin of those viewing behaviours.

The audience construct in the uses and gratifications tradition can be translated into a model in which there is one reciprocal causation relationship. Figure 3.2 gives a causal model of the selective audience construct. In this model Y is an observable endogeneous variable and represents the behaviour of individual i that chooses the television message Z. W is a non-observable exogeneous variable symbolising internal state. W impacts Y by the coefficient β_{WY}, which corresponds to identified needs, and Y influences W by the coefficient β_{YW}, which denotes the result of previous media contacts from which gratifications have or have not been derived. X_1 and X_2 are observable exogeneous variables representing properties and membership and affecting Y through W. X_1 can be individual characteristics such as sex, age, intelligence etc. and X_2 can be social characteristics such as social class, marital status etc. The model implies that Z is selected depending on the interrelation of W and Y.

Figure 3.2. Causal model of the selective audience construct



Source: AE.

Assuming that Y_1 is an indicator of media choice (media uses) and that errors in the system are random,

$$(3.6)\quad Y_1 = \beta_{wY}W + \mathcal{E}_1$$

$$(3.7)\quad W = \beta_{YW}Y + \beta_{x1w}X_1 + \beta_{X2W}X_2 + \mathcal{E}_2$$

$$(3.8)\quad Z = \beta_{WZ}W + \mathcal{E}_3$$

Operational research based on this causal model rely on quantitative measurement designs. Data collection operations are based on the assumption that individuals are fully aware of their needs and consist in asking them to give their media choices and to explain them (Zillman, 1985). Media uses patterns are then examined with the help of multivariate analysis, especially structure-imposed techniques such as cluster analysis. A convergence between the uses and gratifications model and the encoding/decoding model has been argued recently (Jensen and Rosengren, 1990). In particular, cognitive constructs have been included as a category of gratifications derived from media choice. But there are some fundamental differences between the selective audience construct and the 'interpretative audience' construct, as section 3.2.4 and figure 3.3 should make clear.

3.2.4. Interpretative audience construct and encoding-decoding model

In this more recent research tradition, the television audience is defined in terms of participation to a complex cognitive relationship:

(a) Television messages are polysemic texts that are open to a range of interpretations.

(b) Audience members bring to the communication process the cognitive maps of their own cultural, social and psychological backgrounds.

(c) As a result of the interaction between (a) and (b), different readings of the same text can be produced.

The interpretative construct builds on a variety of theoretical frameworks but especially semiology. In his *Cours de linguistique générale* first published in 1916, Saussure postulated the existence of a set of rules underlying language. '*Signifié*'[10] and '*signifiant*'[11] are components of the signand communication is the process binding them. Barthes (1967) extended

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[10] '*Signifié*' refers to the mental representation of a thing.

[11] '*Signifiant*' is the mediator of the '*signifié*' and relates to it by convention alone.

Saussure's linguistic theory to other forms of communications (photographic, iconic, musical, gestual). He suggested that iconic semiological associations are complex constructions of meanings that are matters of social ritual and convention. Media messages are approached as texts i.e. systems of significations capable of generating multiple readings and interpretations (Eco, 1984).

Drawing on this semiological framework, Hall (1980) analysed the television process as an interface between texts and readers:

- Television messages are iconic sets of signs encoded by broadcast organisations according to the codes in use in a given society to signify values, emotions and attitudes. As opposed to textual analysis, which is based on the assumption that media texts have fixed meanings[12], Hall analysed television messages as ambiguous and meanings as multi-layered.
- The meanings of media texts are constrained by the semiotic environment of audience members. Lewis (1991) linked the distribution of specific discursive sets and competence to general characteristics of audience members such as their history, neighbourhood, class and television itself. Morley (1980b) specified key sites for this distribution: family, school, gender and cultural milieu.
- Three categories of decoding positions are broadly distinguished:
  (a) A *'dominant-hegemonic position'*: texts are decoded within the limit of the dominant definitions in which the text has been connotatively encoded;
  (b) A *'negotiated position'*: adaptative elements are mixed with dominant definitions in the decoding process;
  (c) An *'oppositional position'*: decoding is made in a way that is globally contradictory to the dominant code used to encode the text.

Reception is thus defined as the moment when the signs are decoded and appropriated by audience members as a meaningful discourse. As opposed to the two previous audience constructs, reception is not necessarily bound in place and time: *"Viewers 'access' television discourses and representations both in and beyond the act of watching television ('accessing' goes after the television is switched off). And vice versa: television accesses it viewers' (culture's) discourses and identification in the act of production"* (Hartley, 1984, p. 121).

The media effect approach (cf. section 3.2.2) is not completely absent from the interpretative audience construct. Indeed, some scholars (Hall, 1994; Heck, 1980) have argued that audience members and communicators are not in the same position of power

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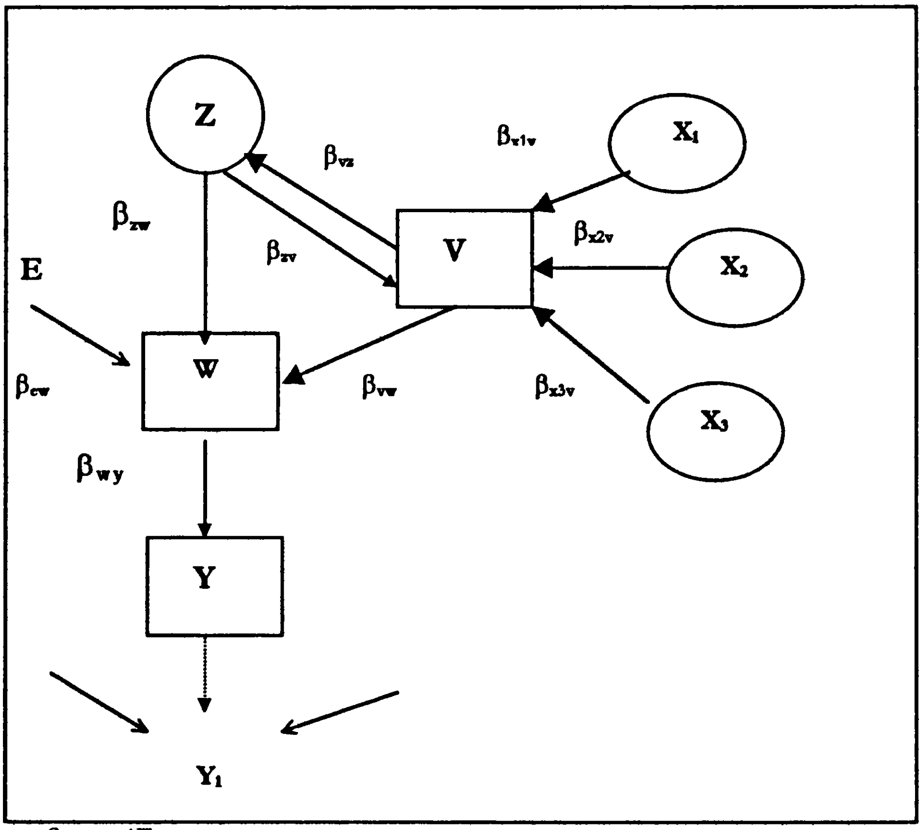
[12] For instance the textual analysis made of television news and current affairs programmes by The Glasgow University Media Group (1972; 1980).

and that dominant reading represents an attempt by the communicator to hegemonise audience members. It has also been suggested that factors which influence the type of reading made by audience members could be used in media effect research (Pingree, 1992).

The communication process on which the interpretative audience construct is based can be translated into a model in which media text and audience members are related by a third variable thus creating a partial effect. Figure 3.3 gives a causal model of the interpretative audience construct. Z is the television message understood as a combination of iconic signs. W is a non-observable exogeneous variable representing the cognitive mapping of individual *i*. Y is the endogeneous variable, which is in this model a non-observable internal state (squared in the graph) corresponding to the reading made by individual *i* and Y_1 is the empirical indicator of Y. V is a second non-observable exogeneous variable symbolising the semiotic cultural environment the individual belongs to. V impacts both Z and W: V interacts with Z (dominant codes are used to encode Z and Z creates new codes that are then fed into V) and impacts directly W. The individual's cognitive map is both a function of V and of idiosyncratic factors represented by E. V varies to a certain extent with exogeneous social variables such as education (X_1), age (X_2) and gender (X_3).

Figure 3.3. Causal model of the interpretative audience construct



Source: AE.

Assuming that errors are random in the system,

$$(3.9) \quad Y_1 = \beta_{Wy} W + \mathcal{E}_1$$

$$(3.10) \quad W = \beta_{EW} E + \beta_{ZW} Z + \beta_{VW} V + \mathcal{E}_2$$

$$(3.11) \quad Z = \beta_{Vz} V + \mathcal{E}_3$$

$$(3.12) \quad V = \beta_{Zv} Z + \beta_{X1V} X_1 + \beta_{X2V} X_2 + \beta_{X3V} X_3 + \mathcal{E}_4$$

This model of media processes is more complex than the models presented in figures 3.1 and 3.2. The introduction of an additional and interrelated variable V leads to complications through additional unknowns. Two exogeneous variables of crucial interest (W and V) are non observable and thus difficult to control by quantitative design. W is impacted to an extent which is difficult to assess by the idiosyncratic variable *E*. The endogeneous variable Y is also non observable and can be measured only by indirect means. Hence, such a model does not lend itself easily to quantitative measurement.

This explains why this research tradition has had to rely on operational methods that are strong on control but weak on representation. Bielby and Harrington (1994) investigated the existence of interpretative communities through social bonds and showed how television audience communities emerge from small groups that form around particular interests and experiences. Morley's (1980a) study of *The Nationwide audience* backed up the encoding-decoding model by identifying different categories of reading. Certain socio-demographic factors were found to impact indirectly decoding processes through the semiotic environment of audience members. In particular, groups dominated by conservatism (e.g. managers) and groups with a lower level of education (e.g. apprentices) tended to produce preferred readings whereas groups dominated by socialist discourses and more highly placed in the educational system (e.g art students) tended to produce negotiated readings. As opposed to social position, the cultural framework was found to be of direct influence on the decoding produced (e.g. black students produced oppositional readings). Livingstone's (1990) study of Dallas, Coronation Street and EastEnders audiences supported the view that viewers are both receptive to different programme structures and selective in their readings. The determinants of the range of readings were found to be not only social (age, gender) but also psychological (identification, evaluation, recognition). The possibility, and even the necessity, of using research methods strong on representation is a debated issue in this research tradition (Livingstone, 1992; Silverstone, 1994; Press, 1992; Jordin and Brunt, 1988).

3.3. Audience construct in television audience measurement systems

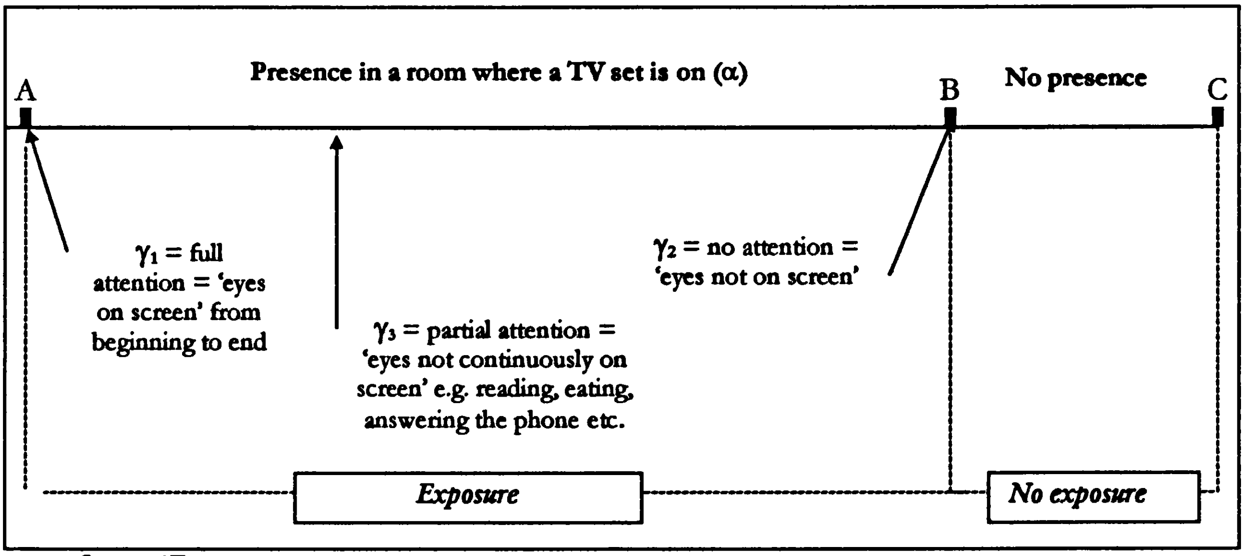
In television audience measurement systems, the audience is constructed as exposure. This section shows that the scope of the exposure construct is broad and the inclusiveness of the operational variables selected to assign values is large. The magnitude of exposure to television is assessed by a ratio scale based on a physical unit of measurement, time, so that television AMS attain a high level of measurement

3.3.1. Scope and inclusiveness

Regardless of the type of audience measurement system in use in the media industry (cf. exhibit 2), the media audience is constructed as 'exposure', which is a behavioural and operational construct. In the context of a BBC lecture, Silvey[13](1966) discussed broadcast audiences as follows: *"The people who are exposed to a broadcast are not similarly captive. Some of them, it is true, may remain in their chairs throughout, enthralled from start to finish by what they hear or see; some, though present in the room, may virtually ignore the broadcast their set is receiving, and some may be present for only part of the time. Is the listener who reads a newspaper to the accompaniment of a radio discussion part of its audience or is he not? Can a viewer who is called several times to the telephone in the course of watching a play be regarded as having seen it?"* (Silvey, 1966, p. 6). The presence of the individual in a room where a message is being broadcast is thus taken as conditional for exposure to that message to take place, hence for an audience to exist. Once this condition is met, exposure is not a unit act but refers to a series of behavioural acts that are not equivalent, which presents boundary problems. The exposure construct can be represented as behaviours that shape into one another along a continuum AB bounded at A by γ_1 and B by γ_2 Figure 3.4 shows how the television exposure construct is defined. Distinct behavioural acts should thus receive differential weights: γ_1 should receive the maximum weight whereas γ_2 should receive the minimum weight. But in between the two extremes at γ_3 it is not clear how behaviours compare and therefore how they should be weighted.

[13] Silvey was the founder of broadcast audience measurement systems in Europe (cf. exhibit 9).

Figure 3.4. Definition of the television exposure construct



Source: AE

An experiment[14] conducted by Allen (1965) provides some quantitative indication of the variety of behavioural acts to which the exposure construct refers. The total set-in-use time was found to be composed as follows:

(a) 19% was a *'no audience'* time: no one was in the normal viewing area;

(b) 35% was an *'attentive audience'* time: at least one person was looking at the TV screen;

(c) 21% was an *'inattentive audience'* time: no one was looking at the TV set;

(d) 25% was a *'busy-doing-something-else audience'* time: people were engaged in non viewing activities such as eating, drinking, reading, sleeping and playing.

The heterogeneity of behavioural acts is even bigger in the case of children, as is seen in section 4.3.4.

In his discussion of what a broadcast audience is, Silvey (1966) does not bring a clear-cut answer to this boundary problem. Indeed, it is considered that exposure can equally be assessed by different variables. It may be defined either *'conservatively'* i.e. by confining it to those who have given the message full attention throughout, or *'generously'* i.e. by including all present, or by choosing any other point as a boundary in between these two extremes. He concluded that: *"The answer to such questions depends, of course, on how you choose to define the term 'audience' [...] There is no harm and indeed there may be positive advantages in this so long as people do not expect the audience estimates produced by different systems to agree"* (Silvey, 1966, p. 7). The

[14] A sample of American families were filmed over several weeks by a hidden camera system.

definition of a television audience in the industry is therefore treated purely as an operational issue that is solved by making explicit assumptions and being aware that those assumptions impact the size of the estimates yielded by the measurement system. As a result, although all AMS in the media industry aim to measure exposure, what is reflected by each measurement system is a different range of phenomena γ that are contained in a larger set α, which is the pre-requisite for exposure to take place, so that $\gamma \subset \alpha$ (cf. figure 3.4), and γ has typically been defined in a rather loose way.

In the readership measurement systems, exposure is defined as having '*read or looked at*' (NRS) or '*lu, parcouru ou feuillete*' (APQ) (cf. exhibits 2C and 3) at least one issue of a particular publication within that publication interval. In the broadcast media, '*listening*' and '*viewing*' have long been used to define γ despite the fact that they are vague terms referring to a range of situations in which the degree of attention paid is highly variable. The inclusiveness of the variable used to assign values is thus left unspecified and open to the interpretation of respondents. In television measurement systems, the inclusiveness of the variable selected to assess exposure has evolved since the mid-1980s from a '*viewing*' to a '*presence*' definition. With the emergence of people-metering data collection techniques (cf. section 4.2.2), two major definitions of exposure have been co-existing in the European television industry (cf. exhibit 6):

- The '*viewing*' definition is still used by few though important television AMS[15] (e.g. in Germany and, outside Europe, in the USA). It is argued that *viewing* is something that only the viewer should define (Nielsen, 1999).
- Many prominent television AMS are now based on a '*presence*' definition. Respondents are asked to record when they are in a room where a television set is on and when they leave that room. It is the definition of exposure used in both BARB and Médiamat.
- Other AMS use the intermediary definition of '*in room and able to view*' (e.g. in Belgium, Switzerland, Denmark).

There has thus been a recent increase in the inclusiveness of the variable selected and reflected by television AMS so that in many cases $\gamma = \alpha$ (cf. figure 3.4). The key argument put forward by the industry is that the presence definition is simple and objective since the respondent's subjectivity does not intervene in the meaning given to exposure (e.g. Clancey, 1993). However, the greater the inclusiveness of the variable and the more it is likely that behaviours that should be sorted into different classes of equivalence are treated as interchangeable and added. The increase in inclusiveness brought up by the *presence*

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[15] It is also the definition used in proprietary audience research, which are not based on people-metering data collection techniques but on DAR or diary techniques (cf. section 4.2.1).

definition has therefore inevitably been leading to a slippage away from the attention criterion, which raises certain issues as to the commodities priced on the market. This point is developed in section 3.5.1.

3.3.2. Level of measurement and audience indicators

One of the key differences between broadcast and print media is that broadcast content occurs in real time. This time dimension has not always been integrated in the measurement of broadcast audiences. In early broadcast AMS, radio content was treated as a succession of basic components (programmes) and respondents were asked what programme(s) they listened to, if any (cf. exhibit 5). The exposure variable was thus a dichotomous discrete variable: all individual behaviours were sorted into two finite categories (exposed/not exposed) that were exhaustive and non-overlapping. It is the level of measurement attained by readership measurement systems nowadays. But in broadcasting the 'radio programmes listened to' variable was rapidly superseded by a 'listening sessions' variable. In so doing, the magnitude of the differences between individual exposures started being assessed by the use of a physical unit of measurement: time.

In most television audience measurement systems the basic time unit used to record the magnitude of exposure is the clock second and the clock minute is usually used for reporting purposes. In many cases a 'persistence threshold' is set[16] (cf. exhibit 6). Exposure is thus operationalised as a continuous variable in which 'no exposure' elements are affected a zero time unit corresponding to a true zero point. The relation between the time X and the magnitude of exposure Y is monotonic and linear with no constant, the transformation being of the form $Y = bX$ with $b \geq 0$. The meaning of the ratio property of the exposure variable is derived from the definition given to the true zero point and from the assumption that the intensity of exposure is a function of time. This use of time to assess the demand for television goods is discussed in section 3.5.2.

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[16] The persistence threshold in television AMS is the set minimum time for exposure to take place; it is of 15 seconds in BARB. There is no persistence threshold in Médiamat.

The audience indicators of reach, share and rating yielded by television AMS have first been introduced in section 1.2.4 and their basic relationships have been presented in equations 2.3, 2.4 and 2.5. How television audiences are calculated is detailed below.

For an individual i from the sample n, the exposure variable Y_{ics} is defined such as $Y_{ics} = 1$ if the individual i is in a room where a TV set is tuned on channel C at the second s and $Y_{ics} = 0$ if the individual i is not.

Let us consider a programme P of a duration S expressed in seconds broadcast on channel C. $n(P)$ is the number of individuals in the sample n exposed to P for at least one second (or for the set minimum persistence threshold if there is any).

$n(P,s)$ is the number of individuals in the sample n exposed to P at the second s,

$$(3.13) \quad n(P,\ s) = \sum_i Y_{ics}$$

and $n(P,s)/n$ is the audience of P at the second s.

$d_i(P)$ is the duration of the exposure of the individual i to P expressed in seconds,

$$(3.14) \quad d_i(P) = \sum_s Y_{ics}$$

$d_i(P)/S$ is the total time expressed in seconds to which the individual i has been exposed, and $d(P)$ is the exposure expressed in seconds of n to P,

$$(3.15) \quad d(P) = \sum_i d_i(P)$$

$A(P)$ is the average audience of P will be defined as:

$$(3.16) \quad A(P) = \frac{\sum_i \sum_s Y_{ics}}{nS}$$

$$(3.17) \quad A(P) = \frac{1}{n}\sum_i \left(\frac{1}{S}\sum_s Y_{ics} \right)$$

$$(3.18) \quad A(P) = \frac{1}{S}\sum_s \left(\frac{1}{n}\sum_i Y_{ics} \right) = \frac{1}{S}\sum_s \frac{n(P,\ s)}{n}$$

$$(3.19) \quad A(P) = \frac{1}{S}\left(\sum_i \sum_s Y_{ics} \right) = \frac{1}{S}\frac{d(P)}{n}$$

A(P) is thus the average, calculated on *S* which is the total duration of *P*, of the exposure second by second; it is the average percentage of the individuals exposed at each second to the channel *C* broadcasting the programme *P*.

R(P) is the reach of *P* and corresponds to the proportion of individuals having been exposed for at least one second to *P*, whatever the total duration of this exposure may have been,

$$(3.20) \qquad R(P) = \frac{n(P)}{n}$$

S(P) is the share of *P* and corresponds to the average audience of *P* on the reach of *P*,

$$(3.21) \qquad S(P) = \frac{A(P)}{R(P)}$$

A simple example illustrates these calculations. Let us assume that the individual *i* is alone in a room where a TV set is tuned on channel C_1 from 8.00 to 8.30 p.m. while programme P_1 is being broadcast. A second individual *j* enters the room at 8.30 p.m. and the TV set is then tuned on channel C_2 until 9.50 p.m. while programme P_2 is being broadcast. The individual *j* is then left alone in the room and the TV set is tuned back on programme P_1 until 10.00 p.m. The TV set is then switched off. At prime time i.e. between 8.00 and 10.00 p.m., television exposure was 110 minutes for *i* and 90 minutes for *j*. Hence, the total exposure to television was 200 minutes and the average exposure to television was 100 minutes. The total exposure to P_1 was 40 minutes (30 minutes for *i* and 10 minutes for *j*), the average exposure was thus 20 minutes. The prime time reach of channels C_1 and C_2 is 100%. The rating for programme P_1, $A(P_1)$ will be 20/120 = 0.166, usually expressed as 16.6% or 16.6 rating points. The total exposure to P_2 was 160 minutes (80 minutes for *i* and 80 minutes for *j*), the average exposure was thus 80 minutes so that $A(P_2)$ was 80/120 = 0.666 i.e. 66.6 rating points.

In this example the reach of P_1 and P_2 is 100% since both individuals *i* and *j* have been exposed to both P_1 and P_2 for at least one second. If it is now assumed that there is a third individual *k* in the household who was not in the TV room and therefore not exposed to P_1 or P_2, then the average exposure to prime time television would be 66.6 minutes. The average exposure to P_1 and P_2 would be 13.3 minutes and 53.3 minutes respectively. Therefore in this second example $A(P_1)$ = 0.110 or 11 rating points and $A(P_2)$ = 0.444 or 44.4 rating points.

The fact that the measurement of audiences in television – and in broadcasting in general as opposed to print – is based on time and that exposure time has not increased in the 1990s explain the 'audience fragmentation' phenomena observed in section 2.3.3. The relationships between time allocation and consumers' satisfaction are approached in section 3.5.2.

3.4. Properties and issues of the industrial audience construct

In section 3.3 the different theoretical constructs of the audience are modelled and in section 3.4 the industrial audience construct is examined. In this section it is argued that the audience construct used in the television industry is not based on a model of television processes but exclusively relies on operational considerations. Therefore, what is captured by the measurement system is flexible in its meaning. In particular, the industrial audience is compatible with two opposite audience models: the mass audience and the selective audience. A number of issues as to the predictive power of the data yielded by these measurement systems, especially in the new television age, are brought up.

3.4.1. Measurement-by-fiat

The way audiences are measured in the television industry is characteristic of a measurement-by-fiat: the construction of the audience as exposure, the variable selected to represent exposure and the scaling system used to assign values are merely dependent on assumptions and operational definitions. It has sometimes been put forward (Delruelle, 1990) that, as opposed to academic research, commercial research is based on operational concerns and on the dismissal of theoretical considerations. The analysis of television audience measurement systems supports this view. AMS are based on an approach to measurement that does not start by a general model of television processes specifying how the observable and non observable variables are related, which is used as a means to an operational end:

- The industrial construction of audiences is fundamentally atheoretical and defined from a mere operational perspective. As opposed to the audience constructs developed in the media and communication research traditions (cf. section 3.2), the exposure construct is not based on a specific interpretation of media processes. How the different variables involved in such processes (i.e. programming content, internal states of audience members, behaviours, social membership etc.) inter-relate is left unspecified and thereby cannot be formulated by a causal model of the type presented in figures 3.1, 3.2 and 3.3. The exposure construct relies entirely on the apparently self-validating view that the coming together of messages and individuals is a pre-requisite for the existence of an audience (cf. section 3.3.1). By extension, the television audience is defined as a finite universe composed of a series of undefined individual behavioural acts that take place at a certain point in space and time.

- Different variables may equally represent the exposure construct and be equally selected as the object of the measurement on the assumption that they are connected with exposure (cf. section 3.3.1). This connection is neither specified nor quantified and the exposure variables that have been selected in television AMS (i.e. '*viewing*' or '*presence*' variables) are partly dependent on the data collection technique available. It has a dual consequence:
  (a) the rule used to sort individual behaviours into two classes ('exposed'/'not exposed') is not consistent at three levels:
    - Within television AMS if they are based on a variable whose interpretation is left to respondents (i.e. '*viewing*' or '*in room and able to view*').
    - Between television AMS because the operational variable selected may well vary.
    - Over time since in many cases the '*viewing*' variable was replaced by a '*presence*' variable in the mid-1980s.

  (b) the 'exposed' class consists of behaviours that are heterogeneous but neither evaluated theoretically nor operationally distinguished by the measurement so that they are treated as equivalent and aggregated.

- Exposure to the television medium is assessed by a high level of measurement since it uses a ratio scale (cf. section 3.3.2). However, the correspondence between the properties of the scale and the phenomenon captured by the measurement is, again, not based on modelling considerations but on operational definitions. The intensity of individual exposures to the television medium is simply assumed as being a function of a physical unit of measurement (time).

The direct outcome of such a measurement-by-fiat approach is that what is measured by television AMS is ambiguous and flexible in its meaning. In other words, what the observations yielded by the measurement say about the state of television processes at the individual and at the aggregate level is not at all clear. This feature endows television audience measurement systems with properties that present an economic interest. These properties are analysed in sections 3.4.2 and 3.4.3.

3.4.2. Compatibility with the mass audience construct

A first property of the industrial audience construct is that it is compatible with the hypodermic needle model of media processes(cf. section 3.2.2 and figure 3.1):

1. The exposure construct is behaviourist and every opportunity of contact with the medium matters, however brief the intensity (time) of exposure and whatever the conditions of this exposure may have been.
2. The content of the message is ignored and treated as homogeneous and obvious.
3. How audience members relate to media content is left out of the measurement; it is the aggregation of the individual intensities of exposure, as assessed by the duration of the exposure, that matters.

These features are in line with the theory of the television audience as a large number of passive receivers linked together by a powerful medium. It should be reminded that the exposure construct was first developed in the 1930s in the USA i.e. in a context in which the hypodermic needle model of media processes was dominant in both the industrial and the academic sphere (Sproule, 1991; Jowett, 1991). The American broadcast industry used to be heavily committed to the empirical 'media effect' research tradition, with the sometimes claimed consequence of having constrained the academic research agenda (Rowland, 1983).

This compatibility is key to the commodity production function of television AMS (cf. section 2.2.2). Television ratings are valued and bought by an industry based on an underlying 'media effect' model of media processes. The expected ability of advertising messages to generate a 'sales effect' over a period of time is ultimately what advertisers are seeking so that it is crucial that the commodities put on the advertising market i.e. the statistics yielded by television AMS (cf. section 2.2.2) reflect attributes that are consistent with such an 'effect' model of television processes. The final purpose of advertising messages is to impact the attitudes and the purchase behaviour of audience members towards the product or the brand advertised. The effective impact of advertising messages on consumer behaviours can only be debatable because it is not possible to clearly demonstrate a causal association between advertisements and sales given the number of exogeneous interrelated variables that need to be controlled for. Some scholars (Barwise and Ehrenberg, 1988) believe that advertisements should rather be regarded as part of the competitive marketing activities with which firms defend their existing market shares. But even in this view, advertisements are regarded as having a strong influence on children, making people buy a new product/brand, reinforcing existing purchasing behaviours etc.

The constant reference of the advertising industry to an underlying model of media processes belonging to the hypodermic needle class is made apparent by the professional terminology: '*target*' for audience, '*impact*' for the coming together of audience members and advertising messages, '*pressure*' for the broadcasting of a campaign within a short period of time, '*advertising effectiveness*' or '*response function*' for the achievement of a set level of recall of the product/brand advertised etc.

The economic importance of the compatibility between the industrial and the mass audience constructs provides an explanation about why attempts to question the exposure construct have failed so far. Audience measurement systems have been the subject of occasional criticisms within the industry on the grounds that exposure is an overly simplistic definition of the media audience (e.g. IREP, 1986). Fouquier and Lioret (1989) emphasised the necessity of improving industrial audience research by integrating the psychological dimension of media processes. But those criticisms have had very little impact on the industrial measurement of audiences. The current use of a '*presence*' variable shows that the exposure construct has not really been questioned by the industry. Nowadays – as it has always been the case - the debate on the improvement of television AMS focuses on data collection techniques rather than on how an individual and aggregate measure of the television audience should be modelled (cf. section 4.2.1).

Interestingly, Internet AMS are also reliant on a measurement-by-fiat approach. The measurement of Internet audiences that is just emerging in the late 1990s does not depart from the industrial approach to measurement (cf. exhibit 2E). Internet AMS are also based on an exposure construct, exposure being defined as number of hits or logging time spent on web pages. Internet content is ignored and how users relate to it is left out of the measurement.

3.4.3. Compatibility with the selective audience construct

A second property of the industrial audience construct is that it is also compatible with the uses and gratifications model of media processes (cf. section 3.2.3 and figure 3.2):

1. Exposure can be regarded as a series of rational and motivated individual behaviours corresponding to different forms of media uses.
2. Media content can be regarded as a production on offer and exposure to a particular medium content reveals individual choices based on past exposure experiences.
3. The uses made of the media by audience members can be explained by social characteristics such as age, education, income etc.

Such an approach is in line with the normative economic model of consumption as revelation of preferences, which states that individuals make choices depending on the principle of optimisation and the laws of probability (Thaler, 1987). By extension, audience members are consumers who act in their own self-interest and come to the television medium with well-formed preferences based on previous choices and revealed by their television consumption. Television exposure is a proxy for television consumption and thereby provides an assessment of those individual preferences, thus of the demand for television goods.

The industrial audience construct is therefore compatible with two major audience constructs that are customarily presented as confronting each other. It is due both to the flexibility of the exposure construct and to the strong similarities between the mass and selective audience constructs. Indeed, the comparison between the two causal models given in figures 3.1 and 3.2 these two research traditions lead to shows that:

- Theoretically there is a feedback relation between *W*, internal states, and *Y*, behaviours, in the uses and gratifications model. But empirically media uses reveal needs and gratifications so that *W* is dependent on *Y*. Hence, *W* can be treated as an intervening variable between *Y* and *Z*, the television message, that may be omitted, as it is the case in the hypodermic needle model.

- As opposed to the hypodermic needle model, the social variables *Xs* (e.g. age, education, gender) affect *W* and therefore *Y* in the uses and gratifications model. In this context, Cantor and Cantor (1986, 1994) argued that there is no mass audience for commercial broadcasters because audience is segmented by age, sex, class etc. in industrial market research. Indeed, socio-demographic variables were introduced as early as 1933 in American AMS (cf. exhibit 5) and today BARB provides 51 standard variables to analyse television ratings by sub-set. But it is important to emphasise that media processes are nonetheless treated in isolation from social processes and that they do not interact. In most uses and gratifications studies social variables are only descriptive and introduced at a late stage in the analysis (Elliot, 1974). Socio-demographic variables can thus be conceptualised as different intercepts that do not modify the functional relationship between *Y* and *Z*. Similarly, socio-demographic variables are purely descriptive in television AMS. In fact, their proliferation has been motivated by the demand of advertisers to be able to closely compare television ratings with the profile of their advertising targets in order to better assess the 'quality' of the commodities put on the market (cf. section 2.3.2).

- In both the hypodermic needle and the uses and gratifications models media audiences are constructed as generalisable individual behaviours and media processes as instrumentalist. What differs is the direction of the causal relationship: in the hypodermic needle model *Y* is a function of *Z* (manipulative media) and in the uses and gratifications model *Z* is a function of *Y* (driven audiences). It is thus not surprising that the same viewing behaviours - escapism, heavy viewing, agenda-setting habits – are given opposite interpretations depending on the underlying causal relationship that is held true (cf. section 3.2.3). Because the exposure construct is not grounded on an explicit theoretical relationship, it is equally open to the interpretation of 'media effect' and 'media choice'.

Since the object of television AMS is a construct that is adaptable and can be attributed opposite meanings, the same statistics can be used to fulfil two different economic purposes – i.e. commodities and measures of demand (cf. chapter 2) - without apparent contradiction. The ambiguity of the data yielded by AMS can thus be regarded as the very source of their dual economic use.

3.4.4. Predictability issues

Prediction is ultimately the purpose of any research undertaken in the scientific field. The objective of any measurement is to illuminate the past and to help controlling and adapting to the future. In the television industry too prediction is of a crucial interest because, as opposed to other commodities, television ratings are not known at the moment when they are priced by advertising and media agencies. Planners accumulate AMS data in order to project the ratings that are likely to be delivered and to set GRP targets (cf. section 2.3.1). Commercial programming decisions and, though to a lesser degree, public programming decisions have been increasingly based on expected ratings deliveries (cf. sections 2.4.1 and 2.4.2).

The predictive power of any measurement is closely related to two aspects: (a) it is partly a matter of making theoretical forecasts based on a model that is believed to reproduce the real world and expresses how one endogeneous variable relates to n-1 exogeneous variables, and (b) partly a matter of being able to use past estimated values to predict future ones. Like any measurement-by-fiat, television audience measurement systems have weak predictability properties because they are weak on these two aspects:

- As the exposure construct is solely based on assumptions and operational definitions (cf. section 3.4.1), the relationships between the different variables intervening in the television process and the sources of variation remain unknown. How exposure relates to television content, social and psychological characteristics is not modelled and remains opaque. With such a measurement system it is very difficult to forecast data meaningfully because it is not clear whether and to what extent changes in the exogeneous variables are likely to affect the endogeneous variable captured by the measurement.

- As different variables can equally well be selected to represent exposure, what is reflected by the measurement may vary greatly over time and between AMS. Different sources of discrepancies linked to the measurement operations carried out help explaining why the audience indicators yielded by different AMS or by the same AMS over time cannot be compared (cf. chapters 4, 5 and 6). But a primary source of discrepancy is simply that television AMS do not consistently measure the same variable (cf. section 3.3.1). Moreover, since the exposure construct rests on operational definitions, no effort has been made in the industry to pin down the specific ways in which different measures are non-comparable. The inconsistency of the exposure definition has a dual consequence:

(a) It is not possible to separate discrepancies due to changes in the variable measured from those due to changes in the measurement operations used.

(b) It is not possible to separate changes in the variable measured from any real changes that are occurring in the population.

As a result, comparing trends between AMS or establishing trends from past AMS data in order to predict future ones is an exercise fraught with risk. For instance, basic questions such as do French or British people consume more or less television than fifteen years ago? And by how much? Do they consume more or less news or sports or documentaries than fifteen years ago? etc. cannot be precisely answered on the basis of AMS indicators because the exposure variable measured by the systems is not the same now as it was then (cf. section 3.3.1).

The content validity approach of the industrial audience construct leads to further question the predictive power of television AMS. Although the industrial audience construct is compatible with two major and opposite constructions of the television audience as argued in sections 3.4.2 and 3.4.3, it does not fully cover the universe of content of the television audience concept. The exposure construct is not compatible with the encoding-decoding model of media processes presented in section 3.2.4 and figure 3.3:

(a) The television audience in AMS is not understood as a cognitive experience.

(b) Television content is ignored because it is regarded as unitary and structurally determined.

(c) Social structures and cultures are given no explanatory power in the relation between audience members and television content.

Therefore, television AMS rely on a construction of the audience that is partial, and are thus not neutral, as it has been argued by McQuail (1987) and McQuail and Windhal (1993) (cf. section 1.1.4).

In the new television environment characterised by major changes in television content and the emergence of interactive television, it is possible that the variables of the audience concept that have been left out of the measurement and considered unproblematical are essential in gaining an understanding of the evolution of television consumption. The digital technology provides a wide set of feasible media forms. Only the profitable ones will be produced depending on costs on the one hand, and both adverting and consumer demand on the other. Economic analysis can help anticipating the technological forms likely to be produced but which of these forms will be the successful and persistent ones eventually cannot be simply deduced from their technical and economic characteristics. Flichy (1991) studied the development of media technologies such as telephone and radio. He showed that there is not such a thing as technological determinism. In order to anticipate how people appropriate media technologies it is also necessary to understand how the technological, cultural and social spheres interact:

- Since it is the message, not the medium, which provides value to consumers (cf. section 2.1.2), gaining some insight on how individuals relate and interact with medium content in their cultural environment can cast light on the future of digital television. Operational research based on the interpretative audience construct bring elements of this kind (cf. section 3.2.4).
- Since medium content is also a social production, how media and social processes interact and influence each other deserve attention. In this respect the uses and gratifications research tradition can bring a helpful approach provided it comes back to Katz and Lazarsfeld's original framework focusing on the social aspect of media processes (cf. section 3.2.3).
- The ethnographic approach[17] taking the family rather than the individual as the object of research also present an interest. Lull (1988; 1990) distinguished different uses of television that are explained by social factors e.g. behaviour regulation, communication facilitation, interpersonal contact opportunities and avoidance, provision of social models etc.

Because television AMS are based on an instrumentalist and isolated view of media processes, how audience members relate to the new television environment is overlooked. The exposure construct is thus not likely to help the industry anticipating the evolution of its market. Yet in the late 1990s the ability to anticipate what audience members want to do with their multi-channel interactive TV sets has become the vital issue to address for the industrial players. The television industry as a whole is in a state of total uncertainty as to this question. On the one hand, it is not clear whether the multi-channel offer will be translated into 'audience segmentation' or 'audience fragmentation' phenomena (cf. section 2.3.3). On the other hand, the evolution of interactive television (cf. exhibit 14) is an object

[17] Ethnographic research methods were first developed in the 1920s with the study of non-Western people and cultures. Since then they have been employed by sociologists and applied to other areas. Such research are essentially concerned by the internal validity of the data. On ethnographic methods applied to media audiences see Lull (1990).

of intense speculation. Some industrial players (e.g. Canal +) believe that interactive services will not be key drivers for digital television (Brown, 1999). Others believe just the opposite but pursue different strategies depending on their anticipation of what interactivity is likely to be for audience members: British Interactive Broadcasting (BIB) is proposing a range of transactional services featuring high street brands, Cable & Wireless Communications (CWC) is working on an offer composed of US software and Internet connections, Telewest is developing interactive advertising, programming and game shows etc. (Broadcast, 1998b).

The weak predictive power of television AMS leads to a paradoxical situation: despite the fact that the television audience has been extensively monitored by the industry for over fifty years, audience phenomena are not really understood and predictions made on the basis of AMS estimates are fallible.

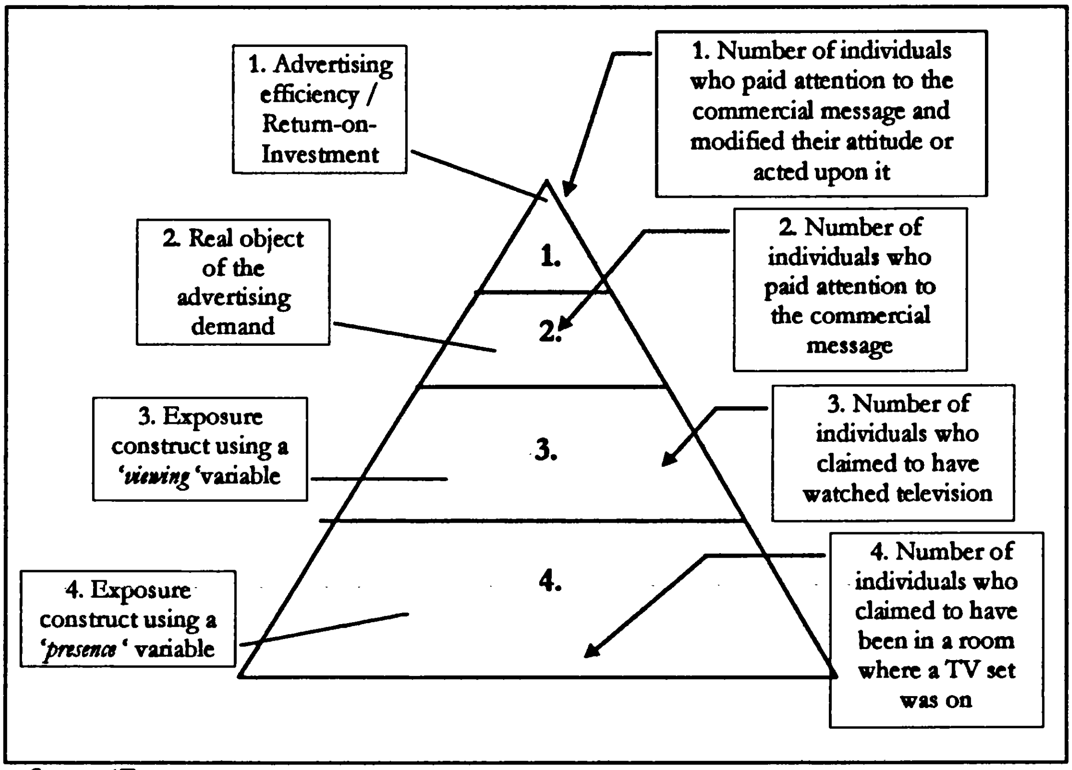
3.5. Using the exposure construct to yield commodities and demand indicators

Chapter 2 shows that television AMS have both a commodity production and a demand revelation function. The implications of using the exposure construct as the object of the measurement on the economy of television are examined in this section. It is argued in section 3.5.1 that the industrial audience construct does not reflect the real object of the advertising demand so that the TVRs market appears as a special case of lack of information. Whether television AMS provide a measure of demand for television goods via the allocation of time is a debatable matter because these systems are not consistent with the measurement and theory of demand traditionally used in the economic field. This point is argued in section 3.5.2.

3.5.1. Attention levels and commodity pricing

There is a gap between those commodities that are priced by advertising and media agencies on the one hand and the want-satisfying characteristics that are the real object of the trade on the other. In order to look at this gap, the exposure construct on the one hand and the object of the advertising demand on the other hand are compared in figure 3.5.

Figure 3.5. Exposure construct and object of the advertising demand



Source: AE

Advertisers ultimately seek a sales effect (cf. level 1 in figure 3.5) and want to buy the effective exposure of some segments of the population to their commercial messages (cf. level 2 in figure 3.5). In the advertising industry, effective exposure is defined as 'attention', which in turn is defined as *'eyes on screen'* (cf. section 3.3.1) because looking at the message is considered a pre-requisite for any potential effect to take place[18]. As opposed to what has been argued by McQuail and Windhal (1993) (cf. section 1.1.4), television AMS do not assess attention and do not get at its sources of variability. Estimating the relations between exposure and attention paid to the television screen would require:

(a) Arriving at a reasonably complete list of exposure behaviours,
(b) Deciding how to aggregate and score these behaviours with regard to levels of attention,
(c) Deciding whether other variables need to be controlled.

[18] Lull (1988) rightly pointed out that attention is a problematical concept because there is not such thing as full attention to the screen and looking at the screen does not mean that the viewer is paying full attention.

As seen in section 3.3.1, the scope and inclusiveness of the exposure construct used in television AMS are not related to the attention criterion (cf. figure 3.4). The choice of a *'presence'* variable has resulted in making the relation between exposure and attention paid to commercial messages even looser (cf. from level 3 to level 4 in figure 3.5). It is argued in section 4.3.4 that this problem is even more serious in the case of children.

The fact that media owners contribute the bulk of the funding of audience measurement systems (cf. section 1.2.4) may explain why loose definitions of exposure are generally used (cf. section 2.3.1). As Broadbent and Jacobs (1984) pointed out, it is not in the media owners' interest to finance audience research whose effect would be to decrease audience sizes. At the same time, although advertisers are sometimes critical of the definition used (e.g. Copage, 1996), they strongly object to be charged for the measurement systems that yield the commodity they buy[19]. It has been argued (Donnelly, 1996) that if the industry could agree on lower exposure numbers as the reference point for competitive pricing, the only result would be a higher CPP. As a result, a common planning practice is to downscale TVRs in order to estimate of the audience's attentiveness to commercials. For instance, prime time TVRs are multiplied by 0.8 because planners consider that large ratings mean high attention levels since they include a higher proportion of light viewers and light viewers are assumed to pay more attention to commercials than heavy viewers (Broadbent and Jacobs, 1984). Such opinion and practices are based on the underlying assumption that attentiveness is randomly distributed but, on the contrary, there are reasons to believe that variables such as media content, conditions of exposure and individual characteristics strongly impact attention levels. For instance, an extensive research conducted by Nielsen in the USA (Ephron, 1997) suggested that attention is a function of a series of variables: type of programme (drama is better than comedy), age (elders pay more attention), presence of children, coincident activity (like reading, snacking, talking), other people in the room (alone is better), whether the viewer selected the programme ('selectors' are more attentive), location of the set etc. and that many of these variables are correlated e.g. talking with programme genre, eating with daypart etc.

Since the association between presence and attention variables is not specified and quantified, television ratings merely provide an upper limit estimation of effective exposure to commercial messages, the lower limit remaining unknown. It implies that prices of TVRs are set according to both an upper limit estimation and beliefs as to the lower limit.

[19] The refusal of the British advertising industry to accept an increase in BARB registration fees in 1998 recently confirmed this position (Campaign, 1998a).

Thus, advertisers cannot rightly value the TVRs put on the market. The television market appears therefore as a special case of lack of information in which consumers (advertisers) wish to buy a certain commodity (attention) but are instead forced by sellers (broadcasters) to buy a different one (exposure). This strongly suggests that the market cannot be efficient and results in the commodities being mis-priced (under or over-valued by advertisers). The effects of those mis-allocations on the programming of broadcasters drawing revenues from the selling of TVRs is unknown. This is not to say that mis-pricing situations are unique to the television market (this point is discussed and examples of uncertainty about the commodities exchanged are given in section 7.2). However, what should be emphasised in the case of the television market is that mis-pricing situations are induced by measurement systems and that these measurement systems are set up by the domestic industries. Understanding therefore mis-pricing issues in the television market require analysing audience measurement systems.

In the current television environment, it becomes increasingly problematical for advertising and media agencies to assess attention levels and therefore to price TVRs correctly. In the 1980s the emergence of the remote control was already at the origin of a debate (Chabrol and Perin, 1992): some advertisers considered that channel zapping was associated with heavy viewers that were not attentive to programmes and commercial messages whereas others regarded the same practice as connected with viewers that were critical because attentive. In the late 1990s the belief of the advertising industry in the correlation between rating size and attention paid contributes to discriminate against small channels. However, an important commercial counter-argument developed by cable and satellite channels is that viewers are more attentive to the programmes and channels they pay for (Walker, 1996). Furthermore, most of these new channels draw on a thematic content that may strongly influence attention levels.

3.5.2. Time allocation and demand assessment

In textbooks on media economics, it is considered that in the television market consumers indicate the intensity of their preferences through the allocation of time (cf. section 1.1.3). From this perspective, television AMS are regarded as providing valid measures of demand for television goods because time allows the assessment of intensity levels (cf. section 3.3.2). It is difficult to address the thereby issue of time as a measure of demand in its theoretical principle but it can be put forward that the industrial audience construct deviates from the measurement and theory of demand traditionally used in the economic field.

From a traditional economic viewpoint, the value of a good is the most an agent is willing to give up in exchange for the good out of the total financial resources he/she controls and demand functions are derived from the measurement of utility as marginal willingness-to-pay. Measurement systems conducted for the specific purpose of revealing the demand for public goods entail the measurement of levels of willingness-to-pay. Of a particular interest, the Contingent Valuation Method (CVM) has been used since the 1960s to measure the valuation of public goods such as recreational areas, air pollution etc. The principle is to elicit people's preferences for public goods by finding out what amount they would be willing to pay for specified improvements in them (Mitchell and Carson, 1989). In the case of television goods, Ehrenberg and Mills (1990) estimated the economic value of BBC1 and BBC2 by assessing British viewers' willingness to pay for those channels. In contrast, television audience measurement systems are not based on such techniques. Whether these surveys provide an adequate assessment of the demand function for television goods leads to approach the difficult problem of time in economics.

There is no single clearly defined concept of time in economic theory[20]. Except from a few specialists concerned with the allocation of time between work and non-work activities (e.g. Becker, 1965) the problem of the allocation of time has been largely ignored in economic analyses of consumer's behaviour. Moreover the attempt to find a sound theoretical basis for the classification of leisure activities has not been successful because of the difficulty of reconciling economic and psychological factors (Owen, 1970).

Sharp (1981) proposed a general model in which the allocation of time between different activities is regarded as the fundamental choice and money becomes an additional factor. $t_1 ... t_n$ are the amounts of time allocated to the n preferred activities. Each activity has a price p_i which represents the money price of required market inputs. The consumer must therefore maximise the utility received from t_n activities subject to two constraints:

$$\sum t_i = Y \quad \text{and} \quad \sum p_i = B$$

[20] In finance, time is used as a proxy for change e.g. interest calculation related to time periods; in forecasting exercises, time is the standard independent variable in equations used to predict the level of economic activities.

Y and *B* representing the time and money budgets respectively. If U_t is the total utility received from activity *1* while activity n yields Ut_n, the utility-maximising equilibrium position can be represented by:

$$(3.22) \qquad \frac{\partial Ut_1}{P_2} = \frac{\partial Ut_2}{P_2} = \ldots\ldots = \frac{\partial Ut_n}{P_n}$$

In this model, money costs of activities are equivalent to a set of weight that can affect the exchange rate between activities.

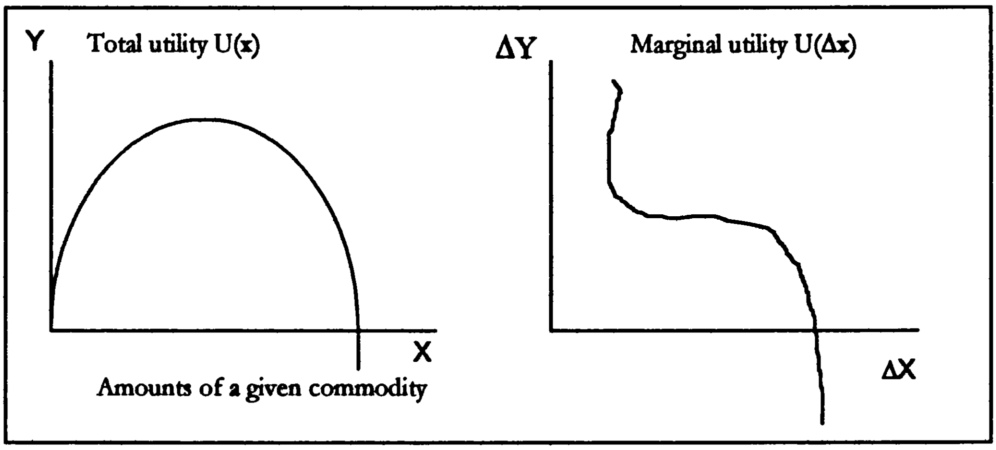
Watching television is also an activity that requires market goods inputs (material carrier, receiving set and programmes) but the money costs associated with those inputs are fixed so that the average money cost falls continuously as the time spent watching television increases (cf. section 2.1.2). Therefore, the marginal money cost per additional time period allocated tends toward zero. This specificity provides an economic explanation to the high level of viewing time within time budget allocation. Indeed, the time budget survey conducted in France by the CESP (1993) reported that time spent with the media was only second to sleeping/relaxing time and, within this media time, viewing time largely prevailed (almost four hours a day). It also provides an economic explanation to the lower income profile of heavy viewers (cf. section 2.3.2): if the money budget is limited, consumers reduce the list of available leisure activities by restricting uses of time that demand variable market good inputs for which money is not available e.g. eating out, going to the theatre, movies etc.

In television audience measurement systems, consumers can be seen as allocating their viewing time budget between alternative programming offers that have various time prices in a way that maximises their utility. From a traditional economic perspective, such a measurement provides an indication of preferences if:

1. An amount of time *X* allocated to programme *a* by consumer *i* reveals that the anticipated satisfaction *Y i* expects to receive from *X* is superior to the anticipated satisfaction from any other alternative allocation of *X*.
2. An amount of time *X* allocated to programme *a* by *i* and an amount of time *Z* allocated to programme *b* by *i* with *Z>X* reveals that the anticipated satisfaction from the allocation of *Z* is superior to the anticipated satisfaction from the allocation of *X*.
3. The principle of decreasing marginal utility on which the quantitative scaffold of modern economics has been erected (Georgescu-Roegen, 1968) states that given a sequence of equal doses of the same commodity ΔX, the marginal utility increment ΔY decreases with each successive dose and ultimately becomes negative. Figure 3.6 shows

how utility functions, from which demand functions are derived, are modelled in traditional economic theory.

Figure 3.6. Utility in traditional economic theory



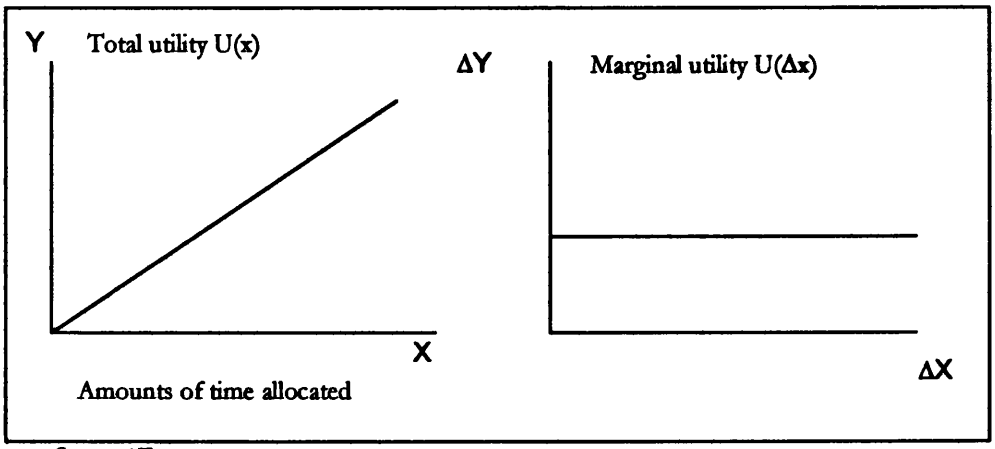
However, the way audiences are measured in television AMS is not in line with those economic principles:

- The exposure construct that is the object of the measurement does not make it necessary for a given allocation of viewing time to be intended (cf. section 3.3.1). An individual may be exposed to a particular television programme he/she has not selected so that it is not obvious whether time allocation reveals individual anticipated satisfactions and thus preferences.
- The exposure construct does not make it necessary for a given allocation of viewing time to be exclusive (cf. section 3.3.1). An individual may be exposed to a television programme and simultaneously allocates time to another activity[21] that is the main one so that it is not obvious whether time allocation reveals preferences within a finite time budget.
- The magnitude of the exposure as assessed in television AMS is not consistent with the decreasing marginal utility principle (cf. section 3.3.2). Figure 3.7 shows how the utility function via the allocation of viewing time is modelled in television audience measurement systems. Each additional unit of time allocated is assumed to increase utility by a constant magnitude. This utility function is very different from the one in force in economic theory and illustrated in figure 3.6. Although the economic principle of diminishing returns may not be relevant in all cases, there is no evidence to suggest

[21] The CESP time budget survey (1992) reported that as much as 38% of viewing time is a secondary activity; BBC studies reported that 25% of viewing time is a secondary activity (Kayes, 1992).

that the marginal utility of watching a programme is an exception to the rule and does not diminish as the amount of time allocated to the programme increases. It may also

Figure 3.7. Utility in television audience measurement systems



Source:AE.

be that the utility of allocating time to a programme is discontinuous so that for instance, an individual may obtain a very high utility from 10 minutes spent watching a programme while the utility of an eleventh minute might be zero or even negative. There is also no evidence to suggest that the marginal utility derived from allocating time to different programmes is comparable. It may well be that the rate at which time allocation to a programme is conferring satisfaction depends on programme content, genre, broadcasting time etc.

Television AMS therefore deviate from the traditional measurement and theory of demand. Therefore the view that television AMS provide acceptable measures of the demand for television goods and can be used as such by broadcasting organisations (cf. section 2.4.2) is questionable.

3.6. Conclusions

The approach to measurement used in television AMS is characteristic of a measurement-by-fiat. How the television audience is defined in the measurement is not based on a formulated model of television processes but relies entirely on assumptions and operational definitions. The scope of the exposure construct used to define the television audience is broad. Different variables, corresponding to various degrees of inclusiveness can be equally well selected to represent exposure in the measurement. The variable singled out is weighted by a physical unit of measurement, time, on the hypothesis that intensity of exposure is a function of time.

Accordingly, television audience measurement systems present the shortcomings of any measurement-by-fiat: what is captured by the measurement is flexible in its meaning and the data yielded have a weak predictive power. Interestingly, the fact that the aspect of television processes which is revealed in AMS data remains unclear makes possible the dual use of these data in the industry. The industrial audience construct is compatible with two existing models of television processes that are customarily presented as opposing each other: the mass audience and the selective audience. This property makes it possible for television ratings to be accepted in the industry as both commodities and measures of demand. However, this approach to measurement and the exclusion of variables that may well be of a key explicative power in the new television environment do not provide the industry with a tool allowing some insight into television consumption in the coming digital age. Research into how individuals interact with medium content in their cultural and social environment are likely to provide crucial information on what audience members will do with their multi-channel interactive TV sets.

The rationale underlying television audience measurement systems leads to question the dual use the data are currently being put in the industry. What advertisers really want to buy (attention) differs strongly from the commodity supplied by broadcasters and traded on the market (exposure). It is thereby likely that mis-pricing situations occur frequently, which suggests that the market for TVRs cannot be an efficient one from an economic viewpoint. TVRs are best regarded as conventions for trading purposes and in the late 1990s television environment this brings up new economic issues that are analysed in chapters 4, 5 and 6.

The view that television audience measurement systems assess the intensity of individual preferences (and thus the demand function) for television goods through the allocation of time within a finite time budget allocation is questionable. Indeed, the measurement is dependent on hypotheses that are not in conformity with the theory and measurement of demand used in economics.

4. Non sampling systematic errors due to observation

In chapter 3 the audience construct which is the object of the measurement design in television AMS is defined and analysed. The next step is thus to consider the measurement design. Measurement errors in sample surveys result from random (variable errors) and non random (systematic errors) sources that are inherent to the measurement design. The sources of errors associated with both the sampling and non sampling operations implemented in television AMS are identified in this chapter and in chapters 5 and 6. As the techniques used to obtain information on exposure to the media have a decisive influence on the sampling designs of audience measurement systems in general, the measurement operations to consider first are the data collection techniques in use. These techniques and their implications are examined in this chapter.

In section 4.1 the general theoretical framework within which errors in television audience measurement systems are to be assessed is presented. This framework is simple but it is fundamental to assess measurement designs and the data they yield. In section 4.2 the data collection techniques currently employed in audience measurement systems are overviewed and special attention is given to the 'people-metering' technique, which is specific to audience measurement systems in television. In section 4.3 the claim made by the industry that exposure data collected by the people-metering technique are highly valid is examined. In section 4.4 the implications of using people-meters to measure audiences on the economy of television are analysed. Finally, a new generation of data collection techniques (the so-called 'passive metering' techniques) is currently undergoing experimental testing. These new techniques are introduced and their likely outcome is discussed in section 4.5.

It is argued in this chapter that the validity of people-metering techniques is reliant on the validity of the sampling designs they impose. Sampling validity issues in television AMS are discussed in chapter 5.

4.1. Theoretical considerations (iii)

The Mean Square Error (MSE) model provides the basic and fundamental theoretical framework within which the measurement operations used in television AMS are analysed. It is presented in this section. This framework is particularly relevant when dealing with biased estimators and this thesis attempts to show in this chapter and in the following one the importance of non random sources of error in television audience measurement systems. Specific issues with regard to the assessment of systematic errors in sample surveys are emphasised.

4.1.1. Mean Square Error (MSE) framework

The Mean Square Error model integrates measures for which precision is rarely feasible. However, it does provide a simple and complete framework for the identification of potential sources of errors in sample surveys. Sample surveys involve the study of a part of a population that is carried out in order to estimate parameters of the total population via the sample observations. Statistical accuracy designates the nearness of an estimate to the true value, which is the aim of the measurement and refers to two desirable properties of any measurement design:

(a) zero or small systematic errors (validity)

(b) small variable errors (reliability).

Estimates can thus be regarded as accurate if the measurement design implemented achieve a high degree of validity and reliability, or conversely low errors or approximations.

The MSE model in survey sampling theory depends on inferences based on normality through the central limit theorem for large samples. The squared total measurement error is defined as:

$$(4.1) \quad E\left[\bar{y}-\bar{Y}_{TRUE}\right]^2 = E\left[\bar{y}-E(\bar{y})\right]^2 + \left[E(\bar{y})-\bar{Y}_{TRUE}\right]^2$$

The expectation E $(\bar{y})$ is taken over the distribution of all possible values of the estimator $\bar{y}$. The first term denotes the mean squared deviation around the average value E$(\bar{y})$ of the sampling design and corresponds to variable errors (VE). The second term denotes the squared deviation of E$(\bar{y})$ from the true value and corresponds to systematic errors or bias (BS) so that:

$$(4.2) \quad \text{Total Error} = \sqrt{VE^2 + BS^2}$$

In design-based studies it is customarily assumed that variable errors from sampling operations have a greater effect on the size of the total measurement error than systematic errors from non sampling operations. The reasons for this assumption are examined in section 4.1.2.

Kish's (1965) extension of the MSE model analyses the departure of the specific sample value $\bar{y}$ from the true population value Y_{TRUE} free of errors into four components:

$$(4.3) \qquad \bar{y} - \bar{Y}_{TRUE} = \left[\bar{y} - E(\bar{y})\right] + \left[E(\bar{y}) - \bar{Y}_P\right] + \left[\bar{Y}_p - \bar{Y}\right] + \left[\bar{Y} - \bar{Y}_{TRUE}\right]$$

where $E(\bar{y})$ denotes the average value of the sampling distribution given the same measurement design. $\bar{Y}_p$ denotes the population value that would be obtained if all the elements in the population were included in the sample, subject to the same essential survey conditions, and serves to separate errors due strictly to the sampling process from other errors inherent to the measurement design, and $\bar{Y}$ is the estimand i.e. the population value free of biases of statistical estimation.

Sampling errors are thus represented by:

$$(4.4) \qquad \left[\bar{y} - \bar{Y}_P\right] = \left[\bar{y} - E(\bar{y})\right] + \left[E(\bar{y}) - \bar{Y}_P\right]$$

The first term includes variable errors due to sampling operations and covers the sampling error of the distribution (cf. section 6.1). The second term includes systematic errors due to sampling operations or statistical biases. Those biases arise when the expectation of the sampling estimate does not equal the population parameter being estimated. Depending on their sources, sampling biases may reduce with larger sample sizes. In this first case, the error resulting from the estimate renders it asymptotically unbiased. But they may not decrease to zero as sample size increases and in this second case the estimator is asymptotically biased.

Non sampling errors are represented by:

$$(4.5) \qquad \left[\bar{Y}_P - \bar{Y}_{TRUE}\right] = \left[\bar{Y}_P - \bar{Y}\right] + \left[\bar{Y} - \bar{Y}_{TRUE}\right]$$

The first term denotes the constant estimation biases affecting the sample value based on a complete coverage. The second term denotes the non sampling systematic errors or non statistical biases. A distinction is usually made between errors of observation and errors of non-observation. Observation errors are fundamental to the whole issue of scientific measurement and affect complete population as well as sample surveys. In contrast, non observation errors arise from failure to obtain data from part of the population (cf. section 5.1).

An unbiased sample design, including both selection and estimation, can thus be defined as:

$$(4.6) \qquad \left[E(\bar{y}) - \bar{Y}_P\right] = 0$$

And an unbiased measurement design can be defined as:

$$(4.7) \qquad \left[E(\bar{y}) - \bar{Y}_{TRUE}\right] = 0$$

In audience measurement systems $\bar{Y}_{TRUE}$ corresponds to the exposure of the population elements to the media (cf. section 3.3). In both BARB and Médiamat $\bar{Y}_{TRUE}$ is defined as how many of the population elements are in a room where a television set showing a particular channel is on at time t; $\bar{y}$ is the expected estimate of $\bar{Y}_{TRUE}$ yielded by the measurement design implemented in these sample surveys. Issues brought up by the estimation of $[\bar{Y}_p - \bar{Y}]$ are analysed in chapter 3. Chapters 4, 5 and 6 focus on the identification of the sources of (1) non sampling systematic errors due to both observation and non observation $[\bar{Y} - \bar{Y}_{TRUE}]$, (2) sampling systematic errors due to selection $[E(\bar{y}) - \bar{Y}_P]$ and (3) sampling variable errors $[\bar{y} - E(\bar{y})]$ in television audience measurement systems. As is shown in chapter 5, given the sampling designs implemented in BARB and Médiamat, it is not possible to distinguish between statistical biases and non statistical biases associated with non observation so that these two types of errors are jointly analysed.

As it is standard in most design-based analyses, non sampling variable errors are assumed to be randomly distributed with a zero mean. Non sampling variable errors are essentially due to coding and between interviewer variability. Although the setting of television panel targets involves interviewing via the 'establishment survey' (cf. section 5.2.1), exposure data are collected without the use of any questionnaire so that it can be assumed that non sampling variable errors have a negligible biasing effect on the total errors.

4.1.2. Systematic errors assessment issues

Codes of good survey presentation practices require that the *"non sampling errors that are known to be important"* (Gonzalez et al, 1975) be clearly indicated. Yet survey presentation practices commonly state standard errors excluding biases, thereby assuming that biases are smaller than variable sampling errors. Such practices are justified on the grounds that the assessment of systematic errors is complex and frequently not possible. Yet, it is essential to investigate this type of error in television audience measurement systems.

Systematic errors or biases are a set of constants of a non random nature. The total systematic error is the algebraic sum of all biases ΣB_r (cf. section 4.1.1):

$$(4.8) \qquad \sum B_r = E(\bar{y}) - \bar{Y}_{TRUE}$$

Such constants may distort the value of the estimator positively or negatively so that they partially cancel each other out. Deming (1968) considered that a sample design is an attempt to strike a balance between three different kinds of uncertainty: *'uncertainty of type I'* comprises built-in deficiencies and structural limitations; *'uncertainty of type II'* includes the existence of error of a non cancelling nature; *'uncertainty of type III'* is caused by random variation. In this view, there is no point in reducing one type of uncertainty far below the level of the two others. Besides, the relative size of the bias, expressed as the systematic error value on the variable error value, is not the same for various domain statistics. As the value of the variable error increases, the value of the bias ratio decreases so that uncertainty of type III tends to dominate, and vice versa. The difficulty inherent to the calculation of systematic errors is dual (Mosteller, 1967):

(1) the variety of the sources of errors is practically unlimited;
(2) their quantification depends on the existence of information external to the survey proper. In most cases the lack of external sources causes biases to be suspected but notions about their magnitude remain inevitably imprecise.

As is the case for most sample surveys it is not possible to calculate systematic errors in television audience measurement systems because there is not one external source that can be accepted as the standard against which the data can be compared. Therefore, the design-based analysis followed in this thesis consists in identifying important sources of systematic errors in BARB and Médiamat given the measurement operations carried out in these two sample surveys and in assessing (as opposed to calculating) how these sources of error directly constrain the total measurement error and, indirectly, the economic system. The professional documentation is used to understand how television AMS are designed and how BARB and Médiamat measurement operations are implemented in practice (cf. section 1.3.3). Survey sampling theory provides the criteria against which the sources of systematic errors in these sample surveys are evaluated. Information from a variety of sources such as results of other audience measurement systems, experiments conducted in the field of survey research, independent analyses of viewing data, results of academic and professional studies, industry trends etc. is also drawn upon.

This thesis attempts to show that, compared with other audience measurement systems that can be found in the media industry, television AMS data raise serious uncertainty of type II issues. Chapter 4 shows that the origin of this weakness has to be located in the data collection technique used, which acts as a powerful constraint on the sampling design that can be implemented to the extent that it leads to the use of samples that are statistically not valid. This point is argued in chapter 5, which also shows that in the 1990's television environment sources of systematic errors have multiplied. At the same time, chapter 6 shows that in the late 1990s the data have become dramatically subject to uncertainty of type III. Therefore, it should be stressed that the relative size of bias in television AMS is strongly dependent on the domain statistics considered.

4.2. Techniques of data collection over time

Three data collection techniques are used to measure media audiences: 'Day-After-Recall' (DAR), 'diary' and 'people-metering' techniques. Each of these techniques is used jointly with a category of longitudinal sampling designs so that three basic types of measurement designs can be distinguished in audience measurement systems. In this section it is argued that the choice of the data collection technique is a crucial one because it has deciding implications, both from a statistical and economic viewpoint. Television audience measurement systems are the only AMS (and more generally the only sample surveys) that are based on a people-metering data collection technique. It is established in this section that the introduction of this technique in the mid-1980s was chiefly motivated by economic rather than by statistical concerns.

4.2.1. Types of measurement design in audience measurement systems

On the one hand, three basic categories of data collection technique over time can be selected in audience measurement systems:

1) Recall techniques, and in particular Day-After-Recall (DAR) techniques, which consists in getting respondents to reconstruct during the interview their contacts with the media over a previous and usually short period of time, typically the day. The principle underlying recall techniques and their current uses in audience measurement systems are presented in exhibit 30.
2) Diary techniques, which consist in formated booklets[1] in which respondents are asked to record their media sessions as they occur over a set period of time, usually over one or a couple of weeks. Diaries are then collected and data are entered. The various types of diary techniques in use are presented in exhibit 31.
3) People-metering techniques, which comprise a set meter, a remote control handset and a central storage unit. The set meter monitors whether the TV set is on and which channel is being displayed. Respondents are asked to log in the remote control handset according to the instructions they have been given. People-metering data collection techniques are presented in exhibits 32A and 32B.

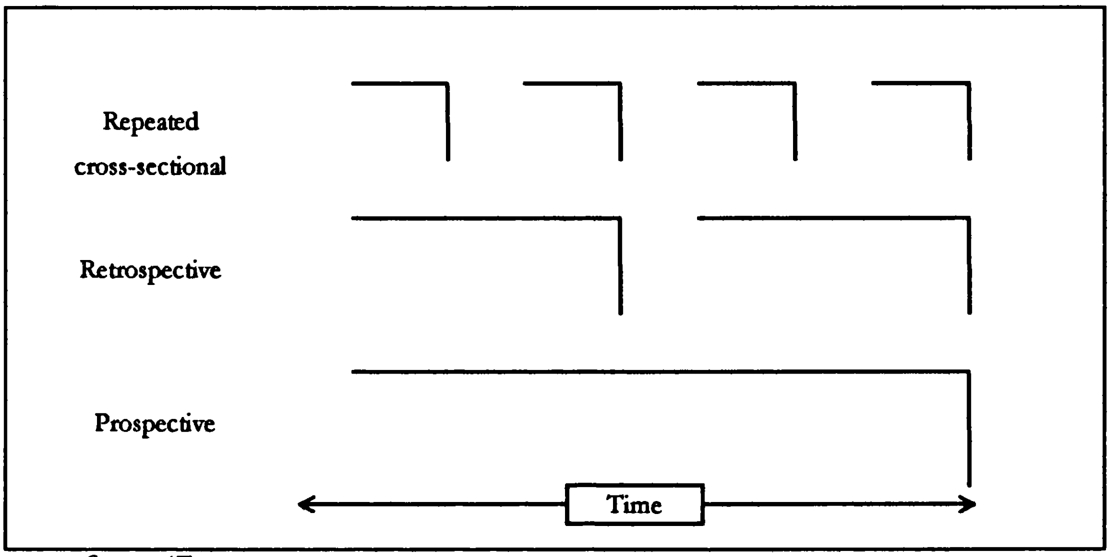
On the other hand, three basic categories of longitudinal sampling designs can be distinguished in audience measurement systems - Menard's (1991) terminology is used: 'repeated cross sectional', 'retrospective' and 'prospective designs'. Figure 4.1 gives a graphical representation of how frequently new samples are drawn over the same period of time for each of the designs used in AMS.

1) In repeated cross-sectional designs, independent samples are drawn at each measurement period. Although each sample contains an entirely different set of cases for each period, the fundamental principle is that cases are comparable from one period to the next.
2) In retrospective designs, one set of cases is drawn for different measurement periods and data are collected on this sample at a single period but for the several previous periods of time.
3) In prospective designs, data are collected for all the measurement periods on a set of cases whose overwhelming majority is meant to be identical (total prospective designs)

[1] There are many different diary designs in use in the media industry; on audience diary design see Purdye and Zdanowicz (1998) and Meier and Stockley (1997).

or whose small part has been dropped and replaced (revolving prospective designs) at different points in time.

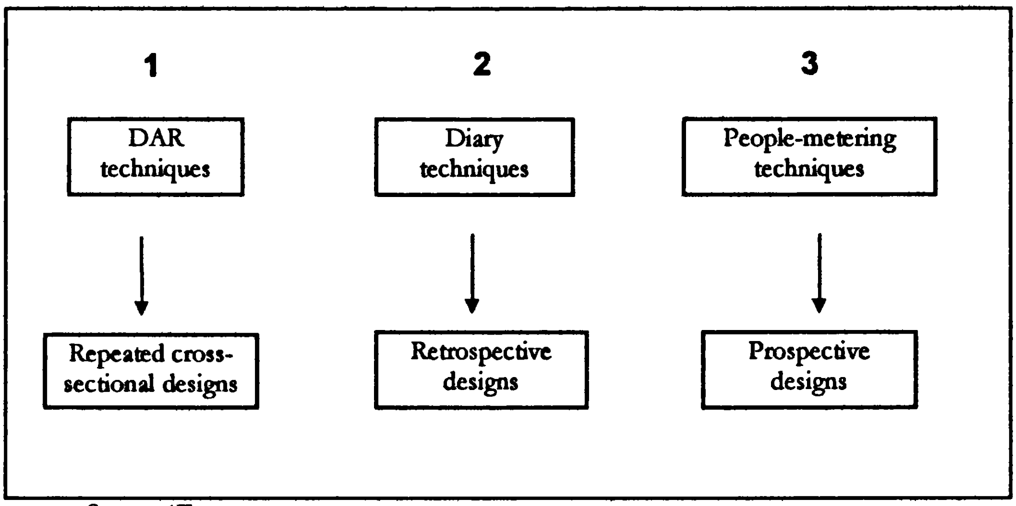
Figure 4.1. Types of longitudinal sampling design in audience measurement systems



Source: AE.

It is important to establish that each of the three categories of data collection techniques is used in association with one of the three categories of longitudinal sampling designs. Figure 4.2 illustrates this connection between data collection techniques and sampling designs.

Figure 4.2. Types of measurement design in audience measurement systems



Source: AE.

DAR techniques are associated with repeated cross-sectional designs[2] in order to avoid obvious conditioning effects, diary techniques with retrospective designs[3] because they

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[2] For instance the NRS in the UK, the 75 000 survey in France (cf. exhibit 3).
[3] For instance RAJAR in the UK (cf. exhibit 3).

require respondents to fulfil a demanding task, and people-metering techniques with prospective designs because of the costs and time involved in installing the equipment and instructing respondents. The size of the total measurement error of AMS data can be expected to vary greatly between these three basic types of measurement designs (cf. figure 4.2) and, within each type, it also varies depending on sampling sizes and scheme, panel management, administration methods and so on. However, similar sources of error tend to be identified, as is seen for BARB and Médiamat in sections 4.3 and 5.3.

Readership measurement systems are based on measurement designs of type 1 (cf. exhibit 2C) whereas in the radio industry audience measurement systems rely on measurement designs of type either 1 or 2, depending on the national research traditions (cf. section 1.2.4 and exhibit 2D). Since the mid-1980s, all audience measurement systems in the television industry in Europe have evolved from measurement designs of type 1 or 2 to measurement designs of type 3 (cf. section 1.2.4 and exhibit 6). In the UK measurement designs of type 2 were the first ones used in the 1940s. They were superseded by measurement designs of type 1 in the early 1950s. In 1956 the British television industry was the first in Europe to introduce the set metering technology and to use it in conjunction with diary techniques in the 1960s and 1970s (cf. exhibit 9). People-metering techniques were pioneered in the UK by AGB in 1984. In France, measurement designs of type 1 in use in the 1960s were replaced by measurement designs of type 2 in the 1970s, which in turn were replaced by measurement designs of type 3 in 1988 (cf. exhibit 10). The reasons for this evolution towards a European standard design for the measurement of television audiences have to be sought at the economic level and are given in section 4.2.2.

4.2.2. People-metering techniques

The data collection technique used to measure audiences has always been of primary importance to the industry because it determines the uses that can be made of the data. As opposed to sampling operations (cf. sections 5.2.2 and 6.2.1) data collection technique is the aspect of audience measurement systems that has attracted most attention from the industry since the outset. What Buzzard (1990) called *"the great ratings war"* refers to a competition involving the American pioneers of broadcast audience measurement systems (cf. exhibit 5). This competition took place on the field of data collection techniques: Crossley's DAR technique competed against Hooper's coincidental technique in the 1930s, which in turn competed against Seiler's diary technique and Nielsen's metering technique in the 1940s.

Nowadays, the volume of information from a professional origin that focuses on data collection techniques in AMS is much more important than that dealing with any other aspect of these sample surveys, thereby showing that this point has remained a priority for the industry over time. It should be pointed out that, just as the exposure construct has not been seriously questioned over time by the media industry (cf. section 3.4.2), modern data collection techniques have not changed in their basic principles since the first American AMS[4]. From this perspective, the sophistication of the data collection techniques used in current audience measurement systems can largely be regarded as refinements of techniques set up fifty years ago in the USA. The only new development in this field is the people-metering technique used in television audience measurement systems. The way audience data are collected in BARB and Médiamat is detailed in exhibit 33.

The reasons for the prominence of data collection techniques in AMS in the industry are to be found in their economic uses. Indeed, each technique yields data that have different strengths and weaknesses with regard to how they can be traded on the marketplace. Such features stem from both the data collection technique itself and from the longitudinal sampling design that has to be used jointly with it. The economic strengths and weaknesses of audience data yielded by AMS based on measurement designs of type 1 and 2 (cf. figure 4.2) are listed in exhibits 30 and 31. The people-metering technique was greeted by the industry as *"un progrès significatif*[5] and *"une étape positive and décisive*[6]*"* (François, 1990). Indeed, the superiority of the data yielded by measurement designs based on people-meters for the industrial players is triple-sided:

1) *Availability of television ratings overnight.* Television ratings can be known overnight in almost all the European television industries (cf. exhibit 6). They are transmitted daily on-line to all the industrial players that fund the measurement system or buy the data. The journalistic investigation made by Dangy (1996) for the French magazine Télé 7 Jours gives a good idea of the operational importance of this feature: *"5h00 Paris s'éveille*

[4] Even though the coincidental technique has been left aside because of its prohibitive cost (Twyman, 1994), it remains nowadays the main data quality check method used in television audience measurement systems (cf. section 4.3.2).

[5] A significant progress.

[6] A positive and decisive step.

et depuis deux heures déjà les audimètres recrachent par le câble téléphonique les 160 000 informations enregistrées la veille pendant la journée. [...] A l'autre bout de la ligne, à Levallois les ordinateurs de médiamétrie, la société spécialisée dans la mesure d'audience tournent a plein régime Jusqu'à 7h30 les informations sont collectées. Elles seront vérifiées dans la journée. Pour l'heure, les chiffres se transforment en tableaux, graphiques et courbes couleurs. A 8h59, tout est fin prêt. Médiamétrie a fait le plus gros de son travail losrque les patrons de chaînes arrivent. 9h00. Etienne Mougeotte à TF1, Jean-Pierre Elkabach à France Télévision, Jean Drucker à M6 montent dans leurs bureaux. Enfin ils vont savoir ce que les Francais ont regardé la veille. Encore tout chauds les résulats d'audience les attendent [...] PDG, directeurs d'antenne, producteurs, presentateurs sont ainsi a l'affût des scores [...] Pour Médiamétrie la ponctualité est essentielle 'a 9h02 s'ils n'ont pas les chiffres ils nous téléphonent déjà!' sourit Philippe Tassi, le DG de Médiamétrie[7]" (p. 15-16). Planners and buyers in advertising and media agencies await television ratings in a similar way.

2) *Availability of spot ratings and programme ratings.* People-meters allowed for the first time the provision of ratings for commercials and individual programmes. Previously, with DAR and diary techniques, only quarter-hour ratings could be put on the market so that it was not possible to distinguish between, on the one hand, commercial ratings and programme ratings, and, on the other, between different individual programme ratings when there was a change in programming within a given quarter-hour. Furthermore, DAR and diary techniques were reliant on respondents' memory so that brief exposures were likely to be forgotten. By contrast, people-meters made possible the inclusion of any individual exposure time, however brief, in the calculation of audience data[8]. In so doing, people-meters made it possible for advertisers to trade with spot ratings and for broadcasters to assess the TVRs delivered by any programme[9].

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[7] 5 am, Paris is waking up and the people-meters have already been crackling over the telephone line for a couple of hours with yesterday's 160 000 items of recorded data. [...] At the other end of the line, in Levallois, the computers of Médiamétrie, the company specialising in the measurement of audiences, are working hard. Until 7.30 am, data are thus collected. They will be checked during the day. Meanwhile, figures are converted into tables, graphs and coloured curves. At 8.59 am, everything is ready. Médimamétrie has completed the bulk of the work by the time the bosses of the different channels arrive. 9.00 am. Etienne Mougeotte of TF1, Jean-Pierre Elkabach of France Télévision and Jean Drucker of M6 arrive in their offices. At last they are going to know what French people watched yesterday. The audience figures, still hot, are waiting for them [...] Likewise, MDs, directors of programmes, producers and presenters await the ratings [...] For Médiamétrie, punctuality is essential. 'if they do not have the figures at 9.02 am they have phoned us already!' smiles Philippe Tassi, vice-director of Médiamétrie.

[8] How brief an exposure is allowed to be for inclusion in the ratings calculation depends on the persistence threshold agreed upon (cf. exhibit 6).

[9] The finest unit for the standard reporting of commercial and programme ratings is the clock minute in both BARB and Médiamat (cf. exhibit 33).

3) *Availability of duplication and cumulative coverage data.* Coverage and frequency data are key considerations for planners (cf. section 2.3.1). The prospective designs that are used in conjunction with people-meters are statistically efficient to estimate gross and net changes. This point is developed in the context of the estimation of standard errors for audience estimates in section 6.2.2.

The near universal adoption of people-meters in television AMS had some detrimental effect on the consistency of television audience data over time. The variability of what is reflected by the industrial measurement of audiences has been argued in section 3.4.4. The global shift from diary techniques to people-metering techniques supports this view. People-meters report higher audience estimates on average than diaries. In Europe overall a 10% increase of the total estimated viewing time between 1988 and 1996 has been observed (Perry, 1997). The systematic differences generally observed by the industry between diary and people-metering data collection techniques are as follows (Purdye and Zdanowicz, 1998):

- People-meters produce noticeably higher estimates off prime time, and especially late at night.
- The weekly reach of individual channels is usually greater with people-meters
- The viewing shares of big television channels are usually lower with people-meters.
- The ratings for children are usually lower with people-meters.

As a result, it is not possible to state confidently whether changes observed in the data over time are due to real changes occurring in the population or are a mere artefact of the change of measurement design. Moreover, higher TVRs meant that advertisers had to spend less to achieve their GRP targets and television revenues declined sharply when people-meters were introduced in national industries. Horsley (2000) evaluated to more than £300 million the amount of advertising revenues the British television lost in 1985, purely as a result of switching from a diary to a people-metering data collection technique. These differences between data collected by diary and by people-metering techniques are accounted for by many aspects of the measurement described in section 4.3.

4.3. Sources of error associated with people-metering techniques

The industrial claim that data collected via people-metering techniques achieve a high degree of validity is commonly found in the industry. François (1990) considers that *"on peut se fier aux mesures d'audience par people-meter[10]"* because *"elles sont un reflet exact de la réalité des audiences[11]"*. Gane (1993) argues that it is unreasonable to expect people-meters to be perfect but that *"correctly implemented, they offer unparalleled accuracy and precision"*. Scaglia (1990) defends the view that the people-metering technique is *"un système dont tout montre qu'il est précis à près de 100% pour le comptage des individus, donc pour la définition de l'audience de chaque population[12]"* (p. 365). The purpose of this section is to examine whether such strong claims are justified. Although people-metering techniques are sometimes referred to as *'automatic'* techniques (e.g. Delecour, 1989), data collected via such techniques require human intervention and are also subject to errors that arise from faults in the method used to measure exposure. Sources of errors can be located at the recording and editing stages. Furthermore, people-meters do not provide valid information on some specific categories of exposure to television. Even more importantly, addressing the question of the validity of people-metering techniques raises the issue of the validity of viewing panels. These different points are examined in this section.

4.3.1. Data recording

DAR and diary techniques are retrospective data collection techniques that rely on the respondents' memory. 'Memory effects' on estimates yielded by sample surveys have long been an object of research in applied statistics (Gray, 1955; Sudman and Bradburn, 1973; Sinkel, 1985). The net systematic error of audience data collected via such techniques can be expected to be a function of two sources of errors that are inversely related:

(a) The under-reporting of the less salient media exposures e.g. brief or interrupted viewing or listening sessions (omission effects);

10 One can rely on audience data by people-meter.

11 They are an exact reflection of the reality of audiences.

12 A system which everything shows is almost 100% precise for counting individuals and thus for measuring the audience of each segment of the population.

(b) The over-reporting of the most frequent media exposures e.g. agenda-setting viewing sessions (forward telescoping effects).

An additional source of error that can be found with these techniques is:

(c) the over-reporting of certain media exposures such as exposures to the largest and most known channels or publications at the expense of smaller and less well know channels or publications (confusion effects) (Santy, 1994).

Therefore, when assessing sources of error in AMS based on DAR or diary techniques aand also in proprietary television audience research these aspects of the measurement are the ones that should be investigated.

In contrast, audience data collected via people-metering techniques do not directly rely on the respondents' memory. Rather, the potential source of error associated with such techniques is the respondents' co-operation. Indeed, logging in and out each time entering or leaving a room where a TV set is on (cf. exhibit 33) appears as a rather demanding task to fulfil. In order to help the compliance of respondents all people-metering techniques are equipped with various forms of reminders[13]. There was nonetheless a concern in the industry - and especially in the French industry (Gane, 1994) - that respondents' fatigue be translated into incorrect data being recorded. This issue was investigated by means of 'coincidental' tests whose principle is to phone respondents and ask them whether the TV set is on and who is in the room at the moment of the phone call. Responses are then compared with people-meter records on a home-by-home, set-by-set and person-by-person basis for the minute of contact. Médiamétrie published the results of a coincidental survey conducted in 1989 on 509 Médiamat households contacted between 6.30 p.m. and 9.30 p.m. (cf. exhibit 34A). The error size was found to be of 5%, randomly distributed, with no significant differences between demographic sub-groups. RSMB conducted the same type of investigation on BARB households in 1992 and 1993 (cf. exhibit 34A). The error size was found to be of 10% and randomly distributed. Coincidental surveys that have been carried out on other people-meter panels across Europe lead to similar conclusions (cf. exhibit 34B). The industrial view that people-meters are an unbiased data collection technique is grounded on the results of those coincidental tests.

[13] Those are visual signals regularly displayed on the television screen to remind respondents of who is recorded as present in the room; respondents are phoned if the people-meters record shows unusual or abnormal data e.g. TV set on but no individual presence recorded after a set period of minutes, individual presence superior to a set number of hours, simultaneous presence recorded in two TV rooms etc.

Yet what is important to stress is that coincidental tests are conducted on households that agreed to take part to the people-meter panel for an indefinite period of time. In the 1989's Médiamat test for instance, the overwhelming majority of the households controlled had already been on the panel for more than a year. It leads to question two aspects of those tests: (1) the existence of conditioning effects and (2) the sample validity.

1) *Existence of conditioning effects.* The validity argument of people-meter data is based on the implicit assumption that there are no conditioning effects at play in people-meter panels. However, control procedures may redefine the task for the respondents in a powerful way: For instance, pushing only one button when the set is on is positively reinforced (phone call from the contractor) but recording the presence of an additional person is either not reinforced or negatively reinforced (no phone call from the contractor).

   Very few pieces of research have been conducted by the industry in order to investigate the existence of conditioning effects in viewing panels. The American channel NBC analysed the performance of Nielsen panelists over time and compared the performances of respondents who had a two-year service with those who had a one-year service in 1986 and 1989 (Cook, 1989). This investigation concluded that there was clear evidence of changes in the performance of panelists over time and that these changes were consistent with the hypothesis of behaviour shaping through reinforcement contingencies. For instance, recorded viewing was found to decline in multi-person households as their length of time in the panel increased (minus 10%). Such findings have not been supported by another piece of research conducted on the New Zealand panel (Danaher and Beed, 1993). Such contradictory findings can be explained by differences in panel management practices that are examined in section 5.2.2 so that there has not been enough research to rule out the existence of conditioning effects.

   Moreover, as it is seen in section 6.2.2 some television AMS - such as Médiamat or the US Nielsen panel - are based on revolving prospective sampling designs[14] that are inconsistent with the claim that audience data collected via people-meters are highly valid. Indeed, such rotation schemes have been motivated by concerns of fatigue in button-pushing co-operation and conditioning effects among panelists (Danaher and O'Neil, 1992). Therefore, to what extent results of coincidental tests are contaminated by conditioning effects is a source of systematic errors that remains debatable.

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[14] In revolving sampling designs households are automatically discarded after a set maximum time on the panel (cf. section 6.1.2).

2) *Sample validity.* The argument that data collected by people-meters are unbiased is dependent on the implicit assumption that the households on which coincidental tests are conducted are an unbiased sample of the total universe so that if panelists' performance is correctly recorded then the data yielded by the measurement design are valid. This is a crucial point to consider. Indeed, it is argued in chapter 5 that people-meter techniques lead to samples that are not valid from a statistical viewpoint and whose claim to be 'representative' of the universe of reference is open to question. The implication is that, since coincidental tests rely on samples that are not valid, then their results cannot be regarded as valid either.

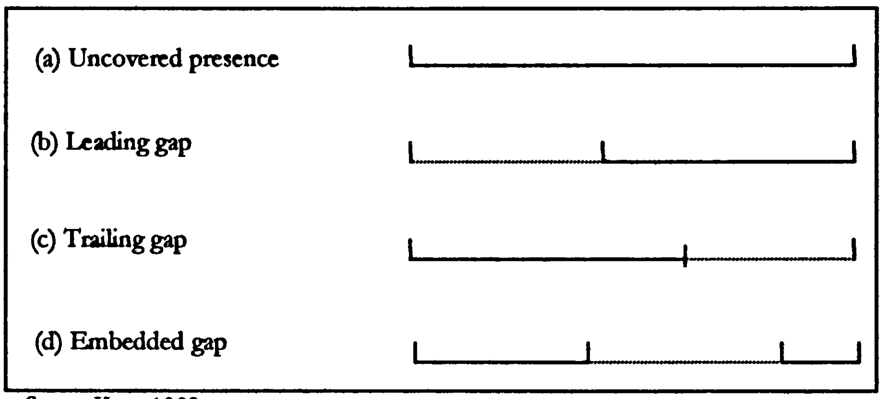
Since the two implicit assumptions coincidental tests rely on are debatable, the validity of people-meter data cannot be established solely on the result of those tests. It should also be stressed that the application of editing rules is not consistent with the argument that people-metering data are highly valid as seen in section 4.3.2.

4.3.2. Data editing

Data editing has a double purpose in television AMS:

1) Spotting and removing 'abnormal' cases that need to be investigated e.g. set on without any evidence of people present in the room for a long period of time, presence recorded for a very long period of time without break etc. Such cases bring up the issue of enforced attrition practices in viewing panels which is examined in section 5.2.2.
2) Handling frequent occasions in which there are mismatches between the records provided for the TV set on and those provided for individual presence. Four types of mismatch can be distinguished. They are illustrated in figure 4.3.

Figures 4.3. Types of mismatch in people-meter unedited data



Source: Kaye, 1992.

a) *'Simple gap'*: the TV set is recorded as switched on for a period of time but no individual's button is pushed to indicate presence in the room.
b) *'Leading gap'*: the TV set is switched on and no presence is recorded to match the period at the start of the TV set record
c) *'Trailing gap'*: the (last) individual presses a button to indicate that he/she is no longer in the room but the TV set stays switched on.
d) *'Embedded gap'*. The TV set stays on and there is presence recorded in the room at the start and at the end of the set on period but in the middle there is a period when there is no button pressed.

Editing rules in television audience measurement systems are not standardised and largely unpublished. They are subject to restricted circulation and thus remain obscure (Gane, 1994). In many television AMS however, the TV set data are treated as true and individual presence is matched to this, except in type (d) gap in which the TV set data are usually ignored (Kaye, 1992; Sharot, 1994a). These editing practices raise ascription problems:

- If type (b) gap occurs in a multi-person household, how many people's presence should be imputed and who are they?
- In type (c) gap if a conscious decision has been made by a respondent to tell that he/she has stopped being present/viewing, should it be ignored?
- The way type (d) gap is treated is inconsistent with the decisions made for the other types of gaps.

More generally, editing practices are a source of errors because editing rules are arbitrary decisions made by people-meter operators interpreting respondents' behaviour without any knowledge of their motivations or of the actual context in which the exposure took place. The higher the likelihood of editing rules being applied, the higher the likelihood of wrong assumptions on individual behaviours occurring. Furthermore, the limits above which editing ceases and households are removed from inclusion in the processing stage are also arbitrary. Data collected from large, multi-set and heavy viewing households are more likely to be edited and to be rejected at the editing stage (Purdye and Charlebois, 1998).

Editing directly refers back to the quality of the individual data records: either people-meter data records attain a high degree of validity, as it is argued by the industry, and editing should be limited to a control function whose purpose would be to spot technical defects only, or the quality of people-meter data records make editing practices necessary and then the data collection technique should be questioned. Therefore, data editing practices hinges on the issue of respondents' co-operation (cf. section 4.3.1).

4.3.3. Extra-domestic exposures

DAR and diary data collection techniques are not location bound so that exposures taking place anywhere can be collected[15]. By contrast, people-metering techniques require a piece of electronic equipment to be attached to the television set. This data collection technique is based on the traditional view that exposure to television takes place at home. In the late 1990s, this approach can be increasingly questioned.

The growing complexity of the conditions of exposure to television has brought problems that have been dealt with by people-meter services:

- Multi-set homes inflated costs by making it necessary to increase the average number of meters per household in viewing panels.
- The Finger Printing Technology (FPT) brought up a solution to VCR practices and made possible the integration of exposures to earlier broadcast materials (cf. exhibit 33A). Exposures to recorded broadcast materials are called in the industry 'timeshift' exposures. Ratings that take into account timeshift exposures are known in the industry as 'consolidated ratings' as opposed to 'live ratings' that do not. Only a couple of AMS in Europe yield such ratings (cf. exhibit 6). The reason is of an economic nature: the production of those ratings is costly and advertisers are only prepared to buy live ratings[16] (Hulks, 1999). The fact that BARB reports consolidated ratings (cf. exhibit 33A) has to be related to the substantial participation of the BBC to its financing (cf. section 2.4.2). The inclusion of timeshift exposures resulted in a 2% increase of the average rating level in the UK (Twyman, 1988).

However, people-meter services systematically under- estimate exposures to television that take place away from home. Two categories of extra-domestic exposures to television can be distinguished: (1) exposures that take place in other peoples' homes - that are included in the universe definition - and (2) exposures that take place elsewhere - that are not included in the universe definition:

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[15] The development of portable, car radios and multi-set ownership explains why set-metering techniques have been left aside in modern radio AMS.

[16] Timeshift exposures are not sought for by advertisers because VCR materials allow the fast-forwarding of advertising spots.

1) *Exposures in another private home.* Many television AMS, including both BARB and Médiamat, measure so-called 'guest' exposures (cf. exhibits 6 and 33). Two methods are used:
   (a) Regular visitors are allocated a button each as though they were members of the household;
   (a) Exposures of occasional visitors can be captured by using further buttons on the handset.

   Guest exposure represents a relatively important proportion of the total audience reported: between 5% and 10% in the BARB panel (Twyman, 1988). However, this category of exposure is systematically under-estimated in the current television AMS. First, its recording requires the extra task from respondents to ask visitors to register their presence and to enter their basic demographics such as sex and age. Secondly, the number of guests that can be recorded is limited. Thirdly, the recording of guest exposure demands all the more panel education as it is not possible to control the presence of guests and non compliance cannot be spotted. As a result, the profile of guests is elementarily recorded and by how much guest exposure is systematically underreported is not known with precision. The fact that the measurement of guest exposures has been dropped out in a few AMS e.g. the German AMS (Darkow, 1996) or that more user-friendly handsets able to cope with a larger number of guests are being researched e.g. in the UK (Meredith and Twyman, 1997) corroborates the poor quality of such data.

2) *Out-of-home exposures.* Some categories of exposure to television are not measured at all by television AMS:
   (a) Exposures that take place in institutions e.g. student residences, hospitals, retirement homes etc;
   (b) Exposures that take place in public places e.g. bars, shops, airports etc.

   It has long been considered in the industry that the total contribution of all these omissions represents a negligible proportion of the overall audience (Sharot, 1994a). However, recent research contradicts this traditional assumption. For instance, the study conducted by the American Network Television Association on a 3,500 sample over an 8-week period via a one-week diary technique (Rosen, 1994) found that audience levels yielded by AMS are systematically underestimated by about 5% and that the amount of out-of-home exposure is not randomly distributed in the population:

- Most out-of-home exposures occur in the workplace, on college campuses and in hotels.
- Sub-groups that are regarded as light viewers do a significant proportion of their total viewing away from home. In particular working women (4% of their total viewing), business people (18%) and college students (31%).
- Significant variations of out-of-home exposures by demographics, day-part and programme genre were observed e.g. out-of-home viewing represents a higher proportion of total viewing for 18-34s, prime time programmes, sport programmes etc.

In Europe also the hypothesis that out-of-home exposure is negligible can be increasingly questioned in the late 1990s television environment. It is argued in section 4.4.2 that the systematic under-reporting of extra domestic exposures by television audience measurement systems induces discriminatory effects.

4.3.4. Children's exposure

Children's exposure is measured by very few AMS based on DAR or diary data collection techniques[17]. By contrast, all television AMS measure the exposure of children to television (cf. exhibit 6). The lower age limit in the universe definitions used in Europe varies from three to six, four in the cases of BARB and Médiamat. In the USA children as young as two are included in the universe definition e.g. the Nielsen panel. How children exposures are measured is an important point since the children TVR market has become one of the most competitive as is developed in section 4.4.2.

Although children's behaviours and attitudes towards the media are known to be complex to assess (Gunter and McAleer, 1990), the measurement of children's exposure to television is a topic that has hardly been investigated by the industry. Research focusing on children in people-meter panels are few and from an American origin (Solomon, 1992). They concluded that:

- Young children are physically unable to perform people-meter related tasks and older ones may lack the co-ordination to operate a people-meter.
- Children do not have a strong sense of responsibility and special motivation to participate in a long term study such as people-meter panels may be required.

[17] RAJAR in the UK is the only AMS based on a diary technique that measures children's exposure.

- Since over half of the children turn on the television themselves, multi-child exposure to television occurs frequently with no responsible person present in the room ensuring that the child pushes his/her button correctly.

Besides, psychological research on television and children have shown that home viewing is a highly discontinuous activity for children and frequently involves leaving the room in which the TV set is operating (Dorr, 1986).

Moreover, the link between exposure and attention analysed in section 3.5.1 is dramatically loose in the case of children. Indeed, academic research on children's behaviours (Gunter and McAleer, 1990; Young 1990; Dorr, 1986) converge in showing that:

- Most of children's television viewing takes place whilst other activities are going on (eating, snacking, playing with toys, doing homework, talking etc.).
- Children frequently look away from the television screen and the younger the children the more frequent they look away.
- All other things being equal, children tend to look away during commercials, when programmes do not have a continuous storyline or when messages are hard to understand.
- Most programmes are not really watched from beginning to end even though children and their parents feel that enough has been watched to report that the children viewed the programme.

The exposure definition used in television AMS is thus particularly unsuited to measure the attention of children to the screen and a low degree of validity for children's exposure data collected via people-meter techniques can be suspected.

4.4. Using people-metering techniques to yield TVRs

In this section it is argued that people-metering techniques have had a determinant economic impact. In section 4.4.1 it is argued that they have radically changed the way TVRs are traded, with the effect of making the market highly responsive to variations in the statistics yielded by the measurement systems. Television audience measurement systems illustrate a case in which change in the process of collecting information in a sample survey has had decisive effects on the economy of an industrial sector. Section 4.2 shows that TVRs yielded by people-metering techniques are error prone with regard to out-of-home and children's exposures to television. In section 4.4.2 it is argued that in the new television environment, this induces discriminatory effects against the programmes that are the most likely to generate these categories of exposure because the TVRs produced by those programmes cannot be estimated with the same degree of accuracy and therefore cannot be correctly valued in market negotiations. Sport, news and children's programming genres are affected by this problem.

4.4.1. Market reactivity

The impact of the data collection technique used in audience measurement systems on the economy of media industries needs to be emphasised. Indeed, the current functioning of the television market is not solely the unavoidable result of the competitive industrial structure brought on by deregulation policies and new technologies, as is generally accepted. It is also largely the consequence of using people-meter techniques to yield TVRs. In the pre-1980s television industry, the reactivity of the market to variations in the TVRs yielded by television AMS was indirect and slow. This was due to the monopolistic structure of the industry, as seen in section 2.3.3, but also to another factor that is typically overlooked: the use of recall data collection techniques in television AMS.

With DAR and diary techniques, only quarter-hour ratings could be made available (cf. section 4.2.1). Spot TVRs were thereby assessed only indirectly and the expert judgement of planners and buyers played an important part in the valuation of the quarter-hour ratings put on the market. Factors such as position of the commercial break, programming genre, broadcasting time etc. were taken in consideration in the estimation of CPPs. Furthermore, with DAR and, even more so, with diary techniques, TVRs could not be made available that quickly because those techniques involve processing operations[18] that are time-consuming. As an indication, readership measurement systems typically report once or twice a year (cf. exhibit 2C) and radio AMS three or four times a year (cf. exhibit 2D) in the late 1990s. Consequently, in the pre-1980s television industry, ratings used to be available weeks after the TVRs were bought and the campaign broadcast. In this context, variations in the TVRs delivered were observed as trends over a period of time. The performance of

[18] Indeed, viewing diaries need to be collected or mailed back, checked, the information contained in each diary needs to be entered or scanned while new diaries need to be placed etc.

advertising campaigns could only be assessed a posteriori and conclusions as to the cost efficiency of the investment were fed into the planning decisions of future campaigns only.

In the mid-1980s, the replacement of recall techniques by people-metering techniques in television AMS played a crucial part in the importance taken by television ratings in the allocation of resources by the market. Indeed, people-metering data collection techniques made it possible to put on the market minute-by-minute TVRs in an exceptionally short time span. This innovation was translated into drastic changes with regard to the structures, trading and programming practices of the industrial players:

- The volume of the data transmitted on a daily basis increased dramatically[19] and required more experts specially trained to examine and manipulate them. As a result, the sales departments of commercial broadcasters and the media departments of advertising agencies grew both in size and in importance, and media agencies specialising in planning and buying services flourished.

- As variations in both the 'quantity' and 'quality' of TVRs became observable from one minute (or even one second) to the next and on the day after the programmes were broadcast, those variations started entering price negotiations. Planners and buyers could recalculate CPPs daily and thus reassess campaign performances. Prices already offered by buyers for future TVRs could be revised on the basis of the most recent delivery of TVRs by channel, genre, time slot, programme etc.

- Commercial broadcasters could analyse in great details the delivery of TVRs from each programme broadcast. Comparisons between their own production of TVRs and their competitors' could be made minute-by-minute and daily. They are helped in those tasks by the development of dedicated software such as ViewTime, which allows the simultaneous display of each image of the programme broadcast and the rating recorded at that very second (LeBoeuf et al, 1998).

Such practices resulted in a high variability of the prices offered by buyers for future TVRs, and hence in an increased uncertainty as to future advertising revenues for commercial broadcasters. Indeed, it became increasingly difficult for a commercial broadcaster to

[19] As an indication, in 1992 130 million of audience estimates were calculated and provided daily by BARB, corresponding to 230 MB (Roberts, 1992).

anticipate revenues that had become dependent on the most recent TVRs delivered by its own programming as well as by the programming of its competitors. From this perspective, the intensification of commercial programming practices (cf. section 2.4.1) can be regarded as the development of strategies implemented by broadcasters in order to control the uncertainty in revenues brought onto them by the introduction of the people-metering data collection technique. Cancellation of programmes practices, which developed in France in the late 1980s (Mamère, 1988, Brochand, 1996), exemplify the impact of the speedy availability of ratings allowed by people-meters on the scheduling policies of commercial broadcasters. Such practices consist for a commercial broadcaster to modify its prime time schedule at a very short notice in order to boost its production of TVRs at the expense of the competitors. These competitive practices can especially be observed at peak advertising periods (e.g. March, April, May, June). In 1995, 63% of cancelling decisions in France were motivated by competitive purposes (Le Quotidien de Paris, 1996). These practices are made possible by the fact that the delivery of TVRs is known so rapidly that changes in the schedules can be translated into quasi-immediate changes in the competitive positions of each supplier on the advertising market. Indeed, in few industries is the time between the implementation of production decisions and the knowledge of the financial results of those decisions that short.

Ratings in the television industry have been compared by the European Audio-visual Observatory (1996) with stock exchange rates in the industrial sector or foreign exchange rates in the international trade. Such a comparison is based on an analogy made with the means of communication between buyers and sellers in financial markets[20]. Prices at which market makers are prepared to buy or sell securities are continuously displayed on computer screens and transactions are made by telephone or by entering orders on line. The function of BARB or Médiamat for the British and French television markets is thereby compared with computer systems such as NASDAQ for the financial markets.

This analogy has its limits. Two-way prices are electronically displayed on the stock exchange versus commodities produced on the television market. The securities whose prices are displayed can be bought or sold at any moment whereas, once they are known to the market makers, TVRs have already been bought and sold and transactions are conducted on the TVRs expected in the future. Furthermore, there cannot be speculation on the television market because TVRs have no market value once they are known. They

[20] On communication means and investment on the stock exchange see Rutterford (1993).

cannot be held and sold later, as it is the case for currencies or ordinary commodities such as cocoa, sugar etc.

But the interest of this analogy actually lies in the risk and return approach to the television market it introduces. As for financial investments, uncertainty about the future characterises TVRs. Like the investor, the buyer of TVRs is concerned with the return expected on the investment and the risk of the investment i.e. how likely it is that the CPP expected will be realised. The investor assesses the risk presented by securities by examining their returns achieved in the past. Similarly, the buyer of TVRs measures the risk taken by looking at actual past TVRs according to methods that entail objective or subjective probabilities. If a particular programme has provided highly variable TVRs in the past and if it has not fundamentally changed (e.g. in content, broadcasting time etc.), it is likely to be equally variable in the future and therefore investing in the TVRs produced by this programme is risky, and vice versa. Alternatively, if data on past TVR performance of the programme are not available (which is often the case in the television industry), the past TVRs of the programme genre at similar time slots etc. are used to assess risks.

The crucial difference which has to be emphasised lies in the type of risk that the television industry has to bear. On the financial markets the risks that lead to variability in return on a security are economic in nature (uncertainty of income, default risks, inflation etc.). On the television market risks are not only of an economic (uncertainty is entrenched in the production of programmes that are prototypes, cf. section 2.1.1) but also of a statistical nature. Indeed, the variability of TVRs is affected by random variations and this type of risk has been increasing dramatically over the last few years. This point is the object of section 6.4.1.

4.4.2. Discriminatory effects

With the emergence of people-metering data collection techniques, television ratings have become subject to two sources of systematic errors: (1) exposures to television outside home have become systematically under-estimated, (2) children's exposures to television have become observable but the validity of those data is low. These points have been shown in sections 4.3.3 and 4.3.4. As a result, the TVRs delivered by the programmes the most likely to generate these types of exposure are logically more error prone and thus less likely to be correctly valued by the market. Sport and news programmes are examples of programme genres that are likely to be chiefly affected by the systematic under-estimation of out-of-home exposures. This is not to say that sport and news are the only programmes likely to be mis-valued. Indeed, quantifying such discriminatory effects is a complex task that would require the implementation of operational research designs which are beyond the scope of this thesis. But what is particularly interesting in the case of sport and news programming is that in the new television environment more and more channels have a thematic format based on these programme genres. These examples illustrate the fact that the non observation of out-of-home exposure, which was regarded as negligible by the industry the 1980s, can have significant implications in the late 1990s. The mis-valuation of children's programming is easier to show.

The TVRs generated by sports programming[21] are the most highly valued by advertisers[22] because of both their 'quantity' and 'quality'. In particular, sport programmes produce TVRs on the 16-34 ABC1 male target, which is a particularly difficult advertising target to get via the television medium. The inflation in the prices of the broadcasting rights of sport programmes observed over the last decade is directly related to the high prices advertisers are prepared to pay for the TVRs generated by those programmes (cf. section 2.5.1). But exposures for sport programmes include exposures that take place away from home. For instance exposures to live sport events increasingly tend to happen in groups and in public places such as pubs and bars[23].

However, extra-domestic and collective exposures are non observable by people-metering techniques. Therefore, the TVRs broadcasters produce through sport programmes are likely to be systematically under-estimated and advertisers get for free these additional rating points that cannot be entered in price negotiations. This is all the more problematical for broadcasters as these TVRs are the most expensive to produce. In 1998 the TVRs produced by the live broadcasting of Football World Cup matches were particularly valuable for advertisers, not least because TVRs on the ABC1 female target were also unusually high for this type of programming. But the attempt of ITV to impose premium prices on games failed for two reasons: partly because the TVRs projected by buyers were lower than the TVRs eventually achieved; partly because buyers do not accept paying for rating points that are not captured by the measurement system, which thus cannot be taken into account in the CPP calculation, and that they already get for free

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21 Especially live broadcasting of football matches and other popular sports such as Formule 1 races, rugby matches etc.

22 Advertisers with a particularly high valuation of these TVRs are brewers, financial services and toiletries manufacturers.

23 With the development of the broadcasting of sport events on pay television in the 1990s, public places have multiplied big screen facilities in order to attract customers.

anyway (Media Week, 1998b). For example, a CIA MediaLab's study claims that as much as 11% of all adults in the UK watched the England v Argentina World Cup game away from home (Neligan and Rowe, 1999). Those TVRs could not be sold by ITV. The under-valuation of sport programmes by agencies impacts also premium channels, which rely on advertising revenues to help securing the expensive broadcasting rights that are vital to having their subscriptions renewed e.g. Canal+, Sky Sports, Eurosport etc.

The exclusion of out-of-home exposure is also a potentially significant problem for channels whose content is mainly composed of news and that are targeted towards up-market ABC1 business audiences because such channels[24] generate a higher proportion of exposure in offices, hotel rooms, airports etc. For instance, CNN chose not to take part in BARB partly because of costs and partly because proprietary studies suggest that a large proportion of its audience is composed of business travellers watching CNN in hotel rooms (Douglas, 1999). Yet advertising is the main source of revenues for these news channels because, as opposed to sport channels for instance that are often premium channels, news channels are always included in basic packages (cf. section 2.3.3).

It is up to these channels to bring evidence of the TVRs they produce in order to be treated fairly in commercial negotiations. They have no choice but to invest in proprietary audience measurement research based on DAR or diary techniques. It is for instance the case of CNN which has been investing in European surveys based on DAR techniques that report once or twice a year (cf. exhibit 2D) It is also the case of CNBC which conducts it own audience survey and releases data once a year. Yet those surveys cannot have the trading assets and the credibility presented by national measurement systems based on people-meters such as BARB and Médiamat. Indeed, since proprietary measurement systems are not based on people-metering techniques, the ratings yielded do not have the same operational assets (availability a few times a year instead of overnight, quarter-hour ratings instead of spot ratings). Furthermore, buyers are suspicious of ratings yielded by surveys financed by one seller. The European evolution towards one television AMS agreed by all parties before hand has largely been motivated by a need for trust in the ratings put on the market (cf. section 1.2.3). As a result, news channels necessarily suffer from a competitive handicap.

Along the same lines, it is not clear to what extent the exclusion of out-of-home exposure from the measurement system results in the under-valuation of channels targeted to other specific audiences e.g. music channels targeted to young audiences such as MTV,

[24] Bloomberg, CNN, CNBC, BBC World, Euronews, Sky News, LCI in France, N-TV in Germany are examples of news channels.

MCM etc. that are likely to generate more exposure in public places (student residences, bars, clubs etc.).

Section 4.3.4 showed that people-metering data collection techniques in AMS are weak on the measurement of children's exposure and, importantly, that the links between exposure and attention is particularly loose in the case of children. The TVRs produced by children's programming cannot therefore be correctly valued by buyers. Children have been an advertising target of interest to advertisers since the 1960s (Young, 1990) because of their prescribing role in the purchase of many household items. In the pre-1980s the strict regulation of advertisements surrounding children programmes in most European countries led to very few children TVRs being put on the market so that the demand largely exceeded the supply. By contrast, in the 1990s the market of children TVRs has become one of the most competitive (Media Week, 1998c). It is characterised by:

a) An inflation of cable and satellite channels specialised in children programming that rely heavily on advertising revenues e.g. Cartoon Network, Nickelodeon, Fox Kids (cf. section 2.5.2).
b) A slight decline in the estimated total viewing time of children.
c) Advertisers that are still largely restricted to toy and games manufacturers.

As a result, TVRs on children have the lowest CPP on the market, with the consequence that some channels had to close down or to review completely their programming schedule e.g. The Children's Channel (TCC) launched in 1985 stopped in 1998. However the mechanism of resource allocation on this market can be questioned since it depends on a data collection technique that is not adapted to children, especially since, as opposed to free-to-air channels, cable and satellite channels aim to generate children's exposures outside the early evening adult family context and some of those channels target younger age groups that have been found to be unable to perform people-meter tasks e.g. The Cartoon Network is targeted at four-to-six-year-olds.

4.5. New metering techniques

In the late 1990s new data collection techniques are being tested by the industry. Although they are still at the experimental stage, they may lead to a new generation of television audience measurement systems and are therefore introduced in this last section on the subject of observation techniques in AMS. Two different categories of technique should be distinguished: (1) new set metering techniques and (2) passive metering techniques:

1. *New set metering techniques.* Conventional set meters are based on a Frequency Measurement Technology (FMT*)* i.e. the channel on screen is identified via the matching of the MHz frequency allocated to this channel, either continuously or on a sampled basis. The monitoring of VCR uses and cable and satellite programming has already required extra features to adjust for those more complicated reception modalities (cf. exhibit 32A). But digital technology brings on a new challenge in destroying the one-to-one relationship between frequency and channel. Indeed, digital broadcasters can transmit a number of programmes and services on the same frequency and FMT monitoring detects only the frequency tuned, not the programme being decoded. With the recent launch of digital platforms, the necessity for a new metering technology has become urgent.

   Two new set metering technologies are currently being tested by the industry: (a) code identification and (b) matching with masters (cf. exhibit 34A). So far the matching with central masters technology seems to be in favour in Europe (Van Meerem, 1998). In the USA, Nielsen has already introduced meters using both code identification and signal matching technologies and is also conducting research on 'software meters' that would be capable of identifying the TV screen content on personal computers (size and location of the video window, whether the video is hidden by another open window/application etc.)(Cook and Aust, 1998).

2. *Passive metering techniques.* The idea of using a data collection technique that would not require respondents to fulfil demanding and repetitive tasks dates from the late 1980s. The scepticism towards people-metering techniques led the French industry to investigate 'non-intrusive sensor' data collection techniques. The Motivac technique consisted of mounting a camera on the TV set to identify the persons present in the viewing area without respondents having to identify themselves. This technique was tested extensively in the early 1990s but was eventually dismissed for two reasons (Fabre, 1992): (a) low coincidental rates and systematic under-counting of the number of persons present due to technical insufficiencies, (b) Serious biases against some segments of the population (65+ respondents and single person households), who rejected the observation technique. In the 1990s a new generation of passive metering techniques is being developed by European and American market research companies and already tested in certain industries. Two types of passive metering techniques can be distinguished (Gane, 1997):

(a) 'signal matching' techniques miniaturised in a watch[25]

(b) 'code identification' techniques miniaturised in a pager-like decoder unit[26].

These techniques are presented in exhibit 35. Experimental testing is currently being conducted especially in the context of radio AMS because the objective of the radio industry is to leave recall techniques behind and to implement an 'audio-meter' i.e. the radio equivalent to the people-meter. In France, Médiamétrie set up an experimental panel to test these techniques on radio in 1997 (Stratégies, 1997b). However, the final purpose of passive metering techniques that justify the heavy investments currently being made is to be used in television AMS. Tests on the television medium have just started in the UK (Fiddick, 1999). In the long run, it may result in radio and television ratings being yielded by a common measurement system.

The replacement of the current set meters by the new set metering technologies presented in point (1) should take place shortly in France and in the UK. In the USA, the Federal Communications Commission (FCC) mandated that the transition take place between May 1999 and 2006 (Cook and Aust, 1998). The introduction of these set metering techniques should set new problems of consistency and comparability of audience indicators over time pointed out section 3.4.4. Indeed, experiments conducted in Canada suggest that data collected via the current FMT technology are not comparable with those collected via signal matching technologies (Purdye and Charlebois, 1998). Each piece of technology has its own specificity about when channel changes should be registered, what constitutes a channel change, what is 'tuning' to a channel, when the set should be considered 'on' and 'off' etc. For instance, persistence thresholds have no meaning with signal matching meters because the minimum time necessary to get a match (and thus to identify the programme being broadcast) depends on variables such as picture content, number of other channels in the reference set with similar picture content, number of situations where the luminance of two areas compared is too small etc.

The effects of introducing passive metering data collection techniques presented in point (2) in television AMS would be much more considerable because it should lead to a different measurement system altogether. As people-metering techniques, passive metering techniques would also allow the provision of minute-by-minute TVRs in an exceptionally

[25] On *Radio Watch* see Werres and Horstmann (1997) and *Radiocontrol* Steinmann (1997).

[26] On *Personal Portable Meter or PPM* see Kolessar and Stowell (1997).

short time span so that the capacity of the market to be highly responsive to variations in the TVRs delivered analysed in section 4.4.1 should be maintained. But as opposed to people-metering techniques, passive metering techniques rely on portable devices (cf. exhibit 35) so that systematic errors due to the non observation of out-of-home and children's exposure and the discriminatory effects they lead to, as seen in section 4.4.2, are likely to be corrected for.

However, audience measurement systems based on passive metering techniques should bring up two fundamental measurement issues:

1) *A new shift in the operational definition given to exposure.* Exposure to television has been measured so far using a *'viewing'* and then a *'presence'* variable (cf. section 3.3.1). With passive metering techniques, a *'within ear shot'* variable is likely to be used. How this variable would be precisely defined from a measurement operation viewpoint would probably be a question of delimitation of ambient sound perimeter. This change of definition has at least three industrial consequences:
   (a) It would reinforce the lack of consistency of the measurement over time identified in section 3.4.4, hence the lack of comparability of the data issue;
   (b) It would imply an even higher inclusiveness of the variable used to denote exposure, which means moving further away from the 'attention' criterion, aggravating thereby the commodity pricing issues analysed in section 3.5.1;
   (c) The impact of such a change of variable on the ratings yielded by the measurement system (reach, share, ratings) for each broadcaster is unknown but potentially liable to modify substantially the allocation of resources between suppliers of TVRs in the industry.

   However, the use of a *'within earshot'* definition is unlikely to modify the analysis of the industrial audience construct presented in chapter 3. Just as the *'presence'* definition currently in use, what would be captured by the measurement should remain a matter of operational definition, hence should remain flexible in its meaning and weak from the predictive viewpoint. Medium content, social and cultural processes would still be left out of the measurement. The approach to measurement used is therefore not fundamentally questioned by the industry in the new television environment.

2) *Validity of sampling design.* The Personal Portable Meter technique has been criticised on the grounds that it would still require the compliance of respondents and that it may induce conditioning effects (Rolland, 1998). But beyond these factors, a crucial point is

that passive metering techniques would have to be used jointly with panels because of the costs of the electronic devices and the time involved in installing the equipment and instructing respondents. Retrospective designs (with Radio Watch and Radiocontrol) or prospective designs (with Personal Portable Meter) (cf. section 4.2.1) are likely to be used. Yet passive metering techniques involve the recording of all sounds in a respondent's vicinity. Even though the original sounds can be made impossible to reconstruct to protect the respondent's privacy, it is not clear whether such devices can be widely understood and accepted by respondents. A potential effect of using passive metering techniques would be to lower the response rate and aggravate sampling bias, which is already a major issue in the current television audience measurement systems as chapter 5 attempts to show.

4.6. Conclusions

The way the television industry currently operates is not merely the outcome of deregulation policies and new technological developments, as is commonly accepted. It is also the direct result of a change in the data collection technique implemented in audience measurement systems all over Europe. By making possible the production of minute-by-minute TVRs and their overnight delivery, people-metering techniques have strongly impacted the economy of television. This has been translated into changes in the organisational structures of the players participating in the industry and into a high reactivity of the market (advertisers and broadcasters) to variations in the data yielded by these sample surveys. Current programming practices can be regarded as strategies carried out by commercial broadcasters in order to control the uncertainty in revenues brought on by the high variability in the prices of TVRs.

From a measurement viewpoint, the use of people-metering techniques is grounded on the industrial claim that it is a highly valid technique for collecting exposure data. Yet television audience measurement systems based on such a technique systematically under-estimate exposures to television that take place away from home. Furthermore, there are strong reasons to suggest that people-metering techniques are not suited to the collection of data on children's exposures. From an economic perspective this means that those programmes are likely to produce TVRs that are incorrectly estimated by buyers. Sport, news or children's programmes are examples of programme genres likely to be incorrectly valued by the market. In the late 1990s television environment it is all the more problematical as many channels are thematic and many of them are specialised in those programming genres. Such channels thereby are very likely to suffer from a competitive handicap that is induced purely by the measurement system in use.

Moreover, the validity argument depends on tests relying on the implicit assumptions that people-meters do not bring about conditioning effects and that the sample on which people-meter observations are based is itself valid from a statistical viewpoint. The first assumption is debatable and contradicted by enforced panel rotation schemes that are used in some television AMS, and the second assumption does not hold: chapter 5 attempts to show that the samples used jointly with people-meters are not statistically valid.

Passive metering techniques are currently being tested by the industry and may well be the next generation of data collection technique in audience measurement systems. The implementation of those techniques would, again, strongly impact the economy of television. These new techniques are likely to introduce industrial problems of their own of a similar magnitude to those brought up by the current generation. However, the new operational definition of exposure they would lead to does not fundamentally depart from the approach to measurement currently in use so that the conclusions drawn in chapter 3 apply. Similarly, these new techniques are unlikely to address the sample validity issues identified in chapter 5.

5. Sampling systematic errors

Chapter 4 emphasises that the validity of the data collection technique is inseparable from the validity of the sample used in television audience measurement systems. Sampling validity issues are considered in this chapter. Sampling systematic errors arise when the expectation of the estimate does not equal the population parameter being estimated. This type of error is usually distinguished from non observation errors which arise from failure of obtaining data from part of the population. The former bias is often classified as statistical and the latter as non statistical. However in television audience measurement systems these two error types are tightly linked and need to be examined together as is shown in this chapter.

In section 5.1 the effects of non response on the relative bias of the sample mean in sampling plans depending on a probability distribution are presented. Divergences between a probability and a non probability approach to sampling are then set out. Nowadays all television audience measurement systems rely on prospective sampling designs (the so-called 'viewing panels') and, in Europe, the composition of viewing panels is closely linked to longitudinal surveys that are run in parallel (the so-called 'establishment surveys'). In section 5.2 sampling schemes and panel management practices in television AMS are scrutinised. In section 5.3 the claim made by the industry that viewing panels are 'representative' of the viewing population is questioned. Sampling validity, self-selection and model specification issues with regard to BARB and Médiamat panels are discussed. A classification of non response rates in viewing panels is proposed and non response rates in BARB and Médiamat are assessed. Finally, the implications of relying on such sampling designs in the late 1990s television environment are emphasised in section 5.4.

This chapter attempts to show that viewing panels are non measurable samples so that whether audience estimates are unbiased estimates is unknown. In contrast, it is possible to assess theoretically and to calculate empirically the variability of audience estimates. Sampling variability issues are tackled in chapter 6.

5.1. Theoretical considerations (iv)

Any survey design based on probability sampling is a trade off between the unknown bias involved in the assumption that those responding are a valid sample of the combined respondents and non respondents universe, and the cost of recall procedures. The crucial difference between probability and non probability samples is that in the former the criteria for judging estimators are design-based and relate to a p-distribution whereas in the latter the criteria are model-based and relate to a purposive strategy in which non response is non apparent.

5.1.1. Non response effects in probability sampling plans

In the MSE framework (cf. section 4.1.1), the validity of estimates depends on the selection with known probabilities in the sample of some of the N population values Y_i with $i = (1,2,3...N)$. Non observation errors stem from two sources:

1) Non coverage errors denote failure to include some units, or entire sections, of the defined survey population in the actual sampling frame.
2) Non response errors refer to failure to obtain observations on some elements that have been selected in the sample.

The effects of non observation errors on survey estimates can be summarised as follows:

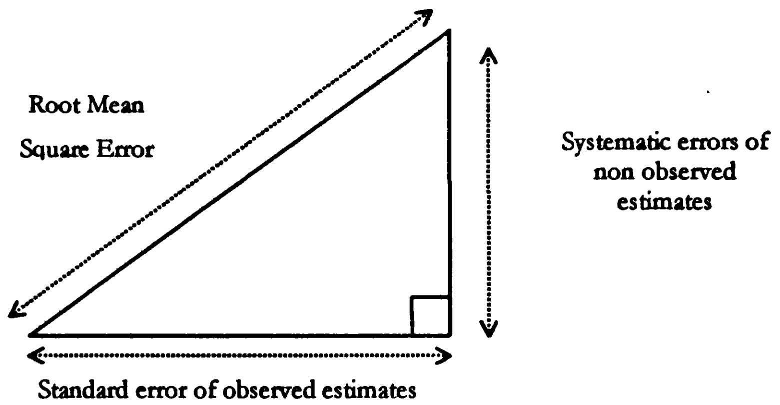
$$(5.1) \qquad \bar{Y} = Y/N = W_1 \bar{Y}_1 + W_2 \bar{Y}_2$$

where Y denotes the population mean, W_1 and W_2 denote the proportions of observation and non observation respectively ($W_1+W_2 = 1$), and Y_1 and Y_2 denote the means of the characteristic in the two segments. The use of Y_1 to estimate Y causes a bias ($Y_1 - Y_2$). The relative bias (RB) of the sample mean is:

$$(5.2) \qquad RB(\bar{Y}_1) = \frac{(\bar{Y}_1 - \bar{Y})}{\bar{Y}} = \frac{(\bar{Y}_1 - W_1\bar{Y}_1 - W_2\bar{Y}_2)}{\bar{Y}} = W_2\frac{(\bar{Y}_1 - \bar{Y}_2)}{\bar{Y}}$$

If $\bar{Y}_2$ differs little from $\bar{Y}_1$, RB will remain small. If both W_2 and $(\bar{Y}_2 - \bar{Y}_1)$ are small, the bias should be negligible. For the bias to be important, large W_2 must coincide with large $(\bar{Y}_2 - \bar{Y}_1)$. Optimum sampling plans with regard to non observation biases and sampling variable errors are defined in figure 5.1.

Figure 5.1. Non observation errors in the MSE framework



Any plan of survey possesses a bias of non observation and a standard error of observation. The right angle addition of the two forms the root mean square error of the particular plan. The criterion for the optimum plan is that it shall give a shorter hypotenuse than any other plan will give for the same cost; or alternatively a plan is optimum if it delivers a prescribed length of hypotenuse at the lowest cost.

Source: Deming, 1953.

Statistical literature on the non coverage source of non observation errors is scarce. Non coverage can only be estimated against some check obtained outside the survey procedure itself. This check may come either from an auxiliary investigation attached to the survey, or from data obtained from independent sources (Kish and Hess, 1953). In practice, the task of estimating non coverage errors is seldom performed because:

1) It entails a quality check by procedures that must be sufficiently better at providing the true value against which the survey results can be compared and such procedures are expensive;
2) It entails the condition of an outside estimate based on the same unit, not only by theoretical definition but also operationally.

In addition, it is generally thought that sample surveys in Western Europe and the USA are characterised by high coverage rates combined with low response rates, as opposed to sample surveys in developing countries which are characterised by low coverage rates and high response rates (Kish, 1987). In this thesis this standard assumption is made. However, certain trends suggest that non coverage is an expanding source of systematic errors in Western European surveys e.g. growing number of intercoms in big cities such as in Paris that prevent interviewers from accessing selected dwellings; growing telephone numbers that are unlisted and prevent households from being included in sampling frames etc. This calls for more research to be conducted in this field.

In contrast, a large body of statistical literature deals with the non response source of non observation errors in sample surveys. Indeed, non response rates can be measured with precision in random sampling plans. The problem is rather rooted in the definition given to non response. As Kvitz (1977) pointed out, there is a high degree of variability in the definitions given to response rate in sample surveys and it often causes confusion with regard to the interpretation that should be given to reported response rates. Since a survey design is a trade off between the systematic error of estimates that are not observed and the standard error of estimates that are observed (cf. figure 5.1), the assessment of response rate should always reflect the degree to which a particular design succeeds in obtaining the co-operation of potential respondents included in the universe of the survey and initially selected in the sample.

Deming's (1953) model provides a useful theoretical framework to understand non response: its possible effects and its control. According to this model, any random sample can be divided into 6 classes reflecting the average proportion of interviews that can be completed successfully out of 8 attempts:

- Class 0 contains:

  a) the stubborn core of permanent refusals,

  b) individuals who are never at home,

  c) individuals who are incapacitated and cannot give meaningful answers.

  The magnitude of this class varies widely, depending on both the type of information called for by the survey and the procedure used to get this information.

- Class 8 contains:

  a) individuals who are always willing to answer questions,

  b) individuals who are at home all the time,

  c) individuals who can give meaningful answers.

- Classes 6, 5, 4, 3, 2, 1 contain

  a) individuals who are not at home all the time,

  b) temporary refusals,

  so that an interviewer will be successful at finding the respondent at home and in getting an interview 6 times out of 8 on average in class 6, 5 times out of 8 in class 5 etc.

The patient mean is the result of calling back ad infinitum all the people in the different classes and is defined as:

$$(5.3) \qquad \bar{a}^* = \frac{\sum_1^8 p_i \bar{a}_i}{\sum_1^8 p_i}$$

where $\bar{a}_i$ is the mean value per sampling unit of some particular characteristic in class i and p_i is the proportion of this class. Members of class 0 contribute nothing to the patient mean. Since sample surveys do not include class 0, they can only produce estimates for classes 1-6. But surveys based on random samples can give the proportion p_0 and some of the characteristics of class 0. It should be added that the difficulty with class 0 is not peculiarly a sampling problem as class 0 exists also (and may be even bigger) in complete counts.

The numerical average of some particular characteristic given by an initial call Y(I) is:

$$(5.4) \qquad \bar{Y}(I) = \frac{\sum R_i \bar{y}_i}{\sum R_i}$$

where R_i represents the number of responses from class i and y_i represents the mean of the R_i responses. Both R_i and $\bar{y}_i$ are random variables with expected values $E\bar{y}_i = \bar{a}_i$ and $ER_i = n\pi_i p_i$ where $\pi_i = i/8$. The variance of y_i will be:

$$(5.5) \qquad \mathrm{Var}\ \bar{y}_i = \frac{\sigma_i}{n\pi_i p_i}\left(1 + \frac{1-\pi_i p_i}{n\pi_i p_i}\right)$$

where σ_i is the standard deviation of the particular characteristic in class i.
The quantity $\bar{Y}(I)$ is a random variable with expected value E(I):

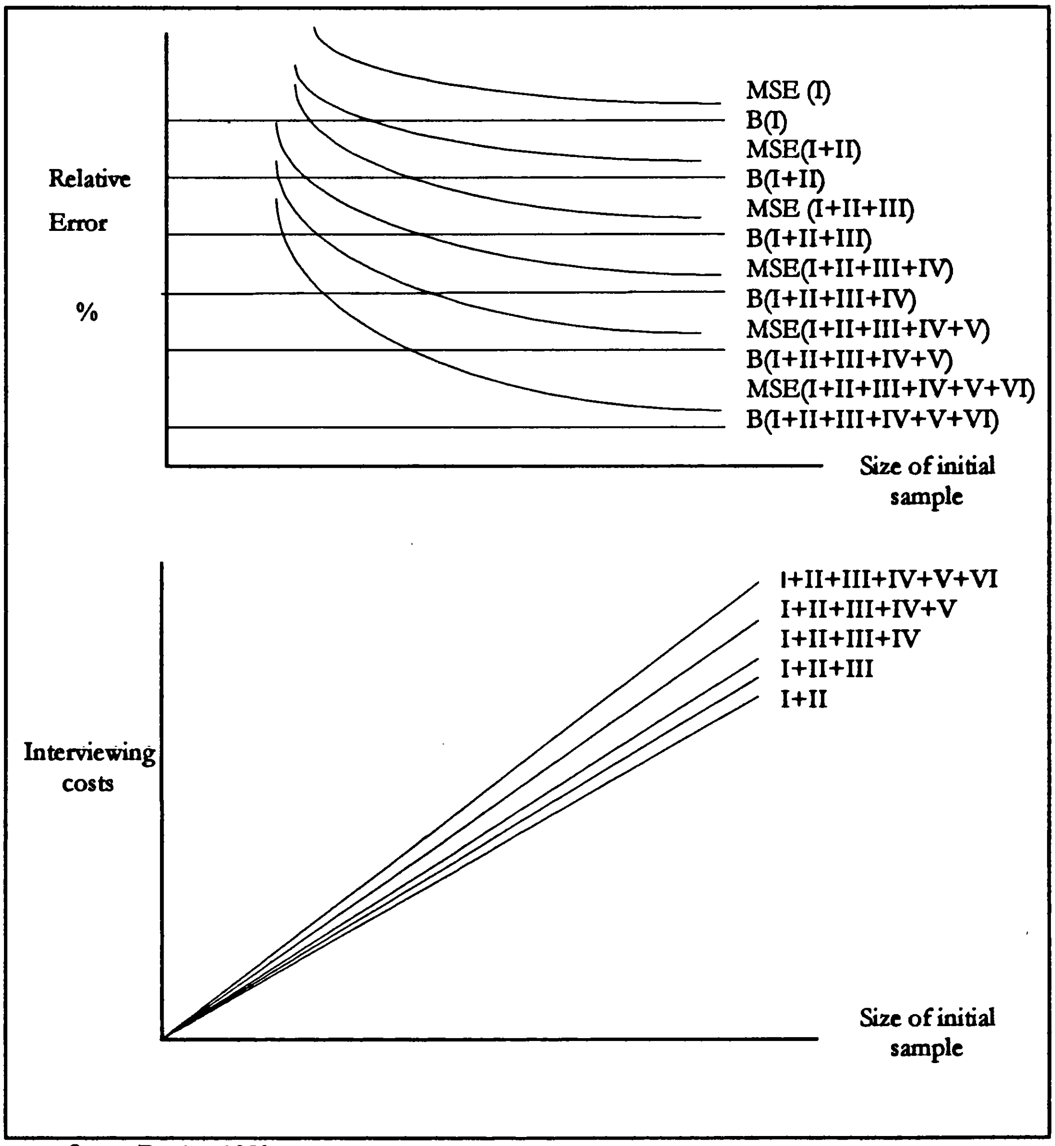
$$(5.6) \qquad E(I) = \frac{\sum ip_i \bar{a}_i}{\sum ip_i} = \frac{G}{H}$$

and variance Var(I):

$$(5.7) \qquad \mathrm{Var}\ (I) = \frac{8}{nH^2}\sum ip_i\left\{\sigma_i^2 + \left[\bar{a}_i - E(I)^2\right]\right\}$$

The systematic error in the expected result E(I) of the initial attempt will be defined as B(I) = E(I) – $\bar{a}$*. Therefore, if recalls are used on a sample of non response each successive attempt will dig deeper into the lower classes and diminish the relative proportions that remain in the upper classes. The combination of successive attempts thus pushes the accumulated result closer and closer to the patient mean $\bar{a}$*. The impact of successive recalls on the size of bias and total error is illustrated in figure 5.2.

Figure 5.2. Deming's non response probability model



Source: Deming, 1953.

For instance, if two recalls are used the result of the combination will be:

$$(5.8)\quad \bar{Y}(I+II+III) = W_I \bar{Y}(I) + W_{II} \bar{Y}(II) + W_{III} \bar{Y}(III)$$

where W_I, W_{II}, W_{III} are weights so that if R_I, R_{II}, R_{III} are the responses in the three separate attempts, then:

$$(5.9)\quad W_I, W_{II}, W_{III} = \frac{R_I, R_{II}, R_{III}}{R_I + R_{II} + R_{III}}$$

The bias of $\bar{Y}(I+II+III)$ will be defined as:

$$(5.10)\ B(I+II+III) = E(I+II+III) - \bar{a}^*$$

The variance of $\breve{Y}(I+II+III)$ will be:

$$(5.11)\quad Var(I+II+III) = e_I^2 Var(I) + e_{II}^2 Var\ (II) + e_{III}^2 Var\ (III)$$

where e_I, e_{II}, e_{III} are the expectations of W_I, W_{II}, W_{III}. The same process applies for $\breve{Y}(I+II+III+IV)$ etc. (cf. figure 5.2).

Survey research has shown that samples differing widely in sizes can have the same average accuracy so that investing in recalling non respondents can have a more significant impact in decreasing the size of the total error than obtaining additional observations by using more sample (Hansen and Hurwitz, 1946). Single call samples have been found to be seriously biased against some variables and in particular against (a) employed persons with full-time jobs, (b) men, and (c) persons having an active lifestyle such as cinema goers, magazine readers and light television viewers (Durbin and Stuart, 1954). Sudman (1976) also observed an association between sex and employment with availability for interviewing. Dohrenwend and Dohrenwend (1968) compared the profile of 'refusers' with compliant respondents and found that refusals are significantly higher among elder people and people with different cultural values such as ethnic minorities. In general, the practice of confining random samples to two recalls has been found to result in little bias when compared with unlimited recalls (Hansen and Hurwitz, 1946). But it does not leave out bias consideration since 20-25% of the population is frequently unobtainable even with extensive recall procedures. The issue of non response in television audience measurement systems, its estimation and its likely effects are examined in section 5.3.1.

5.1.2. Probability and non probability sampling plans

There are different sorts of non probability sampling plans, including haphazard sampling and judgement sampling but the most widely used non probability sampling plan is quota sampling, in which a fixed quota of sample elements are selected in respect of some characteristics of the population, usually age, sex and socio-economic status. In the UK, there has been a polarisation between market research based predominantly on quota sampling and governmental research that relies essentially on random sampling (Kalton, 1983). In France, the situation is less contrasted. The view that *"well applied"* quota sampling yields more efficient results than random sampling is sometimes also expressed in the context of governmental research (e.g. Deville, 1990).

Non probability sampling plans are based on assumptions about the way in which the variables of interest are distributed in the population i.e. on some implicit or explicit model of the population. In probability sampling, a sample *s* is a subset of the units of the population listed in a frame and identified by labels i=1,2,3,....,N. The vector $A_s=(A_1, A_2, A_3, ...,A_N)^T$ determines which units are selected in the given sample s. A_s is a random variable that depends to varying degrees on prior knowledge Z. The randomisation distribution is $f(A_s/Z)$ and inferences are made via the central limit theorem. A sampling scheme is a rule for evaluating A_s. Some sampling schemes rely on sparser prior knowledge (e.g. simple random sampling) than others (e.g. optimum allocation).

The difference between random sampling and quota sampling lies in that in quota sampling the selection scheme depends on some of the variables Y as well as on important prior information Z. Y^q denotes the quota variables and population means or totals that are assumed to be known; Y^m is the measurement variable that is the object of inference and in most cases $Y=Y^q$ but sometimes $Y=(Y^q, Y^m)$. Quota sampling is based on the distribution $f(A_s/Z,Y)$. The measurement of Y^m_i for unit *i* depends not only on whether *i* satisfies Y^q but also on whether *i* is selected. As opposed to probability sampling, it also involves a second stage of selection that determines A_s. If B_s denotes the vector of indicator variables for the second stage, the selection scheme is $f(B_s/ A_s, Y^q_s)$. This second stage depends on both A_s and the values Y^q_s of the quota variables. Differences between the various forms of quota sampling stem from differences at this second stage because the selection procedure can be more or less tightly defined (Moser, 1952).

From a theoretical viewpoint, the validity of a sample is a property of the selection process and not of the sample itself. This is a crucial point on which the assessment of the samples used in television AMS is based in section 5.3. Any particular sample may arise as the result of either:

a) A process in which every element in the population has a known non-zero probability of selection, or
b) A process that is dependent on the validity of assumptions about the distribution of the survey variables in the population.

Within the MSE framework, only by knowing how the estimate derived from the sample can vary from one possible outcome of the sampling procedure to another can the validity of a sampling procedure be judged and only samples of type (a) allow such a judgement to be made. Valid and invalid samples can be distinguished on this basis alone, a point Stuart (1960) summarised thus *"the statistician judges samples by means rather than by end"* (p. 4). It should also be pointed out that in the Bayesian approach to statistical inference, validity can be attributed to quota samples under certain restricted conditions. But even in this approach it is generally considered that in the case of surveys for which there is no simple well-defined user, the sampling method employed should have wide acceptability and be based on minimum prior knowledge (Smith, 1983).

From an operational viewpoint, comparisons between the performances of probability and non probability samples are inconclusive. In their pioneering work, Moser and Stuart (1953) found that quota samples were biased on occupation and education variables[1] but that the setting of additional controls on age and social class variables lead to few differences in results between the two sample types. Although they criticised the use of probability samples on statistical grounds, they also admitted that *"in the hands of practitioners of long experience"* quota samples could give fairly accurate overall estimates. More recently, Marsh and Scarbrough (1990) conducted a similar experimental study and found differences between quota and random samples[2] but no biases against individuals of lower social status and education. They called for a coherent programme reviewing the effects of different quota sampling procedures. However, reviewing the strengths and weaknesses of quota samples in general seems a difficult task. Indeed, biases in quota sampling are likely to vary greatly between surveys, depending on the measurement variables used and the assumptions on their distribution in the population, which in turn depends on the accuracy of prior knowledge and also, to a certain extent, on beliefs.

One of the most serious problems presented by non probability sampling plans in general that needs to be emphasised is that non response is not apparent. From a theoretical viewpoint, random selection is a concept that is rarely achieved in practice because of non response. As Stuart (1968) stressed, *"an incompletely achieved probability sample ceases to be a probability sample"*. Yet when sample elements are selected via a probability sampling scheme

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[1] Lower age and higher education groups were observed to be systematically over sampled in quota samples.

[2] Lower accessibility, household sizes, extremes of income distribution were observed in quota samples.

it is always possible to know precisely how incompletely achieved the sample is, provided the definition given to non response reflects this incompleteness (cf. section 5.1.1). In contrast, there is no clear definition of non response in quota sampling. In market research, non response rates are frequently unpublished or, when they are, they are often equated with refusals. In the UK, the Working Party of the Market Research Society (1976) made an attempt to consider the issue of non response in market research surveys. It was concluded that the definition of response rate in market research should include:

a) refusals

b) ineligibility with respect to quotas

c) termination of interviews with eligible respondents

This piece of work was, however, criticised by the market research industry for *"concentrating on such an esoteric and commercially non-relevant area"* (Working Party of the Market research Society, 1981, p. 17). This attempt to define and collect information on response rates in market research was thus unsuccessful. It is very difficult to make a distinction between sampling biases and non sampling biases due to non response in commercial research.

5.2. Viewing panel designs

All television audience measurement systems in Europe are currently based on prospective sampling designs made necessary by the use of people-metering data collection techniques, as seen in section 4.2.1. In this section it is shown that the prospective sampling schemes used in viewing panels are model-based. In Europe, the model used for the selection of sampling elements in the panel is linked to a continuous survey, referred to as 'establishment survey', whose functions vary depending on the measurement system. BARB and Médiamat establishment surveys are presented in section 5.2.1. Sampling models used in viewing panels are complex, their specification varies and their implementation involves the use of enforced panel attrition practices. The sampling designs of BARB and Médiamat panels are presented in section 5.2.2.

5.2.1. Establishment surveys

The sampling composition of viewing panels may or may not be linked to the existence of a continuous survey that is run in parallel. When it is the case this survey may have either a dual or a triple function. Figure 5.3 summarises the three basic types of viewing panel designs that can be distinguished in television audience measurement systems:

1) *Single-phase sampling with controls derived from external sources.* Sampling elements are first selected randomly. The households designated for recruitment in the viewing panel that do not co-operate are replaced by substitute households that match fixed quotas (the so-called 'quota controls') which are derived from external sources (e.g. census data)
2) *Two-phase sampling with controls derived from an establishment survey.* A large scale survey called the 'establishment survey' is run all year long. Households in the viewing panel are recruited from the pool of households interviewed in the context of the establishment survey and selected according to whether they match controls that are derived from the establishment survey results.
3) *Single-phase sampling with controls derived from an establishment survey.* Households are recruited on an ad hoc basis and selected according to whether they match controls that are derived from the establishment survey results.

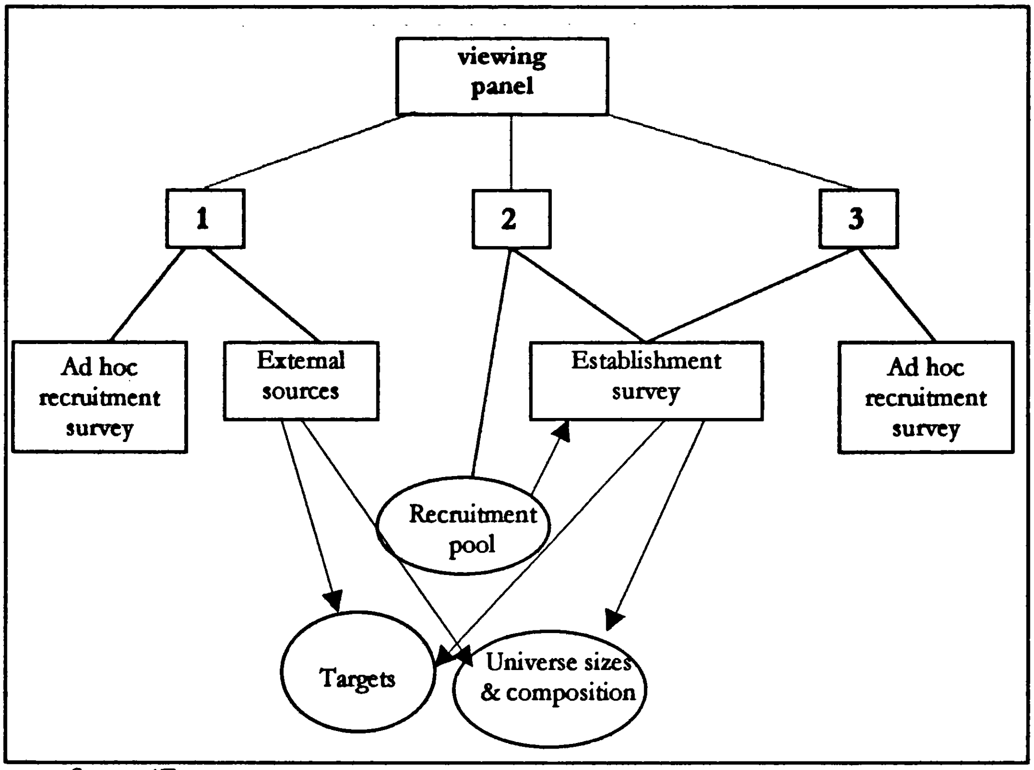
In viewing panel designs of type (1) no establishment survey is run in parallel. In viewing panel designs of type (2) establishment surveys are allocated a triple function (cf. figure 5.3):

a) To provide a pool of households of known characteristics from which sampling units can be selected and recruited for the viewing panel.
b) To estimate the size and composition of the panel universes, particularly with respect to individual and household demographics, television equipment and reception abilities, and in some cases 'viewing profiles'. Variables selected in the sampling model are presented in section 5.2.2.
c) To provide the targets against which the composition of the viewing panel is 'controlled'. Issues related to the calculation of targets on the variables selected in the sampling model are discussed in section 5.3.2.

In television panel designs of type (3) establishment surveys are allocated a dual function only corresponding to the points (b) and (c) above (cf. figure 5.3).

In the USA and Canada, television panel designs are of type (1) e.g. the US Nielsen panel[3] whereas in Europe, the composition of viewing panels is always linked to establishment surveys. About half of television panel designs are of type (2) and establishment surveys are specifically run for viewing panel composition purposes; the other half are of type (3) and establishment surveys have objectives beyond the scope of the viewing panel composition (cf. exhibit 6). The British and French cases illustrate this point. BARB panel design is of type (2). BARB establishment survey is conducted face-to-face and has a 39,000 annual sample size. It is dedicated to feed into the viewing panel sample. BARB establishment survey is presented in exhibit 36A. Médiamat panel design is of type (3). The survey used as establishment survey, the so-called 75 000 survey after its annual sample size, is conducted by phone and it is also the audience measurement system of the French radio industry (cf. exhibit 3). Médiamat establishment survey is presented in exhibit 36B.

Figure 5.3. Types of viewing panel design



Source: AE.

Those two establishment surveys present differences with regard to both data collection methods and sampling designs. BARB is a personal interviewing, pen-and-paper, three-stage stratified survey. In contrast, the 75 000 survey is a Computer Assisted Telephone

[3] External sources used for the setting of quota controls are the US Census Bureau data and local audience measurement systems based on diary techniques.

Interviewing (CATI) three-stage survey that involves the setting of interlocked quotas at the last stage. The sampling scheme used can be summarised as follows: the total population N=X individuals aged 4 and over is grouped in b clusters that are households, with $N_\alpha = X_\alpha$ individuals 4+ in the typical αth cluster, so that

$$(5.12) \qquad \sum_{\alpha}^{b} X_\alpha = X = N$$

The first sampling stage consists in selecting at random a sample of Primary Sampling Units (PSUs) from the A_h clusters within the hth stratum of the H strata. In BARB establishment survey PSUs are postcode sectors that are stratified by a ITV × BBC geographical area matrix (cf. exhibit 36A). In Médiamat establishment survey PSUs are localities that are stratified by a region × locality size matrix (cf. exhibit 36B). The sampling fraction f_a is:

$$(5.13) \qquad f_a = \frac{a_h}{A_h} = K$$

with K being a determined constant of proportionality. K takes higher values in two cases: (a) when A_h is small and a minimum sampling size is set and (b) in BARB when the hth stratum is a BBC and ITV overlapping area, in which case the sampling rate is 2K.

At stage two the sampling frame is composed of B_h clusters corresponding to the PSUs sampled at stage one. Within each hth stratum of the H strata, a fixed sub-sample b_h of clusters is then randomly drawn using systematic sampling. In BARB establishment survey the clusters sampled are addresses. In Médiamat establishment survey the clusters sampled are telephone numbers. The sampling fraction f_b is:

$$(5.14) \qquad f_b = \frac{b_h}{B_h}$$

where the selection interval f_b determined for each hth stratum is B_h/b_h and a random start from 1 to f_h imparts each unit by the selection probability $1/f_h$. The overall sampling fraction is $f = f_a \cdot f_b$.

At the third stage interviewing is attempted with a βth element in each b cluster and information is collected for all the elements in the cluster so that results can be produced on both a cluster and element basis. BARB and Médiamat establishment surveys differ in this last stage. In BARB, interviewing is attempted in each household with a fixed element: the housewife. In Médiamat, interviewing is attempted in each household with a 15+ individual whose eligibility is assessed so as to match fixed interlocked quotas on a sex × age × working status matrix.

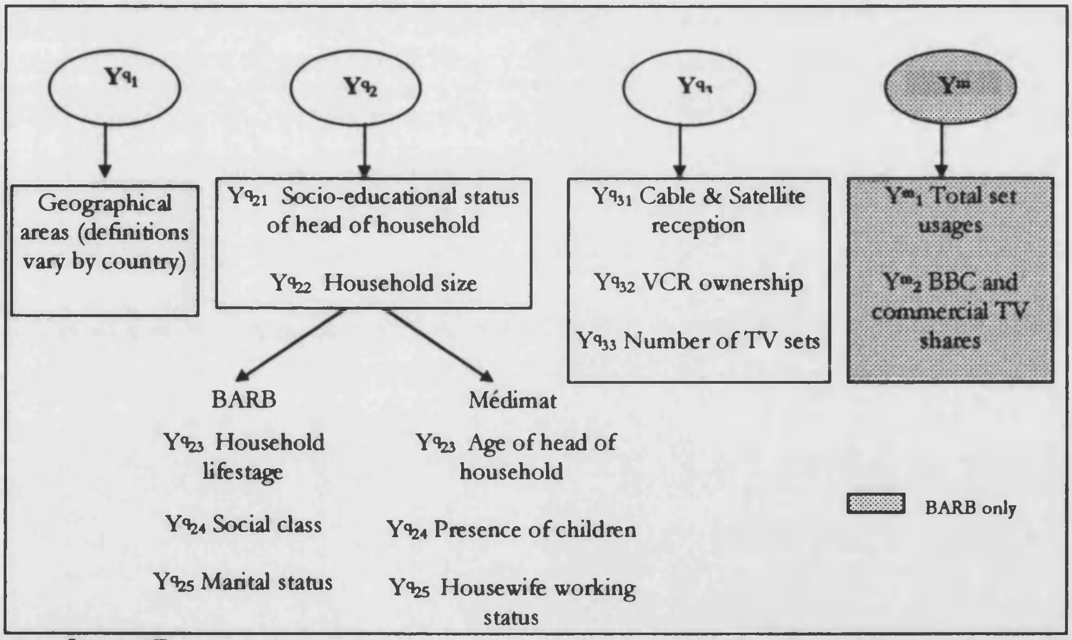
5.2.2. Sampling models

The samples used to estimate exposure in television audience measurement systems are based on complex empirical models. The design of viewing panels is clearly under-developed in the professional documentation available and it is acknowledged therein that this is an aspect of television AMS which is far from being transparent (Syfret, 1993; Gane, 1994). The professional view generally expressed is that viewing panels *"cannot be recruited by known probability of selection"* and are *"best selected by quotas"* (Perry, 1995). They require the use of a *"quality control system"* (Twyman, 1989) whose purpose is *"to keep the sample representative"* (McDonald, 1995b). Each panel household thus continues to be in the panel *"for as long as it remains representative; if a change makes the household statistically unrepresentative it will be dropped from the panel and replaced by a new representative household"* (BARB, 1997a, p. 3). Médiamétrie (1991), as other market research companies in charge of viewing panels, repeatedly emphasises *"the perfect representativity of the panel"*.

It should be reminded that quota sampling designs have been used in audience measurement systems since the outset (cf. exhibit 5). Such designs have been argued on the ground that randomisation cannot be achieved in practice (due to non response, financial constraint on sample sizes etc.), hence has to be manufactured by examining its component parts to see what they are, how they are put together and designing the sample accordingly (Crossley, 1941). Nowadays, many audience measurement systems based on repeated cross-sectional or retrospective sampling designs involve at the last stage the setting of quotas on standard variables such as sex, age, working status, geographical area e.g. 75 000 (cf. section 5.2.1). Those sampling schemes are often referred to in the professional documentation as 'semi-random samples'. However, it is argued in section 5.3.2 that the sampling schemes used in viewing panels have different implications.

The 'control system' used to select samples in viewing panels appears as the crux in the measurement of television audiences. Indeed, selection scheme in television AMS depend on assumptions about the way television exposure is linked to a set of other variables in the population. Inferences from viewing panels are model-based. The purpose of 'panel management' practices is to make sure that the sample is always close to the sampling model specified. The choice of variables and the value assigned to each of them determine the data yielded by the sample. The targets used in panel control systems are numerous and classified by order of priority depending on whether mandatory compliance is required (primary targets) or whether targets are just monitors against which the achieved sample composition has to be compared (secondary targets). In some panels such as BARB a third level of targets is also used. Since the purpose of BARB and Médiamat panels is to make inferences on the same measurement variable (presence in the room, cf. section 3.3.1), comparisons between the two sampling models used are meaningful. BARB and Médiamat panel designs are presented in exhibits 37A and 37B. The number of variables on which targets are formally set is roughly similar in both cases i.e. about 15 and can be classified into four classes that are detailed in figure 5.4.

Figure 5.4. Sampling models in BARB and Médiamat



Source: AE.

1. Geographical variables (Y_1^q) whose definition varies depending on national peculiarities. In BARB television reception areas are used whereas in Médiamat advertising areas are used.
2. Socio-demographic variables (Y_2^q), especially the socio-educational status of the head of household and the household size.

3. Television reception abilities variables (Y_3^q) and in particular cable and satellite reception.
4. Claimed exposure variables (Y^m).

In these models multiple correlation can be suspected (a) between variables belonging to different classes e.g. cable and satellite reception with regions, number of TV sets and household size, and (b) between variables within the same class e.g. household size and presence of children, cable and satellite reception and VCR ownership etc.

It is important to observe that Médiamat and BARB sampling models differ and in particular that:

- Médiamat is based on a model in which panel targets belong to classes 1 to 3. Television exposure is modelled by the social status of the household, its demographic composition and its reception abilities. To resume the notation used in section 5.1.2, the selection scheme in Médiamat is of the type $f(B^*_s / A_s, Y^q_s)$.
- BARB is based on a model using additionally class 4 variables as primary targets. Class 4 variables are proxies for the exposure variable that is the object of inference and are derived from viewing habit questions inserted in BARB establishment survey (cf. exhibit 38A). The selection scheme is of the type $f(B^*_s / A_s, Y^q_s, Y_s^m)$. The use of proxy of the measurement variable to 'control' the sample is argued on the ground that socio-demographic and reception variables are not sufficiently accurate predictors of exposure to television because even within groups defined by variables 1 to 3, large variations of television exposure have been recorded by people-meters (Twyman, 1988). Yet class 4 variables are not - at least not formally - included in Médiamat sampling model.

Issues raised by the specification of sampling models for viewing panels are analysed in section 5.3.2.

The use of model-based samples in television panels unavoidably involves enforced panel attrition practices[4], what Médiamétrie refers to as *"ajustements statistiques[5]"* (Juchs, 1997, p. 14). Sampling elements can be discarded for two kinds of reasons:

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[4] Enforced panel attrition has to be distinguished from enforced panel rotation, which is the practice of systematically discarding sampling elements after a set period of time on the panel. Rotation designs are in use in some television AMS such as Médiamat (cf. section 6.2.3).

[5] Statistical adjustments.

1) Non compliance or meter problems identified at the data editing stage (cf. section 4.3.2). Standard checks include the spotting of nil viewing, extreme viewing, extended uncovered set viewing and repeated unallocated button pushing (Yates and Doe, 1994). About 2% of the sample is annually discarded on this ground in BARB (Sharot, 1991).
2) Non conformity with targets that can be due to changes in the characteristics of the households either on the panel or dropping out (cf. section 5.2.3). Indeed, households are complex sampling elements because numerous changes are likely to occur over time on the four classes of control variables. Consequently household characteristics are monitored and gathered together in so-called 'master files'. When those changes are regarded as leading the sample composition to become 'unbalanced' with respect to the targets set in the sampling model, households with the over-sampled characteristics are discarded. The annual enforced attrition rate in the BARB panel can be estimated to be about 20% (Sharot, 1991).

The use of enforced attrition practices decrease the proportion of the overlapping sample between periods, which impacts in different ways the variability of audience estimates. This point is developed in section 6.2.2.

5.3. Sources of error associated with viewing panels

In this section it is argued that from a theoretical viewpoint, the samples used in television audience measurement systems are not statistically valid. The sampling processes implemented fall outside probability sampling and are ill-defined, whilst estimated non response rates are particularly high. From an operational viewpoint, it is argued that the validity of the estimates yielded by television AMS depends solely on the correct choice of the sampling model selected. Those sampling models are empirical, differ between television AMS and no theoretical framework or external source allows assessing to what extent they are correctly specified. Yet it is shown that in the new television environment, sources of potential errors in the sampling model specifications, both in the selection and calculation of the panel targets, have increased dramatically.

5.3.1. Sampling validity and self-selection issues

The industrial claim that television panels are 'representative' of the population on which inferences are made (cf. section 5.2.2) is not supported by statistical theory. Sampling designs used jointly with DAR and diary techniques are of two kinds: they are either based on probability sampling (e.g. the NRS in the UK), or they involve the setting of quotas at the last sampling stage (e.g. the 75 000 survey in France, cf. section 5.2.1). However, even in this latter case, quota controls are few and set on stable variables (typically sex, age and region), sampling elements are initially selected at random with recall procedures and those that are not needed are rejected. Such sampling schemes can be regarded as equivalent to post-stratified random sampling (Cochran, 1963) and assessed within a classic theory of inference framework (avoidance of selection biases, minimisation of non response etc.). The response rates published for AMS based on cross-sectional designs are typically between 50% (e.g. 75 000 survey) and 60% (e.g. NRS). Response rates for AMS based on retrospective designs are lower and vary a lot depending on factors such as number of days covered by the diary, diary design, mode of placement etc. The response rate in RAJAR can be estimated to be 40%[6].

In contrast, sampling designs used jointly with people-metering data collection techniques are of a different nature. In a classical theory of inference framework, validity is a function of the selection process and not of the sample itself, as explained in section 5.1.2. From this viewpoint, the samples used in BARB and Médiamat (cf. section 5.2.2) are not statistically valid for different reasons:

1) *The sampling processes aim to obtain samples that are 'balanced'.* Samples are especially designed so as to have some predefined characteristics in common with the population from which they are drawn. A large set of variables are selected to be used in the balancing procedure (cf. section 5.2.2). Such a procedure is a complex form of quota sampling and thus falls outside the domain of probability sampling (cf. section 5.1.2). Although it is possible to use resampling plans in order to estimate empirically the sampling variable errors of the estimates yielded by such samples, whether those estimated standard errors are unbiased remains unknown (cf. section 6.1.3).

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[6] The total response rate in AMS based on diary techniques has to be broken down into two rates: a recruitment rate (about 50-55% in RAJAR) and a completion rate (about 65-70% in RAJAR).

2) *The sampling processes are ill-defined.* Directly related to point (1), the sample composition is the result of an implementation process left to the organisation in charge of managing the panel within the constraints imposed by the compulsory targets. Given the large number of targets the sample has to meet simultaneously and daily, tolerance areas are unavoidable. How far from each monitoring target the sample is allowed to be before considered 'unbalanced' is left to the discretion of the panel manager. The line between a 'balanced' and an 'unbalanced' sample is thus blurred and likely to differ between panel managers depending on factors such as the latitude left to them by the industry, their experience, code of practice etc. Different panel managers lead to different sample compositions, even though the same target system is used. Such an ill-defined sampling procedure can only produce samples with ill-defined properties of bias.

In support of this point, the Médiamat panel is composed of two sub-panels managed by two sub-contractors following the same sample control system dictated by Médiamétrie (cf. exhibit 8). It has been repeatedly observed that the data yielded consistently differ between the sub-panels and the explanation put forward by the CESP (1996) was that the different sub-contractors were applying the control system differently.

3) *Non response rates are particularly high.* Non response in television panels is a difficult point that involves addressing different questions: (a) is the mean value on the variable of interest likely to differ between observed and non observed elements? (b) how should non response be defined in viewing panels? and (c) what are the non response rates in BARB and Médiamat?

(a) Causes of non response in viewing panels are related to television exposure owing to two phenomena:

- There is a positive relationship between the likelihood of a respondent being found at home and the amount of his/her television exposure. In the early 1950s Durban and Stuart (1951) had already observed an association between recalls in sample surveys and media consumption indicators. In the 1960s Stuart (1960) emphasised the importance of achieving high response rates in television surveys on this ground. More recently, a study of recalls in the context of the 75 000 survey (Grosbas, 1990) concluded that the claimed individual viewing level decreases with the number of recalls necessary to contact the respondent.

Indeed, media consumption profile is a variable closely associated with mobility levels and lifestyles. The CESP Multimedia Time-Budget Survey showed that time spent at home correlates positively with television exposure and negatively with exposure to the national daily press. Results of this survey are presented in exhibit 38A. Similarly, the INSEE Transport Survey showed that young men and businessmen are the categories of the population least likely to be found at home. These data are presented in exhibit 38B. They also happen to be the lightest television viewers, as opposed to housewives and retired individuals for instance who are heavy viewers and the most likely to be found at home.

- There is a positive relationship between the likelihood of a respondent joining as well as staying in a viewing panel and his/her amount of television exposure. The influence of the subject of a study on respondents' co-operation to on-going panels is a phenomenon that has repeatedly been observed (Williams and Mallows, 1970; Thornton et al., 1982). Sobol's (1959) study is particularly interesting in this respect. The composition of a consumer panel based on a probability sample over a two-year period was examined. No significant differences were found between the final and the initial samples with respect to socio-demographic variables such as place of residence, age, education, occupation or income of the households. Yet families that were the most interested by the subject of the survey were observed to be the most likely to remain in the panel over time. As a result, the panel reported a significantly larger number of purchases at the end of the two-year period than at its beginning.

  Similarly, households that are the most interested in television are also the most likely to join and to stay on viewing panels (Sharot, 1991). It is precisely on this ground that model sampling is supported by the industry. Indeed, it is believed that the use of probability sampling would lead to inferences biased towards heavy television viewers whereas quota sampling corrects for such biases (Perry, 1995; Twyman, 1988). Non response nonetheless occurs also with non probability samples (cf. section 5.1.1) and whether the sampling models used control for the self-selection biases induced by non response is an assumption that remain unsubstantiated.

(b) As it is the case in many sample surveys (cf. section 5.1.1) there is no standard definition of non response in viewing panels so that what is kept or left out of response rate calculations varies between AMS. But because samples in television AMS are model-based (cf. section 5.1.2), non response is not made apparent and response rates are therefore difficult to assess. What is commonly reported in the industry as response rates are in fact acceptance rates i.e. number of households accepting an invitation to move onto the panel over the total number of households invited. Such rates are reported to be of 40% for BARB (Syfret, 1993) and 50% for Médiamat (Aglietta, 1996). However, using acceptance rates as proxies for response rates results in severely under-estimating non response. Indeed, an adequate definition of response rate in television panels should reflect (a) the initial self-selection and (b) the lack of co-operation maintenance over time. The following classification of non response in television panels can be proposed. This classification system applied to BARB and Médiamat is given in figure 5.5:

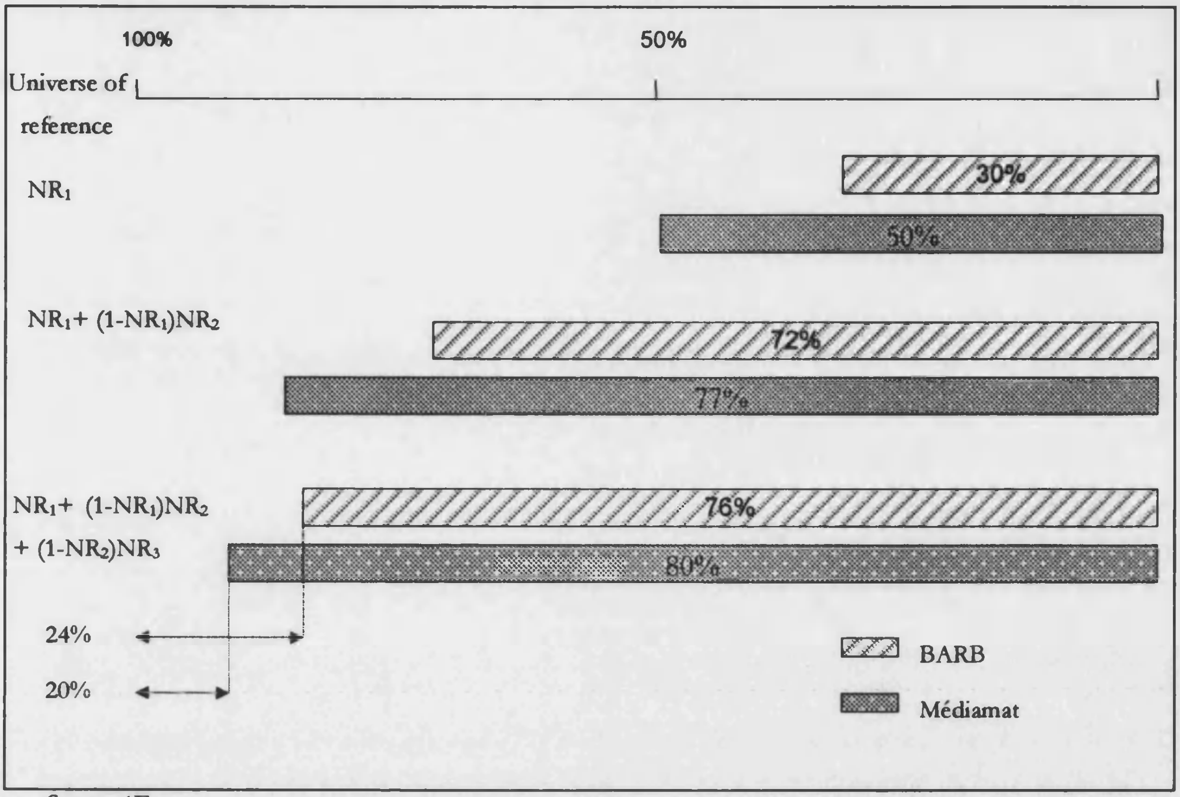
- *Recruitment survey non response rate (NR_1)*. Households in television panels can be recruited either via an establishment survey or on an ad hoc basis (cf. section 5.2.1). In the first case, non response should include the proportion of households for which it was not possible to collect data because of (a) non accessibility or (b) refusals and terminations. In the second case, non response is more difficult to define but should also include ineligibility with respect to the targets (cf. recommendation of the Working Party of the Market Research Society in section 5.1.2).
- *Panel non co-operation rate (NR_2)*. It is defined as the proportion of households that are eligible with respect to the targets but cannot be moved onto the panel. It should include (a) households that refused to co-operate when offered (i.e. the non acceptance rate) and (b) those that were not accessible when recruitment was attempted.
- *Panel natural attrition rate (NR_3)*. It is defined as the proportion of households that have been moved onto the panel but have subsequently decided to drop out because of panel fatigue or external events inducing inability to continue.

With this classification, the total non response rate (NR) in television panels is:

$$(5.15) \quad NR = NR_1 + (1 - NR_1)NR_2 + (1 - NR_2)NR_3$$

(c) Estimating non response rates within this classification framework for BARB and Médiamat leads to make certain assumptions (cf. figure 5.5).

Figure 5.5. Classification and estimation of non response rates for BARB and Médiamat panels



Source: AE.

- In the case of BARB, NR_1 = 30%. Indeed, the maintenance of a 70% response rate is a contractual requirement of the BARB contractor in charge of the panel onto the agencies in charge of the fieldwork. Addresses initially drawn are systematically re-issued by the contractor until the required response rate is achieved. If the published acceptance rate is taken as a proxy for NR_2, then NR_2 = 60%. Natural attrition rate increases over time because the longer a household has been on the panel, the more likely it is to be impacted by external events or fatigue effects. The reported annual average natural attrition rates in viewing panels vary between 7% (Sharot, 1991) and 12% (Yates and Doe, 1994), and are consistent between television panels based on different sampling designs, including the US Nielsen panel (Dimling, 1992). An average annual NR_3 of 10% can thus be assumed.

- In the case of Médiamat, the recruitment survey is conducted by waves on an ad hoc basis depending on the panel needs. The sampling design of the recruitment survey is similar to the Médiamat establishment survey (cf. section 5.2.1). Since the response rate of the recruitment survey is unpublished, it is assumed to be similar to the non response rate published for the establishment survey i.e. NR_1= 50%

(CESP, 1997). However, since the 75 000 survey is based on a sampling scheme entailing the setting of quotas at the last stage (cf. exhibit 36B) it is not clear what is in fact included in this calculation so that the published response rate should be regarded as a maximum. NR_2 = 50% and NR_3 = 10%.

According to this classification system, the non response rate in television AMS such as BARB and Médiamat can be estimated to be between 75% and 80%, and concurrently the response rate is between 20% and 25%. Such a response rate is low, especially given that causes of non response are directly related to the measurement variable. It is much lower than the response rate of AMS based on cross-sectional or retrospective designs. This low response rate rules out any reference to probability sampling and forces consideration on the specification of the sampling model.

5.3.2. Sampling model specification issues

The fact that the samples used in television audience measurement systems are not statistically valid (cf. section 5.3.1) does not necessarily mean that they perform poorly in practice. Indeed, some non probability samples have been found to give fairly accurate overall estimates if managed by practitioners of experience (cf. section 5.1.2). At the same time, even though Crossley introduced quota sampling in audience measurement systems (cf. exhibit 5) he regarded quota sampling applied to panels as *"probably the most dangerous form of research because they readily mislead if mishandled"* (1941, p. 460). The operational validity of the estimates yielded by television panels rests entirely on the assumption that if the sample and the population correspond in terms of some determined known characteristics then it guarantees that the sample gives unbiased estimates of exposure. The key question to address is thus to what extent the sampling model specifications used for television panels fails. Biases in television AMS sampling designs are likely to stem from two sources: (1) the variables selected as targets and (2) the calculation of those targets.

1) *The variables selected as targets in the sampling model.* The problem of model-based sampling in television AMS is that many variables may have an impact on television exposure but that the selection of too many variables as targets makes model sampling totally impractical whereas the selection of too few targets may lead the sample to be biased against some of the uncontrolled variables.

(a) A first question is whether there are important uncontrolled variables that influence television exposure levels and that should be integrated in the model. BARB and Médiamat sampling models diverge in this respect. In the BARB model 'claimed weight of viewing' is a determinant variable and a compulsory target whereas it is not integrated as a target in the Médiamat model (cf. section 5.2.2). Indeed, controlling the panel by the measurement variable is a practice that has been criticised in some industries (Sharot, 1994a). In the UK however it is argued that when occasionally panels have drifted off-target on this variable, it has always had a significant effect on the estimates yielded and it is believed that in industries where panel controls do not include this variable as compulsory target biases are likely to build up (Twyman, 1989). Independent analyses of Médiamat data support this view since it has been observed that individual exposure levels within socio-demographic groups are widely distributed around the mean (Chaniac, 1994).

However, the calculation of 'claimed weight of viewing' targets raises some serious estimation problems that are approached in point 2b. Furthermore, it is not obvious whether there are no other variables that are better predictors and less problematical to estimate that should be integrated in the model. For instance, setting targets on 'time spent out-of-home' can be argued since it has been repeatedly observed in the context of independent research that non television activities determine the size of the total viewing time (e.g. Gensh and Shaman, 1980).

(b) A second question is whether there are important uncontrolled variables that influence exposure to certain programmes or programme genres and that should be integrated in the model. An obvious example is the 'representation' of ethnic groups in the sample. The US panel is controlled for on this variable (Nielsen, 1999) but no controls are set on ethnic origins either in BARB or in Médiamat panels. Yet refusal rates have been observed to be higher among minorities in sample survey research (cf. Dohrenwend and Dohrenwend, 1968) and channels targeted to ethnic minorities have multiplied in the 1990s.

Another example is the 'representation' of individual 'repertoires'. Research undertaken in advanced multi-channel environments suggest that individuals typically watch a set number of channels only which form their personal repertoires (Kennedy, 1998). Factors affecting the formation of those repertoires are not at all well known and viewing panels are not controlled on this variable so far.

2) *The calculation of the targets used in the sampling model.* The calculation of targets on the variables selected is derived from the establishment survey estimates (cf. section 5.2.1) and has a direct impact on which households are recruited, retained or removed from the panel. Accurate estimations of incidence of the characteristics controlled for in the panel are therefore conditional to accurate estimations of incidence of these characteristics in the universe.

(a) Accurate estimations of relatively stable and objective phenomena (cf. section 3.1.1) such as geographic and socio-demographic variables (class 1 and 2 variables in section 5.2.2) are the easiest to achieve but are not error free. For instance, analyses conducted in the UK in 1997 showed that the target calculations for the 16-24 age group (and especially 16-24s householders as opposed to those living with parents) were systematically 5% lower in the BARB establishment survey than the estimation given by the ONS census (BARB, 1997b). This underestimation had a direct impact on the panel composition and led to a significant mis-reporting of television exposure estimates for this age group. It justified the setting of a new weighting system and a special programme of recruitment outside the establishment survey to correct for this bias. It can be conjectured that this underestimation is related to the high mobility of this age group and thus to the difficulty of sampling this population in surveys in general. It does, however, emphasises the effect of non response in viewing panels (cf. section 5.2.2).

(b) Accurate estimations of 'claimed weight of viewing' characteristics (class 4 variable in section 5.2.2) are much more difficult to achieve. The case of the Irish television panel is illuminating in this respect (Kleinman, 1996). In 1996 an average 20% drop in average ratings - and well above 20% for some segments of the universe - was observed in the television ratings yielded by the Nielsen panel in Ireland. After an industry investigation the main factor behind this phenomenon emerged as being a change in the method of questioning respondents about their viewing habits in the establishment survey. The previous contractor (AGB International) used to ask respondents a series of questions including how many hours of television they watched on the day before the interview. Nielsen's method was to ask respondents to estimate their total viewing hours over the week before the interview. Much lower levels of viewing time were reported with the second recall method than with the first one (probably due to memory effects, cf. section 4.3.1) and it was directly translated into a significant change in the estimates yielded by the viewing panel controlled on this target. It seems likely that errors affecting this type of data are autocorrelated as respondents persistently apply a set of subjective standards in their responses, which make estimates of change more reliable than estimates of level for panels controlled by this class of targets.

(c) Even more problematical are accurate estimations of dynamic characteristics such as reception abilities (class 3 variable in section 5.2.2). In the new media environment, access to cable and satellite programming is in constant evolution (cf. section 2.3.3). The new availability of digital transmission complicates further the calculation of accurate and timely targets of reception abilities. BARB universes for cable and satellite receiving homes are updated monthly on the basis of a projection model that produces a smoothed estimate of the future trend, using the establishment survey data for the previous month and some other industry data such as the ITC cable statistics (Gill, 1995). This approach is a typical strategy followed by many viewing panels but that involves risks that have been emphasised by Jephcott and O'Muircheartaigh (1998). Actual growth curves of pay television reception have been shown to be not smooth. For small domain statistics such as take up rate of digital equipment, large fluctuations between monthly estimates from the establishment survey may be real or may be due to normal sampling variations. Smoothing procedures may solve this problem operationally but may also reduce confidence that can be put in the final estimates. The use of industrial sources often creates controversies over the size of some reception characteristics, with each group of industrial players promoting a source or a set of estimates that best serves their commercial interests.

In an increasing number of cases it has been possible to introduce panel controls only after a certain period of time because the establishment survey could not keep pace with the rate of change. This was the case in the UK when Channel 5 was introduced in 1997. BARB (1997c) acknowledged that "[The number of households receiving Channel 5] *cannot be predicted in advance since the situation is changing all the time and any survey results are out of date by the time they are available*". As a result, the level of reception of Channel 5 was initially determined from the BARB panel itself. The same strategy was used in the autumn 1998 to estimate BSkyB digital reception (BARB, 1998) and, since January 2000, to estimate digital television share of viewing in the Médiamat panel (Dutheil, 1999). The validity of this strategy relies entirely on the assumption that the viewing panel is 'balanced' and that the panel homes constitute a 'representative' sample of the total universe. The other obvious problem with this approach is that the panel sample size is typically too small and that estimations for such small domain statistics are made at a low level of precision. This point is developed in section 6.3.2.

Due to the nature of the sampling schemes used in television audience measurement systems it is not possible to establish how well viewing panels perform in practice. Yet in the late 1990s television environment there is even less guarantee that serious biases are not introduced into the results by basing the sample selection on faulty premises.

5.4. Using viewing panels to draw inferences

Since inferences from the samples used in television audience measurement systems cannot be regarded as sound and argued on statistical grounds (cf. section 5.3.1), television ratings are best regarded as industry conventions. In selling and buying the estimates produced by such systems, parties that pursue commercial objectives and need to trade – broadcasters and advertisers – have reached an agreement upon the commodity exchanged on the market. In so doing, they have implicitly accepted the assumption that the sampling model in use by a given industry is correct i.e. that the population is adequately mirrored in the sample elements of the viewing panel and that the TVRs yielded by the television AMS reflect real exposure phenomena occurring in the population. Different sampling models are implemented by different national industries and whether the underlying assumption that they yield unbiased estimates is true remains unsubstantiated from a statistical viewpoint. This view contradicts the professional claim that television audience measurement systems are 'scientific' and 'objective' (cf. section 1.3.1). Since it is not possible to assess sampling biases in viewing panels, the effects of potential systematic errors on the allocation of resources in the television industry are unknown.

The origin of those sampling schemes lies in the choice of data collection technique. DAR or diary techniques do not necessarily dictate sampling designs in which the need for probability sampling is obviated (cf. section 5.3.1). By contrast, people-metering techniques yield estimates that have operational features which are superior from an economic viewpoint (cf. section 4.2.2) but require sacrificing the statistical dimension of the sample surveys (i.e. use of randomisation to avoid or reduce the probability of spurious correlations or mis-identification effects, consideration of non response rates etc.). The economic functions of television audience measurement systems can thus be said to have prevailed over the statistical requirements of the measurement.

The passive metering data collection techniques currently tested by the industry (cf. section 4.5) do not seem likely to address the statistical issues brought up by the current television AMS. On the contrary, passive metering techniques are individual devices that are portable and intrusive (or likely to be perceived as such by respondents). Such features are likely to result in further self-selection problems and demand yet more complex sampling models, thus leading to a sampling selection more prone to biases. The emergence of such techniques would suggest the persistence of television audience measurement systems as industry conventions.

In the new television environment, the assumption that the samples used in television AMS are valid has become fraught with risks. The overall accuracy of the TVRs yielded by viewing panels depends solely on the accuracy of the sampling model specification, which in turn depends on an accurate prior knowledge on the measurement variable and its distribution in the population (cf. section 5.3.2). But the key problem in the late 1990s is precisely that the industry is uncertain as to the dynamic of exposure phenomena in the new television environment and that accurate knowledge on closely related variables which are in constant evolution is extremely difficult to achieve (cf. section 5.3.2). How the changes brought up by the new programming offer modify individual behaviours is a question very much debated in the industry and beyond. The evolution of exposure levels, their distribution between broadcasters in a multi-channel environment (cf. section 2.3.3), the determinant factors that impact exposure phenomena at a household and individual basis (cf. section 3.4.4) are not known and can only be conjectured.

In such a context of uncertainty sampling schemes that rely on minimum prior knowledge should logically be preferred. Indeed, sample surveys that aim to estimate exposure phenomena should favour sampling schemes that rely on randomisation because they guarantee freedom from biases in the selection procedure and thus allow the unbiased estimation of the strength and the direction of the relationship between exposure and other variables. However, since such sampling schemes are not compatible with the use of people-metering (or passive metering) data collection techniques, they mean moving away from the delivery of minute-by-minute TVRs overnight with its related trading advantages (cf. section 4.2.2). It therefore appears that statistical requirements are not compatible with the operational features of the commodities wanted by the industry and the way those commodities are used. This point also emerges from the analysis of sampling variable errors which is presented in chapter 6.

5.5 Conclusions

Television ratings are best regarded as conventions used for trading purposes because they are yielded by samples whose validity is unsubstantiated from a statistical viewpoint. The sampling schemes used in television audience measurement systems do not rely on probability distributions. Whether those samples yield unbiased estimates of exposure phenomena occurring in the population cannot therefore be assessed and can only be an assumption. The samples in use result from models and implementation practices that vary between television AMS and panel management practices. Response rates are low, especially considering that there is a direct relationship between non response and the measurement variable. Consequently, the claim that television audience measurement systems are 'scientific' and 'objective' cannot be supported on statistical ground.

How well those samples perform in practice remains unknown and depends chiefly on the specification of the sampling model. Systematic errors can originate either from the set of variables selected in the model or from the calculation of targets against which the 'balance' of the sample is ascertained. In the late 1990s television environment, television ratings from such model-based samples have become much more prone to sampling biases. As exposure phenomena and their evolution are uncertain, relying on sampling models that demand accurate knowledge of how those phenomena are distributed in the population and the changes the distribution is undergoing has become increasingly fraught with risks. In such a context of novelty and uncertainty, using probability sampling schemes is the only strategy that can bring a guarantee for sound statistical inferences. However, such an approach implies moving away from the current and potentially future data collection techniques (people-metering and passive metering techniques) and the trading characteristics of the commodities they yield. This suggests the existence of a contradiction between statistical requirements on the one hand and industry's requirements on the other.

6. Sampling variable errors

Chapter 5 shows that whether television audience measurement systems yield unbiased estimates cannot be assessed. But the precision of the measurement can be approached both theoretically and empirically. It is the object of this last chapter. The precision of a measurement refers to the extent to which that measurement yields the same results on repeated trials. Precision is thus inversely related to the size of the random variations between the estimates and the expected values of these estimates i.e. to the size of sampling variable errors assessed by the calculation of the sampling variance and standard error. Television audience measurement systems are characterised by complex, overlapping and non measurable sampling designs. In section 6.1 the effects of this type of sampling design on the variance of estimates are first presented within a parametric theory framework. The rationale underlying resampling techniques, and more specifically Bootstrapping, is then introduced. In section 6.2 the static and dynamic statistical efficiencies of BARB and Médiamat samples are theoretically assessed. Components of variance for different types of estimates are identified. In section 6.3 a research method for assessing empirically the standard errors of audience estimates and searching for patterns is proposed. General conclusions as to the maximum degree of precision that can be expected from television audience measurement systems data in the late 1990s are drawn. Finally the implications of using stochastic measures as commodities on the economy of television are discussed in section 6.4.

6.1. Theoretical considerations (v)

Standard error sizes reflect the sample design used to yield estimates, so that the complexity of their assessment depends on the complexity of the sample design. The standard errors of different estimates yielded by the same complex sample can exhibit great diversity but some main sources of variability are identified in this section. In the case of longitudinal sampling designs the assessment issue is further complicated by the existence of overlapping elements that have conflicting effects on the standard errors of different types of estimate. Those elements are also identified. Applying parametric theory to calculate the standard errors of estimates yielded by non probability samples is not sound. It is possible to circumvent this problem by using empirical resampling techniques that produce estimates of standard errors in an empirical and automatic way. A technique for the calculation of standard errors for estimates from non probability samples is presented in this section.

6.1.1. Design effects for complex samples

Since only a part of the population is observed in a sample survey, a difference can be expected between the estimate obtained from the sample and the population value being estimated. This difference is caused by random variations and corresponds to the term $[\bar{y} - E(\bar{y})]$ in the MSE model (cf. equation 4.3). The total sampling variable error of a measurement belongs to the uncertainty of type III in Deming's classification of errors in sample designs (cf. section 4.1.2). The values of sampling variable errors are assessed by the distribution of all possible values of the estimator, standard measures of variability being the variance[1] and the standard error[2]. Measures of variability can be used at the design stage in order to determine in advance the level of precision required of different estimates and samples can then be designed with the aim of yielding the needed level of precision (cf. figure 5.1). Sample survey theory has long focused on the theoretical estimation of those measures to the extent that the concept of error in sample surveys has long been – and is still often - synonymous with sampling variable errors (cf. section 4.1.2).

Estimating the variance or standard error of an estimate can be either a simple or a very complex task. Simple random samples (SRS) yield estimates with simple standard errors because in this sampling scheme each population element is given an equal chance of selection and the selections are made with replacement so that each selection is independent of the others. Complex sampling schemes yield estimates with complex standard errors because the method of calculation must reflect both varying probabilities of selection and the fact that all selections are dependent on each other.

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[1] The variance is the sum of squares of all differences between values of a estimate and the overall mean value.

[2] The standard error is the standard deviation of the sampling distribution of an estimate and the standard deviation is the positive square root of the variance.

The effect of the sample design on the standard error is generally assessed through the design factor (deft) and the rate of homogeneity (roh):

$$(6.1) \qquad \text{deft} = \frac{\text{se}}{\text{sr}}$$

where *se* is the complex standard error and *sr* is the estimate of the simple standard error of a sample of same size n, thus,

$$(6.2) \qquad \text{se} = (\text{deft}) \quad (\text{sr})$$

$$(6.3) \qquad \text{roh} = \frac{\text{deft}^{2} - 1}{\bar{b} - 1}$$

where b is the average sample size per Primary Sampling Units (PSUs) for the subclass for which the estimate is defined. In some cases it is easier to identify an appropriate roh for a particular variable and sub-class and roh can be used to infer the standard error:

$$(6.4) \qquad \text{deft} = \sqrt{1 + (\bar{b} - 1)\,\text{roh}}$$

$$(6.5) \qquad \text{se} = \sqrt{1 + (\bar{b} - 1)\,\text{roh}} \;\; \text{x} \;\; \text{sr}$$

Roh is an extension of the intracluster correlation, rho, which measures the homogeneity of the elements within clusters and tends to increase the variance of the sample. The main component of roh is the correlation between elements within PSUs averaged over all possible samples. Thus in general roh provides an acceptably close approximation to rho and vice versa.

- At one extreme if the members within each PSU take identical values then rho would reach its maximum value of 1. In this case $[1+ (\bar{b} -1)\text{roh}] = \bar{b}$ so that the variance of PSUs is as great as the variance of single elements.
- At the other extreme if the variable is distributed completely at random among PSUs, then roh will be 0 and deft = 1 and the expected variance for PSUs is $1/\bar{b}$ as great as the variance of single elements.

In social research the variance of PSUs is typically greater than for a comparable sample of single elements so that negative values of roh are rare. Rohs are almost always positive and their values typically lie between 0 and 0.2. This homogeneity may be due to selective factors in grouping, joint exposure to similar influences, effects of mutual interaction etc.

In general it is quite common for complex standard errors to be 1.5 to 2 times bigger than simple standard errors (Stuart, 1963). But for many variables, even in the same survey, the appropriate design factor can vary considerably so that the use of a single design factor for all estimates can be misleading. Six main components of variation between the standard errors of different estimates can be identified in the context of equation 6.5:

1) *The sample design.* This is constant for all variables from a survey and contributes to the size of roh in that the smaller the population size of the primary sampling units and the more stages in the sample design the greater the rohs are for most variables. In contrast, optimal allocation designs decrease the rohs for most variables.

2) *The sample size.* The base, n, i.e. the size of the sample (or subclass) on which the estimate is based is itself subject to random fluctuations. Indeed, the sample size becomes a random variable when the sample is composed of unequal sampling units or when estimates are yielded for subclasses. Allowing for this variation in calculating standard errors comes to consider means and proportions as ratio estimates. If y and x are two survey estimates and $r = y/x$ is the ratio between them, the variance can be broken down into three components so long as the relative standard error of x is small:

$$(6.6)\quad \mathrm{var}(r) \approx \frac{1}{x^2}(\mathrm{var}(y) + r^2\,\mathrm{var}(x) - 2r\,\mathrm{cov}(x, y))$$

The variance of means and total become greatly affected as the sizes of subclasses are decreased.

3) *The standard deviation of the variable in the population.* For a proportion p this is just $\sqrt{p(1-p)}$ but for a numeric variable it depends both on the units of measurement and on the variability in the population.

4) *The type of variable.* This also contributes to the size of roh because some variables (e.g. age) can be less affected by clustering (e.g. geographic clustering) whilst others can be dramatically affected (e.g. lifestyle).

5) *The type of subclass.* This affects roh in that larger rohs can be expected from some

subclasses than from others. Three types of subclasses can be identified (Kish and Frankel, 1974; Kish, 1987):

a) *'crossclasses'* that are evenly spread among the PSUs in the population e.g. age and sex,

b) *'segregated classes'* that only involve some of the PSUs e.g. region,

c) *'mixed classes'* for which there is a lot of variation between the proportions in different PSUs e.g. socio-economic status or ethnic group.

As a principle, larger rohs can be expected from mixed classes than from crossclasses.

6) *The average sample (subclass) size per sampling unit* $\bar{b}$. The variation of $\bar{b}$ depends on the type of subclasses:

a) in *'crossclasses'* $\bar{b}$ varies roughly in proportion to the sample size in the sampling units,

b) in *'segregated classes'* $\bar{b}$ is the same as for the whole sample,

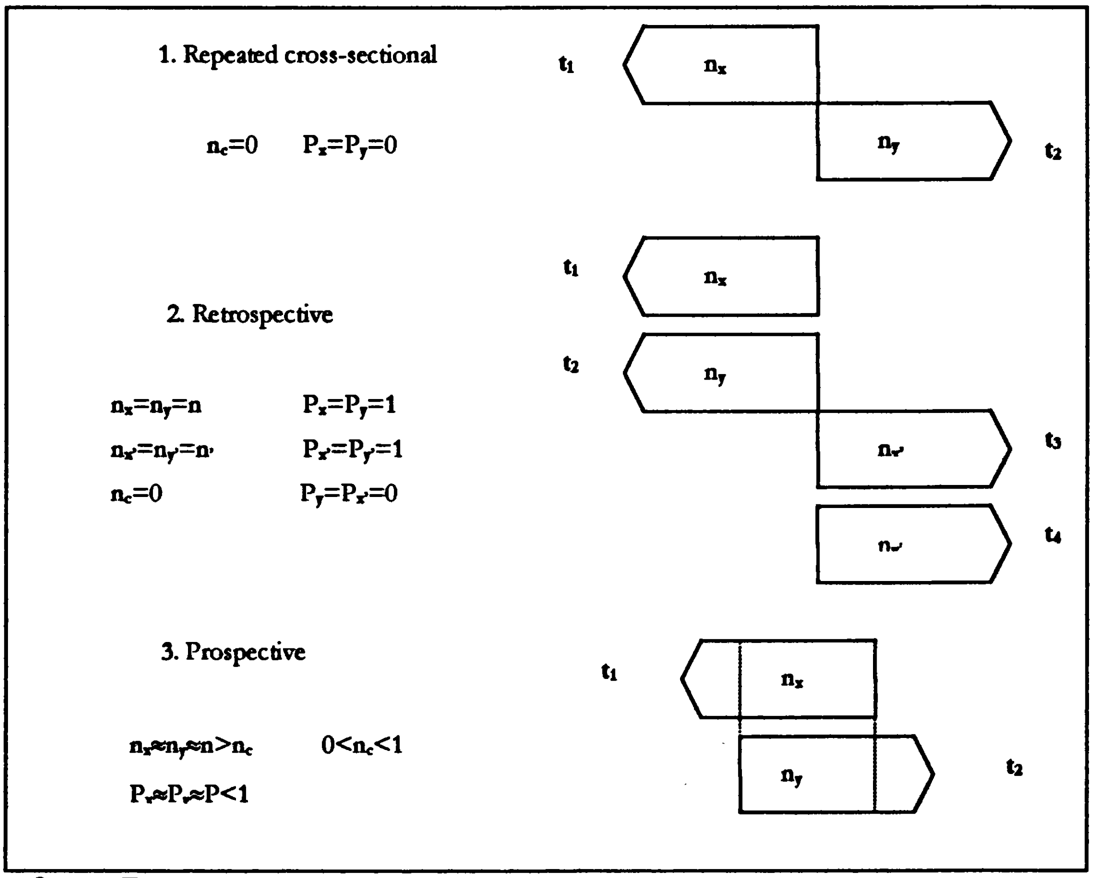
c) in *'mixed classes'* $\bar{b}$ declines with the sampling unit size but there is a lot of variation about the average.

It should be added that the scope for modelling standard errors is limited when the data are weighted and the weights themselves vary strongly. This is because both deft and roh reflect the effect of weighting on variance and this effect may vary considerably between different variables and subclasses.

6.1.2. Design effects for overlapping samples

Longitudinal sampling designs further impact the size of complex standard errors depending on the proportion of sample elements that overlap over time. This results in additional correlations that lead to conflicting design effects as shown in this section. The longitudinal sampling designs used in audience measurement systems are introduced in section 4.2.1 and figure 4.1. They involve different overlapping designs which need to be developed. A graphical representation of these designs is given in figure 6.1. n_x is the size of the first sample at t_1, n_y is the size of the second sample at t_2 and n_c is a sub-sample derived from the elements common to n_x and n_y. The proportion of the overlap is denoted as P_x in the first sample with $P_x = n_c/n_x$ and P_y in the second sample with $P_y = n_c/n_y$.

Figure 6.1. Types of overlapping sampling design in audience measurement systems



Source: AE.

In repeated cross-sectional designs, which are used in AMS based on DAR data collection techniques, independent samples are drawn at each measurement period so that the overlap is nil. In retrospective designs used jointly with diary techniques complete overlap and non overlap samples alternate depending on the measurement periods. The length of those periods can vary greatly, from one to four weeks, depending on the diary period. In contrast, prospective designs brought on by people-metering techniques are characterised by a higher stability of the sampling unit characteristics over time. The overlap is however only partial because of unavoidable losses due to natural panel attrition (panel fatigue, mortality and mobility). Additionally, some panels are based on revolving designs in which the sample elements have a restricted panel life and are dropped out and replaced after a set length of time in the panel.

Partial overlaps result in correlations that have conflicting effects on the variance of estimates depending on whether estimations are concerned with changes, aggregates or averages.

The variance of estimates of changes are usually reduced by the correlation of overlapping units. If

$$(6.7) \qquad \bar{x} - \bar{y} = \frac{x}{n_x} - \frac{y}{n_y},$$

for two partially overlapping SRS samples of roughly equal-size, the standard error of a difference is the square root of the variance computed as:

$$(6.8) \qquad Var\ (\bar{x} - \bar{y}) = \frac{1}{n}[se_x^2 + se_y^2 - 2Pse_{xy}] = \frac{1}{n}[se_x^2 + se_y^2 - 2PR_{xy}se_x se_y]$$

with se_x and se_y being estimates of the standard errors of x and y and $se_{xy}/se_x se_y$ being an estimate of R_{xy}. If P=1, the variance is reduced to the extent that the means are positively correlated. In social research, the correlations found when measuring characteristics over time are almost always positive because some stability of the characteristics exists for most units from one period to another. High values of R are found for quite stable characteristics whereas low values of R often correspond to volatile or poorly measured characteristics.

Similarly, for an identical value of R_{xy}, combined with 0<P<1, the reduction in variance is a function of the proportion of overlapping sampling units. When $se_x^2 = se_y^2 = se^2$ then,

$$(6.9) \qquad Var\ (\bar{x} - \bar{y}) = 2\frac{se^2}{n}(1 - PR_{xy})$$

and $deft^2 = 1 - PR_{xy}$. The effect of partial overlap is thus directly proportional to the portion P of overlap. It is possible to improve estimates of standard errors for differences in allocating larger weights to the overlap portion P than to the non overlap portion of the sample 1 - P = Q by the factor $1/(1\text{-}R_{xy})$, which will approach $(1\text{-}R_{xy})$ for high values of R_{xy} (Kish, 1987).

The variance of estimates of aggregates are, in contrast, usually increased by the correlation of overlapping units. In this case, var (x + y) is of the same form as var (x – y) in equation 6.8 except that the covariance term has a positive sign and positive correlations in the overlap commonly cause the variance to increase.

The variance of estimates of averages from a series of measurement periods are theoretically higher than estimates of means from a single time period. If J samples of equal size partially overlap, the standard error of the mean of their means will be the square root of the variance computed as:

$$(6.10) \qquad \mathrm{Var}\ \left(\sum \bar{y}_j / J\right) = \left(\sum se_j^2 + \sum se_j se_k P_{jk} R_{jk}\right) / J^2$$

However in practice R_{jk} is likely to fluctuate between periods and to decay over longer time spans so that its effect on the variance of averages tends to be larger between neighbouring samples (or time periods) and tends to decrease for distant samples.

6.1.3. Estimation of variance for estimates from non measurable samples

Parametric theory provides a set of standard models to calculate variances and standard errors. These theoretical solutions can however only be adequate if the samples are measurable i.e. if they can be investigated mathematically, which implies the use of probability sampling schemes. The problem of model-based samples of the type used in television audience measurement systems is that they are non measurable (cf. section 5.3.1), which means that they do not attain randomisation so that it is not possible to calculate theoretically the variance of the estimates they yield.

A solution to this problem is to calculate variances empirically by using the device of embedding those nonprobability sampling procedures within a higher-order probability framework. A first possibility is to give independent assignments to interviewers subject to similar working conditions i.e. similar assignment scheme, controls, geographical area etc. This approach has been used to compare the variability of quota samples with the variability of random samples of equivalent sizes (Moser and Stuart, 1953). The variability of quota samples has thereby been shown to be considerably higher (about four times) than the variability of random samples. This higher variability has been analysed as resulting mainly from the selection factor i.e. interviewers select samples that differ in their average characteristics, and this variability factor does not enter into random sampling. It is however not possible to estimate standard errors through independent assignments if the samples are selected via a centralised expert judgement as it is the case in television AMS. A second possibility is to use resampling plans. The Kiaer's principle underlying this approach is that the standard errors of estimates can be assessed by dividing the sample into a number of distinct parts and comparing the results of those parts. The Jacknife proposed by Quenouille in the 1950s and the Bootstrap developed by Efron (1982) and Efron and Tibshirani (1993) are two major classes of resampling techniques.

The Bootstrap technique is based on a plug-in principle and produces estimates of standard errors and biases automatically. The Bootstrapping technique is summarised in figure 6.2. Unless information external to the sample itself is accessible, statistical inference involves the theoretical estimation of some aspect of an unknown probability distribution F on the basis of an observed random set of elements x_i drawn from F so that $F \rightarrow x = (x_1, x_2, ..., x_n)$. The parameter $\hat{\theta}$ is estimated on the basis of x by applying some numerical evaluation procedure t(.) to F so that $\hat{\theta} = t(F) = E_F(x)$. Bootstrapping involves estimating F using the empirical distribution $\hat{F}$, with $\hat{F}$ being a discrete variable that assigns to a set A in the sample space x the proportion of the observed sample $x = (x_1, x_2, ..., x_n)$ occurring in A. Each of the n data points x_i is assigned probability 1/n by the empirical distribution. All the information about F contained in x is also contained in $\hat{F}$. Bootstrapping involves thus estimating the value of $\hat{\theta}$ by applying some numerical evaluation procedure t(.) to $\hat{F}$ with $\hat{\theta} = t(\hat{F}) = t(F)$.

From an operational viewpoint, Bootstrap samples x_i^* are random samples of size n drawn with replacement from $\hat{F}$,

$$(6.11) \qquad x^* = (x_1^*, x_2^*, ..., x_n^*) \text{ and } \quad \hat{F} \rightarrow (x_1^*, x_2^*, ..., x_n^*)$$

with x* being a resampled version of the actual data set x . The Bootstrap algorithm works by evaluating the corresponding bootstrap replications $S(x^{*})$ on each resampled version, and estimating the standard error of $\hat{\theta}$ by the empirical standard deviation of the replications $S(x^{*1}), S(x^{*2}), ..., S(x^{*B})$.

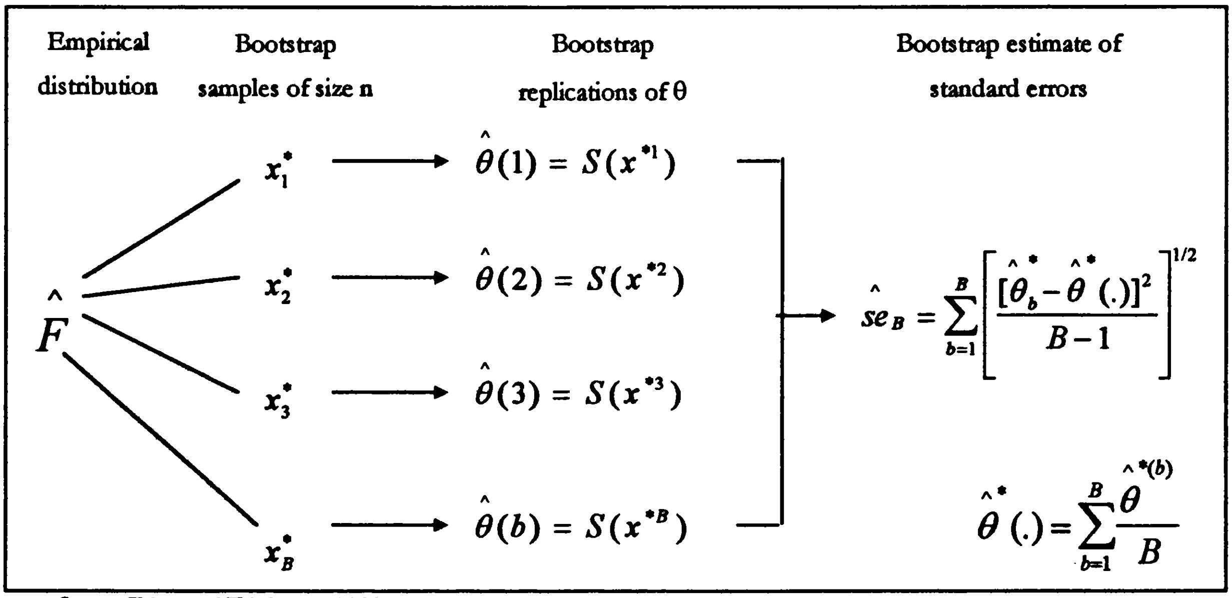
$$(6.12) \qquad \hat{se}_B = \left\{ \sum_{b=1}^{B} \left[S(x^{*b}) - S(.) \right]^2 / (B-1) \right\}^{1/2}$$

where

$$(6.13) \qquad S(.) = \sum_{b=1}^{B} S(x^{*b}) / B$$

and B is the number of Bootstrap samples used.

Figure 6. 2. Bootstrap estimation of standard errors



Source: Efron and Tibshirani, 1993.

The variance of Bootstrap estimates has two components:

$$(6.14) \qquad \mathrm{Var}\ (\hat{se}_B) = \frac{c_1}{n^2} + \frac{c_2}{nB}$$

where the first term corresponds to the sampling variability and approaches 0 as the sample size n approached infinity, and the second term is the resampling variability and approaches 0 as B approaches infinity with n fixed. As $B \rightarrow \alpha$, $\hat{se}_B$ approaches $se_F(\hat{\theta})$. B has values typically comprised between 25 and 200. Experimental research conclude that small sizes of B (e.g. B = 25) are informative and B = 50 is often enough to give a good estimate of $\hat{se}_F(\hat{\theta})$(Efron and Tibshirani, 1993).

It is important to emphasise that although the Bootstrap technique is an appropriate strategy to compute the standard error of an estimate from a non probability sample around its own expected value, it cannot be used to estimate biases in this case. Indeed, Bootstrapping such samples can allow the assessment of $[\bar{y} - E(\bar{y})]$ via se(y) (cf. section 4.1.1) but the gap of the standard error thus estimated to the population parameter $\bar{Y}_p$ remains unknown so that $[E(\bar{y})-\bar{Y}_p]$ also remains unknown. In other words, Bootstrapping does not change a non measurable sample into a measurable sample and whether the thereby estimated standard errors are unbiased estimators remains an assumption (cf. section 5.3).

6.2. Components of variance for audience estimates

The theoretical analysis of the sample composition in television audience measurement systems allows the identification of a number of sources of variation for television ratings that are given in this section. Viewing panel designs can be conceptualised along a space x time dimension: the static dimension corresponds to the features of the sample used to yield estimates of the television audience at a certain point in time; the dynamic dimension corresponds to the features of the samples used to yield estimates of the television audience across different points in time.

6.2.1. Static statistical efficiency

As for other sample surveys, the standard errors of television ratings, if calculated at all, have long been assessed on the assumption of a SRS design rather than on the consideration of the complex designs on which viewing panels are based. The first industry studies focusing on the reliability of television ratings that departed from the SRS assumption dates only from the mid-1970s in the USA (American Research Bureau, 1974) and from the early 1980s in Europe (JICTAR, 1980). Nowadays, studies dealing with the variance of television ratings that have been published are surprisingly few and the ones that are accessible are mostly from a British origin (Wilcox and Reeve, 1992; Twyman and Wilcox, 1996; Twyman and Wilcox, 1998). It is still common to find in the professional documentation calculations of standard errors based on the SRS assumption (e.g. Menneer, 1998; Kirkham, 1996; Sharot, 1994b). The analysis of the sampling designs used in BARB and Médiamat viewing panels makes it obvious that estimations of standard errors for television ratings that assume a SRS design severely under-estimate the size of sampling variable errors. Indeed, television ratings are yielded by samples that are both clustered and disproportionate:

1) *Viewing panels are cluster samples.* The final sampling units in viewing panels are households and, within each sampling unit, all the individuals aged 4 and over (in most cases, cf. section 4.4.3.) are selected as sample elements. Sample sizes in European AMS typically range from 400 to almost 5,000 households (cf. exhibit 6). With a net reporting sample size of about 4,400 households, which corresponds to about 10,200 individuals, the BARB panel is the biggest in Europe. BARB panel design is detailed in exhibit 37A. By comparison, the net reporting sample in Médiamat panel is of 2 300 households only i.e. about 5,500 individuals. Médiamat panel design is presented in exhibit 37B.

   Because the sample elements selected are grouped, the true variance of the estimates yielded by those samples is not only a function of the sample size. Rather, the sampling variance is larger or the design effect is greater than 1 (cf. section 6.1.1). How seriously the precision is affected depends on the intracluster correlation coefficient, rho, developed in section 6.1.1. The within cluster variability in viewing panels can be expected to be relatively low for three reasons: firstly, the number of elements per cluster is small; secondly, households are clusters characterised by internal homogeneity with regard to many social variables; thirdly, even though new phenomena have appeared in the late 1990s (e.g. increase in the number of TV sets per household, development of extra-domestic exposures, cf. section 4.3.3), exposure to television predominantly remains for the time being a family activity as opposed to an individual one. As a result, a high positive intra-cluster correlation coefficient can be expected from such a sample design, which implies a dramatic decrease in the precision of television ratings compared to sample designs based on independent observations.

2) *Viewing panels are disproportionate samples.* There has been an increasing demand from the industry to provide estimates on a bigger range of sub-classes that are highly valued by advertisers (cf. section 2.3.2). In many cases, this demand has been leading to the introduction of disproportionate sampling designs that over-sample households with the most valued socio-demographic profiles and under-sample the others. Furthermore, in countries where the broadcasting industry is organised on a regional basis e.g. the UK, there is the additional requirement of over-sampling households located in television areas that are smaller or more highly sought from a reporting viewpoint. The Médiamat panel has been based on a disproportionate sampling design since 1997 and households whose head is less than 50 are over-sampled (cf. exhibit

37B). The BARB panel has a disproportionate sampling structure in two respects: the sample sizes are determined in relation to the reporting requirements of the ITV areas rather than in relation to the population sizes and households whose head is older and inactive are under-sampled (cf. exhibit 37A).

The use of sampling rates that are not related to the variability of the sample elements with regard to the measurement variable can be expected to lead to losses in precision because it results in the samples being markedly different from the population on a range of characteristics, including characteristics other than those that have been over-sampled on purpose. It makes necessary the use of a heavy weighting scheme to correct for these imbalances and the increase in the sizes of standard errors due to weighting will be a function of the range of the relative weights applied (Kish, 1977).

Those features of the sample designs should impact differently the variance of television ratings depending on the subclass considered. For subclasses of approximately equal sizes:

- Higher precision can be expected for estimates from subclasses that cut across clusters e.g. men ratings, women ratings, housewife ratings;

- Lower precision can be expected for estimates from mixed subclasses e.g. children ratings, 15-24 ratings, because the average number of children and teenagers per household is likely to be higher than for the other age groups in the sample;

- Lower precision can be expected for estimates from subclasses defined by socio-economic characteristics because of high between cluster variations and low or nil within cluster variations e.g. ABC1 ratings, C2DE ratings. However, for upmarket households high variations can be partly compensated for by the gain in precision obtained from larger sample sizes;

- Lower precision can be expected for estimates from subclasses in which television habits are more irregular e.g. 15-24 ratings, AB ratings.

6.2.2. Dynamic statistical efficiency

Additional sources of variance for television ratings are caused by the fact that television AMS samples are the outcome of prospective designs i.e. estimates are yielded from a set of sample elements whose majority is identical between measurement periods. Therefore, the variability of different types of estimates from viewing panels is also impacted by (1) the proportion of the overlapping sample and (2) the value of the correlation of the measurement variable between periods.

1) *The proportion of the overlapping sample between periods.* Beyond losses due to natural attrition, viewing panels overlap incompletely because of enforced attrition practices sometimes combined with revolving designs. The purpose of panel management in television AMS is to make sure that the sample is close to the sampling model specified, which necessarily implies the use of enforced attrition practices (cf. section 5.2.2). In the professional documentation this point is not always clear because sampling units discarded for reasons of non conformity with targets are often assimilated to other traditional causes of panel mortality and globally referred to as 'natural attrition' (e.g. Sharot, 1994a). The European Broadcasting Union (1991) considers that the average annual (natural and enforced) attrition rate in television panels is 25%.

   Additionally, some viewing panels are based on designs that involve automatically discarding sample units after a set maximum period of time in the panel. The Nielsen panel in the USA was the first television AMS to introduce a rotation design in 1988. Such rotation designs are motivated by the suspicion of fatigue and conditioning effects – which, incidentally, is contradiction with the claim that data collected via people-meters are highly valid (cf. section 4.3.1). The BARB panel is not based on a revolving design. In contrast, the CESP (1996) criticised the fact that 50% of the households had been co-operating with the Médiamat panel for more than 5 years and a third had been doing so since the start of the panel eight years ago. This observation lead to two changes in the French panel management policy: (a) half of the households were replaced before the 1st of January 1997 and (b) a 7% annual panel rotation rate was set up in order to replace households regularly (CESP, 1997) (cf. exhibit 37B). In this respect, it is interesting to observe that the average rating level for the first term 1997 was much lower than the levels reported the previous years, which greatly perturbed the market for TVRs. Médiamétrie (Tassi, 1997) accounted this drop to changes in editing rules and weather conditions. However, the fact that half of the sample units were renewed over such a short time period seems to be a more obvious cause. It emphasises the impossibility of distinguishing between real changes and artefacts of the measurement when sampling biases cannot be assessed (cf. section 5.3.1) and it raises the issue of the reduction in effective sample sizes for some types of estimates (see below).

2) *The value of the correlation of the measurement variable between periods.* If the overlapping sample size is a constant, the dynamic statistical efficiency is a function of the degree of correlation of the television exposure variable between periods. Audience duplication over time has been studied since the late 1960s for a marketing purpose (cf. section 1.1.2) and the television exposure variable has been found to correlate positively over time. The so-called Repeat Viewing Law (Ehrenberg and Twyman, 1967; Goodhardt et al., 1975) states that over half of the people (55%) who watch a programme one week also watch the next episode in the following week. This law is at the origin of the theory that viewing is done at a low level of involvement (Barwise and Ehrenberg, 1988). It can be argued that, given the meaning of the audience construct in audience measurement systems (cf. chapter 3), it is difficult to draw conclusions as to individual levels of involvement towards television programmes. But beyond that, a 0.55 correlation between weekly measurement periods is high in a sampling design analysis context and conflicts between optimum designs for different types of estimates can be expected to be severe for such a variate. However, the value of the correlation has also been found to vary depending on:

- *Rating level.* The larger the rating, the higher the audience duplication;
- *Broadcasting time.* Audience duplication between programmes shown in the afternoon, early evening or late at night on different week days on a given channel is higher than the duplication between programmes shown at prime time (Headen et al., 1979);
- *Individual average amount of viewing.* Heavy viewers are more regular in their repeat-viewing day-by-day (65%) than light viewers (25%);
- *Broadcasting channel.* When two programmes are shown on the same channel on different days, duplication is higher than if the two programmes had been shown on different channels (Gunter, 1985);
- *Positioning within the schedule ('lead-in' effect).* For two programmes shown on the same day and consecutive - or near-consecutive - on the same channel, audience overlap

is much higher. This effect becomes negligible after 2 or 3 programme breaks (Barwise and Ehrenberg, 1984; Tiedge and Ksobiech, 1986);

- *Programme genre.* Audience duplication is consistently higher for certain programme genres such as soap operas (Barwise, Ehrenberg and Collins, 1982; Barwise, 1986).

It should be pointed out that a more recent analysis conducted on an American people-meter panel in a multi-channel environment did not support previous findings and found only a 25% repeat-viewing level (Ehrenberg, and Wakshlag, 1987). This suggests that the new television environment may lead to lower correlation values between periods, with the related effects on the variability of television ratings. Unfortunately, audience flow analysis has not been extended to the 1990s television environment yet. The view that the extrageneous variables which have been observed to affect the value of the correlation of the measurement variable between periods (those are listed above) are the same ones in the late 1990s should therefore be regarded as an assumption in this analysis.

The combination of the proportion of the sample elements overlapping and a high value of correlation of the measurement variable between time periods can be expected to lead to different dynamic statistical efficiencies depending on the type of estimates considered. Duncan and Kalton (1986) listed seven possible objectives for longitudinal sampling designs:

a) to provide estimates of population parameters at distinct points in time,
b) to provide estimates of population parameters averaged across a period of time,
c) to measure change at the aggregate level between different time points,
d) to measure changes at the element level between different time points,
e) to aggregate data at the element level over time,
f) to measure the frequency, timing and duration of events occurring within a given time period,
g) to cumulate samples over time, especially samples of rare populations.

The higher the proportion of overlapping sample elements over time, the lower the variance of changes at the element level and the better the ability to measure changes over time (objectives c, d). But the higher the variance of averages and aggregates of television ratings and the more limited the ability to cumulate cases over time for rare characteristic estimations (objectives b, e and g). Given the types of sample overlap involved in the longitudinal designs used in audience measurement systems presented in section 6.1.2, it is possible to assess theoretically the dynamic statistical efficiencies of each design for each of the objectives enumerated by Duncan and Kalton (1986). This assessment is given in figure 6.3.

Figure 6.3. Statistical performances of the longitudinal sampling designs used in audience measurement systems

	a. Estimates at distinct points in time	b. Estimates of averages at the aggregate level	c. Estimates of changes at the aggregate level	d. Estimates of changes at the element level	e. Estimates of averages at the element level	f. Estimates of frequency, timing and duration of events	g. Estimates of rare characteris-tics
Repeated cross-sectional designs	✦✦✦	✦✦✦	✦	✧	✧	✦	✦✦✦
Retrospective designs	✦✦✦	✦✦	✦✦	✦✦	✦✦	✦✦	✦✦
Prospective designs	✦✦✦	✦	✦✦✦	✦✦✦	✦✦✦	✦✦✦	✦

✦✦✦ strong; ✦✦ average; ✦ weak; ✧ n.a.

Source: AE.

It can be seen that the three designs meet objective (a) but behave differently with respect to the other objectives. Because of the overlapping effects, prospective designs are less efficient than cross sectional designs for cumulations and combinations at the macro level over time and space. The superiority of prospective designs lies in their greater analytical potential to study individual characteristics and the dynamics of causation and relationships because they enable components of changes to be measured at the micro level. Retrospective designs hold an intermediate position since they combine the statistical properties of complete overlapping samples over certain time periods with those of independent samples over others. Therefore in this type of design the variance of the estimates yielded is a function of the time periods referred to and of the complete overlapping time span set.

The use of prospective designs in television AMS has therefore a conflicting effect on the type of estimates they yield. Viewing panels that are not rotated such as BARB have higher continuous sample sizes and can be expected to perform better to assess changes in rating levels. Viewing panels that are rotated such as Médiamat can be expected to perform better to estimate averages or aggregates of ratings over time. It should however be stressed that the rotation strategies used in viewing panels are usually slow. The rapid replacement of a large proportion of sample elements such as the one implemented in the Médiamat panel in 1997 (cf. section 6.2.2) is uncommon. The maximum life on a viewing panel is typically set to three years with a speed of rotation of the initial cohort often set between one and two years. Such strategies are justified on the ground that a rapid rotation of the initial cohort produces the undesirable effect of never achieving a steady state, the panel being alternatively 'young' and 'old' (Danaher and O'Neill, 1992). Yet it has also been argued in the industry that slow rotation strategies have the effect of 'smoothing' the data i.e. of concealing the differences in audience levels between 'young' and 'old' cohorts (Cook, 1989).

If the sample sizes and the proportion of the overlapping samples are held constant, the variance of estimates depends on the value of the correlation of the measurement variable. In a SRS design, the variance of aggregates and averages is increased by the factor (1+PR) whereas the variance of estimates of changes is reduced by the factor (1-PR). Since the value of the correlation of television exposure varies depending on the programme or the subclass considered (see above), the variance of estimates from viewing panels is likely to exhibit great diversity. For instance, estimates of changes are likely to be more reliable for a soap opera broadcast in the afternoon on the same channel than for a drama broadcast at prime time on two different channels, and vice versa for estimates of aggregates and averages.

Week-to-week correlations can also be expected to be higher than month-to-month correlations, which in turn should be higher than year-to-year correlations and so on. Therefore estimates of week-to-week changes should be more reliable than estimates of month-to-month changes etc. and vice versa for estimates of aggregates and averages. This theoretical analysis is supported by studies conducted on the US Nielsen panel (Soong, 1988; Schillmoeller, 1992).

6.3. Variability of audience estimates

Calculating the variability of television ratings is a costly process and can be very time-consuming. A method for calculating standard errors for audience estimates is recommended in this section. A general assessment of the evolution of sampling variable errors in television AMS is given based on the theoretical analysis of the samples used and on the audience phenomena presented in section 2.3.3. It is argued that the variability of television ratings has dramatically increased in the late 1990s.

6.3.1. Method of searching for patterns of standard errors

The standard errors of television ratings should be calculated empirically because, as shown in chapter 5, viewing panels are non measurable samples and models used in parametric theory therefore cannot apply. The approach recommended is to embed the data sets within a higher probability framework. The Bootstrap algorithm is the most appropriate non parametric method for computing the standard errors of audience estimates around their own expected values. This technique is presented in section 6.1.3. It should also be stressed that, since television AMS samples are model dependent (cf. section 5.3.1), borrowing the standard errors of audience estimates from other viewing panels of comparable sample size is not recommended. However, Bootstrapping television AMS samples presents both practical and methodological difficulties.

First of all, Bootstrapping supposes accessing electronic raw databases comprising socio-demographic details of households and household members, people-meter minute-by-minute (or second-by-second) records of individual panel members and range of weights applied. In almost all the European industries, such files are not made available by market research organisations even to the annual subscribers of the service (cf. exhibit 6). BARB is one of the few AMS that provide a raw database[3] (so-called '*Database I*', cf. exhibit 14) to a selection of media bureaux that are annual underwriters of the service and use them to develop advertising modelling for their clients. Secondly, if raw databases could be made available to a third party on a fee basis, the size of those files is such that it requires some special hardware and software equipment capable of processing speedily the volume of data involved. It is therefore a costly research programme.

Beyond these practical problems, Bootstrapping television AMS samples also present some methodological difficulties. Indeed, the range of audience estimates and subclasses is

[3] Repeated attempts to be granted access to a fraction of Database I (15 minutes a day over a couple of weeks) in a format requiring no dedicated software from AGB-Taylor Nelson-Sofres and BARB have remained unsuccessful. Notwithstanding several requests no official position was taken by written. However the point that was raised in the discussion is that this database is only available to third parties that are registered with BARB and subscribe to the service on an annual basis. Yet the calculation of standard errors from such a file could have had illustrative purposes only because such data would be too fragmented to look for patterns of standard errors as the analysis of the components of variance presented in section 6.2 suggests.

potentially huge. As an indication, ratings from 150 different subclasses are customarily provided by BARB, even though only about a third of those subclasses are frequently used by planners and buyers (Roberts, 1992). Although it may not be true to say that there is a standard error for every estimate, the sizes of the standard errors of audience estimates should undoubtedly exhibit a very great diversity given the components of variance theoretically identified in section 6.2. Therefore, assessing empirically the standard errors of so many estimates would lead to a prohibitive number of replications. The aim is thus to find patterns in the standard errors that make it easier to understand the variability of audience estimates, and make it possible to extrapolate from estimates for which standard errors have been calculated to other estimates. In this respect, the analysis of the components of variance presented in sections 6.2 provides a framework to interpret the differences found between the variability of different types of estimates calculated.

A simple way to proceed is to use a step-by-step approach, starting with a selection of some of the most commonly used types of estimates and subclasses in the industry, and taking into account the static and dynamic statistical efficiencies of the samples. It can then be ascertained whether a basic model for standard errors of audience estimates can be developed. The prominent types of estimates from viewing panels whose variability should first be assessed are minute-by-minute ratings and programme ratings of the main terrestrial, as well as cable and satellite, channels. Indeed, minute-by-minute ratings are the TVRs priced on the market (cf. section 2.3.2) and programme ratings are key considerations for schedulers (cf. section 2.4.1). The standard subclasses used for the calculation of CPPs that can be initially selected are: all adults, men, women, housewives, children, 16-24s, 25-34, 35-50s, 50s+, ABs, ABC1s, C2DEs and combinations of those. These subclasses represent a mixture of basic cross-classes and mixed classes that are crucial to take into account in the analysis as shown in section 6.2. A number of 50 replications should provide an accurate enough estimation of the variability of each rating type for each channel and subclass considered. A classification of the computed standard error sizes can then be attempted by (a) rating size, (b) type of subclass and (c) average subclass size.

The standard errors of estimates of changes and aggregates should also be calculated because those types of estimates are used by planners to optimise the GRP of advertising schedules (cf. section 2.3.1). Standard errors should be calculated for different (a) time spans (day-to-day, week-to-week and month-to-month), (b) broadcasting times (day time, access prime time, prime time) and (c) programme genres (cf. section 6.2.2). A classification system can then be attempted on the same variables i.e. rating size, type of subclass and average subclasses size.

If a pattern of standard errors can be found, the model can then be elaborated by examining whether the standard errors of other estimates and subclasses that are less commonly used in the industry can be extrapolated and imputed. The theoretical components of variance identified in sections 6.2.1 and 6.2.2 can be used to interpret differences between the sizes of standard errors of various types of estimates. However, the theoretical identification of many components of variance that interact in various ways (cf. section 6.2) suggests that building a general model may be difficult to achieve in practice due to the differing combined effects of those many components on the variability of audience estimates.

6.3.2. Global reliability assessment and trends

General conclusions as to the evolution of the variability of television ratings in the late 1990s can be drawn on the basis of the audience fragmentation phenomena observed over the last few years. Section 2.3.3 shows that the current industrial structure is characterised by an inflation in the number of channels combined with a stabilisation of the total time of exposure to the television medium. It has been leading to a situation in which the shares of the oldest and biggest channels have been continuously decreasing, and the rest of the exposure time has been parcelled out between an increasing number of channels. Annual average rating sizes can be derived from the annual daily reach (cf. exhibit 24) and share (cf. exhibit 25) of the different channels (cf. section 3.3.2). The average rating sizes estimated for the British channels are presented in exhibit 39A. At one end of the spectrum the average rating of the biggest channels (BBC1 and ITV) is about 20% and at the other end the average rating of all the cable and satellite channels combined is 1.8%. The average rating sizes that can be estimated for the French channels make this contrast even more apparent (cf. exhibit 39B). The average rating of TF1, which is the biggest commercial channel in Europe, is about 25% whereas the average rating of La Cinquième and Arte is about 0.5% and all the new channels put together manage an average rating of only 0.8% in total. The evolution of the average rating sizes since 1992 is presented in exhibits 40A for the British channels and 40B for the French channels. This shows that the rating sizes of the biggest channels have regularly decreased at the benefit of smaller terrestrial, as well as cable and satellite, channels but that this evolution is a slow process and since the number of new channels has kept on increasing over time, the range of rating sizes has become wide indeed.

Average rating sizes are however an imperfect measure of the dispersion of rating sizes. Indeed, there is an important difference between the sizes of prime time and off prime time ratings. Kirkham (1996) compiled the programme ratings of BBC1 and ITV in 1985 and 1995. The results of this review are summarised in exhibit 41. It shows that the distribution of the rating sizes reported for those big channels is increasingly skewed towards small ratings, with 83% of the programmes achieving ratings under 10% in 1995. Even for the biggest channels two digit ratings are becoming rarer and rarer in the late 1990s. The top ten programme ratings across Europe are given for December 1999, the month when ratings are usually the highest of the year, in exhibit 42A. In contrast, the top ten programme ratings across Europe are given for in August 1999, the month when ratings are traditionally the lowest, in exhibit 42B. These exhibits show that almost all the programmes listed were broadcast at prime time. Moreover, even in the highest month of the year, the programme ratings reported rarely exceeded 25% in most European industries, Sweden being an exception. In the lowest month, programme ratings were under well 20% in most industries and only single digit ratings are reported in Germany and Greece.

This evolution raises a serious reliability issue for the fundamental reason that the smaller the rating sizes, the larger the relative sizes of sampling variable errors can be expected to be. As is shown in section 6.2.1, the standard errors of television ratings are bigger than standard errors assuming SRS and, given the samples used in television AMS, the overall statistical efficiency can be expected to be much lower. As an illustration, the table presented in exhibit 43 shows confidence limits computed at the 95% confidence level for a wide range of proportions (from 0.1% to 25%) from complex random samples with deft = 1.5 and deft = 2. Those are standard multipliers that should, if anything, underestimate the size of sampling variable errors of estimates from cluster disproportionate samples like viewing panels. Confidence intervals are calculated for different sample sizes corresponding to BARB total panel size (n=10,200), Médiamat total panel size (n=5,500) and large subclass sizes such as London area (BARB), children (Médiamat) (n=1000), 16-24s (BARB) or working individuals (Médiamat) (n=2500). These confidence intervals represent therefore the best that can be achieved by those television AMS. Three basic types of small rating situations that can be identified:

1) *Ratings of large subclasses to small channels.* In the new television environment, the ratings recorded for many channels are permanently very low. To illustrate this point, the top 10 programme ratings on the top 40 channels as reported by BARB on the week ending the 23rd of January 2000 are presented in exhibit 44. The audience of cable and satellite channels is expressed in hundreds of thousands of viewers but the ratings achieved by those programmes in this particular week ranged in fact between 2.5% (Sky sport 1) and 0.02% (Film Four) and the relative sizes of sampling errors for ratings that low can be expected to be large indeed (cf. exhibit 43).

2) *Ratings of large subclasses to big channels at off-prime time.* Almost all the top ratings of the big channels are achieved by programmes broadcast at prime time (cf. exhibit 44). At off prime time even the programmes of the biggest British channel, ITV, were lower than 7% in this particular week of January (cf. exhibit 44). Even on large subclasses such as the London area, which attracts a quarter of the total television advertising expenditure in the UK, the relative sampling variable errors of those programmes are likely to be large (cf. exhibit 43).

3) *Ratings of small subclasses to all channels.* Since the sampling variable errors can be expected to be large for large subclasses, a fortiori the reliability of ratings for small subclasses presents a reliability problem. It is the case of ratings for subclasses that are nonetheless commonly used in the industry e.g. men 16-24s or women ABs in the London area and even more so of ratings for subclasses that are already small in the population such as ethnic or language minorities ratings.

Practitioners in charge of running television AMS have been increasingly concerned by the reliability problem of television ratings. Already in the mid-1970s the American Research Bureau (1974) recommended to the industry to average ratings over time because it was observed that averaging decreases standard errors by the combination of an increasing number of observations and decreasing values of correlations of individuals' viewing probabilities at different points in time. Gains in the size of standard errors were found to increase, but at a decreasing rate, with the number of ratings included in the average, especially for subclasses whose viewing habits are irregular. The use of averages rather than single ratings was also repeatedly recommended in the UK (JICTAR, 1980; Wilcox and Reeve, 1992). Recently, Twyman and Wilcox (1998) emphasised that advertising schedules have much lower sampling errors than spot ratings and that even though there is a plateau beyond which additional ratings do not result in further standard error reduction, by averaging over four weeks sampling errors could be decreased. So far the industrial practices have however not really followed those recommendations for reasons that are analysed in section 6.4.1.

The solution to this reliability problem that is considered by the television industry is to increase the sample size of the viewing panels. It is the solution that has traditionally been adopted in the past. Indeed, since the late 1980s the sample sizes of many viewing panels in Europe have been increased e.g. in Germany, Spain, Sweden, Ireland, the UK. However, larger samples imply higher costs at a time when the financial resources of broadcasters, who contribute the bulk of AMS (cf. section 1.2.4), are over-stretched by programming and technological investments. It has also been pointed out (Kleinmann, 1995) that tracking the rating size of programmes broadcast by small channels is not really an objective for the big commercial and public channels that are currently the main founders of AMS. Beyond these problems, it is doubtful that increasing the sample size of viewing panels could bring a satisfactory solution or even provide the same level of reliability enjoyed in the early 1990s because if panel extensions may, in some cases, decrease the variability of television ratings they can hardly increase rating sizes that are the outcome of independent structural evolutions, in particular the number of channels on offer and the average duration of individual exposure to the medium. For instance, the sampling errors of channels whose ratings are always very low will not become small even if the panel size were doubled.

6.4. Using estimates as commodities

Using estimates that are yielded by stochastic measurement systems as the output of deterministic economic production processes raises up problems that are examined in this section. The TVRs that are traded on the market are increasingly subject to large and unpredictable variations. These variations lead the television industry as a whole to bear increasingly high risks that are of a statistical, as opposed to an economic, nature. Furthermore, since the variability of TVRs is related to their sizes, risks are not distributed evenly between the industrial players: on the one hand, the economic positions of the leading channels are reinforced whereas, on the other, those of small and independent channels are weakened further.

6.4.1. Risk and uncertainty

TVRs are expected values yielded by measurement systems that are stochastic to the extent that random elements participate in determining those values. In contrast, commodities are economic objects that are produced as the result of deterministic production processes i.e. processes that contain no random elements. Treating TVRs as commodities is therefore fundamentally contradictory and this distinctive use of statistics is a feature of the economy of television that needs to be emphasised (cf. section 2.2.2). Indeed, it means that uncertainty and variability about the commodities produced characterises this economy and that risks that are of a statistical order are inherent to this market.

The production of television programmes is intrinsically a risky economic activity because each new programme is a prototype and the demand for a prototype is always uncertain (cf. section 2.1.2). However, in the late 1990s industry, the level of risk born by the players participating in the television industry has increased dramatically. It is due to the necessity of investing in new technologies that are capital intensive and whose future is uncertain (cf. section 3.4.4). But it is also due to a severe increase in risks from a probabilistic origin. This increase can be explained by the conjunction of three factors:

1) An evolution of the industrial structure towards an economic system in which the advertising production mode has become dominant, resulting in the production and selling of TVRs to become an increasingly competitive activity (cf. sections 2.2.1 and 2.3.3);
2) An evolution of the measurement systems towards data collection techniques that allow a high reactivity of buyers and sellers to variations in the TVRs produced (cf. section 4.4.1);
3) An evolution towards audience fragmentation phenomena that have been increasingly translated into a growing proportion of small ratings and a wider range of ratings sizes between the different suppliers of television goods (cf. section 6.3.2)

The result of this triple-sided evolution is larger and unpredictable variations in the TVRs traded on the market in the late 1990s. This uncertainty, which is caused purely by random elements, considerably increases the risks born by the industrial players. Indeed, it becomes more and more difficult for buyers of TVRs to anticipate the CPP that will be realised in the future by examining the returns achieved in the past. Similarly, selecting the programmes the most likely to produce the 'quantity' and 'quality' of TVRs expected by buyers and forecasting revenues has become a more difficult task for sellers. In the late 1990s, both buyers and sellers increasingly tend to react to uncontrollable variations that are artefacts of the measurement systems and do not necessarily reflect real changes.

However, the industry seems, apparently paradoxically, oblivious of the increasing variability of the TVRs exchanged on the market. This is made obvious by the fact that despite the recommendations of some practitioners to move away from trading with single ratings (cf. section 6.3.1), planning, buying and accountability are still based on spot ratings in the late 1990s. For instance, in a paper entitled *What do agencies want from television research?* Perry (1997) acknowledged that the majority of spot ratings *"probably have a statistical error approaching 100%"* (p. 20) but, at the same time, a key requirement is that *"TV audience research must be minute-by-minute because that is how agencies buy air-time"* (p. 16). Douglas (1998) stressed that the industry still adheres to the concept of minute-by-minute rating analysis and trading on individual commercials in the new television environment. Nayman[4] (Media Week, 1999, p. 10) deplored that *"for the vast majority of agencies and independents, the area of non spot opportunities remains uncharted territory"* and attracted the attention on the fact that *"There is life outside absolute cost per thousand, station price and discounts versus ITV".*

This makes plain the use of statistics as commodities and the distinctive role of audience measurement systems in the television industry argued in chapter 2. It also emphasises that the recommendations of professionals with regard to how to use television ratings (cf. section 6.3.2) are not consistent with the data collection technique implemented. Indeed, the design of the current television AMS is dictated by the objective of allowing a spot by spot evaluation of advertising campaigns in a very short time span (cf. section 4.2.2). It is contradictory to set up a measurement system that provides minute-by-minute spot ratings and, at the same time, to recommend not using those data. It also stresses that the continuous demand of the industry to use statistics that are defined by trading considerations – what Ehrenberg (1996) called *"the industry obsession with the latest most-up-to-date-just-out-of-date data"* - has been leading to the sacrifice of the statistical dimension of television AMS not only with respect to biases (cf. section 5.3.1) but also with respect to random errors. It sends back to the conflicting situation referred to in section 5.4 between

[4] Sales director at Granada Media Satellite and Cable.

industrial and statistical requirements, and supports the thesis that television ratings as best regarded as industry conventions.

6.4.2. Barriers of entry

In television economics, the main obstacles new suppliers of television programmes must overcome to enter the television market include economies of scale and scope, high capital costs associated with new material carriers, vertical integration and legal constraints (particularly in Europe). Owen (1975) considered that, strictly as a result of the economic incentives facing broadcast firms, minority taste programmes, opinions and views are probably systematically discriminated against. However, another atypical feature of the television market that is overlooked in economic analysis is the existence of barriers of entry that are of a statistical order. Indeed, in the new television market new channels also have to overcome barriers that are the by-product of using statistics as commodities.

Given that the relative size of sampling variable errors is closely related to rating sizes, small TVRs are subject to larger and more unpredictable variations than large TVRs (cf. section 6.4.1). The variability that can be expected from the large TVRs achieved by the big channels at prime time and the small TVRs achieved by the other channels has become particularly contrasted (cf. section 6.3.2). The first consequence of this situation is to reinforce the market position of big channels. The prime time TVRs of big channels such as ITV in the UK or TF1 in France command important premiums. Such premiums are justified by buyers on the grounds that big channels deliver the largest coverage of the population in the shortest time (cf. section 2.3.2). Beyond this economic justification, these TVRs are also likely to be highly priced because they offer the safest investment opportunities for reasons that are to be sought in the statistical field. Indeed, the prime time TVRs of those channels can be estimated more confidently than the other TVRs. They are less subject to uncontrollable variations caused by random elements in the measurement systems and the CPPs that will be delivered in the future are rendered easier to forecast. The fact that big channels enjoy more predictable TVRs than other channels has been leading to new commercial practices with these broadcasters proposing deals on the basis of guaranteed TVR delivery and fixed prices. The premium paid for those large TVRs can therefore also be regarded from the viewpoint of a premium paid by buyers to minimise risks.

Under-investment in off prime time TVRs is offset by over-investment in prime time TVRs so that the total revenues of the big channels are not necessarily negatively impacted by the size of sampling variable errors of the small TVRs they supply. For instance in the highly competitive American industry the prime time TVRs of the three big networks have been commanding higher and higher premiums, thus leading to a net increase in their total revenues (Sharp, 1997) despite a continuous erosion in their shares of viewing (cf. exhibit 25). In 1998 the Incorporated Society of British Advertisers (ISBA) issued a memo to its members criticising the large shares of ITV and Channel 4 in the total advertising expenditure and emphasising that what advertisers spend on a particular channel should be directly related to that channel's audience performance. This recommendation was strongly criticised on the grounds that guaranteed TVRs delivery is the advertisers' chief interest (Campaign, 1998b).

In contrast, the market position of small channels is weakened further. The share of those channels in the total advertising expenditure is inferior to their rating performances (Sharp, 1997). One overlooked reason for this is that the TVRs yielded by the measurement systems for those small channels can be expected to vary greatly and might even disappear altogether purely under the influence of random elements (cf. section 6.3.2). The TVRs of small channels thus vary in an unpredictable way and, even averaged, represent a much riskier investment for buyers. As a result, the fact that buyers offer discounted prices for those TVRs can be regarded as a compensation for the maximum risk level they accept to bear. Small channels therefore suffer from a commercial handicap because the 'quantity' and 'quality' of the ratings they put on the market cannot be estimated with the same degree of reliability as those of the big channels.

To circumvent this problem, a first possible strategy for those small channels is to supplement television AMS with proprietary research in order to bring evidence of their audience and its value to advertisers. Yet proprietary research can have neither the credibility nor the trading assets of television AMS as argued in section 4.4.2. Furthermore, the costs of measurement research on small audiences can be prohibitively high for and the smaller the audience the more costly audience measurement research is likely to be. A second possible strategy is to sell TVRs by offering packages of channels. Indeed, the aggregation of estimates of a series of such channels can be expected to produce higher and thus less variable TVRs. This strategy is already used by some broadcasters e.g. Sky channels in the UK or TPS channels in France are sold as packages. However, it should be stressed that those strategies result in favouring small channels that belong to big broadcasting groups at the expense of small independent channels. Indeed, the former can more easily be supported financially and sold together with other small channels or with a big channel belonging to the same group. It creates a further incentive towards industrial concentration i.e. towards a market structure in which many of the small channels are owned by few broadcasters.

6.5. Conclusions

The economy of television has an unusual feature that has been overlooked so far in economic analyses: estimates which are expected values yielded by stochastic measurement systems are used as commodities i.e. as economic objects produced by deterministic production processes. It implies that uncertainty about the commodities produced and risks that are of a statistical order are entrenched in the television market.

The theoretical analysis of viewing panels allows the identification of many components of variance both at a certain point in time and across different points in time that interact in different ways. The recommended method to search for patterns of standard errors for television ratings is to Bootstrap minute estimates and programme estimates for a selection of subclasses customarily used. The components of variance theoretically identified can be used to interpret differences in the sizes of standard errors empirically estimated.

General conclusions can be drawn as to the evolution of sampling variable errors in television AMS. Indeed, the late 1990s are characterised by a continuous decrease in the average rating sizes and by a marked contrast between the average rating sizes of the big terrestrial channels and those of the new cable and satellite channels. The variability of television ratings has increased dramatically in the late 1990s for the fundamental reason that the ratings sizes themselves have decreased dramatically. This results in larger and unpredictable variations in the TVRs traded on the market. This variability issue has been leading to a severe increase in the risks that buyers and sellers have to bear in the new television environment. In the new television market, barriers of entry are also of a statistical nature. The rating sizes of big channels at prime time are much larger than other ratings. They are less subject to random variations and are thus more predictable. The premiums for those TVRs can also be regarded as premiums paid by buyers to minimise risks that are statistical in nature. Vice versa, small channels have very low ratings that vary in an uncontrollable way under the influence of random elements. The discounted prices paid by buyers for those ratings can be explained by the high level of statistical risks born.

7. General conclusions

In this final chapter some points pertaining to the delimitation and limitation of the thesis are stressed, the main findings are summarised and questions related to the research topic undertaken are discussed.

7.1. Perspective and scope

The medium of television is multi-faceted and hence can be approached from many perspectives. It is a topic that has aroused the interest of economists, sociologists, psychologists and, of course, broadcasters, advertisers, public lobbyists, politicians etc. All attempt to address issues in the field of television with the help of different analytical frameworks, objectives or concerns, which partly explains why television gives rise to so many heated discussions. The emergence of new technologies, especially digital, has further widened the interest in television and intensified debate. In this context, it is interesting to observe that statisticians have been hitherto absent from such a debate. This is all the more surprising as statisticians know of the sample surveys that are operated in the television industry, if only because they are old and famous, and the public debate involving these surveys is also widely known (cf. section 1.1.1). This absence tends to suggest that applied statisticians are not prominent in debates that are related to social measurement issues and perhaps consider such discussions as falling outside the research field of statistics. One direct consequence is that in some cases statistical and political or business aspects become entwined and confused, which is detrimental to the discipline of statistics.

This thesis proposes a statistical approach to television. It focuses on the sample surveys used in the television industry and issues are addressed from the perspective of the analysis of these measurement systems. It thus brings these overlooked surveys to the attention of statisticians and, in so doing, it is particularly concerned with separating statistical aspects from business aspects. In the field of television the two are confused and it is believed that the clarification of this problematic is of importance to the discipline of statistics and also to the television industry.

The analysis developed in this thesis focuses on the identification of the measurement errors which occur in television audience measurement systems and their implications on the television industry (cf. section 1.3.1). BARB in the UK and Médiamat in France are the two sample surveys that are examined. It has been pointed out that the British and French cases do not fully represent the variety of situations that exist in Europe and especially outside Europe with regard to the design of the measurement systems in use and the structure of the national television industries. In particular, television audience measurement systems of a small scale and television industries where the penetration of new technologies is either much higher or lower than the European average are not appropriately covered (cf. section 1.3.2). However, the British and French cases present similarities and differences on key characteristics so that a comparative analysis allows conclusions to be drawn.

The research method used involves a measurement design-based analysis. Measurement errors in BARB and Médiamat are identified by assessing the sampling and non sampling operations implemented but also, and this is an important point, by integrating the uses that are made of the estimates yielded and the meaning of the concept measured. In so doing, the thesis defends the view that social measurement cannot be separated from its social context and emphasises the importance of incorporating the latter in any design-based analysis. In particular, the thesis attempts to show that the meaning of measurement errors in sample surveys is not a fixed but rather a variable and evolutionary notion. For instance, prior to the mid-1980s the industrial structure was such that the setting of prices in television was only loosely related to the estimates yielded by audience measurement systems whereas, from the mid-1980s onwards, the prices advertisers have been prepared to pay have become closely dependent on these estimates (cf. section 2.3.3). As the uses of the data have evolved so has the meaning of measurement errors in these sample surveys and, necessarily, the industrial implications of these errors have also changed. Similarly, the television audience is an intrinsically blurred concept that has been modelled differently over time (cf. section 3.2) and the emergence of new technologies should lead to further developments in the interpretation given to this concept. Measurement errors in television audience measurement systems differ depending on which model of the television audience is held as reproducing the real world. In emphasising that measurement errors are relative, this thesis attempts to show the importance of the interplay between statistical theory and measurement practice. It also attempts to show the necessity of taking into account a variety of economic, social and political issues when assessing and a fortiori setting up any social measurement. The view of statistics that is taken in this thesis is therefore a pragmatic and operational one rather than a formal system of reasoning with universally accepted axioms. These two views are not mutually exclusive but rather complementary and it is believed that there is scope for both in modern statistics.

In using such a research method to assess television audience measurement systems, the economy of television, past and present, is analysed from the perspective of the relationships between the industry and the measurement system, and how each influences the other. In the execution of this, the thesis attempts to demonstrate how a statistical approach can produce an understanding of some issues that are traditionally located within other disciplines, such as media economics and audience research. As Bartholomew (1995) pointed out variability and uncertainty are the hallmarks of a statistical problem. Unsurprisingly therefore issues pertaining to television economics and audience research are mainly analysed in this thesis from a variability and uncertainty perspective. Even though other perspectives are possible and indeed legitimate, it is hoped that the value of this approach, particularly in the current television environment, is demonstrated.

Links are also developed between bodies of literature that have been hitherto partitioned (cf. section 1.1). Interdisciplinarity is not always considered favourably in the social sciences. However, in the media, as in many other fields of research, problems are interdisciplinary in nature and research methods that safely lie within the traditionally accepted boundaries of one academic discipline do not always grasp their full complexity. Interdisciplinarity nonetheless presents well-known difficulties, not least in its accessibility to specialists in each of the disciplines involved. It is hoped that this thesis manages to avoid the pitfalls of interdisciplinary research.

7.2. Starting points

The essential point established at the outset of the thesis is that the standard market research classification of television audience measurement systems does not reflect their specificity (cf. section 1.2.2) and that the customary claim made in media economics that audiences are the commodities exchanged on the television market is misleading (cf. section 2.2.2). Indeed, the commodities traded on the television market are not audiences but statistics. The primary purpose of television audience measurement systems is to transform an unobservable phenomenon with no natural occurring metrics into tangible commodities (the so-called television ratings) that can be produced and sold by commercial broadcasters, and priced and bought by agencies on behalf of advertisers. This is a distinctive function of these sample surveys. That is not to say that the transformation of an abstract phenomenon into observable indicators for economic or business purposes is exclusive to television AMS. Estimates of inequality and intelligence that are used in social and recruitment policies are other examples of such a transformation. Nor does it suggest that estimates yielded by other measurement systems do not have a crucial importance in other economic fields. Indeed, certain performance indicators play a central role in the decision process of managers and politicians. For instance, estimates of unemployment or price levels strongly influence economic policies, rises in benefits, the prices of products and services etc. and therefore have far reaching consequences. What is more unusual and actually characteristic of the function of television AMS is that the estimates yielded by these sample surveys are the commodities exchanged on a given market.

The basis on which prices are set on the television market is analysed. It is shown that, as for any manufactured product, prices attached by buyers to these estimates rely on factors that are grounded on economic rather than on statistical considerations. They depend on both the observable 'quantity' i.e. the size and 'quality' i.e. the socio-demographic composition of the television ratings. But unlike other manufactured products, these commodities are not known by both buyers and producers at the moment they are priced and need to be projected. The means through which television ratings are produced by commercial broadcasters and priced by advertising and media agencies are examined (cf. sections 2.3.1, 2.3.2 and 2.4.1). It follows that variability and uncertainty about the commodities exchanged are features of the television market, and these features have been hitherto disregarded in television economics. It should be stressed that variability and uncertainty about what is exchanged is far from being unique to the television market. Certain policy decisions taken by governments and large corporations also depend on the assessment of uncertainties and pay-offs. Uncertainty in transaction on the conditions that will prevail when a contract is being executed or on the party that subscribes the contract (e.g. the insurance market), in performance measurement (e.g. the labour market) or in the quality of the good being traded (e.g. the second-hand car market) is known and studied in the current approach of economic problems. An obvious example of uncertainty in the economic field is the setting of prices on the stock market. How television ratings compare with financial investments is discussed in section 4.4.1. The difference between the two markets that is highlighted is that in the stock market variability and uncertainty are mainly of an economic nature whereas in the television market they are also, importantly, of a statistical nature.

This thesis is essentially interested in the commodity production function of television audience measurement systems since it is a distinctive feature of these sample surveys. However, it is also pointed out in section 2.4.2 that the very sample surveys that yield the commodities traded on the advertising market have also long been attributed the function of revealing the demand for television goods. This function is most apparent in the case of the few public broadcasters such as the BBC that draw their financial resources from the licence fee and do not participate at all in the market for television ratings. This dual function gives rise to ambiguous statements from authorities, BBC officials and researchers. Thus, television AMS illustrate a case where more than one meaning is given to the same set of estimates, and the measurement system is meant to meet different economic needs.

7.3. Key findings

Four key findings emerge from the analysis:

1) The complexity of measuring the television audience stems from the fact that this is not only an imprecise concept but also a social phenomenon that has been interpreted in different ways. Three theoretical constructs of the television audience concept that are translated into causal models are identified: the mass audience, the selective audience and the interpretative audience (cf. section 3.2). In contrast, television AMS are not based on a particular model of the television audience that expresses the relationships between the variables involved in this phenomenon and is taken as reproducing television processes in the real world (cf. sections 3.3.1, 3.3.2). Rather, television AMS are based on a measurement-by-fiat approach i.e. they rely entirely on assumptions and operational definitions (cf. section 3.4.1). It follows that what is captured by the measurement is flexible in its meaning.

   In this respect, it is argued that the audience construct used in the industry (the exposure construct) is compatible with both the mass audience and the selective audience constructs (cf. sections 3.4.2 and 3.4.3). Although these two theories are customarily regarded as opposing each other, they lead to models of television processes that are not fundamentally divergent. This ambiguity provides an explanation of the dual use of the estimates yielded by those systems as both commodities and measures of demand.

However, this dual use is questioned. First, it is doubtful that the television market can be efficient from an economic viewpoint because the commodities which buyers want to buy (attention) differ substantially from those supplied by sellers (exposure). The implication is that this market suffers from lack of information and consequently mis-pricing problems are likely to be frequent (cf. section 3.5.1). Secondly, the claim sometimes made in media economics that television AMS assess the demand for television goods through the allocation of time is questionable because these measurement systems are not consistent with the measurement and theory of demand traditionally used in the economic field. Measurement systems that have a demand revelation function are based on the estimation of levels of willingness-to-pay (e.g. the CSV technique) and the modelling of magnitude in television AMS is not in line with the decreasing marginal utility principle in force in economic theory (cf. section 3.5.2).

It should be stressed that the television audience is a multifaceted phenomenon like unemployment, power, alienation, health etc. and for such phenomena, whatever the construct chosen, it is unlikely that one set of measures is sufficient to convey information. Additionally, in the case of the television audience there is no agreement about the nature of the social phenomenon under study so that the choice of observable variables and empirical indicators in the measurement can only be a debatable matter. This thesis attempts to show that the issues presented by television AMS are not so much related to the choice of the measurement variables themselves as to the approach to measurement underlying this choice. Especially for measures that play such an important role in the economic field it is essential that they are based on a formulated model of the phenomenon under study in order to clarify what is exactly captured by the measurement and whether what is captured is relevant to the uses to which the measures are being applied. Alternatively, the choice of variables can also be justified retrospectively by demonstrating the properties of the measurement. In the case of television AMS none of these approaches to measurement has been used. Therefore the suitability of the measures for their dual use by the industry is questionable and so is the prediction property of the measurement as summarised in section 7.4.

2) The high reactivity of the industrial players to television ratings is not merely the outcome of deregulation policies and new technological developments as is typically stated. The thesis argues that this reactivity is also the direct outcome of a change in the data collection techniques used in television AMS across Europe (cf. section 4.2). The introduction of people-metering techniques as observation instruments has resulted in an increased variability in the prices offered by buyers for projected ratings and in a higher uncertainty as to the anticipated revenues of commercial broadcasters (cf. section 4.4.1).

   The thesis does not support the industrial claim that data collected via people-metering techniques achieve a high validity. First, the claim that this category of data collection techniques does not bring out conditioning effects is open to debate (cf. sections 4.3.1 and 4.3.2). Secondly, and this is an important point, this technique imposes the use of samples whose statistical validity is questioned in this thesis (cf. finding 3 below). Thirdly, the validity of this technique to collect data on out-of-home and children's audiences is low (cf. sections 4.3.3 and 4.3.4). Therefore, those programmes genres most likely to generate such audiences (such as sports, news, children's programming) cannot be correctly valued by the market and suffer from a competitive economic handicap that is induced by the measurement system (cf. section 4.4.2).

3) The thesis does not support the industrial claim that viewing panels are representative of the population but rather argues that the samples used in television audience measurement systems are not valid from a statistical viewpoint (cf. section 5.3.1). Inferences on television audiences are drawn from samples that are model-based, as opposed to probability-based (cf. section 5.2.2). The objective of the sampling operations implemented is to achieve samples that are 'balanced' with regard to the sampling targets selected, and the sampling procedure is ill-defined. Non response rates in BARB and Médiamat are assessed and found to be high, especially considering that there is a direct relationship between non response and the measurement variable. From a statistical viewpoint, the idea that viewing panels yield unbiased estimates is open to question and the actual performance of these samples is unknown.

   This finding is central to the argument put forward in this thesis that television ratings are best regarded as industry conventions. In exchanging estimates yielded by a sampling process with these characteristics, buyers and sellers implicitly assume that the sampling model used in a given industry and its implementation by a given contractor accurately reflect the universe of the survey. The fact that television AMS are based on an assumption that cannot be supported on statistical grounds contradicts the view expressed in the public debate that audience measurement systems are scientific and thereby provide a form of democratic system in which programming decisions can accurately be made (cf. section 1.1.1). The industrial implication is that since sampling systematic errors cannot be assessed in television AMS, the consequences of these errors on the pricing decisions made by buyers and on the programming decisions made by sellers are unknown (cf. section 5.4).

4) Television ratings are estimates yielded by stochastic measurement systems but these estimates are used as economic objects produced by deterministic production processes (cf. section 6.4.1). This implies that risks that are not only of an economic but also of a statistical order are embedded in this market. Assessing those risks in a given industry comes down to assessing the variability of the estimates yielded by the measurement systems in use in that industry. Components of variance for audience estimates are theoretically identified taking into account the static and dynamic dimensions of the sampling designs (cf. section 6.2). The analysis concludes that the statistical efficiency of the samples used is low and that there exist many components of variance that interact in various ways depending on the type of estimate considered. This suggests that building a general model of standard errors for audience estimates is likely to be difficult to achieve in practice. An empirical method of searching for patterns in standard errors for audience estimates based on Bootstrap replications is recommended.

7.4. Implications

The new television environment is characterised by the emergence of technologies that have been leading to innovations in programming forms and production modes, and in an explosion of private suppliers (cf. section 2.2.1). In this context, the phenomena of 'audience fragmentation', with a few channels still representing most of the total viewing but progressively whittled away by an increasing number of new channels, have come to light (cf. section 2.3.3). The findings summarised in section 7.3 have some interesting implications for this environment.

- Linked to finding (1), television AMS cannot be very helpful in anticipating new forms of television consumption in the digital era (cf. section 3.4.4). How audience fragmentation phenomena are going to evolve and what people are going to do with their multi-channel interactive TV sets are currently issues of vital importance for the industry. However, the estimates yielded by television AMS do not provide information suitable for addressing these issues. First, since these measurement systems are not based on an explicit model of the different variables involved in the television process (television content, individual attitudes, psychological and social characteristics etc.) the way in which changes in some of these extraneous variables may affect the endogeneous variable that is the object of the measurement (exposure) cannot be anticipated. Secondly, the industrial measurement of television audiences has proven to be inconsistent over time and different variables have successively been selected to define exposure (cf. section 3.3.1). As a result, it is difficult to separate real changes occurring in the population from changes that are mere artefacts of the measurement design. Thirdly, certain variables that have not been formalised and measured (such as television content, social and cultural processes) may well have a key explanatory power in the new television environment. What is emphasised is not only that there are complexities in the television process that cannot be captured by numbers alone but also the difficulty in making predictions based on a measure which is not clearly defined. This is especially the case in rapidly changing circumstances where a single measure is unlikely to capture all the relevant features of the phenomenon.

- Linked to finding (2), the multiplication of thematic channels relying on a content composed of programme genres whose audiences are not measured with the same level of accuracy leads to discriminatory effects that are induced by the measurement system. Mis-pricing issues have particularly serious consequences for markets that are highly competitive such as those for sport and children ratings (cf. section 4.4.2).

  In this respect, the use of proprietary studies commissioned by broadcasters such as CNN or CNBC has been pointed out in section 4.4.2. It is up to the channels that are organised around programming genres whose audience is not estimated adequately by television AMS to bring evidence of the ratings they generate. The measurement of audiences is therefore not exclusive to television AMS and lies within a more complex industrial context in which proprietary audience measurement also exists. It is, however, difficult to assess precisely the use that is made of such proprietary research by buyers because it varies strongly from one agency to the other. What is put forward in section 4.4.2 is that proprietary measurement systems cannot present the credibility and the trading assets of television AMS. The development of passive metering data collection techniques by the industry in the pursuit of improving the measurement of out-of-home exposures in television AMS corroborates this (cf. section 4.5). However, the introduction of these new data collection techniques does not seem likely to question the approach to measurement used in the television industry and thus to modify substantially the analysis of these sample surveys presented in this thesis.

- Linked to finding (3), inferences from viewing panels have become increasingly prone to sampling bias in the new environment (cf. section 5.3.2). Sources of systematic errors are identified and originate either from the set of variables selected in the sampling model of the population in use ('claimed weight of viewing', individual repertoires, ethnic groups) or from the targets set on these variables (estimation of 'claimed weight of viewing', reception abilities). It leads to the conclusion that the use of probability sampling schemes is the only strategy that could bring guarantees of sound inference in this environment. However, this would mean moving away from the current people-metering data collection technique and therefore from the provision of overnight spot ratings, which is wanted by the industrial players. It emphasises the existence of a contradiction between statistical constraints on the one hand and business requirements on the other.

- Linked to finding (4), the variability of television ratings has increased dramatically in the new environment because programme ratings have reduced dramatically under the joint pressure of an increasing number of channels and the stabilisation of the total viewing time (cf. section 6.3.2). The trends observed are (a) a continuous decrease in the average rating size of the big terrestrial channels and (b) a marked contrast between the average rating sizes of these channels and those of the cable and satellite channels. Because variability and ratings sizes tend to be inversely associated, premiums paid by buyers for the ratings of big channels are also related to the lower variability of these estimates and therefore to the safer investment opportunities they represent. Vice versa, discounts on the ratings of small channels can also be explained by the riskier investment opportunities they represent. It leads to the conclusion that small channels have to bear a higher level of risk that is of a statistical, as opposed to an economic, order. This creates a further incentive favouring the position of big channels and broadcasting groups at the expense of small and independent channels. It supports the view that concentration of ownership is likely to remain a feature of the new television market (cf. section 6.4.2).

How to fix the measurement errors associated with television AMS that are identified in this analysis is not necessarily the best way of looking at the problem. This thesis leads to the conclusion that it is essential that the measurement of the television audience be based on the formulation of an explicit model of the television process that is held as reproducing the real world and that expresses which variables are important in the social phenomenon under study and how they interact. Whatever the model chosen, it is unlikely that all relevant features of the television audience can be captured by one set of numbers only. In particular the same model cannot be used both to yield commodities and to reveal demand. This thesis leads to the recommendation of moving away from non probability sampling schemes in the new television environment in order to be able to calculate how the estimates from the sample can vary from one possible outcome of the sampling procedure to another. This implies using a data collection technique compatible with a probability sampling scheme. However, the main conclusion that is drawn from this analysis is that although the measurement of the television audience is a matter amenable to statistical treatment, it is not on the whole susceptible to precise quantification or calculation. Whatever the measurement system selected, the features captured by audience measures can be made clear and the assessment of orders of magnitude is a key element that is possible to attain. This is often enough when estimates are used as performance indicators but it is problematical when they are used as precisely defined and quantified commodities. Some of the problems and side-effects induced by the use of audience statistics as commodities have become more apparent in the new television environment and are highlighted in this analysis.

7.5. Other measurement issues

The thesis does not pretend to exhaust the topic of measurement in television. There are other current measurement issues that are indirectly related to the object of research undertaken and would deserve investigation. Some of these are briefly pointed out in this section. The subject of audience appreciation data is particularly sensitive in the UK where an audience appreciation service is run, as referred to in the footnote 25 of chapter 1.

Audience appreciation data are accessible to the BBC and ITV only but their availability in the public domain has sometimes been called for (e.g. Collins and Murroni, 1996). Which latent parameter is exactly captured by these measurement systems is a complex and interesting topic. Indeed, in the UK indices of audience appreciation are based on scores out of 10 on how informative/entertaining the programme broadcast was and these scores are very clustered. In 1995 the average index was 7.7 and only about 20% of the programmes recorded scores higher than 8.2 or lower than 7.2 (Windle and Landy, 1995). In other words about 80% of the programmes are given appreciation scores between 7 and 8. An approach at the individual level in order to analyse the observable variable selected and the scalar system used would be necessary to understand the source of so little variation.

The clarification of concepts that are commonly found in debates about television is also of interest. Obvious examples are the concepts of 'quality' and 'diversity' that are commonly encountered in the public debate as well as in the academic literature (cf. section 1.1.1). The objective here is not to take part in such debates but rather to emphasise the fact that little effort has been put into defining these concepts, as has already been pointed out (e.g. Collins, 1998). From a sole statistical perspective there is little point or meaning to the questions that are based on such concepts unless a model can be formulated and variables can be measured. The concept of 'diversity' in programming seems more amenable to statistical treatment because its operationalisation involves formulating measures of dispersion and movement. However, the construction of indices of diversity also involves defining the meaning of the concept of 'programme'. Indeed, in the new media environment the notion of 'programme' is rapidly evolving with the emergence of Web television, video on Web, Video-On-Demand, Pay-Per-View, Interactive services etc. How to identify and monitor the evolution of audio-visual forms and contents, and how to sample broadcasting schedules are tasks for applied statisticians interested in measurement issues.

Beyond estimation issues, the field of television also presents some classification issues. Indeed, statistical information on the audio-visual sector (industrial structures, players and markets) is poor indeed as has been acknowledged by the Office for Official publications of the European Communities (EUROSTAT, 1995). This is partly due to the fact that it is one of the most difficult economic sectors to monitor statistically due to the increasingly tight links between the various activities and markets composing the sector, and the fast technological changes that strongly impact these activities and markets. Establishing a classification system capable of providing meaningful indicators on variables such as industrial concentration therefore not only requires statistical knowledge but also a good understanding of the economy of the sector in its full complexity. Given the growing interest aroused by the audio-visual sector (cf. section 1.1.3), developing a tool that makes possible the monitoring of its industrial evolution is becoming a necessity for the implementation of public policies as well as for business purposes.

7.6. Evolution of television audience measurement systems

The idea that television audience measurement systems will not persist in the new television environment has been put forward both in media economics and in media audience literatures, which has contributed to make these sample surveys appear as an obsolete object of research (cf. sections 1.1.3 and 1.1.4). The disappearance of television AMS is often attributed to the take over of pay television and new uses of the television medium. However, this thesis attempts to show that the analysis of these measurement systems is important in understanding the evolution of the economy of television and programming over time, especially since the mid-1980s. Furthermore, although the eventual role of television audience measurement systems in the allocation of resources in the digital era remains to be seen, the analysis of the current television industry does not support this view. In the late 1990s most pay channels already participate or are willing to participate in the advertising market and the pay television industry has been evolving towards a mixed production mode combining subscriptions and advertising (cf. section 2.5.2). It is argued in section 2.5.1 that even though new technologies permit the emergence of a pay production mode for television goods, the relationship between payment and consumption remains inaccurate. Additionally, television is characterised by increasingly high programming costs and this creates a further incentive for pay broadcasters to enter the advertising market.

If television is compared with the other media, it appears that audience measurement systems are limited in industries where the pay exclusion system is accurate, such as in the cinema industry, or in industries that do not participate at all in the advertising market, such as the book or music publishing industries (cf. section 1.2.2). In the print industry, where both the pay exclusion system is inaccurate and where advertising is an important source of revenues, audience measurement systems are prominent (cf. section 1.2.3). The development of audience measurement systems in the context of the Internet is interesting because this medium has distinctive features: it is personally addressable and has low fixed costs. How the Internet will develop in the future is difficult to predict but if advertising becomes a major source of financing audience measurement systems may also have a role to play in the economy of this medium.

However, even if television audience measurement systems persist in the digital era, the uses that are made of the data may evolve, as they have evolved in the past. This is an important consideration. Recently, the television industry as a whole has had a growing need to gain a better understanding of media processes in general and television processes in particular. There has been a proliferation of proprietary audience research studies commissioned by broadcasters and agencies that draw on methodologies that are more qualitative. It is possible that the result of these studies will increasingly be taken into account by buyers when pricing the estimates yielded by television audience measurement systems. In this case the prices attached to these estimates would integrate pieces of information that are external to the measurement systems themselves. If the use made of audience estimates evolves towards the provision of bottom line data then the impact of television AMS on the allocation of resources in the industry would become looser and the meaning of measurement error would also evolve, as emphasised in section 7.1.

Finally, this thesis proposes an analysis of what is measured, how it is measured, for what uses and with what consequences on the television sector. It is hoped that the approach developed is of value for the assessment of errors in other measurement systems that can be found in the economic field and perhaps in other social fields. It is believed that such analyses could broaden the outlook of statisticians and increase their links and influence outside the traditional boundaries of their discipline. In particular, it is hoped that this thesis emphasises the importance for statisticians to take part in public or academic debates that are based on social measurement data.

Appendices

Exhibit 1. Variables for the classification of audience measurement systems

Source: AE

I	**Medium audience measured**	1. Flow media			2. cultural goods	3. Contact media
		A. Print	B. Broadcast	C. Internet	D. Cinema	E. Outdoor
II	**Geographical coverage**	1. National		2. International		
III	**Type and size of the universe of reference**	1. General		2. Specific		
		A. 15+	B. 4+	C. Business	D. Affluent	E. Profes-sional

Exhibit 2. Outline of audience measurement systems in the European media industry

Source: AE

A. Outdoor audience measurement systems

The objective of these sample surveys is to estimate the audience of posters or billboards. Although surveys of this type have been existing locally and on an ad hoc basis, they have really developed since the late 1980s. They typically cover a 15+ universe in urban areas and report annually on individual journeys within a pre-delimited geographical area. From individual journeys data are derived probabilities on the number of times individuals pass in full view of a particular panel.

Outdoor AMS do not exist in all the European counties (e.g. Italy) and are too recent for a standard measurement regimen comparable to print AMS to be established. They are based on recall techniques, which consist in asking respondents to reconstruct their daily travels over a set period of time. They increasingly use sophisticated technology such as mapping software and portable devices are currently researched.

Outdoor AMS are always national, or rather multi-local e.g. POSTAR in the UK, Affimétrie in France. They are particularly developed in the largest urban area e.g. MetroBus, which measures the audience of posters on the Paris underground and bus shelters.

B. Cinema audience measurement systems

	Cinema AMS do not really aim at measuring audience size but rather audience composition. The cinema audience has a distinctive profile - skewed towards young, urban, and affluent individuals, which is not subject to large variations. These elements explain why AMS in the cinema industry are not as developed as the AMS found in other media. They can be divided into two sub-categories: multi-media and dedicated cinema audience measurement systems.
1. Multi-media cinema audience measurement systems	In most European countries, cinema audience indicators are the by-products of other media AMS. Data on the demographic profile of cinema-goers are often collected within the context of other surveys e.g. In France they are collected in the context of the radio AMS; in Ireland or in Switzerland in the context of the national print AMS.
2. Dedicated cinema audience measurement systems	In a few European countries, there is an AMS especially designed to measure cinema audiences. It is the case of CAVIAR in the UK.

C. Readership measurement systems

1. National readership measurement systems

Readership measurement systems appeared in the late 1920s in the USA. They are large and sophisticated surveys.

Print AMS are based on Day-After-Recall data collection techniques often conducted face-to-face and sometimes associated with sophisticated technology e.g. the AEPM survey has been using a Computer Assisted Personal Interviewing Double Screen technology since January 1999.

The calculation of the Average Issue readership (AIR) of print publications is similar between European countries and based on the so-called Recent Reading (RR) technique, which was first introduced in the UK in the 1950s. The RR technique consists in asking respondents whether they have read a given title, it does not matter which issue, within its latest publication interval (i.e. daily for newspapers, weekly for weekly magazines etc.). The readership of the title is estimated by the proportion of the sample that claims to have done so.

Readership surveys usually use repeated cross-sectional sampling designs. Sampling scheme are extremely varied and can be based on probability samples e.g. the NRS or on a combination of non probability and probability samples e.g. APQ.

National readership surveys can be divided into two sub-classes depending on their universe size: general and specific AMS.

1.1. General readership measurement systems

These AMS are the largest sample surveys in the print media industry and among the largest surveys conducted in the private sector. They are also used as an important source of information outside the media sector. Annual sample sizes of 25 000 and over are commonly encountered. They typically report audience size and composition of press publications on a 15+ universe once or twice a year.

In most countries, there is only one national print AMS assessing the readership of both newspapers and magazines. The most prestigious of the print AMS in Europe are Media-Analyse (MA) in Germany and the National Readership Survey (NRS) in the UK which have been running continuously since 1954 and 1956 respectively.

In a few European countries, two general readership measurement systems can be in competition. It is the case in France where two print AMS have been co-existing since 1983 as a result of the failure of the two classes of print publications to agree on a common measurement regimen: Audience Etudes de la Presse Magazine (AEPM) measures magazine readership whereas Audience de la Press Quotidienne (APQ) measures newspaper readership. These cases remain nonetheless quite exceptional in Europe nowadays.

1.2 Specific readership measurement systems

These second national print AMS focus on a restricted national universe. The most important ones report the readership of business or affluent populations annually or bi-annually e.g. the British Business Survey (BBS) in the UK, La France des Cadres Actifs (FCA) or La France des Hauts Revenus (FHR) in France. Other specific AMS measuring the readership of professional publications can also be found such as the agricultural press AMS e.g. Agrimedia in France or Agridata in the UK, or the medical press AMS e.g. Audience de la Presse Medicale (APM) in France or the Joint Industry Committee for the Medical Audience Research Survey (JICMARS) in the UK.

2. Pan-European readership measurement systems

It is in the print media industry that pan- European AMS are mainly to be found. All the European readership measurement systems have in common to focus on restricted universes. The oldest one is the European Business Readership Survey (EBRS), which has been reporting on the readership of the top 0.2% of the business population over 17 countries every two years since 1973. A more recent one is the European Media & Marketing Survey (EMS), which has been measuring the readership of the top 20% affluent individuals over 17 countries annually since 1995. In between these two universe sizes, Europe 2000, launched in February 2000 measures the readership of the top 2% affluent people over 14 countries.

D. Broadcast audience measurement systems

1. Radio audience measurement systems

Radio AMS are always national. They typically report 3 or 4 times a year on audience size and composition on a 15+ universe although some AMS include children in the universe definition. e.g. in the UK.

Radio AMS are based on large sample sizes. As an illustration, annual sample sizes of 50,000 or over are not uncommon. Measurement designs are particularly diversified. The data collection techniques used are either to recall or diary techniques. A wide range of longitudinal sampling designs (repeated cross-sectional designs or retrospective panel designs, probability or non probability samples) can be found in Europe. It is therefore particularly difficult to make generalisations about this category of AMS.

As it is the case with cinema AMS, radio audience indicators can be collected by AMS dedicated to the radio medium e.g. in Belgium, Italy, Switzerland, Sweden, UK or in the context of multi-media surveys e.g. in France, Germany, Greece, Spain. The oldest radio AMS in Europe is Contimuluister-Onderzoek (CLO) in the Netherlands, which has been constunously running since 1965. The British radio AMS, the Radio Joint Audience Research (RAJAR) is among the most recent ones and it is also the largest radio AMS in Europe with an annual sample size of 160,000.

2.1 National television audience measurement systems

National television AMS are the most sophisticated and expensive sample surveys conducted in the media industry and beyond it. These AMS measure the television audience size and composition of a large universe. In Europe 4+ or 6+ universe definitions are the most commonly used.

They are typically composed of two inter-related elements: an establishment survey and a viewing panel. In all European countries the data collection technique used is the peoplemetering technology, which is always associated with a prospective panel design. Television AMS are the only surveys in which data are collected second per second every day and all yearlong. As an illustration, these systems produce from 1,500 observations per second e.g. in Denmark, Ireland or Norway up to about 14,000 observations per second in Germany or in the UK.

Apart from the exceptional cases of Belgium, Norway and Portugal where two national television AMS are currently in competition, the scale of these systems and the costs associated with it means that there is room for only one national television AMS per country in Europe.

2.2 International television audience measurement systems

International television AMS only appeared in the late 1980's with the Pan European Television Audience Research (PETAR), which used to report on the audience size and composition of Pan-European channels on a yearly basis from 1987 until 1995. Nowadays international television audiences are measured in the context of multi-media surveys whose designs is closer to readership audience measurement systems than to national television audience measurement systems. The two European multi-media AMS are EMS and Europe 2000 (cf. section A on international readership measurement systems). So far CNN, BBC World and CNBC are the TV sponsors of the Europe 2000 survey.

E. Internet audience measurement systems

The measurement of this new type of audience is just emerging in Europe but has been existing in the USA since 1995. Industrial research on the matter is currently intense and a measurement regimen for this new medium can be expected to emerge in the short term.
Two AMS currently exist in Europe: Cybermonitorr. Pro and Media Metrix.

Cybermonitor. Pro

It was introduced by Médiamétrie in January 1999 in France and it is the oldest Internet AMS in Europe. Data (number of hits) are collected via the insertion of non visible devices in selected Web pages.

Media Metrix

This AMS was launched By the Ipsos group in Europe in October 1999 and covers three European markets: France, Germany and the UK. Italy and spain should follow at the end of the year 2000. It is the adaptation of the American Internet audience measurement systems designed by Media Metrix.

Data are collected via a meter (the PC meter), which performs many of the functions of peoplemeters in national television AMS. This device is installed on a PC and records when the PC is on and being used, when it is on but not being used, and when it is off. When the PC is in use, the meter prompts users to identify themselves at the individual level. As users switch from one application or programme to another, the meter logs the event. When a user goes onto a commercial online service, the meter steps up the recording detail, logging usage of components within the service e.g. user read email, played online game etc. When the user starts a world wide web browser of any kind, the meter begins tracking web usage. As each page is viewed, the meter records the Uniform Resource Locator (URL) or page address on the web and the duration in time during which that page is displayed on the screen. This data collection technique is used in association with prospective panel designs. The universe is defined as individuals living in PC owning households.

In 2000, Nielsen is expected to launch NetRatings, another Internet audience measurement system, in several European countries including France and the UK

Exhibit 3. Audience measurement systems in France and the UK

Source: AE

	France	United Kingdom
Print Industry	AEPM Audience et Etude de la Presse Magazine APQ Audience de la Presse Quotidienne FCA France des Cadres Actifs FHR France des Hauts Revenus AGRIMEDIA APM Audience de la Presse Medicale	NRS National Readership Survey BBS British Business Survey AGRIDATA JICMARS Joint Industry Committee for the Medical Audience Research Survey
Television Industry	MEDIAMAT	BARB Broadcasters' Audience Research Board
Radio industry	75 000	RAJAR Radio Joint Audience Research
Cinema industry	75 000	CAVIAR
Outdoor industry	AFFIMETRIE	POSTAR
Internet	CYBERMONITOR.PRO MEDIA METRIX	MEDIA METRIX

Exhibit 4. Structures responsible for audience measurement systems

Source: AE

1. Joint Industry Committee (JIC)

In this first case, audience measurement systems are contracts between non-profit organisations representing the industry as a whole on the one hand, and market research company(ies) on the other hand. Three parties traditionally compose the JIC body: media owners, advertisers and advertising/media agencies. The JIC body is responsible for the technical specifications and for overseeing both the running of the services and the commercial exploitation of the data. The responsibility(ies) of the market research company(ies) that is (are) awarded the JIC contract is (are) limited to the daily operations of the service, which have to be in strict conformity with the specifications approved by the JIC body.

JIC bodies exist in a majority of European countries. It is the case in the UK where the television AMS is operated by the Broadcasters' Audience Research Board Ltd (BARB), hence the name of the British television AMS. This situation is however relatively recent. From 1967 until 1980, two organisations in the television industry used to run their own television audience measurement systems: one was operated by the BBC whereas the other one was operated by another JIC body, the Joint Committee for Television Advertising Research (JICTAR) composed of the Independent Television Companies Association (ITCA) and advertisers' associations.

Similarly, the British radio audience measurement system has been operated by a JIC body, the Radio Joint Audience Research Ltd (RAJAR) since 1992 only. Before that, two AMS used to exist: a first one run by the BBC and a second one run by the Joint Industry Committee for Radio Audience Research (JICRAR) since 1978. The same arguments in favour of a single JIC body operating a single service that were used for television eventually prevailed for radio.

Motivations behind the single AMS per medium in Europe are that it allows the pooled resources of money and experience. It thus leads to much larger and sophisticated surveys than European domestic media owners could afford otherwise. It also provides the different parties with a forum. Another important motivation is that it establishes one source agreed by all parties before hand. This greatly contributes to stop discussions over figures, hence builds the medium's credibility.

2. Own service

In this second case, both the technical specifications and the running of the service are the responsibility of a market research company that owns the data and sells them to the industrial users.

Broadcast own services exist in a minority of countries in Europe e.g. Greece, Hungary, Portugal, Turkey but it is a distinctive feature of American audience measurement systems. The American situation is however different from these European cases because there is always more than one national audience measurement system by medium in the United States so that private entrepreneurs compete in the promotion of their own services and sell the data to as many users as possible.

This structural difference between the European and the American cases can be explained by legal considerations: the American Antitrust regulation makes the acceptability of a JIC difficult. But considerations of another nature also come into play: there is a belief that a JIC is less able to make crucial decisions and to take decisive steps than competing private market research companies; it is also argued that since the American television industry is much larger than the European ones, it would be difficult to keep together such a number of firms to finance a single service. For all these reasons, the JIC is regarded as a rather inefficient structure to operate audience measurement systems in the USA (Beville, 1985). As a result, different AMS designs compete for each medium and arguments over audience data occur regularly. In television the Nielsen ratings are however by far the most used data in the USA. In

Europe, Portugal is the only country where two own services operate competing television AMS. In general, attempts of private entrepreneurs to enter the market as competing data providers have proven to be unsuccessful in the long run in Europe. The failed attempt of Sofres-Nielsen to launch a competing people-meter service in France in 1988 illustrates this point.

3. Mixed service

In this third case, audience measurement systems are specified and run by an organisation that is intermediate between the own Service system and the JIC. The structure of the organisation operating the French AMS is a good illustration of this third case. The market research company specifying and operating both the radio and television audience measurement systems, Médiamétrie, is directly owned by media owners and advertising agencies. The AMS contracts between this company and other independent market research companies are restricted to fieldwork only. The data are sold to as many clients as possible.

This hybrid situation can be explained by the fact that, as opposed to British AMS, French AMS are not the product of negotiations between different industrial organisations running competing services but rather the result of the privatisation of the Centre d'Etudes d'Opinion (CEO) - the research department of the public broadcasting organisation ORTF - in 1985. In the newly created company Médiamétrie the state remained an important shareholder via public broadcasters but the majority of the capital was held by private broadcasters, advertisers and agencies. Indeed, the establishment of Médiamétrie marked the first 'full weight' contribution of private broadcasters and advertisers to audience measurement systems in France (Bourdon, 1994).

Since Médiamétrie has the monopoly over the production of broadcast audience data, an exterior joint industry body, the Centre d'Etudes des Supports de Publicité (CESP) performs some JIC supervising functions. It controls that the service is run in conformity with the specifications approved by the shareholders.

Exhibit 5. Overview of broadcast audience measurement systems in the USA

Main sources: Beville (1985); Buzzard (1990); AE.

pre-television

1930 CAB (Co-operative of Analysis of Broadcasting) provided the first survey of radio audience run on a continuing basis. Only advertisers and agencies were accepted as clients.

Archibald Crossley created the first Audience Measurement System and coined the term *rating*.
Survey design:
- 12-month study in 50 cities
- quota sample of 17,000 households using radio
- Day-After-Recall data collection technique

Base figure for ratings: Households Using Radio (HUR), all households with telephone and listening to the radio.
Audience indicators reported: when sets were used, who listened, which programmess and stations were listened to and which programmes were preferred.

1933 39 cities of fairly equal network competition were covered by CAB. The total sample was 75,030. Introduction of ratings by socio-economic groups defined by rent and occupation.

1934 The first syndicated radio audience survey using a coincidental data collection technique was launched by Clark.E Hooper, who founded the first commercial venture in media measurement. This survey was founded by magazine publishers.

Survey design:
- total sample of 12,404 over 16 cities
- Telephone coincidental interviewing i.e. interviews placed simultaneously with the broadcasting of the programme.

Base figure for ratings: the Available Audience defined as all households with telephone and radio sets.
Audience indicators reported: sets in use, hours of listening, network programme ratings, audience share, audience composition, audience trends by time period, day, month.

1938 Hooper's survey covered 32 cities with station affiliates of the three networks and used a PPS sampling method

1942 Arthur C. Nielsen introduced the NRI (Nielsen Rating Index), first radio audience measurement systems using a set metering data collection technique.
Survey design:
- stratified random panel of 800 households (25% universe of US households)
- panel controls using 8 dimensions: number of radio sets at home, family size, geographical location, size of locality, income, occupation, telephone ownership

Base figure for ratings: All households with radio sets.
Audience indicators reported: continuous record of frequency of tuning, time and length

	of tuning, stations tuned to, audience flow and duplications between programs.
1946	The NRI coverage expanded to 63% of US households and used a total of 1300 set meters placed in 1100 households
1949	The NRI coverage expanded to cover 97% of US households, ratings became for the first time nationally projectable

post-television

1948 C.E Hooper introduced the first radio diary data collection technique.
The diary was a device to establish relationships between areas that can be reached by telephone and other areas.

1949 ARB (American Research Bureau) and James Seiler pioneered the first television diary data collection technique.
Survey design:

- Random telephone sampling over 3 cities
- one week diary

Base figure for ratings: All individuals with telephone and television sets.
Audience indicators reported: audience flow, cumulative audience of programmes and audience composition.

1950 A.C Nielsen launched NTI (National Television Index), first television survey using a set metering data collection technique.

Survey design:

- 290 installed households, a sub-sample of NRI's 1500 households
- Program's share of audience determined by coincidental telephone calls in 405 households per city

Base figure for programme rating: PSA, households in cities where the programme was broadcast.

1951 NTI sample expanded to 450 households.
A.C Nielsen launched MNA (Multi-Network Audience), a new service based on an NTI's sub-sample measuring programme popularity under relatively equal competition conditions.

1954 Nielsen launched NAC (National Audience Composition) for both radio and television media in order to furnish the demographic data not provided by AMS based on set meter techniques.
Survey design:

- coverage of the 30 top US market
- close-end household diaries; with face-toface placement and calls back
- combined with set meter-controlled

Audience indicators: 4-week reach and frequency, demographics initially defined as men, women, teens and children but age groups gradually introduced and expanded.

1960 Nielsen began using total US television households as base figures for rating calculations.

1973	Nielsen introduced SIA (Storage Instantaneous Audi-meter) which provided day-after ratings for local market services in New York and Los Angeles and 48-hour ratings for national TV shows.
1975	NTI began reporting ratings for programmes of less than 5 minutes' duration and all programmes were rated to the nearest minute.
1977	Nielsen introduced the AMOL (Automated Measurement of Lineups), which allowed the identification of network programmes.
1982	AGB Research PLC announced its intention to enter the US television audience research business with its new peoplemetering data collection technique already tested in the UK.
1983	Super-stations and satellite & able networks induced Nielsen to increase its NTI sample from 1250 to 1700 metered households.
1984	AGB launched the first US test of validation of AGB peoplemetering techniques in the city of Boston over an 8-month period on two matched panels of 200 households. Nielsen began a national test of the Nielsen peoplemetering technique.
1987	Nielsen converted its television set meter measurement system into a peoplemeter measurement system using a sample of 5000 households.
1988	AGB withdrew from the United states.
1993	Arbitron abandoned the television audience research business and restricted its activities to radio audience research. Nielsen Media Research became the main provider of television ratings.
1999	Statistical Research Inc. (SRI) announced the star of a nationwide measurement based on its SMART (Systems for Measuring And Reporting Television) new decoding technology. Arbitron tested its PPM (Personal Portable Meter).

Exhibit 6. Overview of television audience measurement systems in Europe

Source: ESOMAR, 1995.

Countries	Services	Universe		Establishment Survey			Annual gross panel size
		Private households	Lower age limit	Frequency	Type	Annual sample size individuals	Households
Austria	Teletest	with TV/phone	3	cont. monthly roll.	multimedia	24,000	610
Belgium (1)	Audimétrie	with TV	6	once a year	multimedia	10,000	630
Belgium (2)	Audiemétrie	with TV	6	once a year	multimedia	10,000	600
Denmark	Gallup TVR	with TV	4	cont. monthly roll.	Specific	10,000	530
Finland	Finnpanel TV	with TV/phone	3	cont. monthly roll.	Multimedia	11,000	475
France	Médiamat	with TV/phone	4	cont. monthly roll.	Multimedia	75,000	2,300
Germany	GfK	with TV	3	once a year	multimedia	50,197	4,400
Greece	AGB Hellas	with TV	6	once a year	specific	18,195	700
Hungary	AGB Hungary	all	4	once a year	specific	9,000	600
Ireland	TAM	with TV	4	once a year	specific	na	432
Italy	Auditel	all	4	twice a year	specific	30,000	2,420
Netherlands	Intomart	all	6	once a year	specific	10,000	1,250
Norway	NTVMP	with TV/phone	3	once a year	specific	3,870	550
Portugal (1)	AGB Portugal	all	4	once a year	multimedia	15,000	600
Portugal (2)	Ecotel	all	4	once a year	multimedia	13,000	550
Spain	Sofres AM	all	4	three times a year	multimedia	45,000	2,500
Sweden	MMS	with TV	3	once a year	specific	15,000	620
Switzerland	Telecontrol	with TV/phone	3	cont. quarterly roll.	multimedia	18,200	1,600
Turkey	AGB anadolu	all	5	once a year	specific	45,000	660
UK	BARB	with TV	4	cont. monthly roll.	specific	39,000	4,701

Countries	Services	Criterion of viewing	Persistence threshold sec.	Operational definition for commercial ratings	
				Unit interval	Measure
Austria	Teletest	in room and watching	30	commercial break	average rating of break
Belgium (1)	Audimétrie	in room and able to watch	15	commercial break	aver. 15 sec. rating of break
Belgium (2)	Audiemétrie	in room and able to watch	15	commercial break	aver. 15 sec. rating of break
Denmark	Gallup TVR	in room	15	minute	rating of minute in which spot begins
Finland	Finnpanel TV	in room and able to watch	10	minute	rating of minute in which spot begins
France	Médiamat	in room	1	commercial break	average second rating of break
Germany	GfK	watching	0	commercial break	average rating of break
Greece	AGB Hellas	in room	30	commercial break	aver. minute rating of break
Hungary	AGB Hungary	in room and watching	30	commercial break	aver. minute rating of break
Ireland	TAM	in room	15	three minutes from beginning	aver. minute ratings during the three minutes
Italy	Auditel	in room and watching	30	minute	aver. of minutes in which spot appears
Netherlands	Intomart	in room and watching	15	minute	rating of minute in which spot appears
Norway	NTVMP	in room and watching	30	commercial break	aver. minute rating of break
Portugal (1)	AGB Portugal	in room and watching	30	minute	rating of minute in which spot appears
Portugal (2)	Ecotel	in room and watching	5	commercial spot	rating of time occupied by spot
Spain	Sofres AM	in room	5	minute	rating of minute in which spot begins
Sweden	MMS	in room	30	minute	rating of minute in which spot begins
Switzerland	Telecontrol	in room and able to watch	0	commercial break	net reach of break
Turkey	AGB anadolu	in room and watching	30	minute	aver. of minutes in which spot sppears
UK	BARB	in room	15	minute	rating of minute in which spot begins

Countries	Services	Consolidated ratings	Guests	Availability of data to buyers	Aggregated data		Raw data
					online	Downloading or other transfer to third parties	Downloading or other transfer to third parties
		Y=Yes; N=No		*ND=Next Day; NW=Next Week*			
Austria	Teletest	Y	Y	ND	N	N	N
Belgium (1)	Audimétrie	N	Y	NW	Y	N	N
Belgium (2)	Audiemétrie	N	Y	NW	Y	Y	N
Denmark	Gallup TVR	N	Y	ND	N	Y	Y
Finland	Finnpanel TV	N	Y	ND	Y	Y	N
France	Médiamat	N	Y	ND	N	Y	N
Germany	GfK	N	N	ND	Y	Y	N
Greece	AGB Hellas	N	N	ND	N	N	N
Hungary	AGB Hungary	N	N	NW	N	N	N
Ireland	TAM	N	Y	ND	Y	Y	N
Italy	Auditel	N	Y	ND	Y	N	N
Netherlands	Intomart	N	Y	ND	Y	Y	N
Norway	NTVMP	N	Y	2 days	N	N	Y
Portugal (1)	AGB Portugal	N	N	NW	N	y	N
Portugal (2)	Ecotel	N	Y	ND	Y	Y	N
Spain	Sofres AM	N	Y	ND	Y	Y	N
Sweden	MMS	N	Y	ND	N	N	N
Switzerland	Telecontrol	N	Y	No fixed time	Y	Y	N
Turkey	AGB anadolu	N	N	ND	Y	N	N
UK	BARB	Y	Y	ND	Y	Y	Y

Exhibit 7. Distribution of advertising expenditure in key European media industries

Source: Young and Rubicam, 1998.

	Total expenditure in millions of US$	News - papers %	Magazines %	TV %	Radio %	Cinema %	Outdoor %
Germany	21,410,4	48.1	19.4	23.8	4.1	1.0	3.6
UK	13,654,8	40.9	18.3	32.7	3.5	0.7	3.9
France	10,187,7	24.4	22.8	33.5	7.0	0.6	11.6
Italy	5,996,3	21.0	16.4	56.7	3.3	0.0	2.6
Spain	4,799,4	31.5	15.6	37.7	9.8	0.8	4.6
Netherlands	3,521,6	49.8	22.3	18.9	4.9	0.4	3.7
Belgium	1,703,5	26.4	23.3	32.2	8.1	1.4	8.7
Austria	1,665,2	45.6	17.5	20.9	9.7	0.0	6.4
Denmark	1,509,2	61.9	13.8	19.3	1.9	0.7	2.1

Exhibit 8. Structures responsible for BARB and Médiamat

Compiled by AE.
Sources: BARB; Médiamétrie.

BARB	Médiamétrie
Broadcasters' Audience Research Board Ltd. was established in 1981 to replace the original Joint Industry Committee for Television Audience Research Ltd (JICTAR). It operates single audience measurement and appreciation systems for the television industry.	Mediamétrie is a private company established in 1985. It operates audience measurement systems for the cinema, radio and television industries. It also conducts other commercial audience research (leaflet and free press audience, multi-media audience, European media surveys) and produces media-planning soft-wares.
BARB is a company jointly owned by the Independent Television Association (ITVA) and by the British Broadcasting Corporation (BBC).	The capital of Médiamétrie is shared as follows: 35% by television channels (TF1, France Television, Canal +, La Cinquième), 35% by advertisers and agencies (UDA, Publicis, Havas, Carat, FCB, DDB-Needham), 27% by radio stations (Radio France, RMC, Europe 1, RTL) and 3% by other media operators.
The board is drawn from the two shareholders, Channel 4 and the Institute of Practitioners in Advertising (IPA) under an independent chairman. Two principal committees report to the Board: the Audience Appreciation Management Committee (AAMC) and the Audience Measurement Management Committee (AMMC). The AMMC includes representatives from the satellite broadcasters, the IPA, the Incorporated Society of British Advertisers (ISBA) and the Association of Media Independents (AMI).	Shareholders participate in five committees whose function are to assist the management board of the different services and products sold by the company. Each committee deals with the problems of a specific medium: Comité Audimétrie, Comité Radio, Comité Cinema, Comité Cable et satellite, Comité Metridom. In 1997, Mediamétrie realised a turnover of 167 M. F and had 192 employees.
In 1991, the measurement service contract was awarded to: a) RSMB Television Research for the panel design, panel control system and the establishment survey, whose fieldwork is sub-contracted to Ipsos- RSL and Millward Brown. b) AGB Taylor Nelson Sofres for the design, supply and installation of the metering equipment as well as data processing and transmission. In 1997, both contracts were renewed up to the year 2002. The new BARB contract should be awarded in 2000 and run in 2001.	In 1996, contracts were awarded to: a) Audimedia and Infodience for the selection, recruitment and maintenance of the panel households up to respectively 1998 and 2001. b) Telcontrol for the design, supply and installation of the metering equipment. Médiamétrie is in charge of the panel design, panel control system, data processing and transmission.

Exhibit 9. Overview of broadcast audience measurement systems in the UK

Main sources: Briggs, 1965; 1979; 1995; Paulu, 1981; AE.

pre-television

1936 The BBC created the Listener Research Group, first group specialised on audience research problems, which appointed RJE Silvey of the London Press Exchange as Research director.

The IPA (Institute of Incorporated Practitioners in Advertising) conducted the first poll on radio listening habits based on 20,000 sample.

1937 Silvey's research began with a series of inquiries into audiences of different programme genres. The first one to be chosen was the audience for drama and features followed by music, talks and discussion, light entertainment and daytime women's programmes.
Survey design:
- panel of 350 to 500 listeners having an interest in the programming genre studied
- self-completion questionnaires
- programmes were awarded a mark out of 10 which was then multiplied by 10 to give a score out of 100. This system was called an 'Appreciation Index' (AI).

post-television

1948 Silvey conducted the first multi-media audience survey.
Survey design:
- two panels of 1,062 households each
the first panel was randomly drawn from the Post Office's geographical tabulation of TV homes and the second panel was a control group as nearly similar as possible from the first one but owning no TV sets
- listeners/viewers in every age group were asked to keep for 21 days a logbook recording their hours of listening and viewing and other information like leisure time and bed time.

1949 Panel members were asked to record their 'reactions' to particular programmes using a 5-point alphabetical scale (A+, A, B, C, C-) with verbal explanations provided for each score. The results were presented in terms of 100-point scale by according points to each position.
This system applied to television was called a 'Reaction Index' (RI).

1950 The name BBC Listener Research Department was changed to that of Audience Research Department. Its purpose was to measure audiences for all BBC and Independent Broadcasting Authority (IBA) domestic programmes, set up listening and viewing panels, make special studies of individual programmes and conduct pre-broadcast inquiries.

The Daily Survey of Listening and Viewing reported the size of BBC and ITV radio and television audiences.

Survey Design:
- 2,500 interviews per day of individuals 5+
- geographical age, sex, working status, socio-economic class demographics
- Day-After-Recall data collection technique
- Listening and viewing sessions reported quarter-hour by quarter-hour,
- TV and radio sets ownership, reception of programmes from relay services

An individual is reported as being in the audience of a programme if he/she has listened to/viewed at least half of it.

1955 The BBC maintained an Audience Reaction service.

Survey design:
- panels of 4,000 listeners and 2,000 viewers
- recruitment for 12 months
- self-completion questionnaires covering also appreciation of actors, direction, scripts etc. of the programmes listened/viewed

The BBC Television Programme Board welcomed a suggestion from the Audience Research Department to provide a regular service of graphs to illustrate statistics of audience size and appreciation.

Independent television companies and advertising agencies purchased audience data from the BBC.

1956 TAM (Television Audience Measurement) became ITV's official ratings provider.

Survey design:
- set meters installed in 850 homes receiving both BBC and ITV programmes
- 550 of the panel homes also kept viewing diaries
- ratings based on households
- reports compiled minute-to-minute audiences for both the BBC and ITV

1966 The Independent Broadcasting Authority (IBA) created an Audience Research Department.

1967 The Independent Television Companies Association, the Incorporated Society of British Advertisers and the Institute of Practitioners in Advertising contracted with Audits of Great Britain (AGB) to conduct television audience measurements. The resulting Joint Industry Committee for Television Advertising Research (JICTAR) measured TV audiences using a technology similar to TAM.

Survey design:
- TV meters installed in 2,655 homes receiving ITV signals
- All the households also kept viewing diaries indicating on a quarter-hour basis
- age, sex, working status demographics

The IBA arranged research into television audience appreciation.

Survey design:
- panel of 900 in the London area and 900 in the other ITV regions
- weekly diaries sent alternatively to each geographical area
- respondents rated each BBC or ITV programme on a 6 point scale from "extremely interesting/enjoyable" to "not at all interesting/enjoyable"

1974 Audience measurement for Independent Local Radio became the responsibility of the Joint Industry Committee for Radio Audience Research (JICRAR) representing the Association of the Industry of Radio Contractors, the Institute of Practitioners in Advertising, the Institute of the Incorporated Society of British Advertisers and the IBA.

1978	First Radio Network survey carried out simultaneously in all areas covered by independent radio Survey design: - panel of 12,000 adults 15+ and 3,000 children 4+ - radio diaries over a 4 week period
1981	The Broadcasters' Audience Research Board Limited (BARB) was set up by the BBC and the ITV Association stimulated by the Annan Report to provide a single system for TV audience research. The Audience Reaction service was run by the BBC Broadcasting Research Department
1984	The BBC listening panel was re-designed to incorporate the use of the Daily Survey of Listening and Viewing as a sampling frame for the recruitment of panel members. AGB introduced the people-meter technology in the television audience panel.
1992	Radio Joint Audience Research Limited (RAJAR) was established by the BBC, UK licensed and other commercial radio stations to provide a single system for the radio audience.
1994	The Audience Reaction services, Television Opinion Panel (TOP) and Radio Opinion Monitor (ROM), were awarded to Research Services Limited and carried out on behalf of the BBC, ITV, Channel 4 together with Independent Television Commission (ITC) for TOP and on behalf of the BBC only for ROM. The data are confidential and not made available to other organisations in the television industry (broadcasters, advertisers and agencies).
1997	A new audience reaction service, the Broadcasters' Audience Reaction Service (BARS), was launched and replaced TOP/ROM. The data are made available to the BBC and ITV only. Channel 4 launched its own audience reaction service, 4Sight, which ceased in 1998. The BARB contract is renewed to RSMB and AGB until the year 2002.
2000	Market research companies tender for the new BARB contract to be run in parallel with the current contract in 2001.

Exhibit 10. Overview of broadcast audience measurement systems in France

Main sources: Laborie and Fraisse, 1989; Bahu-Leyser, Chavenon and Durand, 1990; Médiamétrie, 1991; Bourdon, 1994; AE.

1949	The first radio listening polls were introduced by IFOP-ETMAR. These polls were concerned with individual behaviours, appreciation of radio programmes and general opinions on television.
1961	Radio listening polls were extended to television.
1967	ORTF (Office de Radio-Diffusion Television Française) created the first television audience measurement system which was run by the CEO (Centre d'Etudes d'Opinions), the newly created audience research department. Survey design: - quota panel of 800 individuals 15+ - viewing diaries placed for two weeks - data collected: programme ratings, audience appreciation and tastes.
1968	CESP (Centre d'Etude des Supports de Publicité) launched the first multi-media survey: Survey design: - Universe of individuals 15+ - From 12,000 to 14,000 interviews a year, within 2 or 4 waves - personal interviewing method - day-after-recall about listening/viewing habits - audience data published on an average quarter-hour basis for an average week, Saturday and Sunday
1975	CESP launched the first radio-television panel: Survey design: - 1000 individuals 15+ from the multi-media survey recruited for 8 weeks - panel turnover of 1/4 every 2 weeks - listening/viewing diaries - audience ratings published quarter hour by quarter hour
1981	CEO introduced Audimat contracted to SECODIP, first television audience study using metering technology: Survey design: - quota sampling - panel of 650 households - one Thomson meter installed in each household Audience data were reported on a household basis.
1984	Audimat panel was extended to 1000 households.

1985	CEO was privatised and replaced by MEDIAMETRIE. MEDIAMETRIE created the 55 000 survey to supplement the data provided by the Audimat panel. Survey design: - quota sample of 55 000 individuals - telephone interviews over 10-month a year - Day-After-Recall data collection technique Thomson meters were replaced by Bertin meters in Audimat panel. SOFRES-Nielsen launched a television metering panel using 200 households in Ile-de-France region.
1986	Audimat Plus was launched. It was an arithmetical model associating 55 000 and Panel Audimat and providing estimations on the basis of individuals.
1988	MEDIAMETRIE introduced Panel Médiamat, sub-contracted to SECODIP and AUDIMEDIA, first television measurement system in France based on peoplemetering technology. Survey design: - panel of 2300 households corresponding to 5600 individuals 6+ - 1000 sampling points - quota variables: region, area, social grade and audio-visual equipment Mediamat panel set up and maintenance was ensured by SECODIP and ISL and controlled by CESP. SOFRES-Nielsen proposed a people meter panel based on 11150 households in Ile-de-France region. TELEMETRIC tested Motivac, panel using passive detection to count and identify people seated in front of the television set.
1989	55 00 became 36 000 and was used as the Establishment Survey for Mediamat.
1990	36 000 became 75 000 and was allocated a double objective: measuring radio and cinema audiences and being the Establishment Survey for Mediamat. Motivac test was stopped.
1992	CESP became an inter-professional organisation whose missions were to audit and control audience studies conducted in France, this function allowing it to conduct its own studies if necessary, and to be a centre of new methodologies and ideas for the inter-profession. CESP run the "budget-Temps Multi-Médias" survey.
1993	Panel Radio was created by Médiamétrie in order to supplement 75 000 in providing longitudinal information.

1994	Audicable survey was launched by Médiamétrie.
1997	European Broadcasters' Union guidelines for July-August audience data were applied to Médiamat panel.
1998	Audicable survey became AudiCabSat survey.
1999	Médiamétrie launched Cybermonitor.Pro, the first internet audience measurement system in Europe.

Exhibit 11. Cable and satellite television reception ability in Europe

Source: Young and Rubicam, 1998.

	Cable/satellite %	Cable %	Private dish %
Netherlands	96	95	5
Belgium	92.5	91.9	2.4
Germany	81	53	28
Switzerland	79	79	6
Austria	72	38	27
Denmark	61	25	9
Norway	60	46	14
Sweden	58	36	22
Ireland	52	37	15
Finland	43	36	7
Italy	43	-	39
France	31	7	8
UK	25	9	16
Portugal	15	-	15
Spain	4	3	1
Greece	3	-	3

Exhibit 12. BARB and Médiamat reporting

Source:s Barb; Médiamétrie.

BARB

BARB service provides two databases:

- *Database I* contains the records of each panel member's viewing. It is provided to the underwriters to make special viewing patterns analyses requiring as input the viewing sessions of each individual. It is used mostly by data analysis bureaux which develop coverage and frequency modelling for their clients.

- *Database II* contains a range of pre-calculated audience estimates as well as the transmission details. It is the database used by the industry. It is organised into 4 files:
    - programme ratings
    - quarter hour ratings
    - spot ratings
    - commercial break ratings

  Each file gives both live and consolidated ratings for up to 51 pre-defined socio-demographic characteristics.
  Database II is released via electronic transfer in three times:
    - overnight: live ratings for eleven socio-demographic characteristics
    - eight days after: consolidated ratings
    - eight days after: live ratings for all characteristics

BARB provides a limited number or printed reports:
- *The Weekly TV audience Network Report* (Green Book)
- *The Astra Satellite Panel Weekly TV Audience Report* (Yellow Book)
- *The BBC Report* (Grey Book)
- *This Week's Viewing Summary* (Press Release)

Médiamat

Médiamat service provides its subscribers with an electronic database released in two times:
- Overnight: quarter hour and programme live ratings
- Ten days after: commercial break live ratings

Médiamétrie does not release any database containing the records of each panel member. Special analyses requiring raw data have to be ordered from Médiamétrie.

Médiamétrie publishes annually the *L'Année TV* providing a summary of the Médiamat service results.
Médiamétrie also publishes monthly the periodical *Audience* released to the subscribers of the service. It contains a summary of the weekly programme ratings, specific analysis and methodological discussions.

Exhibit 13. New technologies in the television industry

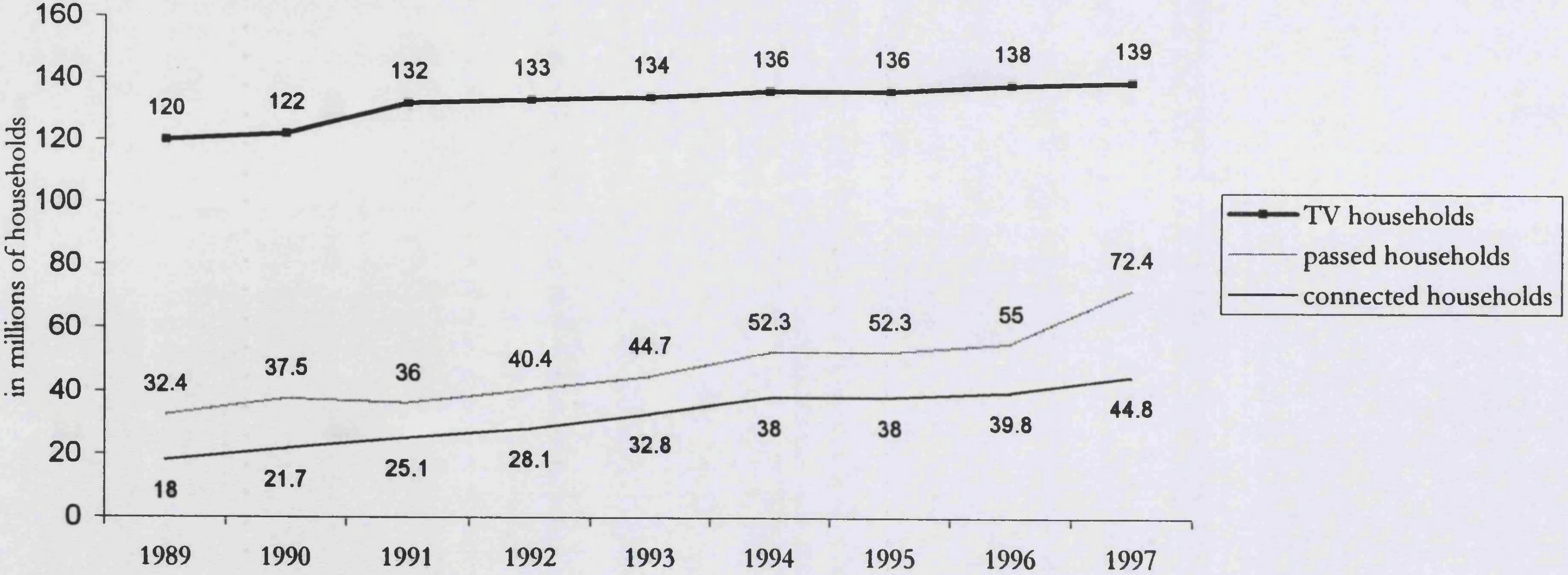
Source: AE

A. Cable technology

Principle	It relies upon a direct wired connection between the viewer's television set and the cable distributor. Programme material intended for transmission by cable networks reaches the cable station by a variety of different means (terrestrial, videotapes, satellite etc.)
Characteristics	Cable is a capital intensive and high-risk industry. This means of delivery makes it possible to establish a two-way audio or electronic link between the viewer and the cable station. The viewer's television set can be connected to distant computers using systems such as teleshopping or telebanking. Products and services can be ordered and paid for using a microprocessir controlled digital keypad to the cable-linked receiver.
Development	The delivery of programmes via cable started in some rural areas of the USA in the mis-1940s. The first significant cable channel was HBO, a division of Time inc., which started broadcasting its movies and entertainment services on November 8 1972. Through the 1970s and 1980s the key drivers of subscriptions to cable in the USA were HBO, CNN and ESPN. Prior to 1990, cable distribution in Europe was far from being widespread. Only in Belgium was cable available nation-wide followed by the Netherlands. Since the late 1990s, cable penetration has been rising. The early cable operators made their channels near-copies of commercial free to air channels but heavily dependent on cheap, imported programming. In the UK early cable channels were Sky Channel and TEN launched in 1984, and Premiere launched in 1996.
Penetration	Cable has been most successful in small wealthy countries where it was government policy to support cable technology. Of the large countries only Germany adopted this policy. In 1997, 72.4 million of households were passed by cable in Europe and 44.8 million are connected to cable i.e. a progression of 300% compared with 1988 (cf. exhibit 13B).

B. Evolution of cable penetration in Europe

Source: European Audiovisual Observatory, 1998.



C. Satellite technology

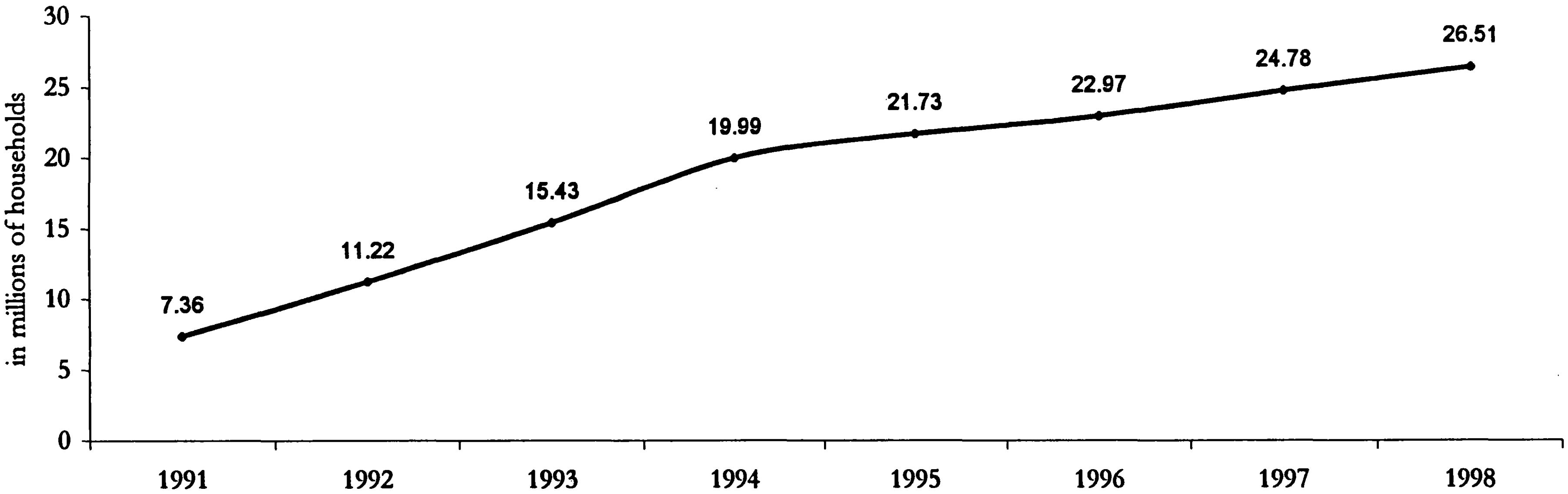
Source: AE.

Principle	Programme material is transmitted up to an orbiting satellite from a ground station and the satellite beams the signal back to earth. Highly directional antennae aboard the satellite carefully direct the signal in a predetermined pattern known as footprint. Signals can be picked up on small individual rooftop antennae (direct-To-Home or DTH) or on large collective antennae (Satellite Master Antenna TV or SMATV) combined with receiver units
Characteristics	Satellites offer cheaper and more effective methods of signal distribution. Few satellites can cover the whole world wheras thousands of land-transmitters may be necessary to cover a small country. High costs and risks are involved in designing, building and launching spacecraft.
Development	The first television pictures relayed by satellite were broadcast in 1962 in the USA under Telstar. Sky Channel, Europe's first satellite television channel, was launched in April 1982 but satellite broadcasting in Europe developed in a very haphazard way prior to 1988. In 1988 Astra 1A, owned and financed privately by the Société Européenne des Satellites (SES), was launched. From it broadcasters supplied a mix of English and German analogue programming. BSB commenced transmission in April 1990. Astra 1A enabled many more viewers to access satellite television with low-cost, rudimentary receiver boxes and small satellite dishes.
Penetration	Satellite is less important than cable in most European countries except in Italy, Portugal or in the UK where it is the second mode of delivery of programme material after terrestrial. In 1998 26.5 million of households received ASTRA signals either DTH or SMATV i.e. a 200% progression compared with 1991.

D. Evolution of ASTRA penetration in Europe (DTH*/SMATV**)

Source: SES/ASTRA

** Direct-To-Home; ** Satellite Master Antenna TV;*



E. Digital technology

Source: AE

Principle	Digital is a technique of storing or retrieving information in an encoded form. The signals used are just two states (1's and 0's) and data are sent in a stream of pulses, largely immune to interference or corruption, which can be readily processed by computers and similarly digitally based equipment such as digital television set or Set Top Box (STB). Digital signals can be delivered by terrestrial (20-30 channels), cable (100 channels) and satellite (200 channels) or over the telephone line. Digital is on the verge of becoming the broadcasting standard because it is technically superior and more efficient than analogue.
Characteristics	The quality of the broadcast signal is increased. Many more channels can be broadcast since digital broadcasting uses a compression system that allows an average of about 6 channels to be broadcast from a single satellite transponder where only one channel was possible before. The ability to broadcast computer data allows the associated development of interactive services. Digital broadcasting can involve radio (Digital Audio Broadcasting or DAB), television (Digital Video Broadcasting or DVD), text, multimedia programmes, the internet and data. Digital technology has created the basis for the convergence of TV, PC and telecommunications.
Development	European digital broadcasting in Europe started in France with CanalSatelliteNumérique launched on ASTRA in April 1996. In most European countries digital transmissions were introduced in 1998. In the UK the competition between the two digital platforms, OnDigital and Sky Digital, has been leading to a price war: set top box decoders for the services being proposed free of charge to potential subscribers. Analogue tranmsmissions should progressively be superseded by digital transmissions. The US federal government made the decision to turn off analogue in 2006.
Penetration	Digital figures are not easily available and are in constant evolution. In 1998 the digital satellite market was estimated to be of 4 million households in five European countries: France, Germany, Italy, the Netherlands and Spain (source: Merz and Roberts, 1998).

F. Reception abilities in Europe

Source: Merz and Roberts (1998).

Base = 164 milllions of households

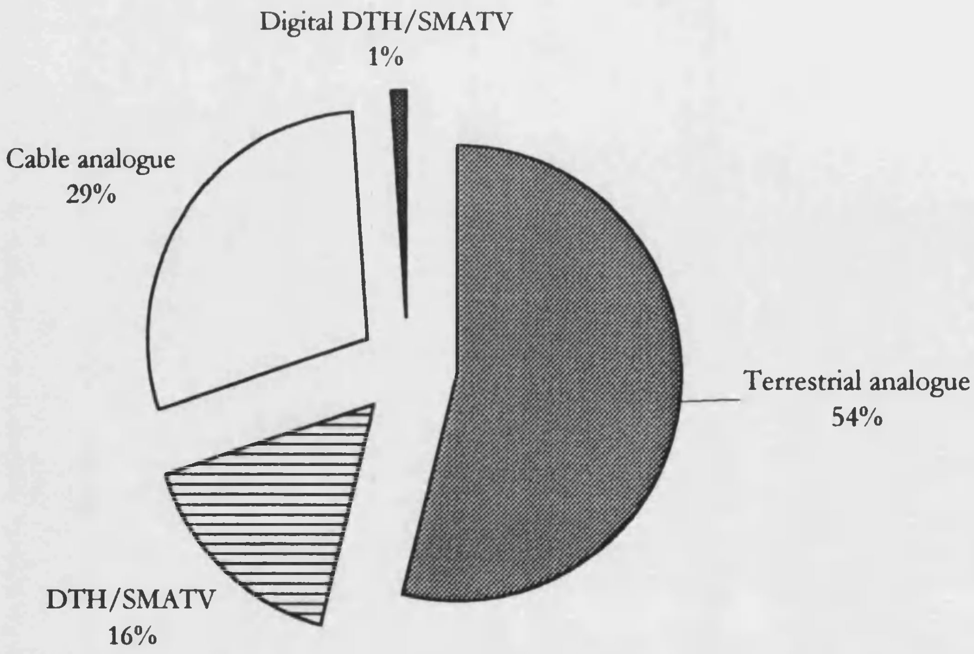


Exhibit 14. Interactive television (iTV)

Source: AE.

Principle

Interactive television or iTV refers to any activity in which viewers use a remote to interact with information displayed on a TV screen.

It can take several forms: Video-On Demand (VOD), interactive programme guide (IPG), interaction with programmes (choice of language, live video games etc.), and web browsing on TV screens. It also allows new advertising opportunities such as interactive commercials and e-commerce.

Until the late 1990s cable was the only technology to allow a two-way communication. Presently, the digital set-top box allows iTV for cable, satellite and terrestrial transmissions.

Development

In the UK BSkyB launched *Open* in September 1999.
In France Canal Satellite and TPS launched digital bouquets including interactive services in 1998.

In the USA it is believed that Microsoft's *Wink*, a platform that delivers interactivity in both advanced analogue and digital video environments, will speed up the penetration of iTV in the USA.

Strategies

Except from the VOD facilities, which have proven to be successful so far, iTV is still embryonic in the late 1990s. Strategies of broadcasters as to iTV differ widely. For instance Canal Satellite believes that iTV is a trigger to buy digital television and has especially developed services such as Internet access facilities whereas TPS considers iTV as a consumer service and has been investing in e-commerce. Some of the interactive services proposed have already proven unsuccessful. For instance, the digital interactive channel Spectacle, which was proposed by Canal Satellite and offered the facility to buy CDs, cinema and theatre tickets etc. had to cease its activity in 1998.

In the field of interactive advertising the most commented upon development so far has been TPS's success with an interactive Renault commercial in 1999. 97% of the subscribers that saw the commercial pressed their remote control for more information and 5% requested to be sent more information (Shannon, 1998).

Perspectives

The development of iTV is a source of uncertainty in the industry. An important question is whether iTV will evolve in parallel with the Internet or whether, as hoped by the computing industry, it will become part of the Internet and accessible from specifically designed PCs (iTV-PC). This latter possibility of evolution is often referred to as *technological convergence*.

Exhibit 15A . Main television channels and modes of finance in the UK

Source: European Audiovisual Observatory, 1999.

* digital platforms

Broadcasting organisation	Channels	Licence fee/ public subsidies	Advertising	Subscription	Pay-Per-View
Anglia Television Ltd	*ITV-Anglia*		✓		
Arts and entertainment Ltd	*The Arts Channel*		✓	✓	
Asianet	*Asianet*		✓	✓	
BBC	*BBC 1*	✓			
BBC	*BBC 2*	✓			
BBC	*BBC News 24*	✓			
BBC	*BBC Parliament*	✓			
BBC Worldwide	*BBC Prime*		✓	✓	
BBC Worldwide	*BBC World*		✓	✓	
BET International Ltd	*BET on Jazz*		✓		
Border Television	*ITV-Border*		✓		
Bloomberg	*Bloomberg Television*		✓		
British Digital Broadcasting	*On-Digital**		✓	✓	
British Sky Broadcasting Ltd	*Sky Digital**		✓	✓	
British Sky Broadcasting Ltd	*.tv*		✓	✓	
British Sky Broadcasting Ltd	*National Geographic*		✓	✓	

Broadcasting organisation	Channels	Licence fee/ public subsidies	Advertising	Subscription	Pay-Per-view
British Sky Broadcasting Ltd	*Sky Box Office (1-4)*				✓
British Sky Broadcasting Ltd	*Sky Cinema*			✓	
British Sky Broadcasting Ltd	*Sky movie Gold*			✓	
British Sky Broadcasting Ltd	*Sky Movie Max*			✓	
British Sky Broadcasting Ltd	*Sky News*		✓	✓	
British Sky Broadcasting Ltd	*Sky One*		✓	✓	
British Sky Broadcasting Ltd	*Sky Premier*			✓	
British Sky Broadcasting Ltd	*Sky Soap*		✓	✓	
British Sky Broadcasting Ltd	*Sky Sport*		✓	✓	
British Sky Broadcasting Ltd	*Sky Sport 2*		✓	✓	
British Sky Broadcasting Ltd	*Sky Sport 3*		✓	✓	
British Sky Broadcasting Ltd	*Sky Sport News*		✓	✓	
British Sky Broadcasting Ltd	*Sky Travel*		✓	✓	
Channel one Ltd	*Channel One*		✓	✓	
Channel Television	*ITV-Channel TV*		✓		
Channel 4 Television	*Channel four*	✓	✓		
Channel 4 Television	*Film Four*			✓	
Channel 5 Broadcasting	*Channel five*		✓		
China News Entertainment	*CNE*		✓	✓	
CNBC	*CNBC Europe*		✓	✓	
Country Music Television	*CMT Europe*		✓	✓	
Discovery Communication	*Animal Planet*		✓	✓	
Discovery Communication	*Discovery Channel*		✓	✓	
Discovery Communication	*Discovery Civilisations*		✓	✓	
Discovery Communication	*Discovery Home & Leisure*		✓	✓	

Broadcasting organisation	Channels	Licence fee/ public subsidies	Advertising	Subscription	Pay-Per-view
Discovery Communication	*Discovery Sci-Treck*		✓	✓	
Discovery Communication	*Discovery Travel & Adventures*		✓	✓	
European Business Partners	*EBN*		✓	✓	
Flextech plc	*Bravo*		✓	✓	
Flextech plc	*Challenge TV*		✓	✓	
Flextech plc	*Living*		✓	✓	
Flextech plc	*ScreenShop*				✓
Flextech plc	*The Playboy Channel*			✓	
Flextech plc	*Trouble*		✓	✓	
Front Row	*Front Row*				✓
Grampian Television Ltd	*ITV-Grampian TV*		✓		
Granada Television Ltd	*ITV-Granada TV*		✓		
Granada Television Ltd	*ITV-LWT*		✓		
Granada Sky Broadcasting	*Granada Men & Motors*		✓		
Granada Sky Broadcasting	*Granada Breeze*		✓	✓	
Granada Sky Broadcasting	*Granada Plus*		✓	✓	
Hartcape Ltd	*TV Shop*			✓	✓
Home Video Channel Ltd	*The Adult Channel*			✓	
HTV Group	*ITV-HTV*		✓	✓	
ITV Network	*ITV 2*		✓	✓	
Japan Satellite TV	*JSTV*			✓	
Manchester United	*MUTV*			✓	
MBC Ltd	*Middle East Broadcastnmg*		✓	✓	
Meridian Broadcasting Ltd	*ITV- Meridian TV*		✓		

Broadcasting organisation	Channels	Licence fee/ public subsidies	Advertising	Subscription	Pay-Per-view
MTV Networks Europe	*M2*		✓	✓	
MTV Networks Europe	*MTV UK*		✓	✓	
MTV Networks Europe	*VH-1 UK*		✓	✓	
Nickelodeon UK	*Nickelodeon*		✓	✓	
Nickelodeon UK	*The Comedy Channel*		✓	✓	
Portland Enterprises Ltd	*Gay TV*			✓	
Portland Enterprises Ltd	*TVX*			✓	
Rapture TV Ltd	*Rapture TV*		✓	✓	
Reuters			✓	✓	
Rolldale Ltd	*Babylon Ble*			✓	
Sci-fi Channel Europe	*Sci-Fi Channel*		✓	✓	
Select TV Cable Ltd	*Carlton Food Network*		✓	✓	
Select TV cable Ltd	*Carlton Select*		✓	✓	
Setanta Sport Ltd	*Setanta Sport Ltd*			✓	
Scottish Television plc	*ITV- Scottish TV*		✓		
Starstream Ltd	*TCC*		✓	✓	
The Box	*The Box*		✓	✓	
The Cartoon Network	*Cartoon Netwrok*		✓	✓	
The History Channel	*The Histroy Channel*		✓	✓	
The Walt Disney Company Ltd	*The Disney Channel*			✓	
Travel Industry Channel	*Travel Industry Channel*		✓	✓	
Turner Broadcasting System	*CNN International*		✓	✓	
TV Asia ltd	*Zee TV*		✓	✓	
TV Travel Shop	*TV Travel Shop*				✓
TWC	*The Weather Channel*			✓	

Broadcasting organisation	**Channels**	**Licence fee/ public subsidies**	**Advertising**	**Subscription**	**Pay-Per-view**
Ulster Television plc	*ITV-Ulster TV*		✓		
Wiggin & Co	*Fox Kids*		✓		
Westcountry Television Ltd	*ITV-Westcountry*		✓		
Yorkshire Television Ltd	*ITV-Tyne Tees TV*		✓		
Yorkshire Television ltd	*ITV- Yorkshire TV*		✓		
S4C	*S4C*		✓		

Exhibit 15B. Main television channels and modes of finance in France

Source: European Audiovisual Observatory, 1999.

** digital platforms*

Broadcasting organisation	Channels	Licence fee or public subsidies	Advertising	Subscription	Pay-Per-View
Absat (SA)	*ABSat**			✓	
including: Absat (SA)	*AB1*			✓	
Absat (SA)	*ABSport*			✓	
Absat (SA)	*Action*			✓	
Absat (SA)	*Animaux*			✓	
Absat (SA)	*Automobile*			✓	
Absat (SA)	*Chasse-Peche*			✓	
Absat (SA)	*Cine-Palace*			✓	
Absat (SA)	*Encycolpédie*			✓	
Absat (SA)	*Escales*			✓	
Absat (SA)	*Fit TV*			✓	
Absat (SA)	*La chaine Histoire*			✓	
Absat (SA)	*Mangas*			✓	
Absat (SA)	*Musique Classique*			✓	
Absat (SA)	*Nostalgie*			✓	
Absat (SA)	*Polar*			✓	
Absat (SA)	*Rire*			✓	
ABSat	*Romance*			✓	
Absat (SA)	*XXL*			✓	

Broadcasting organisation	**Channels**	**Licence fee/ public subsidies**	**Advertising**	**Subscription**	**Pay-Per-view**
Absat (SA)	*Zik*			✓	
ATE GEIE	*ARTE*	✓			
C: (SNC)	*C:*			✓	
CANAL+	*Canal+*		✓	✓	
CANAL+	*Canal + 16/9*		✓	✓	
CANAL+	*Canal+ leu/jaune/vert*		✓	✓	
Canal Assemblée Nationale	*Canal AS*	✓		✓	
Canal JSA	*Canal J*		✓	✓	
Canal Jimmy	*Canal Jimmy*		✓	✓	
Canalsatellite	*Canalsatellite**				✓
Canalsatellite	*Le Sésame*			✓	
Ciné-Cinémas Cable (SA)	*Ciné-Cinémas I,II & III*		✓	✓	
Ciné-Cinémas Cable (SA)	*Cine Classics*		✓	✓	
Club Téléacahat	*Club Téléacahat*				✓
CTV Contact Télevision	*CTV (1)*		✓		
Demain	*Demain*		✓	✓	
Diseny Channel France (SA)	*Dsney Channel*			✓	
Euromusique	*MCM*		✓	✓	
Euoshopping (SA)	*Shopping Avenue*				✓
Extension TV	*M6 Music*		✓	✓	
Extension TV	*Série Club*		✓	✓	

Broadcasting organisation	Channels	Licence fee or public subsidies	Advertising	Subscription	Pay-Per-View
Fashion TV	*Fashion TV*		✓	✓	
Fédération nationale des sociétés de courses	*France Courses*		✓	✓	
Fox Kids France	*Fox Kids France*		✓	✓	
France Télévision	*France 2*	✓	✓		
France Télévision	*France 3*	✓	✓		
France Télé Films	*Festival*		✓	✓	
France Tél'emusque	*Mezzo*			✓	
Fun TV	*Fun TV*		✓	✓	
Game One	*Game One*		✓	✓	
Histoire	*Histoire*			✓	
Kiosque	*Kiosque*				✓
L'Equipe TV	*L'Equipe TV*		✓	✓	
La Chaine Info	*LCI*		✓	✓	
La Cinquième	*La Cinquième*	✓	✓		
Métropole TV	*M6*		✓		
MCM Africa	*MCM Africa*			✓	
MCM Classique Jazz	*Muzzik*		✓	✓	
Médecine Plus	*Médecine Plus*		✓	✓	
Multithématiques	*Seasons*		✓	✓	
Multivision	*Multivision 1\6*				✓
Multivision	*Multivision Cinéma*				✓
Multivision	*Multivision Sport*				✓
Multivision	*Spectacle Multivision*				✓
Olympique de Marseille	*TVOM*		✓	✓	
Paris Première	*Paris première*		✓	✓	

Broadcasting organisation	Channels	Licence fee or public subsidies	Advertising	Subscription	Pay-Per-View
Plaisance Télévision	*Plaisance Télé-achat*				✓
Planète Cable SA	*Planète*		✓	✓	
Planète Cable SA	*Forum Planète*		✓	✓	
Rapido Annonces SA	*Rapido*		✓		
Régions	*Régions TV*			✓	
Rigolo Film 2000	*Comédie!*		✓	✓	
SAS Voyage	*Voyage*		✓	✓	
Satellimage TV 5 SA	*TV5 Europe*	✓	✓		
SECEMIE SA	*Euronews*	✓	✓		
SEDI TV	*Téva*		✓	✓	
Shalom Channel International	*Shalom Channel*			✓	
SCS	*Odyssée*		✓	✓	
SPDV	*TV Guide*		✓	✓	
Tecsol	*Canal Auto*		✓		
Télévision Francaise Juive	*TFJ*		✓		
TF1	*TF1*		✓		
TPS*	*TPS*			✓	✓
including: TPS Cinémas	*Cinstar 1 & 2*			✓	
TPS Cinémas	*Cinétoile*			✓	
TPS Interactif	*bandiagara*			✓	
TPS Interactif	*Espace Annonces*			✓	
TPS Interactif	*TPS Boutiques*				✓
TPS Interactif	*Infoscore*			✓	
TPS Interactif	*L'Oeil du hibou*			✓	

Broadcasting organisation	Channels	Licence fee or public subsidies	Advertising	Subscription	Pay-Per-View
TPS Interactif	*Le guide des programmes*				
TPS Interactif	*Météo Express*			✓	
TPS Jeunesse	*Télétoon*		✓	✓	
TPS Sport	*Infosport*		✓		
TVMétéo	*La Chaine Météo*			✓	
TV Sport	*Eurosport France*		✓	✓	
Universal Studios	*13ème rue*			✓	

Exhibit 16. Evolution of the distribution of advertising expenditure

Source: Young and Rubicam, 1998.

A. In France

	Total (in FF millions)	News-papers %	Magazines %	Television %	Radio %	Cinema %	Outdoor %
1983	21,635	29.5	30	16.6	8.6	1.7	13.4
1985	26,945	28.4	30.4	17.2	9.2	1.8	13.1
1987	35,750	28.7	28.2	22.4	7.4	1.1	12.2
1989	46,540	29	27.4	24.6	6.8	0.8	11.4
1991	49,095	27	26.6	27.2	6.5	0.6	12
1993	46,260	25	23.5	31.2	7.7	0.6	12
1995	50,600	24.6	22.8	33	7.4	0.6	11.6
1996	52,115	24.4	22.8	33.5	7	0.6	11.6

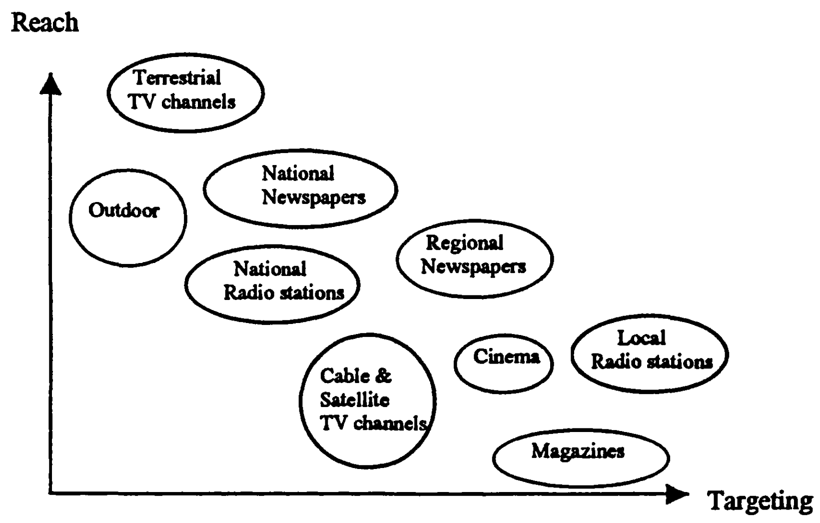
B. In the UK

	Total (in £ millions)	News-papers %	Magazines %	Television %	Radio %	Cinema %	Outdoor %
1983	3,183	44	19.1	30.7	2.3	0.4	3.4
1985	3,926	44.6	19.5	30.3	1.9	0.4	3.3
1987	5,164	43.4	19.5	31.4	2	0.3	3.3
1989	6,684	43.8	20.6	29.8	2.2	0.4	3.2
1991	6,314	43.6	19.2	31.1	2.1	0.5	3.4
1993	6,771	43.3	17.2	32.8	2.6	0.6	3.5
1995	8,119	41.8	17.6	32.8	3.3	0.7	3.7
1996	8,739	40.9	18.3	32.7	3.5	0.7	3.9

Exhibit 17. Intermedia competition

Source: AE.

A. Reach and targeting abilities



B. Reach and frequency of contacts

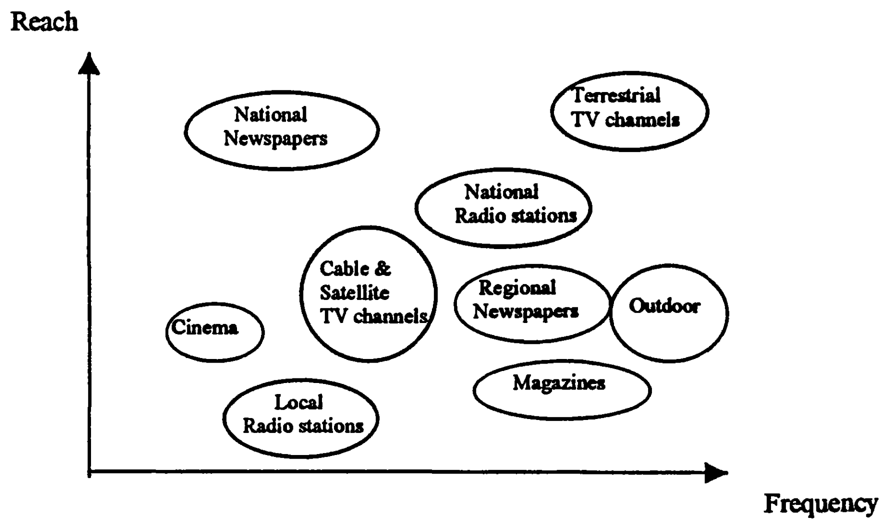


Exhibit 18A. Evolution of television advertising expenditure in France

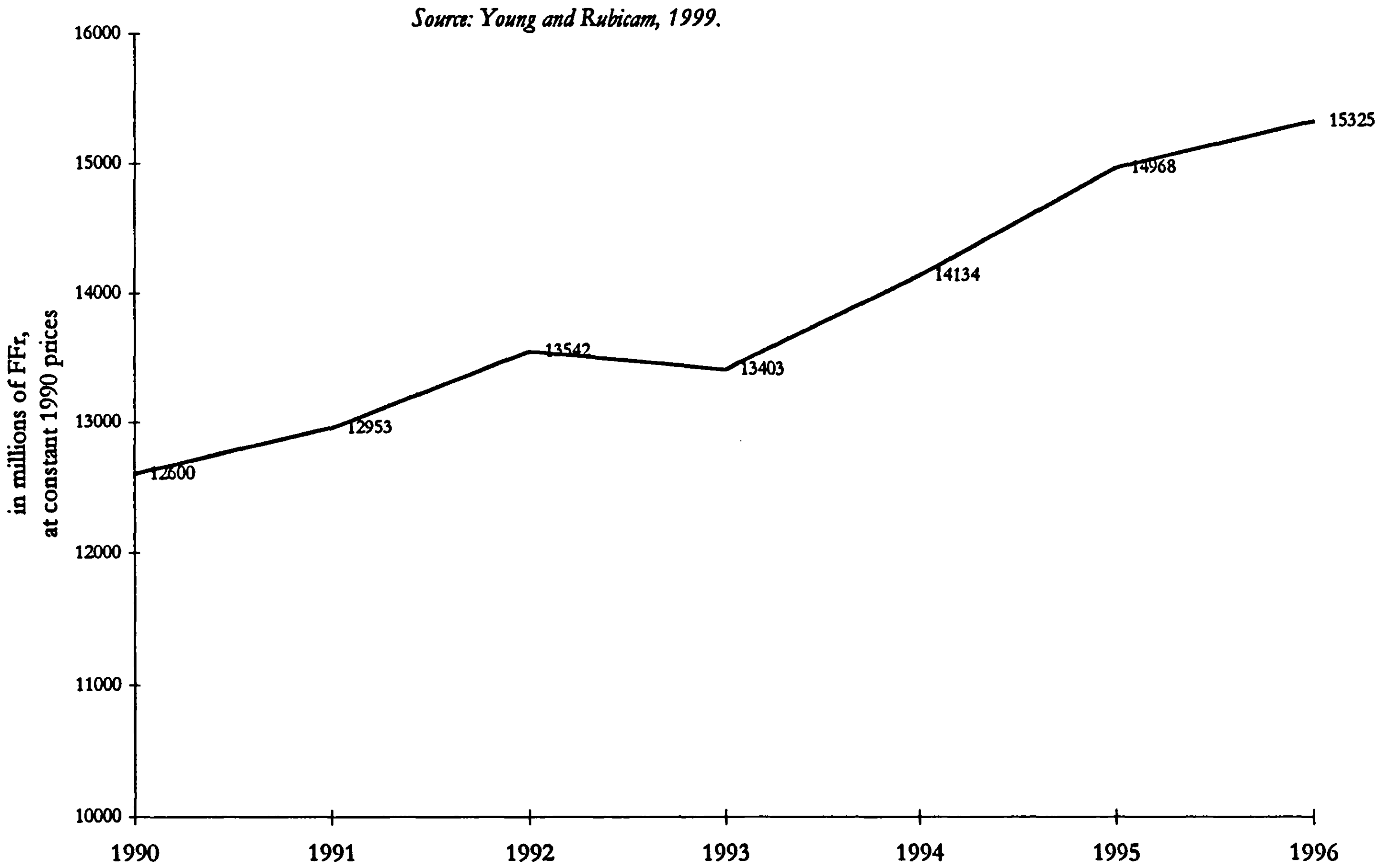


Exhibit 18B. Evolution of television advertising expenditure in the UK

Source: Young and Rubicam, 1999.

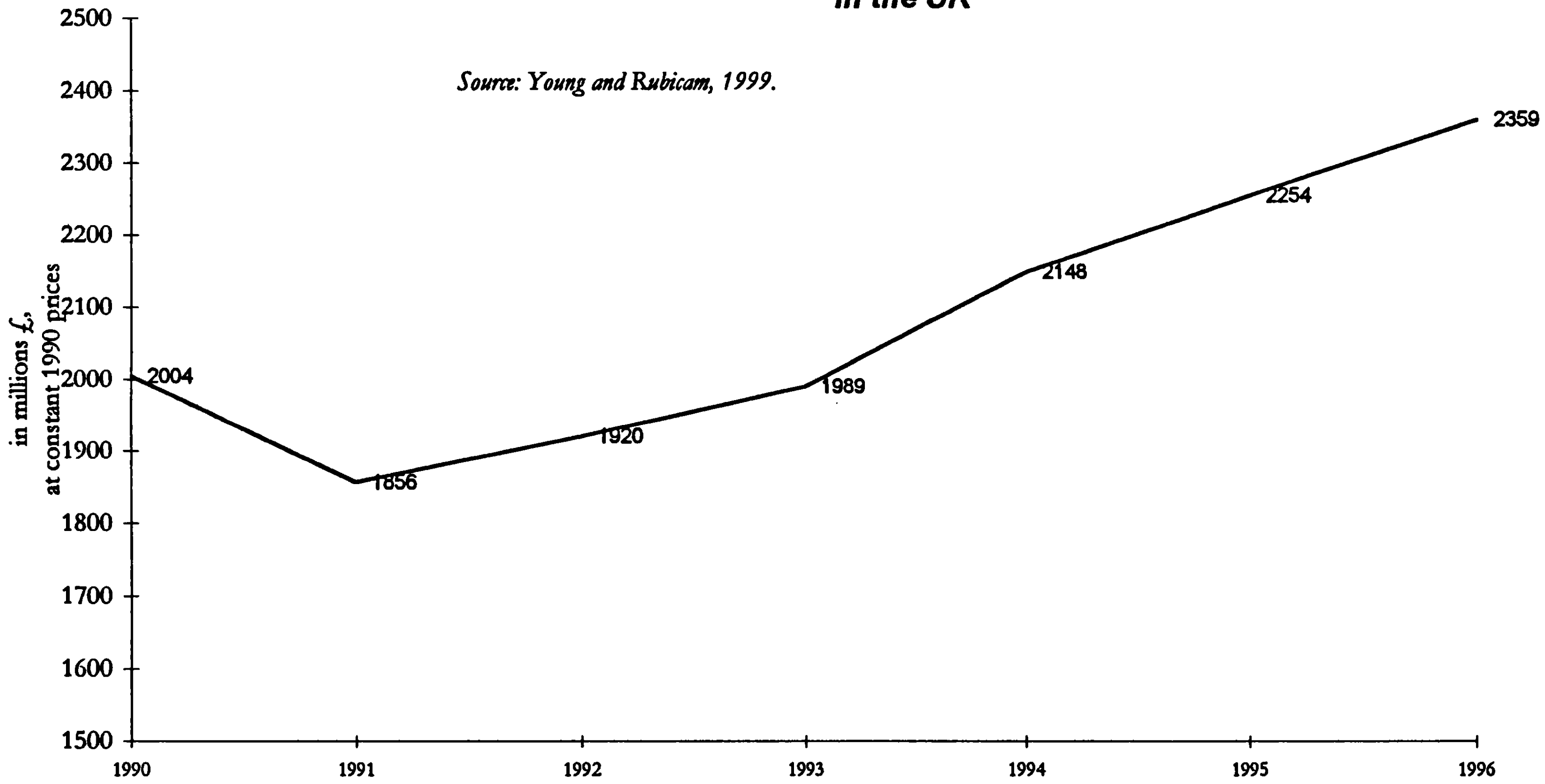


Exhibit 19. Media portfolios by sector of activity

Source: AE.

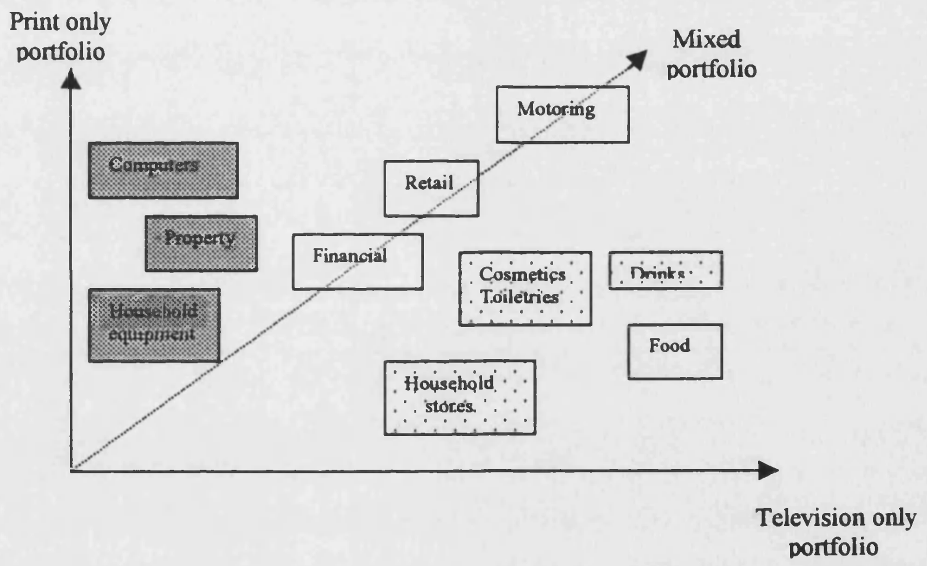


Exhibit 20. Portfolios of the top 10 advertisers

Source: Young and Rubicam, 1999.

A. In France

Advertiser	Total Adspend in 1997 (FF million)	TV %	Press %	Radio %
Renault	1,244	41	24	23
Nestlé	1,243	69	12	2
Procter & Gamble	987	94	2	1
Peugeot	912	33	32	24
France Telecom	881	39	43	7
Citroën	842	50	19	22
Polygram	751	70	2	26
Ford	650	40	25	10
Carrefour	603	*	42	27
Henkel	580	90	5	-

* The French regulation does not allow supermarkets to advertise on television

B. in the UK

Advertiser	Total Adspend in 1997 (£ 000s)	TV %	Press %	Radio %
British Telecom	129,286	75	17	4
Procter & Gamble	91,504	96	2	1
Ford Motor Company	72, 683	64	22	6
Vauxhall Motors	66,298	55	33	5
Kellogg	61,249	81	9	1
P&G	60,174	91	6	1
Renault	59,476	65	21	6
Elida Fabergé	54,511	78	11	1
Van den Bergh Foods	54,162	83	9	1
Mars Confectionery	51,871	85	7	1

Source: BARB.

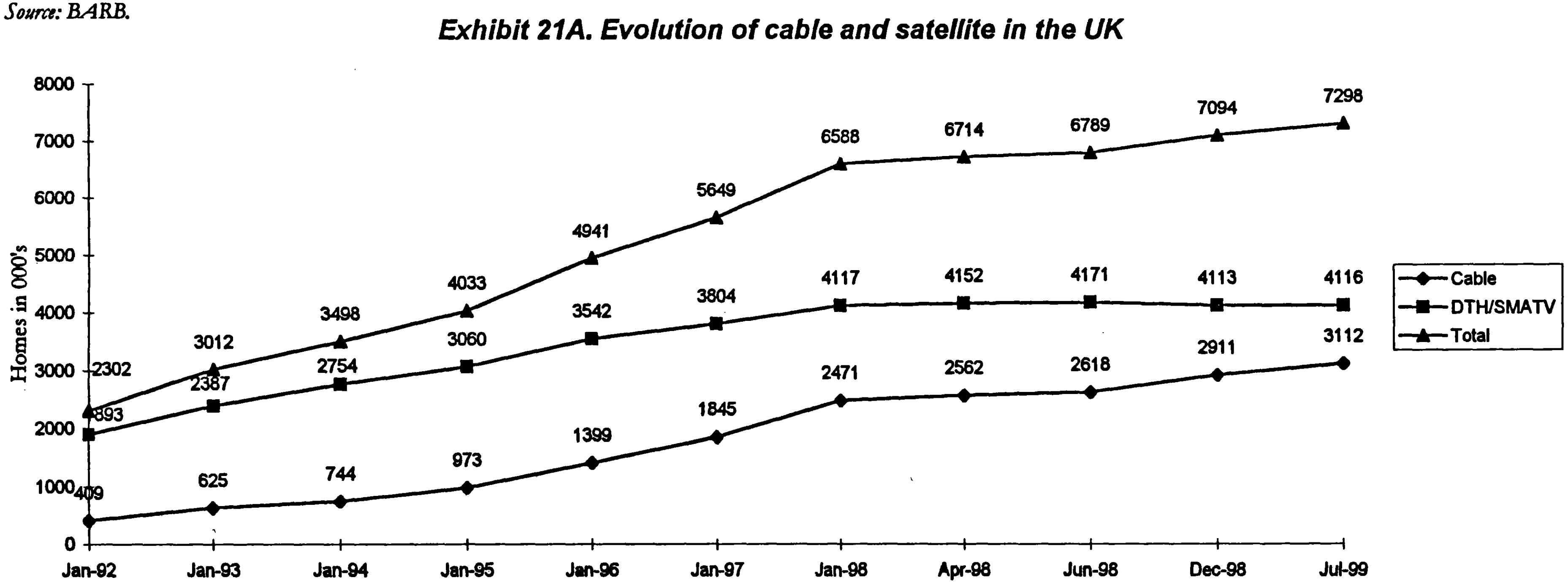


Exhibit 21A. Evolution of cable and satellite in the UK
Homes in 000's
8000
7000
6000
5000
4000
3000
2000
1000
0
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Apr-98
Jun-98
Dec-98
Jul-99
Cable
DTH/SMATV
Total
2302
3012
3498
4033
4941
5649
6588
6714
6789
7094
7298
1893
2387
2754
3060
3542
3804
4117
4152
4171
4113
4116
409
625
744
973
1399
1845
2471
2562
2618
2911
3112

Exhibit 21B. Evolution of cable and satellite in France

Source: Mediamat.

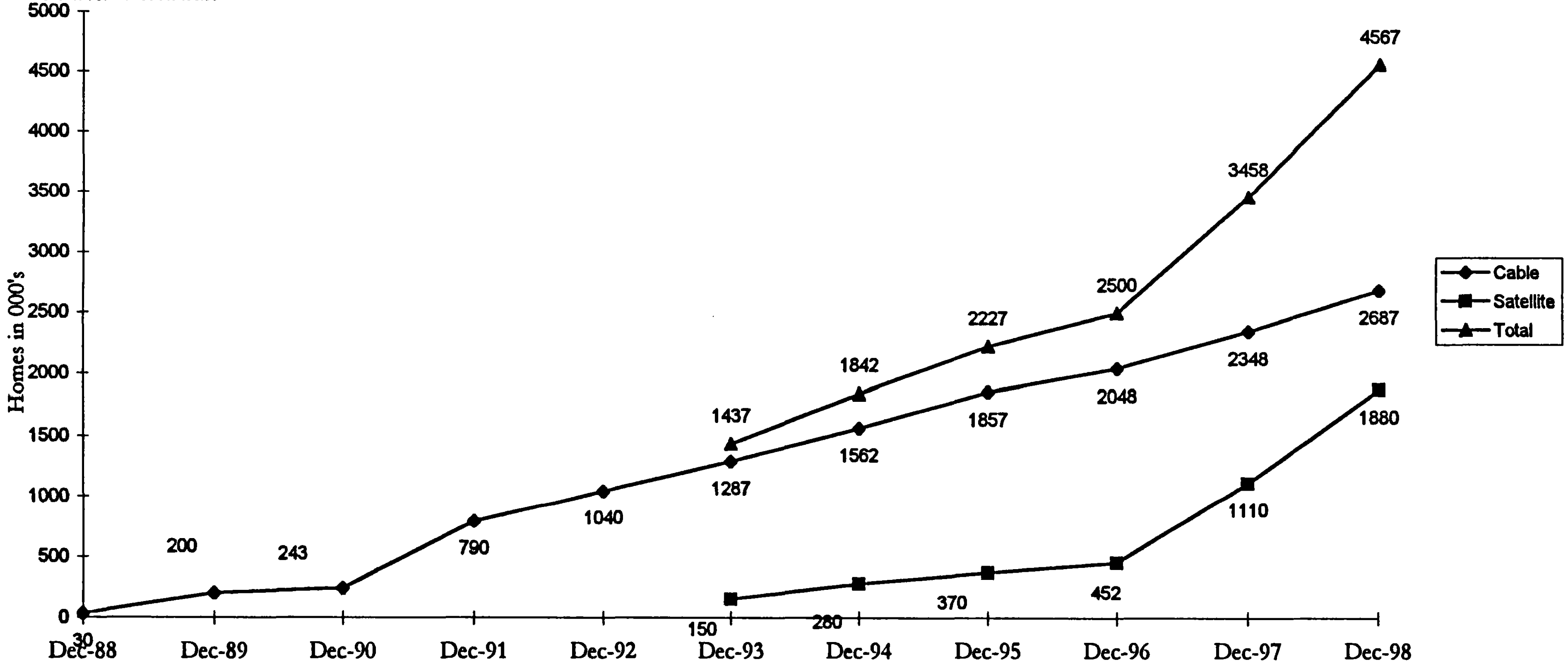


Exhibit 22A. Evolution of daily viewing hours per individual in France

Source: Mediamat.

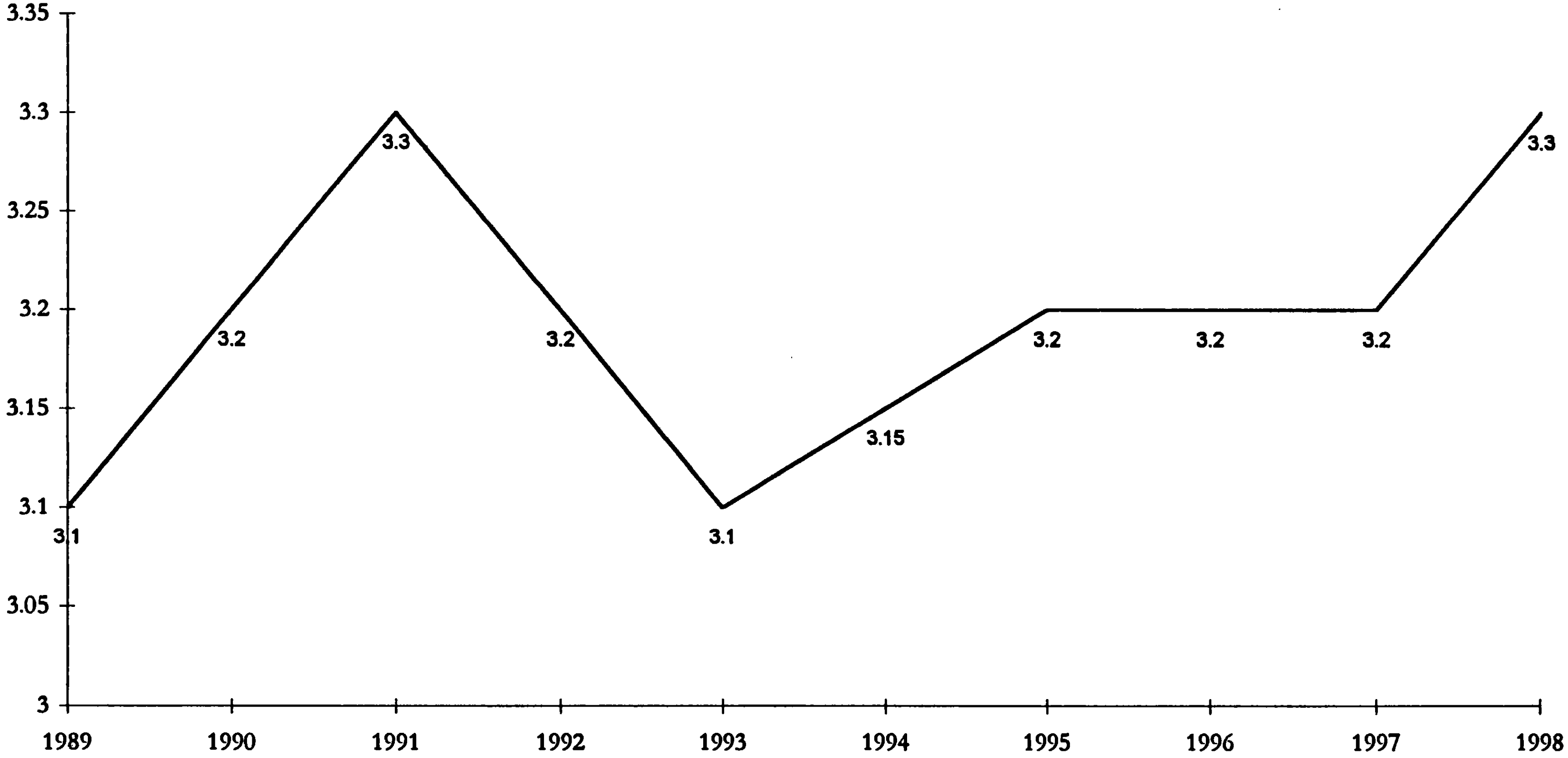


Exhibit 22B. Evolution of daily viewing hours per individual in the UK

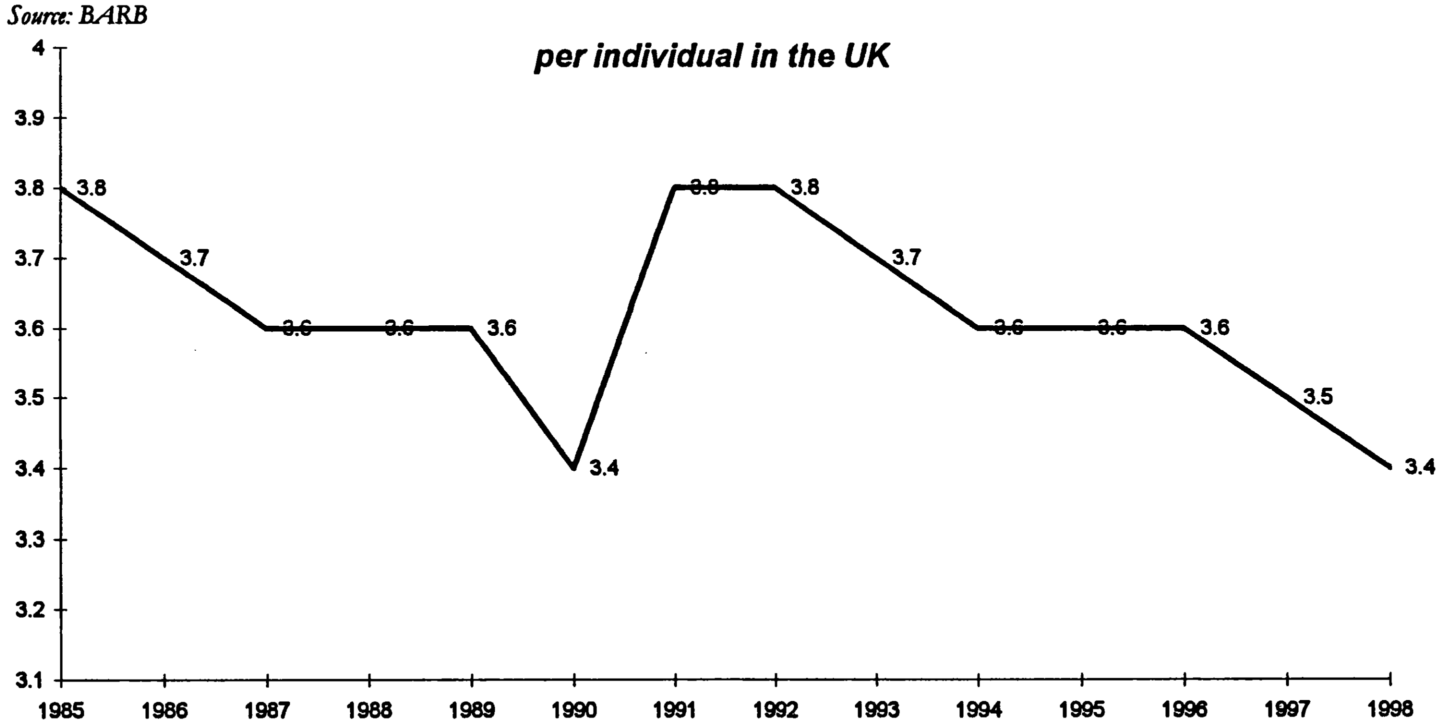


Exhibit 23. Weekly viewing hours in terrestrial and multi-channel homes in the UK

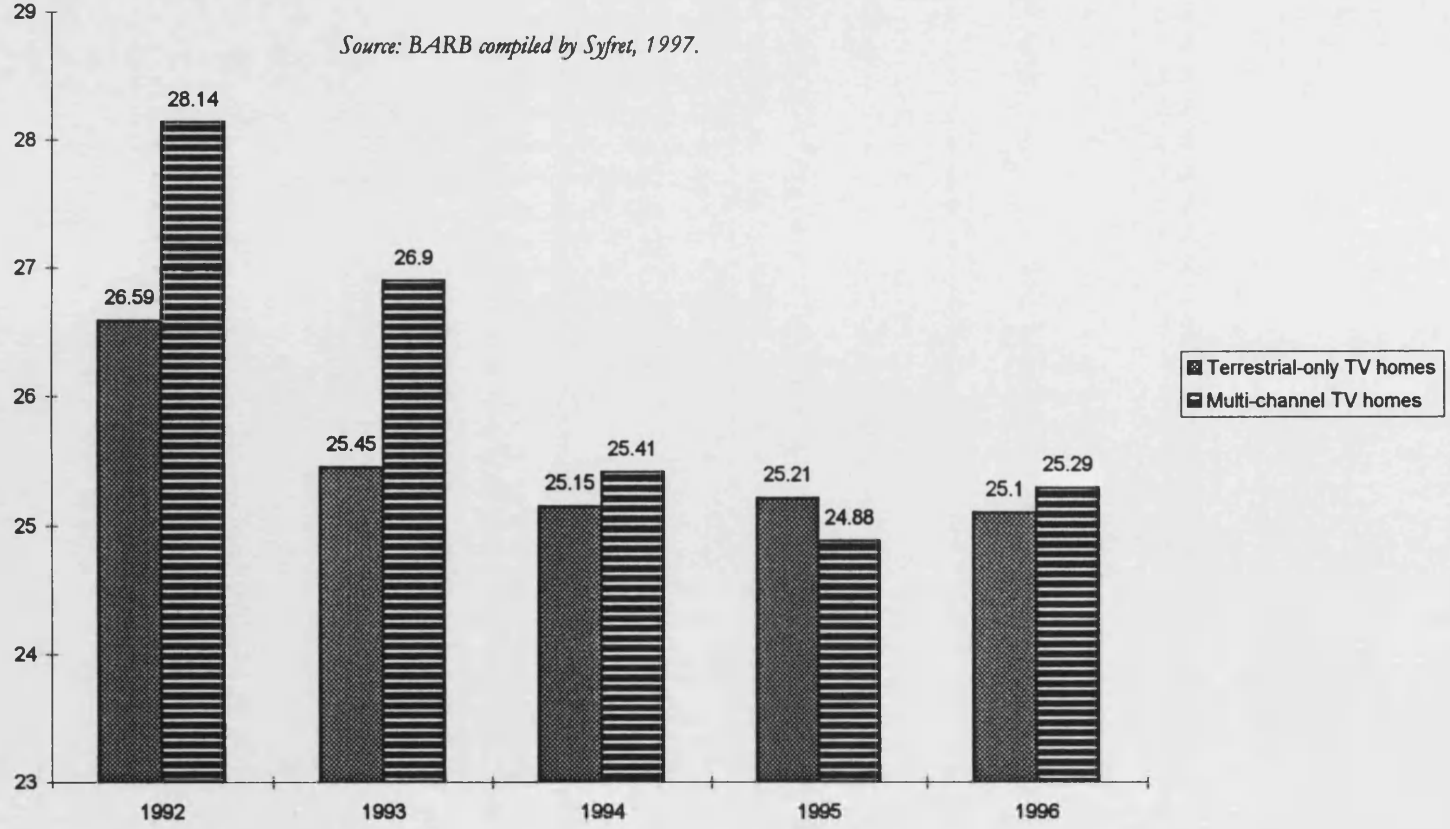
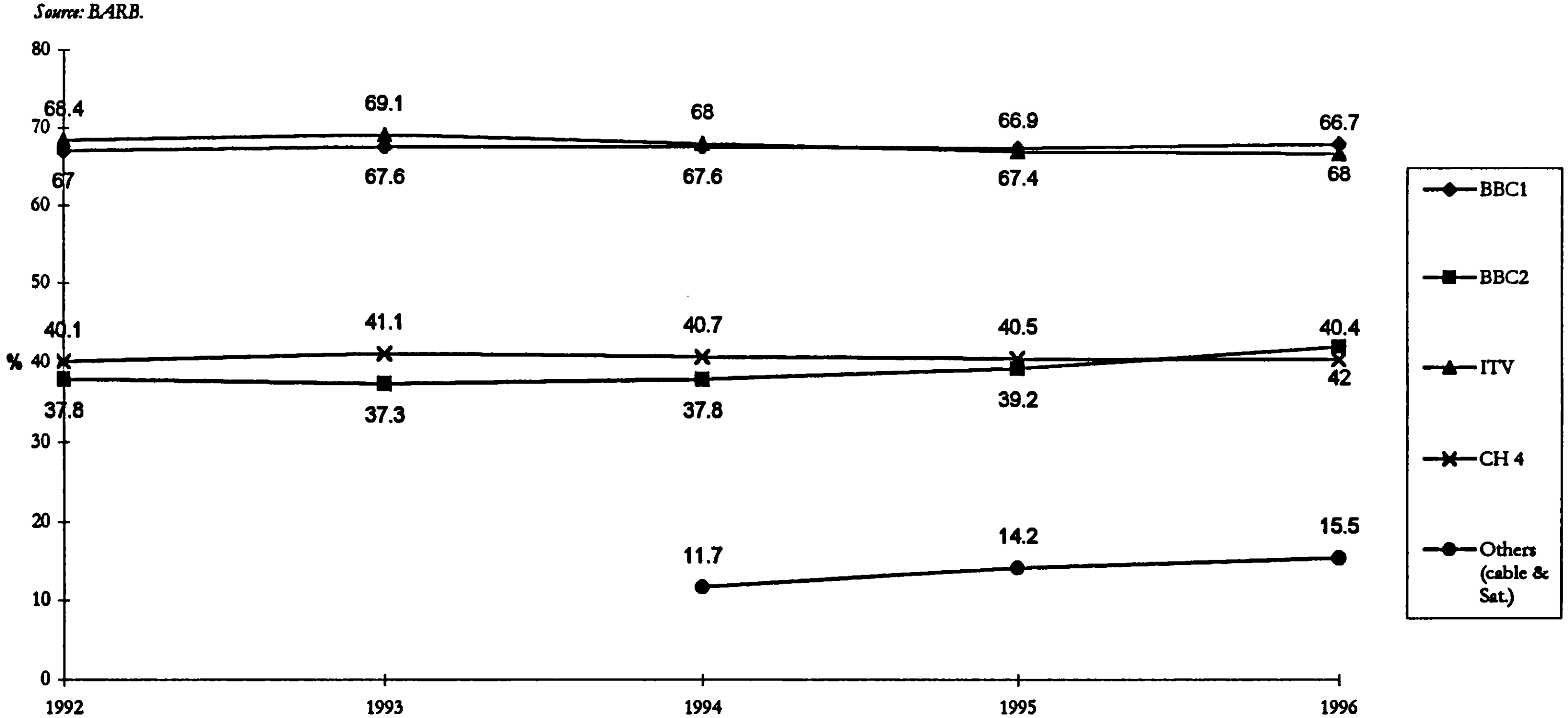


Exhibit 24A. Evolution of the annual reach of viewing in the UK



Source: Mediamat.

Exhibit 24B. Evolution of the annual reach of viewing in France

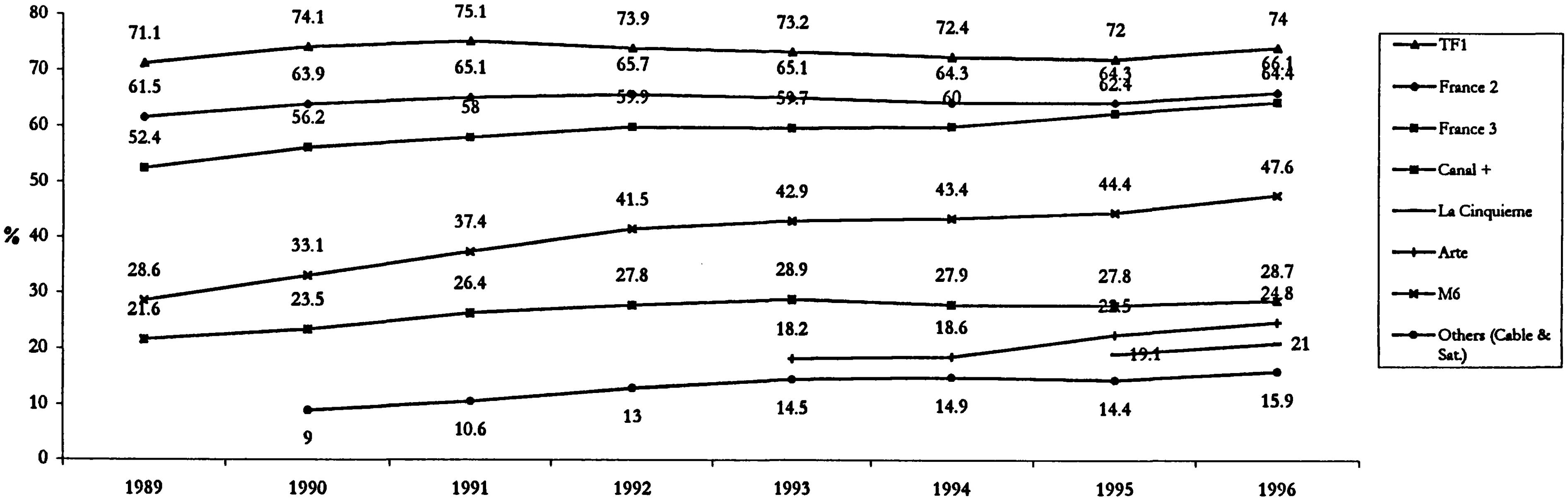


Exhibit 25A. Evolution of the annual shares of viewing in the UK

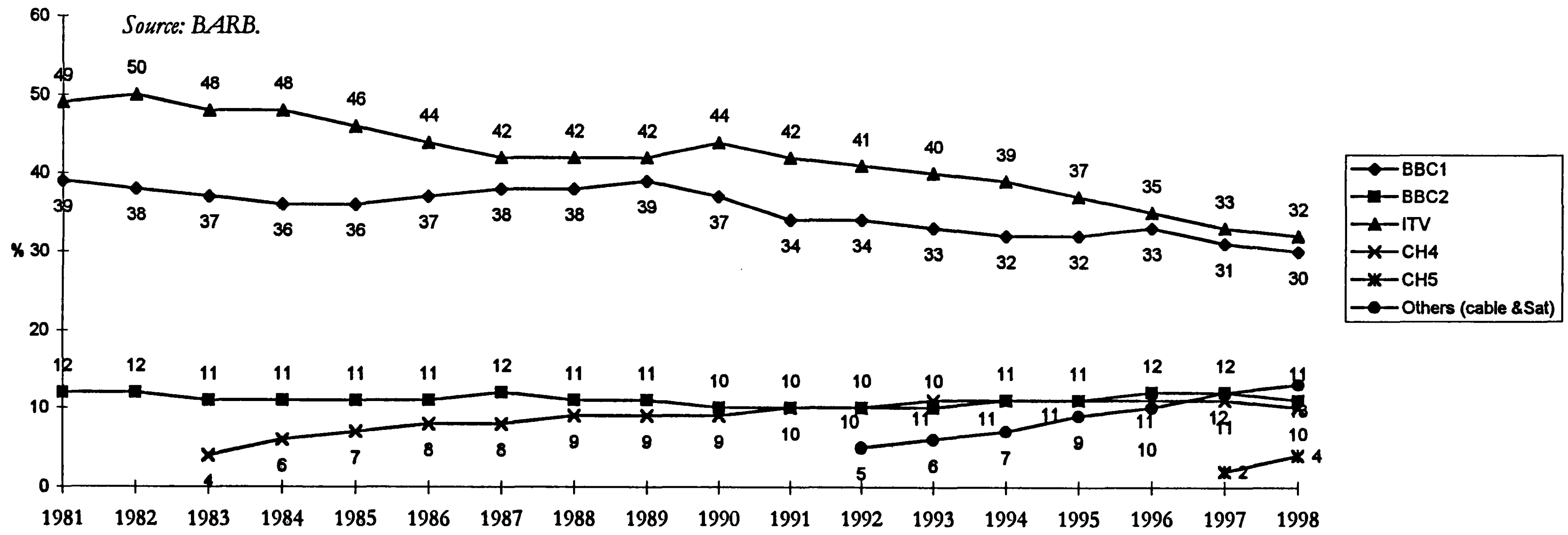


Exhibit 25B. Evolution of the annual shares of viewing in France

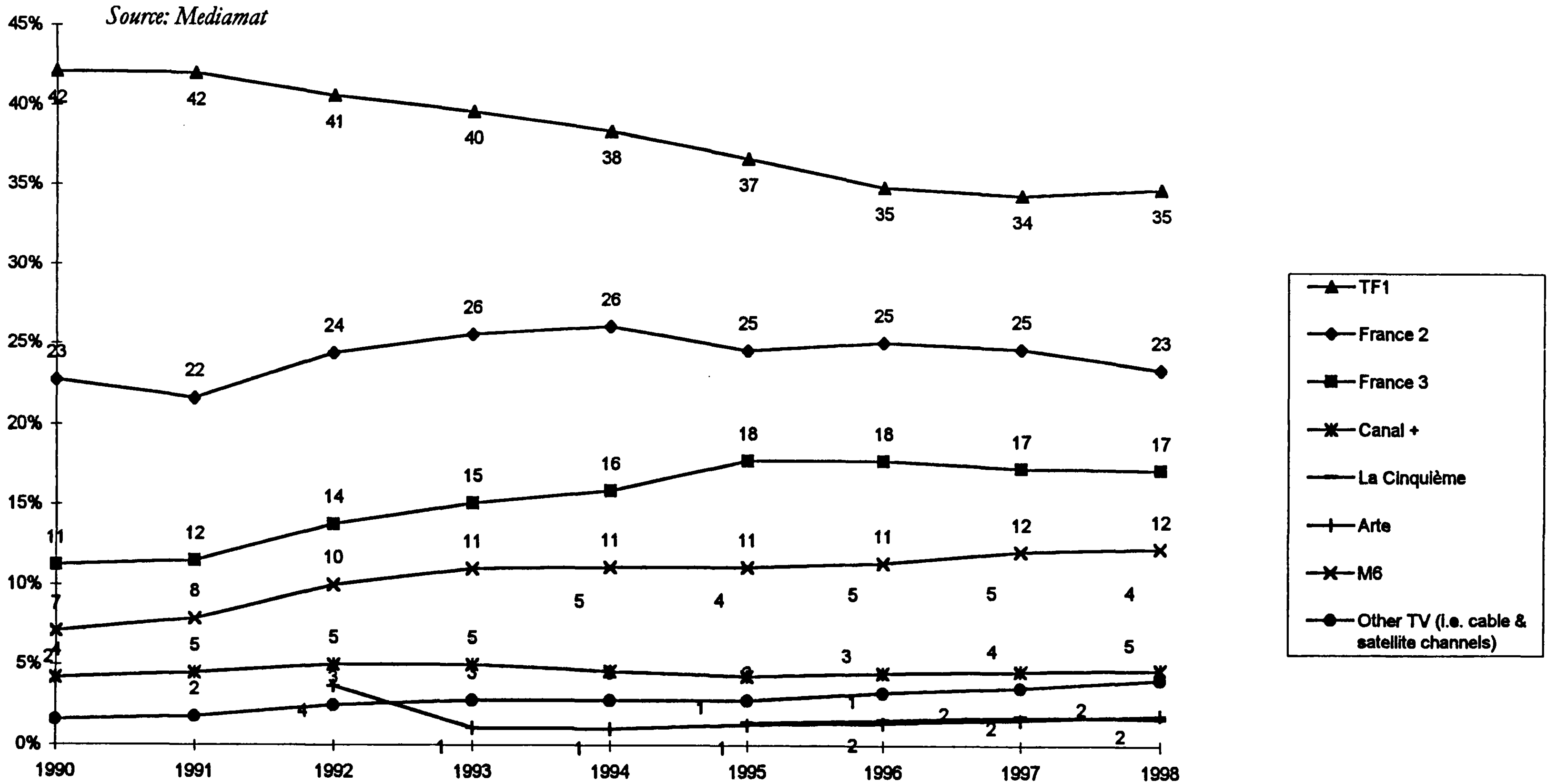


Exhibit 26. Key annual shares of viewing in Europe

Source: TV Express, 13 January 2000.

DENMARK	July.'99	Aug.'99	Sept.'99	Oct.'99	Nov.'99	Dec.'99	Dec.'98
DR	28.0	24.0	26.0	27.0	26.0	28.0	32.0
TV2	34.0	30.0	36.0	36.0	34.0	41.0	36.0
TV3	10.0	14.0	12.0	12.0	13.0	8.0	11.0
Local TV	9.0	10.0	9.0	9.0	9.0	7.0	8.0
Others	19.0	22.0	17.0	16.0	18.0	16.0	13.0

Source: Gallup A/S

GERMANY	July.'99	Aug.'99	Sept.'99	Oct.'99	Nov.'99	Dec.'99	Dec.'98
RTL	14.7	15.3	15.5	15.1	14.2	15.9	15.2
ARD	14.4	13.9	13.9	13.3	13.3	13.3	14.1
ARD III	12.4	12.2	12.2	12.2	12.4	14.0	12.4
Sat 1	10.2	10.3	10.3	10.2	10.4	9.8	11.9
ZDF	13.6	12.7	12.0	13.3	13.5	14.7	13.1
ProSieben	8.3	8.3	8.3	8.5	8.6	7.8	9.2
RTL2	4.3	4.5	4.6	4.3	4.2	3.7	3.7
Kabel 1	5.3	5.3	5.7	5.9	6.0	5.1	4.8
Vox	2.9	3.2	2.8	2.9	2.9	2.8	2.8
Super RTL	2.7	2.8	2.7	2.7	2.7	2.5	3.5

Source: IP, Blickpunkt: TV

GREECE	July.'99	Aug.'99	Sept.'99	Oct.'99	Nov.'99	Dec.'99	Dec.'98
ET1	5.3	7.1	5.0	5.1	6.0	4.0	5.7
Net	3.6	3.7	3.6	3.5	3.7	4.6	3.8
Mega TV	18.8	20.7	21.5	20.1	20.0	23.0	22.7
Antenna 1	21.1	21.7	22.0	22.6	22.8	22.0	25.9
Star	14.2	12.8	12.9	14.6	13.8	16.6	12.5
Alpha	18.6	15.4	17.4	17.3	17.1	14.5	14.2
New Channel	2.0	1.8	1.7	1.6	1.4	1.2	2.2
Alter5	2.5	2.1	3.3	3.6	3.7	4.1	-

Source: AGB Hellas.
As of January 4, 1999 - the panelsize is 800 households in Athens, Salonica and urban area.

IRELAND	July.'99	Aug.'99	Sept.'99	Oct.'99	Nov.'99	Dec.'99	Dec.'98
RTE 1	36.0	37.3	36.5	38.3	36.6	38.1	41.8
Network 2	15.0	13.7	15.4	13.5	15.8	14.4	14.2
TnaG	1.0	1.3	1.1	1.4	1.3	1.6	1.1
TV3	7.0	7.2	7.5	7.3	6.7	6.8	5.2
UTV	10.0	10.0	12.0	10.5	12.1	10.0	9.6
HTV	1.0	0.5	0.6	0.5	0.6	0.7	0.6
BBC1	8.0	9.1	7.7	8.4	7.5	9.0	8.8
BBC2	3.0	3.8	2.8	3.3	3.3	3.4	3.1
Channel 4/S4C	4.0	3.9	4.1	4.0	4.1	4.1	3.8
Sky One	5.0	4.7	4.3	4.8	4.7	4.6	-
Others	10.0	8.3	8.1	7.9	7.2	7.2	11.8

Note: Sky One figures included from January 1999 - which were previously included in Others total.
Source: AC Nielsen (Ireland)

ITALY	July. '99	Aug.'99	Sept.'99	Oct.'99	Nov.'99	Dec.'99	Dec.'98
Rai 1	19.9	21.52	22.31	23.77	23.17	23.8	23.7
Rai 2	15.1	15.36	14.44	14.89	15.27	15.37	16.32
Rai 3	10.3	10.89	9.21	8.67	8.56	8.93	8.95
Canale 5*	21.5	20.26	21.39	22.21	23.28	22.51	20.33
Italia 1*	12.3	11.88	12.37	11.51	11.29	10.89	10.96
Rete 4*	10.0	9.15	9.56	9.65	9.62	9.62	9.79
TMC	2.3	2.27	2.21	2.24	2.14	2.07	2.38
Others	8.6	8.69	8.48	7.05	6.68	6.82	7.58

* Mediaset channels

Source: Auditel

NETHERLANDS	July.'99	Aug.'99	Sept.'99	Oct.'99	Nov.'99	Dec.'99	Dec.'98
Nederland 1	11.7	12.3	11.5	11.2	11.2	11.8	14.0
Nederland 2	15.1	13.1	14.7	13.1	12.9	13.8	13.1
Nederland 3	7.2	7.5	8.3	8.7	9.1	8.9	10.3
RTL4	13.7	14.0	16.4	17.2	17.1	16.8	18.2
RTL5	4.3	4.5	3.6	3.4	3.0	3.4	3.7
Veronica	6.5	7.5	8.8	9.4	10.1	8.5	9.4
SBS6	10.6	11.0	10.6	10.0	9.2	10.1	12.4
Fox	1.9	2.2	2.2	2.6	3.2	2.0	1.4
TMF	1.6	1.6	1.3	1.1	1.1	1.3	0.6
Net5	2.7	2.0	2.6	2.8	3.7	0.6	-
Others	24.7	24.3	20.0	20.5	19.4	22.8	16.9

Source: Intomart

NORWAY	July.'99	Aug.'99	Sept.'99	Oct.'99	Nov.'99	Dec.'99	Dec.'98
NRK	35.0	34.0	34.0	34.0	35.0	38.9	39.0
TV2	30.0	31.0	31.0	31.0	31.0	29.2	28.0
TVN	8.0	8.0	9.0	10.0	10.0	8.8	8.0
TV3	8.0	9.0	11.0	9.0	9.0	7.2	11.0
NRK2	4.0	4.0	3.0	3.0	3.0	2.9	2.0
Others	16.0	15.0	12.0	13.0	12.0	12.9	13.0

Source: MMI/Norsk TV-meterpanel

PORTUGAL	July.'99	Aug.'99	Sept.'99	Oct.'99	Nov.'99	Dec.'99	Dec.'98
RTP1	27.3	27.0	29.1	29.6	26.6	25.6	30.0
RTP2	5.6	5.8	6.5	6.0	6.2	6.1	5.
SIC	47.4	47.7	46.7	47.1	50.1	49.9	49.8
TVI	19.7	19.6	17.7	17.2	17.1	18.3	14.7

Source: Marktest

SPAIN	July.'99	Aug.'99	Sept.'99	Oct.'99	Nov.'99	Dec.'99	Dec.'98
TVE1	24.4	25.9	25.0	24.8	25.0	24.6	25.9
La 2	8.5	10.0	8.2	7.8	7.5	7.5	8.0
Antena 3	23.0	21.0	22.3	22.3	23.4	23.8	23.0
Tele 5	21.4	19.1	20.7	21.7	21.4	21.5	20.2
Canal Plus	2.0	2.1	2.3	2.4	2.3	2.1	2.5
Regional	15.8	16.7	16.5	16.3	16.1	16.2	16.5
Others	4.9	5.2	4.9	4.7	4.3	4.2	4.0

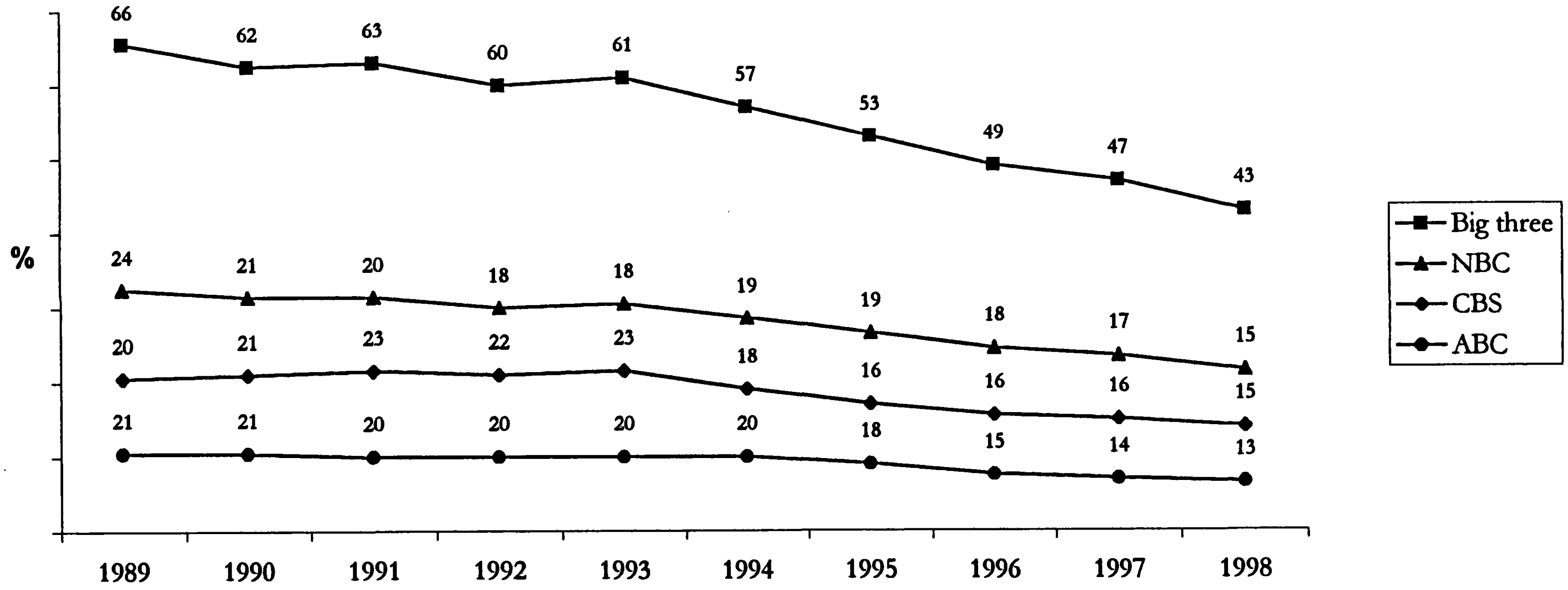
Source: Antena 3

SWEDEN	July.'99	Aug.'99	Sept.'99	Oct.'99	Nov.'99	Dec.'99	Dec.'99
SVT 1	23.0	22.0	21.1	20.9	20.9	23.1	24.8
SVT 2	26.0	26.0	24.4	25.9	25.3	25.3	24.6
TV3	11.0	11.0	11.6	10.9	10.9	9.6	9.4
TV4	24.0	27.0	27.9	27.6	27.0	26.4	26.1
Kanal 5	7.0	6.0	6.1	6.3	6.4	5.8	6.0
Others	12.0	11.0	8.9	8.4	9.6	9.8	9.2

Source: MMS

Exhibit 27. Evolution of the annual shares of viewing of the three networks in the USA

Source: Nielsen compiled by Philipps, 1999.



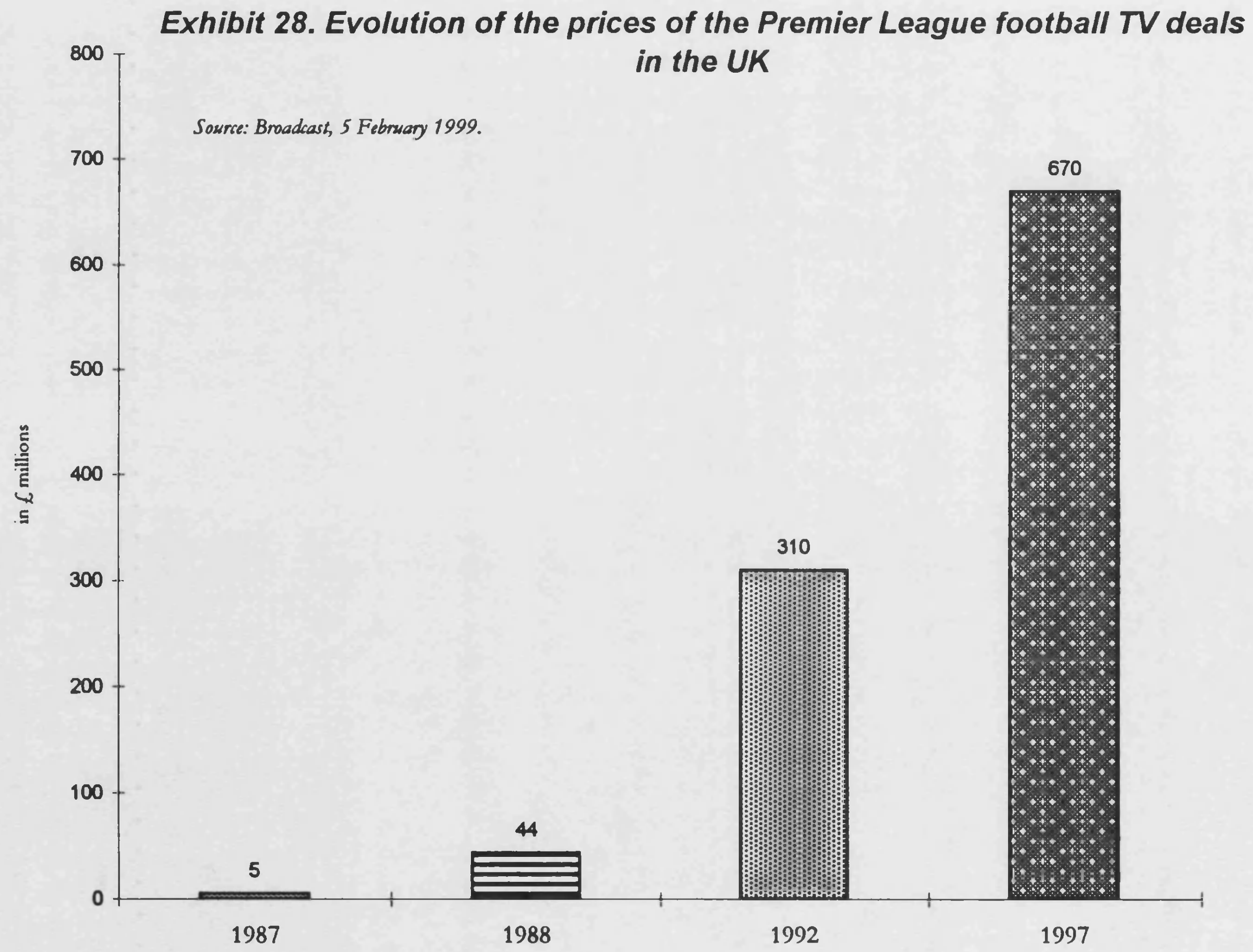


Exhibit 28. Evolution of the prices of the Premier League football TV deals in the UK
Source: Broadcast, 5 February 1999.
in £ millions
800
700
600
500
400
300
200
100
0
5
44
310
670
1987
1988
1992
1997

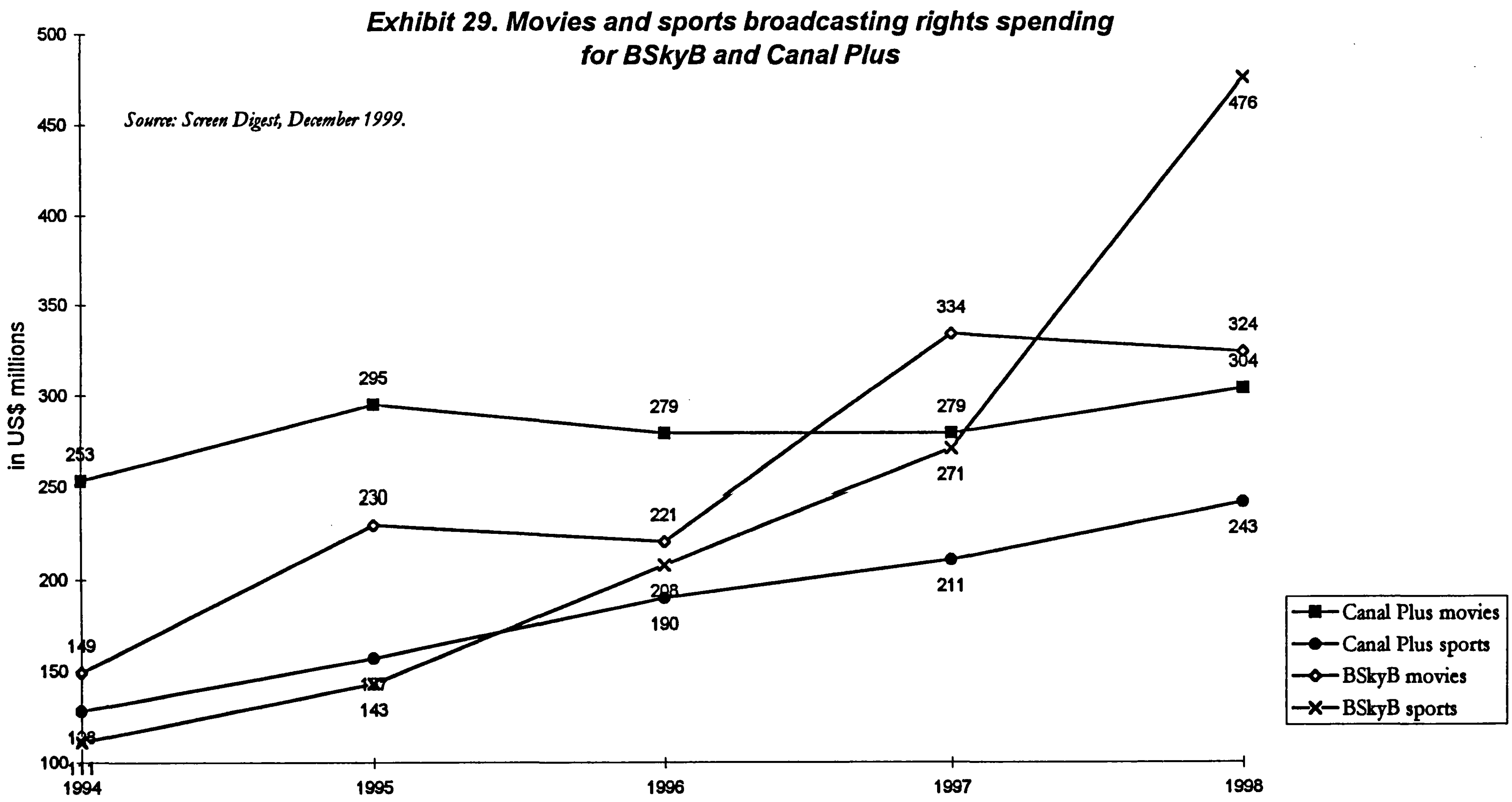


Exhibit 29. Movies and sports broadcasting rights spending for BSkyB and Canal Plus
Source: Screen Digest, December 1999.
in US$ millions
500
450
400
350
300
250
200
150
100
1994
1995
1996
1997
1998
253
295
279
279
304
128
157
190
211
243
149
230
221
334
324
111
143
208
271
476
Canal Plus movies
Canal Plus sports
BSkyB movies
BSkyB sports

Exhibit 30. Recall data collection techniques

Source: AE.

Principles	It involves getting people to reconstruct a previous time period and report publications read or looked at or listening/viewing sessions that occurred within that period. Recall questionnaires often include some general habits questions e.g. when respondents usually read/listen/view and what publications/stations/channels they usually read/listen to/view. This information is expressed in terms of estimated frequency of reading/listening/viewing to different publications/stations/channels at different times. The amount of aid given to jog memory varies widely depending on the contact method used (telephone or face-to-face), the degree of audio and visual material prompts on stations/channels/programmes used and the trouble taken to help respondents to reconstruct the previous day's activities.
Day-After-Recall (DAR)	The Day-After-Recall (DAR) is the most widely used recall technique. Respondents are asked what they read/listened to/watched yesterday, when they did it and for how long, prompted either by publications, time periods or programmes. Data are reported as Average Issue Readership (AIR) in print AMS or average quarter-hour listening/viewing ratings in broadcasting.
Sampling design	Recall techniques are used jointly with repeated cross-sectional sampling designs (cf. section 4.2.1)
Economic strengths	It is the cheapest class of data collection techniques in audience measurement systems. Because of the sampling design used, they allow detailed targeting in media-planning and general media habits data can be translated into probabilities of contact for a wide range of targets (cf. section 6.2.2).
Economic weaknesses	They do not allow trading on spot ratings and provide imperfect measures of programme ratings. They do not allow assessing audience duplication and cumulative built up coverage because no estimates of gross changes can be provided (cf. section 6.2.2).
Current uses	Recall techniques are used in readership measurement systems e.g. NRS, AEPM, APQ. They are also sometimes used in radio audience measurement systems e.g. 75 000. Recall techniques are the oldest way of measuring TV viewing but they are now limited to international or proprietary surveys or to industries that are too small to finance another data collection technique.

Exhibit 31. Diary data collection techniques

Source: AE.

Principles	Diaries are short booklets with one or two pages for each day of the week. Each page is a grid, where respondents tick what they have listened/viewed. Respondents are asked to fill in their listening/viewing session as they occur. There is a wide range of variations of this technique in use.
Closed diaries	In closed diaries, each day's page is pre-printed with the names of radio stations/TV channels are randomly rotated along the top and time-periods are listed down the side - usually quarter or half-hours.
Open diaries	In open diaries, the respondents may have to write in the station/channel listened and entries of times for starting and finishing listening/viewing sessions have to be made. Between the totally closed diary where all stations/channels in the area are pre-listed together with the time slots, and the totally open diary where nothing is pre-printed except from the grid, there are many intermediate diary designs. The amount of aid used to jog memory also varies widely: list of all the stations/channels received in each area with their frequencies, brief description of their logos and description of programming may be joined with the diary. Diaries may be personally placed and collected, or either or both of these operations may be conducted by post. Telephone may be used for recruitment, followed by postal placement and retrieval. They may be placed with only one person in the household or with all the members of the household.
Sampling design	Diary techniques are used jointly with retrospective sampling designs (cf. section 4.2.1). The panel may last from one week to four weeks, which are not necessarily consecutive.
Economic strengths	Because of the sampling design used, diary techniques allow the assessment of audience duplication and cumulative built-up coverage over the period measured (cf. section 6.2.2).
Economic weaknesses	It is the slowest data collection technique. Diary techniques do not allow trading on spot ratings and do not provide measures of programme ratings. They allow limited targeting in media-planning.
Current uses	Together with recall techniques, diary techniques are the main techniques used to measure radio audiences e.g. RAJAR Diary techniques were widely used in television audience measurement systems before the development of people-metering data collection techniques. They are now limited to small industries that cannot afford electronic measurement or to proprietary surveys, especially for channels with low penetration rates or which are broadcast in different countries.

Exhibit 32A. Set-metering data collection techniques

Sourcε: AE

Principles	It is a piece of equipment attached to the radio/TV set that measures whether the set is tuned on and, if it is, what station/channel is being broadcast. . The set meters currently in use to determine tuner status can be based on different technologies: local oscillator frequency, tuner varactor diode voltage pre-metered tuner or signal injection, or a combination of these techniques. It is also possible to record the uses of VCR, video disc or games, to identify the programmes that have been recorded and then subsequently played back in the household by the addition of encoding technologies. This information is recorded in the meter and collected daily by the research company's computer via the telephone line.
New set-metering technologies	A new generation of set meters is currently being developed in order to identify channels carried out by digital technologies. They are based either on a code signal technology (programmes are encoded with the broadcaster's unique code signal that is decoded by the meter) or on a matching with masters technology (studio samples are compared with audio or picture samples registered in homes).
Sampling designs	If set meters are used jointly with diary data collection techniques they are used jointly with retrospective designs. Nowadays they are used with people-metering techniques and prospective designs.
Economic strengths	They provide spot ratings and programme ratings on a household basis. They provide detailed audience duplication and cumulative built up coverage data on a household basis. The data delivery is fast and databases are generally updated daily.
Economic weaknesses	Viewing data on individuals can only be obtained if set meters are combined some another data collection techniques, either diary or people-meters. They are expensive and costs increase as the number of TV sets per household increases and new further technological sophistication is required. They do not allow detailed targeting in media-planning.
Current uses	The radio industry was the first one to use set metering techniques in the 1940s in the USA but it has been demised afterwards due to the growth in car radios, portable radios, and multi-set ownership. Set meters are now used em in conjunction with people-meters in all the European television audience measurement systems.

Exhibit 32B. People-metering data collection techniques

Source: AE.

Principles	People-meters are sometimes referred to as electronic diaries. It is a manual logging system consisting of a recording unit that is usually placed on top of the TV set or integrated into a pre-metered tuner, and a separate hand-set. The hand-set looks like a remote control unit, and has a number of buttons on it. Each member of the household is assigned an individual button, which he/she has to press on the hand-set according to the instructions given. Guests can also be required to log in and to enter limited demographic information. Instructions given vary. Respondents can be asked to press the assigned button when they start or stop viewing, or when they enter or leave a room when a TV set is on. Variations of these instructions can also be used such as being in the room and viewing or being in the room and able to view. Information is stored in the recording unit and sent back to the research company with the information from the set-meter. The recording unit usually has a display face that shows which panel members have registered their presence. It may also be used for other purposes e.g. programme appreciation, although it is rarely the case.
Sampling design	People-meters are used jointly with set meters and prospective designs (cf. section 4.2.1).
Economic strengths	The data delivery is fast and databases are generally updated daily. They allow trading with spot ratings and programme ratings on an individual basis. Because of the sampling design used, they provide detailed audience duplication and cumulative built up coverage data on an individual basis (cf. section 6.2.2).
Economic weaknesses	People-meters are the most expensive data collection technique. They are weak on out-of-home and children's exposures.. They do not allow detailed targeting in media-planning and are weak on estimates of averages and aggregates (cf. section 6.2.2).
Current uses	All the European industries currently use people-meters jointly with set-meters to measure television audiences. The main providers of people-metering technologies in Europe are AGB, Telcontrol and Nielsen.

Exhibit 33A. BARB data collection technique

Source: BARB.

Technology	AGB people-meters have been in use since 1991. The main components are: • *A Monitor Display Unit (MDU).* The MDU electronically monitors whether the TV is switched on and, if so, which channel is displayed. It also monitors the use of VCR, cable system or Direct-To-Home satellite receiver attached to the television set. The MDU displays each person's allocated button. • *A remote control handset.* Each household in the panel is provided with a special remote control handset. Each member in the home is allocated a separate button on this handset with which to register his/her presence in the room when the set is on. The presence of guests is also registered as well as the guests' basic demographics (age and sex). The current system can cope with up to seven guests n the home. • *A Central Data Storage Unit (CDSU).* Each home has a CDSU connected to the telephone line. The MDU sends its data to the CDSU via the mains wiring and the CDSU stores this information ready for transmission to AGB. The CDSU is contacted via the phone line every night and information is transferred to AGB-Taylor Nelson Sofres's head office where data are processed.
VCR usage	VCR usage is also monitored through electronic fingerprint on all material recorded off-air, This technology identifies the content of the material being played back if it had been previously recorded at home. All transmission event data are provided to AGB by the broadcaster. From these AGB creates electronic records used to encode transmissions. Each record carries an AGB programme code. Each week approximately 16,000 programme events are processed. Post transmission logs of commercial events are received by AGB electronically. There are more than 60,000 such events per week. The data are then matched with the transmission logs to allow ratings to be calculated for each transmission.
Persistence threshold	Statements from the people-meters are timed to the nearest second but new switching statements can be created only when a channel has been tuned on for at least 15 seconds. The statement is then backdated to the second in which the channel change was actually made. The same rule applies to presence statements entered through the handset: a viewer must have logged-in for a minimum of 15 seconds before a statement is generated.

Calculation rules

The finest unit of time for reporting purposes is the clock minute. the minute attribution rules are as follows:

- the channel deemed tuned for each clock minute is the one tuned for most of the minute. If two or more channels are tuned for exactly equal parts of a minute then the last channel viewed is attributed to the minute.
- spot ratings are attributed to the minute in which the spot begins
- a viewer is deemed to be present for a clock minute or the majority of a minute. If presence was recorded for exactly 30 seconds, then the first 30-second period determines the status for the whole minute.

Guest viewing requires a separate treatment because people-meters capture only the age and sex of each guest. When calculating audiences by sex and age, guests contribute directly to the calculations. For other sub-groups in which the guest demographics are not known, guest viewing is allocated across the population groups by assuming that the guest profiles are the same as the panel members'.

Holiday absence of panel members is retained in the audience calculation.

Time-shift viewing is combined with live ratings to provide if the replay takes place within 163 hours of recording. These ratings are referred to as consolidated ratings.

Exhibit 33B. Médiamat data collection technique

Source: Médiamétrie.

Technology	Telcontrol people-meters have been used since 1986. The components are similar to AGB peoplemeters: ▪ *A Monitor Display Unit.* It is possible to monitor up to 100 channels. Visual signals regularly remind respondents about who is recorded on the handset as present in the room. If the TV set is on and nobody is recorded as being in the room, the MDU rings. VCR usage is not monitored. • *A remote control handset.* Each member is allocated a separate button on the handset lettered from A to H. The presence of guests is also recorded via the handset together with the guest's age and sex. • *A Central data storage unit.* All viewing data are send via the telephone line each night between 3.00am and 5.00 am. Some households cannot be equipped with Telcontrol meters: households without phone, about to move out, owning certain types of television sets such as wide-screen TV, TV sets dated from before 1975, TV sets framed in the wall or a piece of furniture, sets that are regularly moved from a room to another; it represents from 10% to 15% of the total households.
Persistence threshold	Statements from the people-meters are timed to the nearest second. No persistence threshold is applied to the MDU and handset statements. The ratings are calculated on the base of the exact cumulation of logged seconds. The finest unit of time available for analysis is the clock second although for reporting purposes the clock minute is ften used.
Calculation rules	Médiamat panel integrates in the rating calculations guest viewing as in BARB but time-shift viewing is excluded. Before1996, panel homes going on holidays were dropped out of the panel during that time, the argument being that almost all the panel homes go on holidays in France and watch television elsewhere. All audience calculations were then made on the basis of non-holiday panel homes. Since July 1996, holiday absence of panel homes is retained in the calculation of audiences and allocated nil viewing, in accordance with the European editing practices. Audiences are calculated for the unit interval of commercial break on the base of the average second rating of break.
Checking procedures	The statements of up to 60 panel members are checked each day. The data collected by the interviewing of 250 individuals a day over 10 months in the context of the 75 000 survey are also used to some extent to assess the viewing statement of the panel members.

Exhibit 34. Results of coincidental surveys

A. For Médiamat and BARB panels

Sources: Scaglia, 1990) Twyman, 1994.

	Médiamat 1989	BARB RSMB 1992	BARB RSMB 1993
Present, button correct	96%	91%	92%
Not present, button correct	94%	84%	88%
Overall 'accuracy'	95%	89%	90%

B. For other European panels

Source: Scaglia, 1990.

	Service	Overall 'accuracy' %
Belgium	CIM	99.6
Spain	Ecotel	98.1
Finland	Finnpanel	99.3
Netherlands	AGB Intomart	97.0
West Germany	GfK	96.0

Exhibit 35. Passive metering data collection techniques

Sources: Werres and Hortsmann, 1997; Steinmann, 1997; Kolessar and Stowell, 1997.

Radio Watch [developed by Infratest Burke and Ipsos]	Meters are designed as watches that respondents have to wear over a period of time. Each watch contains a microphone to record sound patterns in the room and a radio tuner taking at the same time sound patterns of all receivable radio stations. Sound patterns in the respondent's vicinity are recorded at regular intervals. These recorded sound patterns and those of all the radio stations are compared. If the pattern recorded is equal to one of the station pattern, the computer of Radio Watch stores the time and frequency of the station identified. This central computer can also be activated with the spoken names of newspapers or magazines. The data can be processed to ascertain who read what and for how long if the watch is activated prior to reading and deactivated afterwards. The Radio Watch technique is being tested in association with one or two week retrospective designs.
Radiocontrol [developed by Telcontrol]	Meters are also designed as watches. The watch contains a microphone that detects sounds in the respondent's vicinity and a processor that digitizes the sound waves reaching the microphone and reduces the data. The end result is audio samples of a four-second sequence by minute. These samples are sent to an evaluation unit, in which the audio samples and studio samples are compared. If an encoded radio programme is identified, the time and duration of the programme is then stored. Radiocontrol is being tested in association with a one-week retrospective design.
The Personal Portable Meter (PPM) [developed by Nielsen]	The equipment consists of different devices: ▪ an encoder that provides continuous, real time encoding of programme material as it is broadcast. Each broadcaster carries a unique identifying signal in a standard format. ▪ a pager-size decoder that has to be carried by the respondents throughout the day and consists of a sensitive audio transducer, a digital signal processing circuit and a memory. Broadcasters' signals in the respondent's vicinity are detected, recognised and stored. ▪ a base unit/recharger for each meter. The portable decoder must be placed in this base station each night so that the meter's battery can be recharged. ▪ a household data collector. Data from each respondent's portable decoder in the household are transmitted to Nielsen's central computer over the telephone line each night. The audio encoding/decoding system is also capable to detect and identify a variety of media exposures including exposures CDs, audio over the Internet, videos etc. The PPM technique is currently being tested in association with prospective designs.

Exhibit 36A. BARB Establishment survey

Source: BARB; AE.

Universe	All permanent residents 4+ in private households in the UK.
Sample size	The total annual sample size is of 40,000 households. The issued sample is divided into twelve equal groups and the fieldwork is conducted in twelve consecutive four weeks, starting mid-January and ending mid December.
Sampling (1)	The UK is divided into geographical areas defined by the intersection of ITV areas and BBC Regions. An ITV area's boundary is defined by all the administrative districts in which the "home" station can be received. A district is included in the ITV area if at least 15% of homes can receive this station. BBC editorial regions are non-overlapping regions defined by the BBC. When ITV areas and BBC regions are overlaid, a total of 58 separate ITV/BBC area segments are generated. Within each building block listed in each geographical strata, the issued household sample is derived from the Small User Postal Address File (PAF), the Post Office's computerised list of delivery points which includes private dwellings and multiple household dwellings. Postcode sectors are drawn from this sampling frame. Sampling fractions are calculated depending on the numbers of ITV households required for each ITV area panel, subject to the requirement of a minimum sample size of 1000 for any whole ITV area (apart from the Channel Islands). ITV overlaps are sampled at about twice the rate of core areas and a sample of 100 multi ITV station homes is drawn within each ITV area sample; approximately 16% of the population reside in such overlap areas.
Sampling (2)	From each Postcode sectors drawn, a fixed number of addresses are then drawn using systematic random sampling.
Sampling (3)	Interviews take place at home and have to be carried out with the housewife. At least three calls must be made, two of which in the evening or at week end, before an address is classified as non-contact
Data collection technique	The survey is based on a pen and paper data collection technique. The average interview length is 20 minutes.
Questionnaire	Four main areas are covered in the questionnaire: • ownership of television sets and television related

equipment
- channel reception capability and quality
- claimed viewing levels and channel viewing shares for the respondent and all the members of the household
- Demographics of all the member in the households

Calculation of universes

The achieved sample is weighted to government projections of total household and individual populations within each ITV/BBC area segment.
The data are weighted to correct for average household size, so that both the household and the individual survey data match the population targets when grossed up.

The purpose of the establishment survey is to allow full regional data calculation on a quarterly basis.
For non-dynamic variables 24 months survey data is used and for dynamic variables, the data are based on surveys for a shorter period.

Universes used for the calculation of audiences are based on the establishment survey data, further monthly updated with government-based estimates of the total household population in ITV and BBC areas.

Universes for satellite and cable receiving homes are updated monthly using a projection model which produces a smoothed estimate of the future trend, using previous monthly survey data and some other data such as ITC cable statistics.

Exhibit 36B. Médiamat establishment survey
(also called 75 000)

Source: Médiamétrie; AE.

Universe	All permanent residents 15+ in private households with phone.
Sample size	75, 250 interviews over 43 weeks in 4 waves: • January-March • April-June • September-October • November-December About 250 interviews are conducted a day, including Sundays and public holidays.
Sampling (1)	The geographical distribution of the sample is determined by the number of individuals 15+ in each administrative area as given by INSEE Census data. These data are updated annually by other INSEE surveys such as Enquêtes Emplois. The total geographical area is divided using a region X locality size matrix. In each of the 21 administrative region (except from the Paris region), localities are classified in four strata: • less then 2,000 residents • 2,000-20,0000 residents • 20,0000-100,000 residents • more than 100,000 residents Within each stratum localities are randomly drawn.
Sampling (2)	The sampling frame is the telephone directory. A fixed number of telephone numbers is then randomly drawn in each locality drawn at the previous stage.
Sampling (3)	The final stage entails the setting of daily quotas set on sex X age and sex X working status. Each number has to be called at least four times before being abandoned. Individuals do not need to be in their permanent residence at the moment of the phone call to be interviewed. After 4 unsuccessful recalls, systematic procedure of random re-dialling of the last two digits is then incremented.
Data collection technique	The data collection technique used is Computer Assisted Telephone interviewing (CATI). Interviews take place between 5.30 and 9.00 pm. The average interview length is about 25 minutes.
Questionnaire	The questionnaire is divided into four sections: • radio listening sessions on the day before the interview (the survey is also the audience measurement system in

the radio industry)
- cinema going habits
- Ownership of television and television related equipment
- Viewing sessions on the day before the interview
- Demographics of all 4+ household members

Calculation of universes

Data are weighted and grossed according to the INSEE census data annually updated.

- Demographic cells are weighted to correct for the profile of the sample for simple variables such as working status of the respondent, working status of the head of household.
- Demographic cells are weighted to correct for the profile of the sample for interlaced variables such as sex X working status, sex X age, Sex X region
- Periodic cells are weighted to correct for the profile of the sample on Monday-Friday, Saturday and Sunday.

Universes used for the calculation of panel targets are calculated three times a year.

Exhibit 37A. BARB panel design

Source: BARB; AE.

Universe

All permanent residents 4+ in private households

Sample size

The gross sample size is 4,700 households and the average reporting sample size is 4,435 households.

BARB panel is composed of regional samples with a fixed number of panel households by ITV area:

	Households	Individuals
London	475	1,140
Midlands	500	1,200
North West	450	1,080
Yorkshire	400	960
Central Scotland	300	720
HTV West	200	480
HTV Wales	200	480
South and South East	450	1,080
North East	270	650
East	400	960
South West	250	600
Ulster	200	480
Border	100	240
North Scotland	200	480
Channel Islands	40	95

It is possible for some homes to receive broadcast transmissions from more than one ITV station. Where these homes are within an ITV overlap area they can be members of both panels, becoming the so-called dual-panel homes or dual-reporting homes. The panel typically includes between 100 and 200 of such reporting homes, which are double-counted in the targets.

Static sampling design

The viewing panel has a disproportionate structure in two respects:

- it is disproportionate by ITV area. The sample sizes are not directly proportional to the population sizes of the areas but are determined in relation to the reporting requirements of the ITV company concerned, thus over-sampling smaller areas in the total sample. Within each ITV area panel the sample is structured geographically to proportionately represent each of the separate ITV/BBC area segments.
- Within each ITV area it is disproportionate demographically. Upmarket groups are over-sampled. Downmarket homes with a older and economically inactive head of household accounts for about 20% of all households in the population and for about 7% of the panel sample. Sample sizes for other target groups (ABs, households with children...) are over-sampled by an average of around 16%.

Dynamic sampling design

BARB panel uses no enforced rotation design. Households are discarded when they move out unless they stay within the same sampling point.

Control system

BARB establishment survey is used to generate targets against which sample profile is monitored and controlled. The aim is to keep the actual number of installed households as close to the target as possible in each cell.

- Priority 1 Controls:
  ITV/BBC Area Segment
  Single versus dual ITV reception
  Reception of satellite/cable
  Life stage and socio-educational education
  Claimed total set usage
  Claimed BBC/Commercial TV share of set usage
  Household life-stage
  Socio-educational status of the head of the
  Household size

- Priority 2 Controls:
  Housewife and individual working status
  VCR ownership
  Number of TV sets
  Size of household
  Age of individual

- Priority 3 Controls:
  Social class
  Age of housewife
  Adults' terminal education age
  Marital status
  Sex

Recruitment

New households with the required characteristics are selected from the pool of households interviewed in the context of the establishment survey

Addresses from the most recent establishment survey (the so-called 'potentials' file) are scanned for eligible households. These are listed and issued to interviewers to attempt recruitment.

Interviewers call on the selected households and invite them to join the panel. Once an household has agreed to join the panel, an appointment is made for an AGB installation engineer to call in order to assess the equipment to be monitored, to determine the connection to the telephone line, to install the metering equipment and to ensure that the use of the equipment is understood. For households without telephone, AGB arranges for a telephone to be installed by BT and pays any deposits, installation costs and line charges.

Monitoring

Special attention is given to the updating of the following information:

- household demographics (number and occupational status of the household members)
- television equipment (number of TV sets and VCRs, satellite dish or cable convector or digital and any changes to channel subscription)
- changes to reception quality

Weighting and projections	A rim weighting process is used. The resulting weights are the projecting factors. An audience estimate for a population category is represented in the weighting process and derived by multiplying the minutes of viewing on each statement by its weight and summing over the statement. Extra processing is required for any reporting category not represented in the rim weighting scheme. The ratio universe/sum of the weights is calculated and applied as a further category factor in calculating audiences for the category

Exhibit 37B. Médiamat panel design

Source: Médiamétrie compiled by AE.

Universe

All permanent residents 4+ in private households.

Sample size

The gross sample size is 2,500 households and the average reporting sample size is 2,300 households corresponding to 5,540 individuals 4+ and 4,680 individuals 15+.

The minimum reporting sample sizes by demographics are as follows:

Men	2,326
Women	2,553
4-14	1,010
15-34	1,793
35-59	2,020
Housewives	2,131
Working individuals	2,614
Main shopper aged less than 60	1,675

Static sampling design

Since 1997, the panel has been designed to have a disproportionate structure. Households whose head is less than 50 years old are over-sampled. These households represent 55.5% of the total sample whereas a sampling proportional to size would require 50% of the total sample.

Dynamic sampling design

Since 1997, the panel has been using a revolving design. The enforced annual rotation of 6-7% in order to allow the renewal of homes that have been part of the panel for a long time.

Before 1997, 50% of the panel homes had been collaborating to the system for 5 years or more, including one third of them who have been in the panel since it started in 1988.

Control system

- Priority 1 controls:
  - UDA Régions
  - Working status of head of household
  - Occupation of head of household
  - Age of ead of household
  - Number household members
  - Presence of household members aged less than 15
  - Housewife working status
  - Ownership and regular use of more than one TV set
  - Ownership of VCR
- Priority 2 controls:
  - Age of housewife
  - households owning at least one remote control
  - households receiving La Cinquième/Arte, M6
  - households subscribing to Canal +
  - age of the other household members
  - sex of the household members

Recruitment

Before 1996, households were recruited using a personal interviewing procedure. In each commune, interviewers were allocated sampling points corresponding to building blocks and asked to attempt recruiting households with the wanted characteristics.

Since 1996, households have been recruited by telephone interviewing. This change was motivated by the intercom obstacle preventing interviewers from accessing a growing number of buildings, especially in the Paris area.

All households contacted by phone have to answer to a screening questionnaire and, if eligible,are asked to join the panel. Households that agree are then re-contacted face-to-face at home.

The recruitment questionnaire cover technical details to be used for the people-meter installation and more detailed demographics on the household members. Respondents are then asked to sign their written agreement and all household members 4+ present are explained what their tasks would be. Appointment is then taken with Telcontrol for the installation of the metering equipment.

Monitoring

Information regarding the composition of the households and their television-related equipment are updated weekly for each panel home.
Demographic details of each household members are updated on a yearly basis

Exhibit 38A. Media consumption and time spent out of home in France

Source: CESP Multimedia time-budget survey 1991/992.

	All	Did not go out Yester-day	Went out yesterday (Monday-Friday)						
			< 2 hours	2-4 hours	4-6 hours	6-8 hours	8-10 hours	10-12 hours	>12 hours
National dailies*	0,12	0,06	0,10	0,11	0,11	0,13	0,12	0,16	0,19
Regional dailies*	0,41	0,41	0,43	0,42	0,43	0,40	0,38	0,38	0,41
Magazines *	0,50	0,53	0,56	0,51	0,52	0,47	0,45	0,37	0,50
TV magazines *	0,41	0,37	0,41	0,46	0,43	0,36	0,37	0,35	0,41
Radio**	126,2	120,8	130,1	118,7	112,7	123,4	135,3	152,5	126,2
Television **	211,5	307,8	293,3	263,4	223,4	191,4	163,9	127,8	95,2

* Claimed number of titles read; ** Claimed listening/viewing time per person (in minutes)

Exhibit 38B. Time spent out of home by socio-demographic characteristics in France

Source: INSEE Transport Survey 1993/94.

	In hours and minutes
All	5,39
Sex	
Men	6,34
Women	4,48
Age	
15-24	7,07
25-34	7,14
35-49	6,58
50-64	4,29
65+	1,59
Working status	
Self-employed	6,32
management, senior professionals	8,55
intermediate professionals	8,15
White-collars	6,53
Blue-collars	7,43
Retired	2,13
Pupils, students	7,14
Housewives	3,31
Residence	
Greater Paris	6,50
Other regions	5,23

Exhibit 39A. Average rating sizes in the UK

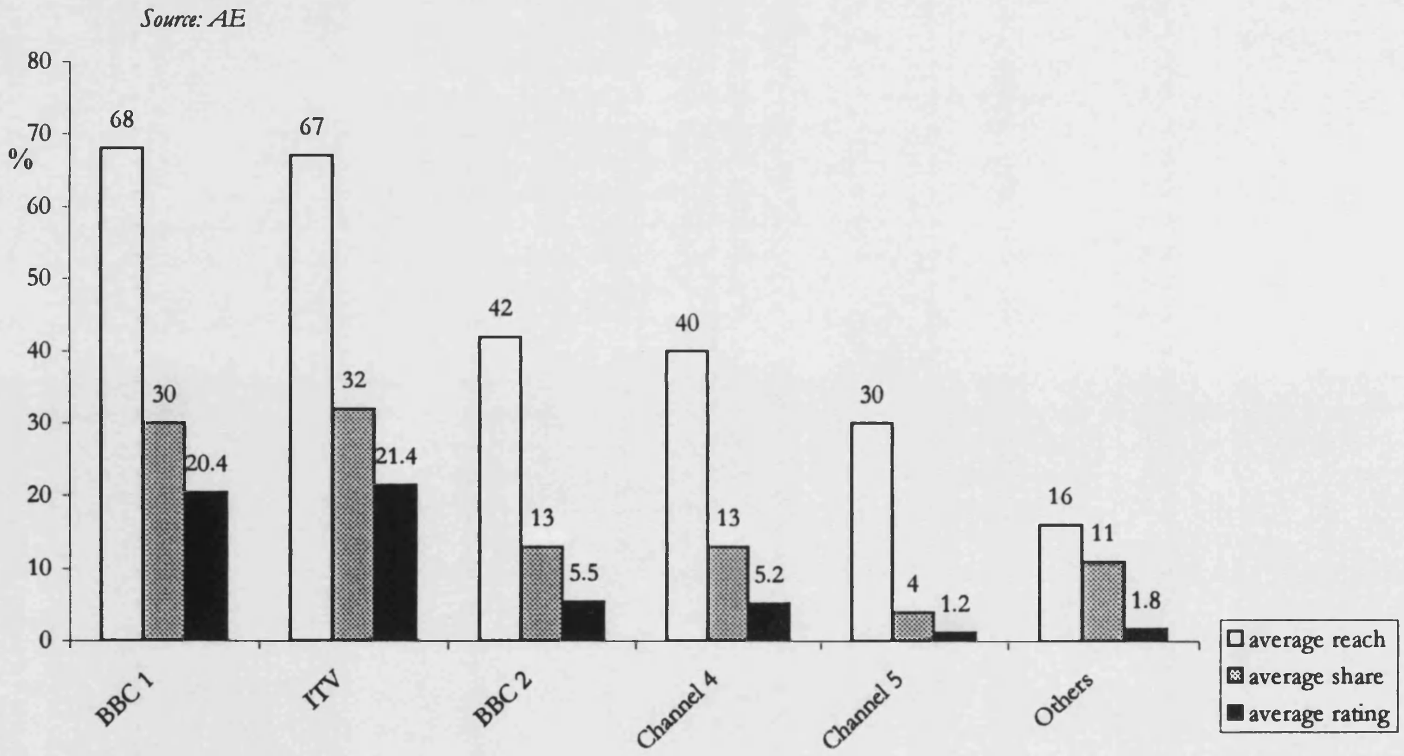


Exhibit 39B. Average rating sizes in France

Source: AE.

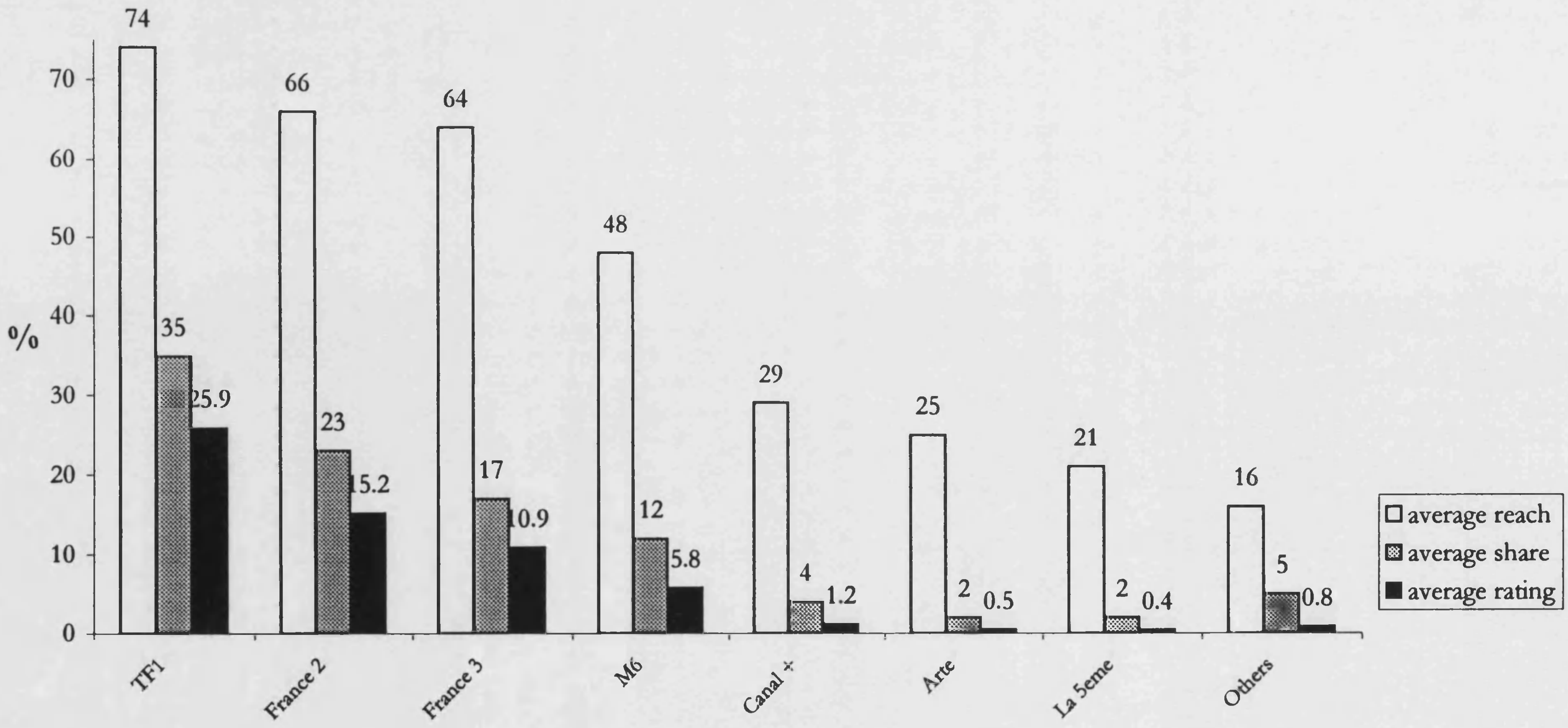


Exhibit 40A. Evolution of the average rating sizes in the UK

Source: AE.

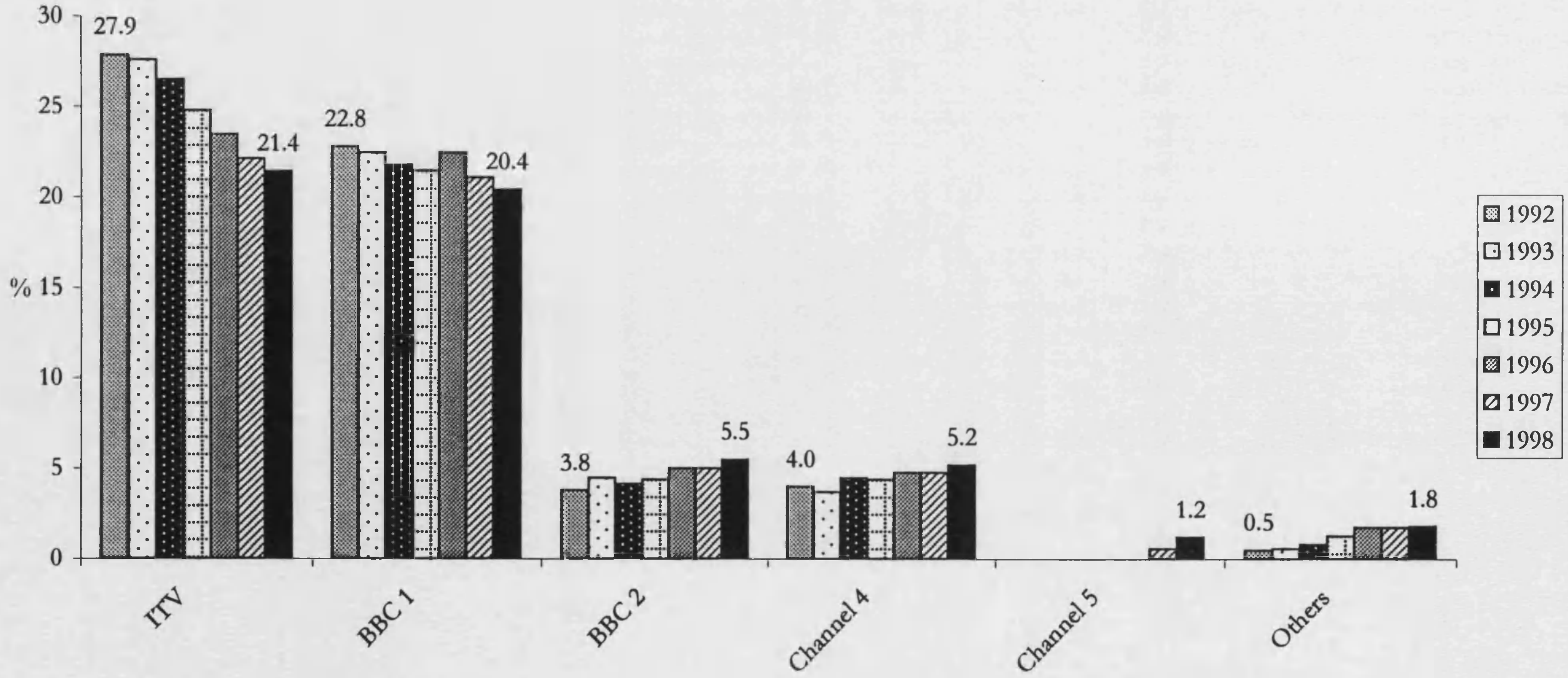


Exhibit 40B. Evolution of the average rating sizes in France

Source: AE

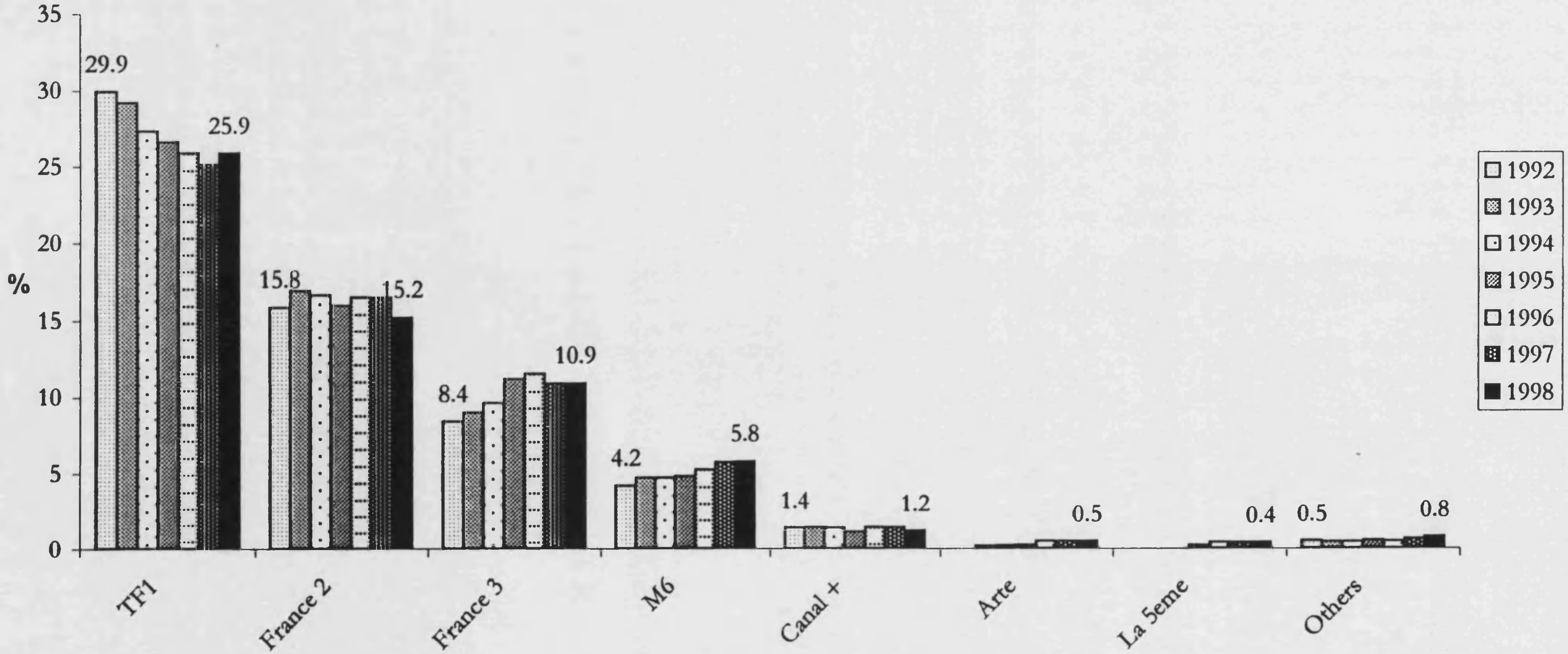


Exhibit 41. Distribution of the rating sizes of BBC1 and ITV

Source: BARB compiled by Kikham, 1996.

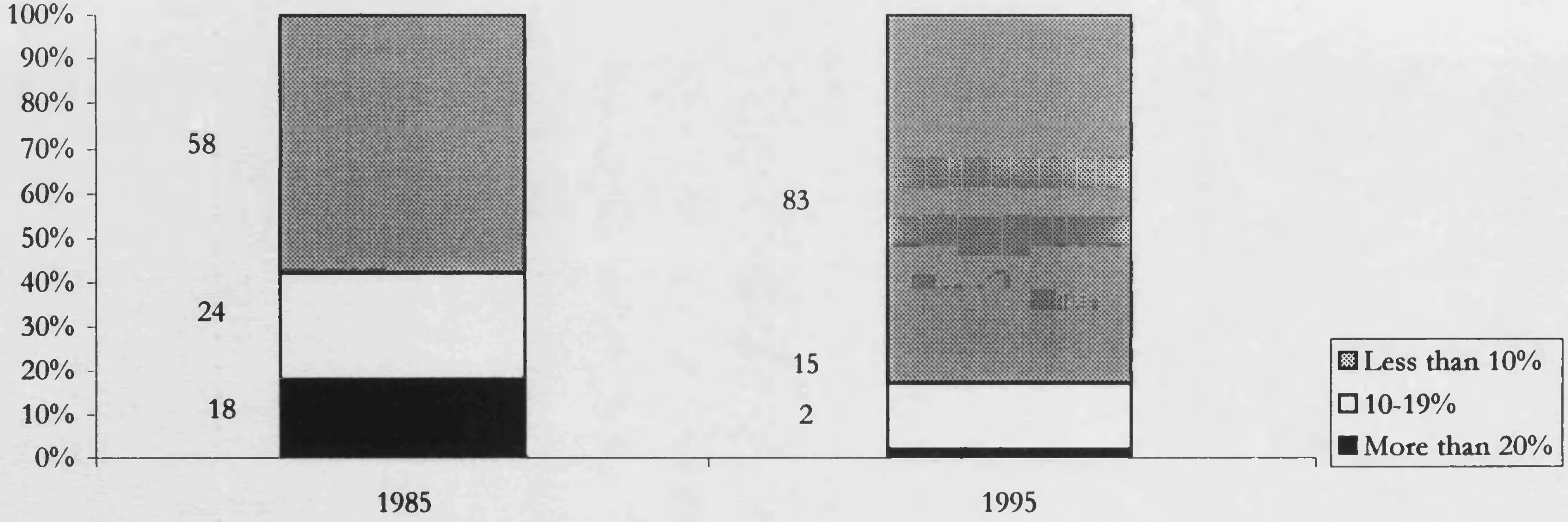


Exhibit 42A. Top ten programme ratings across Europe (December 1999)

Source: TV Express, 27 January 2000.

GREECE: TOP TEN DECEMBER 1999

Programme	Genre	Channel	Time	Rating	Share%
1. Zougla	information	Alpha	23:04	16.5	55.3
2. Epithymies	drama series	Antenna	21:45	16.1	39.6
3. Konstantinou ke Elenis	sitcom	Antenna	21:17	14.0	38.2
4. Ke I Pantremi Ehoun Psyhi	sitcom	Antenna	21:37	13.9	33.4
5. Kitrinos Typos	information	Alpha	23:31	13.5	50.5
6. Deka Mikri Mitsi (Best of)	entertainment	Mega	21:25	13.2	34.1
7. Eglimata	sitcom	Antenna	21:29	13.0	34.5
8. Synora Agapis	drama series	Antenna	22:44	12.6	33.9
9. A.M.A.N	entertainment	Antenna	22:14	12.4	29.7
10. I Hartopaihtra	film	Antenna	22:23	11.9	33.4

Source: AGB Hellas

SPAIN: TOP TEN DECEMBER 1999

Programme	Genre	Channel	Time	Rating	Share%
1. Médico de Familia	sitcom	Tele 5	22:05	22.1	46.2
2. Compañeros	sitcom	Antena 3	21:59	17.1	36.9
3. Twister	film	TVE1	21:35	16.4	39.7
4. En Efecto 2000	magazine	TVE1	21:43	14.7	45.6
5. Periodistas	sitcom	Tele 5	22:07	14.3	31.1
6. Con Primera Al 2000	magazine	TVE1	23:05	14.2	45.1
7. Casper	film	Antena 3	21:59	14.1	30.1
8. Inspectores	film	Tele 5	22:07	14.0	35.6
9. Manos A La Obra	sitcom	Antena 3	22:02	12.7	28.4
10. Difícil De Matar	film	Tele 5	22:09	12.6	32.8

Source: Antena 3 TV

NETHERLANDS: TOP TEN DECEMBER 1999

Programme	Genre	Channel	Time	Rating	Share
1. Big Brother Final	docu-soap	VOO	21:05	25.1	57.2
2. Youp Van't Hek	cabaret	Ned3	22:29	20.0	46.2
3. Oranje Van Eeuw	sport	Ned2	22:00	19.8	51.1
4. TV Show Op Reis	chat show	Ned2	21:43	17.4	43.0
5. Studio Sport 1	sport	Ned2	19:00	17.0	46.7
6. Big Brother Discus'	docu-soap	VOO	22:27	16.9	47.8
7. Feyenord v O. Marse	football	Ned2	20:40	16.3	41.5
8. Journaal 20 U	news	Ned1	20:00	15.7	37.4
9. Big Brother	docu-soap	VOO	17:54	14.9	43.9
10. Baantjer	drama	RTL4	20:33	14.9	37.3

Source: Intomart

PORTUGAL: TOP TEN DECEMBER 1999

Programme	Genre	Channel	Time	Rating	Share%
1. Terra Nostra	novela	SIC	21:23	29.2	74.3
2. A Lojo Do Camilo	sitcom	SIC	21:00	26.2	64.3
3. Medico de Familia	sitcom	SIC	21:05	25.9	65.1
4. Grande Jogo	football	SIC	20:28	24.9	58.5
5. Clube dos Campeoes	sitcom	SIC	20:59	24.8	61.2
6. Residencial Tejo	sitcom	SIC	21:06	24.7	62.3
7. Os Malucos do Riso	sitcom	SIC	21:03	24.1	59.4
8. Bravo Bravissimo	entertainment	SIC	21:10	24.0	63.9
9. Sic No Pais De Natal	entertainment	SIC	20:54	22.6	57.7
10. Jornal Da Noite	news	SIC	19:58	22.0	54.3

Source: Marktest

IRELAND: TOP TEN DECEMBER 1999

Programme	Genre	Channel	Time	Rating	Share
1. Michael Collins	film	RTE1	21:08	24.0	49.0
2. The Late, Late Show	chat show	RTE1	21:40	22.0	64.0
3. Coronation Street	soap	RTE1	19:30	21.0	53.0
4. Glenroe	soap	RTE1	20:29	20.0	48.0
5. Ransom	-	RTE1	21:39	19.0	56.0
6. Westlife at HQ	music	RTE1	18:58	18.0	40.0
7. Fair City	drama	RTE1	18:59	18.0	49.0
8. Father Of The Bride	film	RTE1	21:36	17.0	56.0
9. The Santa Clause	film	RTE1	18:34	17.0	49.0
10. 101 Dalmatians	film	RTE1	16:42	17.0	44.0

Source: AC Nielsen

ITALY: TOP TEN DECEMBER 1999

Programme	Genre	Channel	Time	Rating	Share
1. Jesus - Parte II	-	Rai 1	21:00	21.22	40.24
2. Apertura Della Porta Santa	-	Rai 1	22:55	19.27	62.8
3. Jesus - Parte I	-	Rai 1	20:42	17.77	33.99
4. TG1	motor racing	Rai 1	19:59	16.96	36.95
5. Carramba Che Fortuna!	-	Rai 1	20:57	16.40	40.09
6. Aldo Giovanni Giacomo Show	-	Canale 5	20:42	16.19	31.30
7. Striscia La Notizia	-	Canale 5	20:35	15.83	31.58
8. Madri - Parte II	-	Rai 1	21:00	15.76	30.84
9. Scherzi A Parte	-	Rai 1	20:59	15.00	33.10
10. I Guardiani Del Cielo - Parte II	-	Rai 1	21:00	14.28	28.37

Source: Auditel

SWEDEN: TOP TEN DECEMBER 1999

Programme	Genre	Channel	Time	Rating	Share
1. Kalle Anka och hans vänner	cartoon	SVT1	15:00	49.5	92.0
2. Så ska det låta	entertainment	SVT2	20:00	36.8	74.9
3. Reuter & Skoog	sitcom	SVT2	20:00	36.0	69.5
4. Expedition: Robinson	entertainment	SVT2	20:00	33.9	59.0
5. Svensson, Svensson	film	SVT2	20:00	32.6	68.5
6. Nyheterna	news	TV4	22:00	25.8	51.0
7. Rapport	news	SVT2	19:30	24.1	61.9
8. Uppesittarkväll	entertainment	TV4	22:15	23.5	56.7
9. Sportspegeln	sports news	SVT2	20:30	23.1	48.1
10. Antligen hemma	lifestyle	TV4	20:30	22.5	56.1

Source: AGB Hellas

Exhibit 42B. Top ten programme ratings across Europe (August 1999)

Source: TV Express, 8 October 1999.

DENMARK: TOP TEN AUGUST 1999

Programme	Genre	Channel	Time	Rating	Share%
1. Fodboldlandskamp Den vs Neth	football	DR1	18:59	17.0	49.0
2. Søndagsmagasinet (3)	news	DR1	21:15	17.0	42.0
3. Simons Films	documentary	DR1	20:00	17.0	47.0
4. Hokus Krokus (2)	entertainment	DR1	20:31	16.0	52.0
5. Dags Dato (2)	news	TV2	20:00	16.0	48.0
6. Horisont (2)	current affairs	DR1	21:25	16.0	44.0
7. Nyhederne	news	TV2	19:00	16.0	61.0
8. TV-avisen	news	DR1	21:00	16.0	44.0
9. Pengemagasinet (2)	economic news	DR1	21:41	16.0	43.0
10. Anklaget	film	DR1	21:31	16.0	50.0

Source: Gallup

GREECE: TOP TEN AUGUST 1999

Programme	Genre	Channel	Time	Rating	Share%
1. Konstandinou ke Elenis (R)	sitcom	Ant 1	23:27	9.7	36.7
2. Unwed Father	film	Mega	22:56	9.6	34.3
3. AIK Stockholmv AEK	football	Mega	20:53	8.9	33.4
4. Dyo Xeni (R)	sitcom	Mega	21:30	8.8	33.0
5. Striking Distance	film	Mega	21:33	8.2	25.4
6. Ekines ki Ego	sitcom	Ant 1	22:20	7.5	24.5
7. I Lampsi	soap	Ant 1	19:11	7.4	38.8
8. Olympiakos v Pas Gainena	sports	Skai	22:18	7.2	21.8
9. Ke I Padremeni Ehoun Psihi (R)	sitcom	Ant 1	22:25	7.0	24.6
10. Ston Asterismo tis Parthenou	film	Ant 1	21:23	6.9	21.6

Source: AGB Hellas

ITALY: TOP TEN AUGUST 1999

Programme	Genre	Channel	Time	Rating	Share%
1. Formula One	sport	Rai 1	13:48	17.7	67.8
2. Formula One	sport	Rai 1	13:51	16.31	57.1
3. Pole Position	sport	Rai 1	13:07	13.86	57.3
4. Formula One	sport	Rai 1	13:52	13.7	70.0
5. TG1	news	Rai 1	20:00	12.37	35.20
6. Un Amore Tutto uo	film	Rai 1	20:56	10.5	25.52
7. Lundifilm	football	Rai 1	20:55	10.4	25.47
8. Calcio Torneo Intertoto	news	Rai 1	20:45	10.0	28.16
9. TG5	news	Canale 5	19:58	10.0	27.4
10. Beautiful	soap	Canale 5	13:41	9.08	31.75

Source: Auditel

SWEDEN: TOP TEN AUGUST 1999

Programme	Genre	Channel	Time	Rating	Share%
1. Fridrotis-VM	athletics	TV4	20:30	21.5	30.8
2. Allsång på Skansen	entertainment	SVT1	20:00	19.7	27.0
3. Stadskampen	entertainment	TV4	21:00	17.6	20.3
4. Bingolotto	entertainment	TV4	19:00	17.5	21.2
5. Sånt är livet	documentary	SVT1	20:00	17.2	25.1
6. Famijen Macahan	Western series	SVT2	21:00	16.5	25.6
7. Rederiet	drama series	SVT1	20:00	15.7	19.3
8. Skärgardsdoktorn	drama series	SVT2	20:00	14.1	20.8
9. Sporten	sports news	TV4	22:30	13.3	15.9
10. Fotboll Sweden v Austria	football	SVT2	20:00	13.1	25.2

Source: MMS

SPAIN: TOP TEN AUGUST 1999

Programme	Genre	Channel	Time	Rating	Share%
1. Valencia v Barcelona	football	TVE1	21:48	11.1	41.0
2. Celtic v R. Madrid	football	TVE1	21:49	10.1	35.8
3. R. Madrid v Milan	football	Antena 3	21:51	9.5	32.3
4. Fenerbache v R. Madrid	football	TVE1	21:59	9.3	32.0
5. Martial Law	sitcom	Antena 3	22:53	8.6	27.4
6. El Sustituto	film	Tele 5	22:04	8.0	32.8
7. Sevilla '99	sports	TVE1	21:38	7.9	33.6
8. Grand Prix	magazine	TVE1	21:53	7/8	28.2
9. Mi Querido Enemigo	film	Antena 3	21:54	7.7	23.5
10. Circulo de Fuego	film	TVE1	16:09	7.6	35.8

Source: Antena 3

PORTUGAL: TOP TEN AUGUST 1999

Programme	Genre	Channel	Time	Rating	Share%
1. Benfica v Bayern Munich	football	SIC	20:56	21.0	57.5
2. Suave Veneno	telenovela	SIC	21:54	20.7	59.7
3. Os Malucos Do Riso	sitcom	SIC	21:10	20.1	54.2
4. Imagens Reais	entertainment	SIC	20:52	19.4	53.0
5. Clube Dos Campeoes	sitcom	SIC	21:04	18.3	50.4
6. JornalDa Noite	news	SIC	19:58	18.1	52.3
7. O Fura-Vidas	sitcom	SIC	21:54	17.3	55.3
8. Ponto De Encontro	docusoap	SIC	21:09	16.7	49.3
9. Roda Dos Milhoes	variety	SIC	22:32	15.9	54.8
10. Alice E Maravilhas	variety	SIC	22:45	15.8	59.4

Source: Marktest

IRELAND: TOP TEN AUGUST 1999

Programme	Genre	Channel	Time	Rating	Share%
1. The Rose of Tralee (Part 2)	mini-series	RTE1	21:36	25.0	63.0
2. The Rose of Tralee (Part 1)	mini-series	RTE1	20:00	18.0	51.0
3. Coronation Street	soap	RTE1	19:30	18.0	58.0
4. Memoirs of Hyac	-	RTE1	19:52	16.0	48.0
5. Fair City	soap	RTE1	19:01	16.0	55.0
6. Presumed Innocent	film	RTE1	21:36	15.0	49.0
7. Fame and Fortune	-	RTE1	20:22	14.0	51.0
8. Mad Love	-	RTE1	21:35	13.0	43.0
9. Crimeline	public service	RTE1	21:34	13.0	40.0
10. Ballykissangel	drama	RTE1	20:02	13.0	49.0

Source: AC Nielsen

NETHERLANDS: TOP TEN AUGUST 1999

Programme	Genre	Channel	Time	Rating	Share%
1. Zonsverduistering	entertainment	Ned2	11:00	15.1	80.3
2. Studio Sport 11	sport	Ned2	20:14	14.0	39.8
3. Denemarken v Neder	sport	VOO	18:46	13.4	40.2
4. Studio Sport 1	sport	Ned2	19:00	12.7	48.2
5. PSV v Zimbru	sport	Ned2	19:56	12.6	36.2
6. Journaal 20 U	news	Ned1	20:00	12.3	36.6
7. Nabesch Voetbal	sport	Ned2	21:53	12.2	31.6
8. Villa Felderhof	entertainment	Ned1	21:02	11.0	30.7
9. Studio Sport ZA	sport	Ned3	22:43	10.6	35.8
10. Kunst En Kitsch	arts	Ned1	21:59	9.8	25.4

Source: Intomart

NORWAY: TOP TEN AUGUST 1999

Programme	Genre	Channel	Time	Rating	Share%
1. Monarkedet	entertainment	NRK1	21:00	22.5	62.6
2. VM: Friidrett 1999	sport	NRK1	19:39	22.0	64.7
3. Lottotrekning	lottery	NRK1	20:01	21.3	65.6
4. VM: Friidrett	sport	NRK1	20:05	19.6	58.8
5. VM i Friidrett	sport	NRK1	19:36	18.6	50.6
6. VM: Friidrett 1999	sport	NRK1	22:21	18.6	57.0
7. VM: Friidrett	sport	NRK1	19:30	18.5	53.7
8. Lottotrekning	lottery	NRK1	20:02	18.1	66.9
9. Norge rundt	entertainment	NRK1	19:30	18.0	68.5
10. VM: Friidrett 1999	sport	NRK1	19:45	17.6	50.9

Source: MMI/Norsk TV-meterpanel

GERMANY: TOP TEN AUGUST 1999

Programme	Genre	Channel	Time	Rating	Share%
1. Formula One - Germany	motor racing	RTL	13:57	8.95	59.3
2. Formula One - Belgium	motor racing	RTL	13:54	8.19	57.5
3. Formula One - Hungary	motor racing	RTL	13:53	9.48	56.3
4. Formula One - Germany (ceremony)	motor racing	RTL	15:27	7.65	53.0
5. Formula One - Hungary (ceremony)	motor racing	RTL	15:51	7.42	46.1
6. Formula One - Germany (start)	motor racing	RTL	12:59	3.81	35.2
7. Formula One - Belgium	motor racing	RTL	12:43	2.85	34.6
8. Formula One - Hungary	motor racing	RTL	12:44	2.86	34.5
9. Tagesschau	news	ARD	19:59	7.12	33.0
10. Formula One - Germany (highlights)	motor racing	RTL	15:43	3.89	32.6

Source: IP/GfK - Fernehforchung

Exhibit 43. Variability of estimates for sample sizes = 1000, 2500, 5500 and 10200 with deft = 1.5 and deft = 2

Source: AE.

		Sample sizes											
(at 95% condidence level)		1000			2500			5500			10200		
P	Deft	Upper (%)	Lower (%)	(%) (+/-)	Upper (%)	Lower (%)	(%) (+/-)	Upper (%)	Lower (%)	(%) (+/-)	Upper (%)	Lower (%)	(%) (+/-)
0.001	1.5	0.003939	-0.001938	0.002938	0.002858	-0.000858	0.001858	0.002253	-0.000252	0.001259	0.00192	7.99107E0.	0.00092
	2	0.004918	-0.002918	0.003918	0.003578	-0.001477	0.002477	0.002671	-0.00067	0.00167	0.002227	-0.000226	0.001226
0.005	1.5	0.011558	-0.001557	0.006557	0.009147	0.000852	0.004147	0.007796	0.002203	0.002796	0.007053	0.002946	0.002053
	2	0.013743	-0.003743	0.008743	0.01053	-0.000529	0.005529	0.008728	0.001271	0.003728	0.007738	0.002262	0.002737
0.01	1.5	0.01925	0.000749	0.00925	0.015851	0.004149	0.00585	0.013944	0.006055	0.003944	0.007103	0.007103	0.002896
	2	0.022334	-0.002333	0.0123339	0.017801	0.002119	0.0078	0.015259	0.00474	0.005293	0.013862	0.006138	0.003861
0.02	1.5	0.033016	0.006984	0.0130159	0.028232	0.011768	0.008232	0.02555	0.014449	0.00555	0.024075	0.015924	0.004075
	2	0.037355	0.002645	0.017354	0.030976	0.009024	0.016976	0.0274	0.012599	0.0074	0.025434	0.014566	0.005433
0.03	1.5	0.04586	0.01414	0.0158596	0.040031	0.019969	0.01003	0.036763	0.023237	0.007625	0.034966	0.250341	0.004965
	2	0.051146	0.008853	0.021146	0.043374	0.016625	0.0133374	0.039017	0.020983	0.009016	0.036621	0.233788	0.006621
0.05	1.5	0.070263	0.029374	0.020262	0.062815	0.037184	0.012815	0.05864	0.04136	0.008639	0.056344	0.043655	0.006344
	2	0.077017	0.022398	0.027016	0.067087	0.032913	0.0170868	0.06152	0.03848	0.011519	0.058459	0.04154	0.008459
0.1	1.5	0.127891	0.072108	0.027891	0.11764	0.8236	0.01764	0.111893	0.088107	0.011892	0.108733	0.091266	0.008733
	2	0.137188	0.062811	0.037188	0.12352	0.07648	0.023521	0.115857	0.084142	0.015857	0.111644	0.088355	0.011644
0.15	1.5	0.183197	0.116802	0.033197	0.170996	0.129004	0.020995	0.164155	0.135844	0.014155	0.160394	0.139605	0.010344
	2	0.194263	0.105736	0.044263	0.177994	0.122005	0.027994	0.168874	0.131126	0.018873	0.163859	0.13614	0.0138592
0.2	1.5	0.237188	0.162811	0.037188	0.22352	0.17648	0.02352	0.215857	0.184142	0.015857	0.211644	0.188355	0.011644
	2	0.249585	0.150415	0.049584	0.231136	0.16864	0.03136	0.221143	0.178857	0.021142	0.215526	0.184474	0.015525
0.25	1.5	0.290258	0.209742	0.040257	0.275461	0.224538	0.025461	0.267166	0.232834	0.017165	0.262605	0.237394	0.012695
	2	0.303677	0.196323	0.053676	0.283948	0.216051	0.033948	0.272888	0.227112	0.022887	0.266807	0.2331931	0.016806

Exhibit 44. Top ten Weekly programme ratings in the UK (week ending the 23rd of January 2000)

Source: BARB.

BBC1

Programme Title	Date	Start	000's
EASTENDERS	Thu 20 Jan 00	19:32	4874
EASTENDERS	Mon 17 Jan 00	20:01	4217
EASTENDERS	Tue 18 Jan 00	19:30	4161
CASUALTY	Sat 22 Jan 00	20:06	3059
HOLBY CITY	Thu 20 Jan 00	20:00	2924
SUNBURN	Sat 22 Jan 00	20:57	2811
NAT.LOTTERY STARS	Sat 22 Jan 00	19:45	2794
A QUESTION OF SPORT	Mon 17 Jan 00	19:00	2785
THIS IS YOUR LIFE	Mon 17 Jan 00	20:30	2649
CLOCKING OFF	Sun 23 Jan 00	21:00	2579

BBC2

Programme Title	Date	Start	000's
GIMME GIMME GIMME	Fri 21 Jan 00	21:00	1403
ROBOT WARS	Fri 21 Jan 00	18:46	1326
SIMPSONS	Fri 21 Jan 00	18:23	1292
GORMENGHAST	Mon 17 Jan 00	20:59	1227
NEVER MIND/BUZZCOCKS	Fri 21 Jan 00	21:30	1193
SIMPSONS	Fri 21 Jan 00	18:01	1131
SIMPSONS	Mon 17 Jan 00	17:59	1078
HOME FRONT/GARDEN	Wed 19 Jan 00	21:00	915
JAMIE THE NAKED CHEF	Tue 18 Jan 00	20:00	842
FOOD & DRINK	Tue 18 Jan 00	20:30	829

ITV

Programme Title	Date	Start	000's
CORONATION STREET	Wed 19 Jan 00	19:31	5645
CORONATION STREET	Sun 23 Jan 00	19:30	5558
CORONATION STREET	Mon 17 Jan 00	19:32	5424
WHO/BE A MILLIONAIRE	Wed 19 Jan 00	20:02	5155
CORONATION STREET	Fri 21 Jan 00	19:30	4862
HEARTBEAT	Sun 23 Jan 00	20:02	4629
WHO/BE A MILLIONAIRE	Fri 21 Jan 00	20:02	4490
WHO/BE A MILLIONAIRE	Sat 22 Jan 00	19:59	4173
EMMERDALE	Wed 19 Jan 00	19:01	4138
WHO/BE A MILLIONAIRE	Thu 20 Jan 00	20:01	3891

CH4/S4C

Programme Title	Date	Start	000's
STRIPTEASE	Sun 23 Jan 00	22:00	1009
BROOKSIDE	Sat 22 Jan 00	17:59	998
BROOKSIDE	Sat 22 Jan 00	17:32	990
COUNTDOWN	Wed 19 Jan 00	16:30	967
TOP TEN	Sat 22 Jan 00	20:59	958
BROOKSIDE	Tue 18 Jan 00	20:00	916
COUNTDOWN	Fri 21 Jan 00	16:30	873
SHIPWRECKED	Wed 19 Jan 00	18:00	843
COUNTDOWN	Mon 17 Jan 00	16:29	840
FRIENDS	Fri 21 Jan 00	21:02	837

CH5

Programme Title	Date	Start	000's
LETHAL WEAPON	Tue 18 Jan 00	21:03	1108
GHOSTBUSTERS	Sun 23 Jan 00	17:38	957
5 NEWS UPDATE	Tue 18 Jan 00	20:59	591
ISLAND OF DR.MOREAU	Sun 23 Jan 00	21:01	573
IN LOVE AND WAR	Wed 19 Jan 00	21:04	532
CROSSWORLDS	Sat 22 Jan 00	21:01	503
MURDER DETECTIVES	Tue 18 Jan 00	23:08	498
DRIVING MUM CRAZY	Tue 18 Jan 00	20:29	494
OTHER PEOPLE'S MONEY	Thu 20 Jan 00	21:01	480
AREA 51	Sun 23 Jan 00	19:59	477

SKY 1

Programme Title	Date	Start	000's
FRIENDS	Thu 20 Jan 00	21:02	2251
THE SIMPSONS	Sun 23 Jan 00	18:31	1239
THE SIMPSONS	Sun 23 Jan 00	18:00	907
E.R.	Thu 20 Jan 00	21:31	845
STARGATE S G-1	Wed 19 Jan 00	20:01	661
THE SIMPSONS	Wed 19 Jan 00	19:31	630
BUFFY/VMPRE SLYR (S)	Fri 21 Jan 00	20:01	576
THE SIMPSONS	Tue 18 Jan 00	19:02	560
THE SIMPSONS	Fri 21 Jan 00	19:32	558
THE SIMPSONS	Wed 19 Jan 00	19:00	551

SKY NEWS

Programme Title	Date	Start	000's
LIVE AT 5	Fri 21 Jan 00	17:00	113
SKY NEWS TODAY	Sat 22 Jan 00	13:00	85
LIVE AT 5	Mon 17 Jan 00	17:00	77
SPORTSLINE	Mon 17 Jan 00	22:31	74
LIVE AT 5	Tue 18 Jan 00	17:00	69
NEWS ON THE HOUR	Wed 19 Jan 00	24:00	67
SKY NEWS AT TEN	Tue 18 Jan 00	22:00	67
NEWS ON THE HOUR	Thu 20 Jan 00	23:00	64
TECHNOFILE	Sat 22 Jan 00	09:30	60
NEWS ON THE HOUR	Sat 22 Jan 00	15:00	58

SKY MOVIEMAX

Programme Title	Date	Start	000's
MEAN GUNS	Fri 21 Jan 00	22:05	219
LETHAL WEAPON 2	Sun 23 Jan 00	22:02	219
SCREAM 2	Thu 20 Jan 00	22:01	180
INFERNO (FILM)	Fri 21 Jan 00	23:44	167
MURDER AT 1600	Sat 22 Jan 00	21:02	163
BEVERLY HILLS NINJA	Mon 17 Jan 00	21:03	141
ONE EIGHT SEVEN	Sun 23 Jan 00	20:02	138
FACE	Sat 22 Jan 00	22:52	137
ST PATRICK/IRISH LGD	Wed 19 Jan 00	21:01	133
WING/A PRAYER (FILM)	Sun 23 Jan 00	18:01	112

SKY PREMIER

Programme Title	Date	Start	000's
LOST IN SPACE (FILM)	Tue 18 Jan 00	20:03	351
ROCKET MAN	Sun 23 Jan 00	19:01	302
THE BIG LEBOWSKI	Sat 22 Jan 00	22:02	243
GODZILLA (1998)	Sun 23 Jan 00	21:01	208
WITCHES	Sat 22 Jan 00	16:03	179
MIMIC (FILM)	Mon 17 Jan 00	22:02	175
JUNGLE 2 JUNGLE	Sun 23 Jan 00	17:02	169
DEEP IMPACT	Sat 22 Jan 00	14:01	150
GODZILLA (1998)	Sun 23 Jan 00	10:12	141
IT TAKES TWO	Mon 17 Jan 00	15:46	140

SKY CINEMA

Programme Title	Date	Start	000's
THE VIRGIN SOLDIERS	Tue 18 Jan 00	20:06	103
THE DREAM TEAM	Tue 18 Jan 00	22:02	99
PATRIOT GAMES	Wed 19 Jan 00	22:01	88
MEN IN WAR	Thu 20 Jan 00	17:32	57
GUADALCANAL DIARY	Sun 23 Jan 00	14:02	55
THE BOSTON STRANGLER	Fri 21 Jan 00	22:04	55
MOBSTERS	Sun 23 Jan 00	22:02	55
THE GUNS OF NAVARONE	Thu 20 Jan 00	19:32	44
FAREWELL TO THE KING	Thu 20 Jan 00	22:08	38
FIREPOWER	Sun 23 Jan 00	23:47	37

SKY SPORTS 1

Programme Title	Date	Start	000's
SUPER SUNDAY LIVE	Sun 23 Jan 00	15:59	1404
SUPER SUNDAY INTRO	Sun 23 Jan 00	15:00	453
FOOTBALL ANALYSIS	Sun 23 Jan 00	18:00	435
GILLETTE SOCCER SAT	Sat 22 Jan 00	12:00	325
WRESTLING	Sat 22 Jan 00	22:00	191
RUGBY LEAGUE	Sat 22 Jan 00	17:59	170
SKY SPORTS CENTRE	Wed 19 Jan 00	17:59	166
SKY SPORTS CENTRE	Mon 17 Jan 00	17:59	150
SKY SPORTS CENTRE	Tue 18 Jan 00	22:01	126
SAT/FIGHT NIGHT LIVE	Sat 22 Jan 00	20:00	121

SKY SPORTS 2

Programme Title	Date	Start	000's
F.A CUP SPECIAL LIVE	Wed 19 Jan 00	19:46	858
INT. CRICKET LIVE	Sun 23 Jan 00	12:11	294
FOOTBALL LGE LIVE	Fri 21 Jan 00	19:45	203
INT. CRICKET LIVE	Sun 23 Jan 00	07:30	199
SOCCER AM	Sat 22 Jan 00	08:00	190
TEST CRICKET LIVE	Tue 18 Jan 00	11:07	189
INT CRICKET	Sun 23 Jan 00	11:18	175
F.A CUP INTRO	Wed 19 Jan 00	19:00	148
RUGBY UNION	Sat 22 Jan 00	13:30	112
RINGSIDE SPECIAL	Tue 18 Jan 00	20:00	112

SKY SPORTS 3

Programme Title	Date	Start	000's
SCOTT/FOOTBALL LIVE	Sun 23 Jan 00	17:50	381
WWF RAW	Fri 21 Jan 00	21:59	248
INT. CRICKET LIVE	Fri 21 Jan 00	16:43	135
SCOT FTBALL ANALYSIS	Sun 23 Jan 00	20:06	80
SCOT FOOTBALL INTRO	Sun 23 Jan 00	17:30	67
GOALS ON SUNDAY	Sun 23 Jan 00	20:30	61
BIG FIGHT	Tue 18 Jan 00	22:30	56
INT. CRICKET LIVE	Fri 21 Jan 00	12:00	51
TRIATHLON	Sun 23 Jan 00	16:30	37
SOCCER EXTRA	Sun 23 Jan 00	09:00	32

.TV

Programme Title	Date	Start	000's
CHIPS/EVERYTHING	Tue 18 Jan 00	18:40	44
EX MACHINA	Mon 17 Jan 00	19:31	30
BUYERS GUIDE	Mon 17 Jan 00	18:01	29
BUYERS GUIDE	Wed 19 Jan 00	18:01	27
MASTERCLASS	Tue 18 Jan 00	20:21	24
CHIPS/EVERYTHING	Wed 19 Jan 00	18:40	22
CHIPS/EVERYTHING	Mon 17 Jan 00	18:41	22
ON LINE	Sat 22 Jan 00	19:31	22
MASTERCLASS	Tue 18 Jan 00	22:22	21
MASTERCLASS	Mon 17 Jan 00	18:21	19

MTV

Programme Title	Date	Start	000's
CELEBRITY DEATH MATC	Thu 20 Jan 00	21:29	148
DAILY EDITION	Thu 20 Jan 00	21:02	97
EUROPEAN TOP 20	Thu 20 Jan 00	20:01	80
DAILY EDITION	Wed 19 Jan 00	21:00	78
SELECT MTV	Fri 21 Jan 00	15:58	74
CELEBRITY DEATH MATC	Tue 18 Jan 00	21:28	72
THE STORY SO FAR	Sun 23 Jan 00	21:58	68
EUROPEAN TOP 20	Mon 17 Jan 00	14:02	61
NEWS WEEKEND EDITION	Sat 22 Jan 00	11:58	60
SELECT MTV	Wed 19 Jan 00	16:02	60

SKY TRAVEL

Programme Title	Date	Start	000's
AQUA PLANET	Thu 20 Jan 00	15:31	13
WAS IT GOOD FOR YOU	Tue 18 Jan 00	14:30	13
AROUND THE WORLD	Wed 19 Jan 00	15:01	13
AQUA PLANET	Wed 19 Jan 00	15:30	12
AROUND THE WORLD	Mon 17 Jan 00	15:00	11
AROUND THE WORLD	Fri 21 Jan 00	15:00	10
TRAVEL FILE	Tue 18 Jan 00	15:31	9
TRAVEL FILE	Mon 17 Jan 00	15:30	8
FILLER	Mon 17 Jan 00	15:29	7
ISLANDS IN THE SUN	Wed 19 Jan 00	14:31	5

DISCOVERY

Programme Title	Date	Start	000's
FORENSIC DETECTIVES	Thu 20 Jan 00	22:00	210
TIME TEAM	Thu 20 Jan 00	17:00	182
THE FBI FILES	Thu 20 Jan 00	20:58	165
CROCODILE HUNTERS	Fri 21 Jan 00	20:59	133
CROCODILE HUNTERS	Sun 23 Jan 00	18:00	132
TIME TEAM	Tue 18 Jan 00	17:00	113
TIME TEAM	Fri 21 Jan 00	17:00	110
BATTLEFIELD	Thu 20 Jan 00	23:02	108
FORENSIC DETECTIVES	Sat 22 Jan 00	22:58	105
REX HUNT'S FISHING A	Mon 17 Jan 00	16:00	104

UK GOLD

Programme Title	Date	Start	000's
THE ROYLE FAMILY	Wed 19 Jan 00	21:40	345
ONLY FOOLS & HORSES	Thu 20 Jan 00	22:20	317
PORRIDGE	Sun 23 Jan 00	20:26	290
THE ROYLE FAMILY	Sat 22 Jan 00	22:01	273
BILL	Mon 17 Jan 00	15:31	254
HEARTBEAT	Sun 23 Jan 00	18:01	253
BILL	Fri 21 Jan 00	15:31	247
HARRY ENFIELD/CHUMS	Sat 22 Jan 00	22:40	245
MEN BEHAVING BADLY	Wed 19 Jan 00	22:20	240
BILL	Wed 19 Jan 00	15:32	232

TROUBLE

Programme Title	Date	Start	000's
FRESH PRINCE/BEL-AIR	Wed 19 Jan 00	16:01	139
PARKERS, THE	Thu 20 Jan 00	16:33	131
FRESH PRINCE/BEL-AIR	Thu 20 Jan 00	16:00	128
FRESH PRINCE/BEL-AIR	Tue 18 Jan 00	16:01	120
PARKERS, THE	Tue 18 Jan 00	16:33	116
PARKERS, THE	Wed 19 Jan 00	16:33	106
FRESH PRINCE/BEL-AIR	Fri 21 Jan 00	16:01	103
PARKERS, THE	Mon 17 Jan 00	16:33	101
PARKERS, THE	Fri 21 Jan 00	16:33	98
FRESH PRINCE/BEL-AIR	Mon 17 Jan 00	16:01	96

HOME & LEISURE

Programme Title	Date	Start	000's
NEW YANKEE WORKSHOP	Thu 20 Jan 00	14:29	152
TIME TEAM	Sun 23 Jan 00	15:02	132
THIS OLD HOUSE	Thu 20 Jan 00	14:59	119
OUR HOUSE	Sun 23 Jan 00	13:00	94
MODEL MAGIC	Sun 23 Jan 00	11:28	94
TIME TEAM	Thu 20 Jan 00	19:30	87
HOOKED ON FISHING	Sat 22 Jan 00	11:00	85
GO FISHING	Sat 22 Jan 00	10:29	85
NEW YANKEE WORKSHOP	Fri 21 Jan 00	14:29	81
OUR HOUSE	Thu 20 Jan 00	13:58	78

BRAVO

Programme Title	Date	Start	000's
SHOCK VIDEO	Sun 23 Jan 00	22:34	163
MOST AMAZING VIDEOS	Mon 17 Jan 00	21:03	160
SHOCK VIDEO	Sat 22 Jan 00	22:34	155
SEX BYTES	Mon 17 Jan 00	22:32	134
MOST AMAZING VIDEOS	Tue 18 Jan 00	21:04	134
LEPRECHAUN 2	Fri 21 Jan 00	23:03	111
SEX BYTES	Tue 18 Jan 00	22:33	110
SEX BYTES	Fri 21 Jan 00	22:31	106
STRIPPER	Sat 22 Jan 00	23:04	100
CONFESSIONS/W.CLEANR	Sun 23 Jan 00	23:03	93

CHALLENGE TV

Programme Title	Date	Start	000's
FAMILY FORTUNES	Thu 20 Jan 00	18:01	205
FAMILY FORTUNES	Tue 18 Jan 00	18:01	132
FAMILY FORTUNES	Mon 17 Jan 00	18:02	131
FAMILY FORTUNES	Wed 19 Jan 00	18:00	109
CATCHPHRASE	Sat 22 Jan 00	18:32	107
FAMILY FORTUNES	Fri 21 Jan 00	18:01	91
FAMILY FORTUNES	Sat 22 Jan 00	18:02	85
CRYSTAL MAZE	Thu 20 Jan 00	19:59	82
CATCHPHRASE	Mon 17 Jan 00	18:33	81
CATCHPHRASE	Fri 21 Jan 00	18:32	80

NICKELODEON

Programme Title	Date	Start	000's
SABRINA/TEENAGE WTCH	Sun 23 Jan 00	09:30	322
SABRINA/TEENAGE WTCH	Sun 23 Jan 00	10:00	322
SABRINA/TEENAGE WTCH	Sun 23 Jan 00	13:30	315
SABRINA/TEENAGE WTCH	Sun 23 Jan 00	10:30	310
SABRINA/TEENAGE WTCH	Mon 17 Jan 00	17:00	305
FILLER	Sun 23 Jan 00	10:56	305
SABRINA/TEENAGE WTCH	Sun 23 Jan 00	12:02	300
SABRINA/TEENAGE WTCH	Sun 23 Jan 00	11:01	300
SABRINA/TEENAGE WTCH	Sat 22 Jan 00	17:31	295
SABRINA/TEENAGE WTCH	Sun 23 Jan 00	09:00	286

PARAMOUNT

Programme Title	Date	Start	000's
FRASIER	Thu 20 Jan 00	22:00	181
FRASIER	Tue 18 Jan 00	22:00	174
FATHER TED	Wed 19 Jan 00	22:29	165
FATHER TED	Thu 20 Jan 00	22:29	160
FRASIER	Sun 23 Jan 00	21:00	145
FRASIER	Wed 19 Jan 00	22:00	141
FATHER TED	Mon 17 Jan 00	22:30	140
FRASIER	Sun 23 Jan 00	21:29	138
MARRIED WITH CHLDRN	Mon 17 Jan 00	21:00	138
FRASIER	Mon 17 Jan 00	22:00	128

LIVING

Programme Title	Date	Start	000's
JERRY EDITS2000	Tue 18 Jan 00	18:11	299
JERRY EDITS2000	Thu 20 Jan 00	18:11	231
JERRY EDITS2000	Wed 19 Jan 00	18:15	219
JERRY SPRINGER SHOW	Mon 17 Jan 00	18:15	209
JERRY EDITS2000	Fri 21 Jan 00	18:14	206
MAURY POVICH	Sat 22 Jan 00	17:32	198
SEX BYTES	Sat 22 Jan 00	23:46	194
MAURY POVICH	Sat 22 Jan 00	16:41	194
JERRY SPRINGER SHOW	Sat 22 Jan 00	22:53	187
JERRY SPRINGER SHOW	Sun 23 Jan 00	22:54	176

CARTOON NETWORK

Programme Title	Date	Start	000's
FLINTSTONES	Tue 18 Jan 00	18:28	220
ED, EDD AND EDDY	Tue 18 Jan 00	17:02	186
ANIMANIACS	Wed 19 Jan 00	17:58	184
ED, EDD AND EDDY	Wed 19 Jan 00	16:59	179
ANIMANIACS	Thu 20 Jan 00	17:59	178
COURAGE/COWARDLY DOG	Fri 21 Jan 00	18:31	172
JOHNNY BRAVO	Wed 19 Jan 00	17:30	172
JOHNNY BRAVO	Mon 17 Jan 00	17:27	164
TOM/JERRY THE MOVIE	Sun 23 Jan 00	11:58	157
JOHNNY BRAVO	Tue 18 Jan 00	17:31	155

VH-1

Programme Title	Date	Start	000's
TOP 40 80'S	Sat 22 Jan 00	13:58	111
TEN OF THE BEST	Fri 21 Jan 00	22:01	77
WHAM IN CHINA	Sat 22 Jan 00	16:59	63
POP UP VIDEO	Fri 21 Jan 00	21:28	61
BEHIND THE MUSIC	Mon 17 Jan 00	21:00	58
BEHIND THE MUSIC	Sun 23 Jan 00	19:01	53
BEHIND THE MUSIC	Sun 23 Jan 00	12:25	51
ZONE ONE	Sun 23 Jan 00	13:00	47
VH-1 ALBUM CHART	Sun 23 Jan 00	20:05	47
EGOS & ICONS	Sat 22 Jan 00	20:57	46

SCI-FI CHANNEL

Programme Title	Date	Start	000's
TOTAL RECALL	Tue 18 Jan 00	21:58	208
THE ABYSS	Mon 17 Jan 00	21:00	117
WRAITH	Wed 19 Jan 00	22:03	95
KRULL	Sun 23 Jan 00	20:00	92
CIRCUITRY MAN	Thu 20 Jan 00	22:00	86
SPACEHUNTER: ADV/FORB	Sat 22 Jan 00	20:00	84
FILM: THE DENTIST	Sat 22 Jan 00	21:58	77
BABYLON 5	Tue 18 Jan 00	21:02	66
INVASION EARTH	Tue 18 Jan 00	20:00	58
SCI-FOCUS	Tue 18 Jan 00	24:52	57

GRANADA MEN & MOTORS

Programme Title	Date	Start	000's
BLACKPOOL ROCKS	Wed 19 Jan 00	23:00	104
JO GUEST IN AMERICA	Sat 22 Jan 00	23:31	102
STRIPPERS	Tue 18 Jan 00	23:00	97
JO GUEST IN AMERICA	Wed 19 Jan 00	24:01	69
FULLY X-POSED	Sat 22 Jan 00	23:00	64
MOTOR WEEK	Thu 20 Jan 00	23:00	61
TALKING DIRTY	Wed 19 Jan 00	23:34	54
STRIPPERS	Fri 21 Jan 00	24:01	51
JO GUEST IN AMERICA	Fri 21 Jan 00	24:33	51
BLACKPOOL ROCKS	Sat 22 Jan 00	24:32	50

THE HISTORY CHANNEL

Programme Title	Date	Start	000's
GRT MILITARY BLUNDER	Thu 20 Jan 00	16:30	105
GRT MILITARY BLUNDER	Thu 20 Jan 00	16:00	90
LEGENDS OF HISTORY	Sun 23 Jan 00	18:01	73
BIOGRAPHY	Sat 22 Jan 00	13:01	73
BIOGRAPHY	Sat 22 Jan 00	14:01	67
BIOGRAPHY	Sat 22 Jan 00	19:01	66
HISTORY UNCOVERED	Wed 19 Jan 00	18:00	62
TALES OF THE GUN	Wed 19 Jan 00	17:00	53
GREAT PLANES	Sat 22 Jan 00	18:00	50
GRT MILITARY BLUNDER	Wed 19 Jan 00	16:00	46

TNT

Programme Title	Date	Start	000's
WCW THUNDER	Fri 21 Jan 00	21:04	146
WCW NITRO	Thu 20 Jan 00	21:04	121
GET CARTER	Mon 17 Jan 00	22:02	52
DUKES OF HAZARD	Sat 22 Jan 00	24:03	41
THE HITCHHIKER	Sat 22 Jan 00	23:31	38
DUKES OF HAZARD	Fri 21 Jan 00	24:00	34
CHINA BEACH	Mon 17 Jan 00	21:04	32
RATBOY	Wed 19 Jan 00	22:02	31
THE CLIENT	Wed 19 Jan 00	21:04	26
ADVENTURES/BRISCO CY	Thu 20 Jan 00	23:01	26

EUROSPORT

Programme Title	Date	Start	000's
FOOTBALL	Sun 23 Jan 00	20:46	128
NEWS SPORTSCENTRE	Sun 23 Jan 00	20:39	100
RALLY	Tue 18 Jan 00	22:01	98
NEWS SPORTSCENTRE	Fri 21 Jan 00	22:03	95
RALLY	Fri 21 Jan 00	21:34	82
FOOTBALL	Sun 23 Jan 00	19:41	80
NEWS SPORTSCENTRE	Tue 18 Jan 00	19:20	80
TENNIS GRAND SLAM	Tue 18 Jan 00	22:32	78
RALLY	Sat 22 Jan 00	22:15	76
BOXING	Tue 18 Jan 00	20:01	73

DISNEY CHANNEL

Programme Title	Date	Start	000's
BOY MEETS WORLD	Mon 17 Jan 00	18:29	183
THE RESCUERS	Sat 22 Jan 00	15:59	143
RESCUERS DOWN UNDER	Sun 23 Jan 00	16:01	135
TIMON & PUMBAA	Sun 23 Jan 00	15:33	121
RECESS	Tue 18 Jan 00	17:05	108
HONEY, I SHRUNK/KIDS	Sat 22 Jan 00	17:14	106
MICKEY MOUSEWORKS	Wed 19 Jan 00	07:55	104
SMART GUY	Thu 20 Jan 00	18:03	104
101 DALMATIONS	Wed 19 Jan 00	08:02	103
RECESS	Thu 20 Jan 00	17:03	101

GRANADA PLUS

Programme Title	Date	Start	000's
KOJAK	Thu 20 Jan 00	20:59	129
KOJAK	Wed 19 Jan 00	20:59	115
KOJAK	Mon 17 Jan 00	16:00	103
MINDER	Tue 18 Jan 00	20:01	89
TAGGART	Wed 19 Jan 00	22:00	88
CLASSIC CORONATN ST	Wed 19 Jan 00	18:30	84
MINDER	Mon 17 Jan 00	19:59	84
KOJAK	Fri 21 Jan 00	21:01	84
PROFESSIONALS	Tue 18 Jan 00	22:01	83
BEAT THE CARROTT	Sat 22 Jan 00	22:01	79

GRANADA BREEZE

Programme Title	Date	Start	000's
JUDGE JOE BROWN	Wed 19 Jan 00	16:54	84
MONTEL WILLIAMS SHOW	Wed 19 Jan 00	16:03	71
JUDGE JOE BROWN	Tue 18 Jan 00	16:54	41
ANTIQUE FAIR	Fri 21 Jan 00	17:26	33
MONTEL WILLIAMS SHOW	Fri 21 Jan 00	16:02	33
CONSUMING PASSIONS	Wed 19 Jan 00	17:54	29
MONTEL WILLIAMS SHOW	Thu 20 Jan 00	16:02	28
ROSEMARY CONLEY	Wed 19 Jan 00	17:24	28
MONTEL WILLIAMS SHOW	Mon 17 Jan 00	16:02	27
JUDGE JOE BROWN	Thu 20 Jan 00	16:53	27

FOX KIDS

Programme Title	Date	Start	000's
THE TICK	Sun 23 Jan 00	14:40	76
DENNIS AND GNASHER	Tue 18 Jan 00	16:59	71
GOOSEBUMPS	Wed 19 Jan 00	18:30	63
DENNIS AND GNASHER	Mon 17 Jan 00	17:00	60
GOOSEBUMPS	Thu 20 Jan 00	18:30	55
GOOSEBUMPS	Tue 18 Jan 00	18:31	54
DENNIS AND GNASHER	Fri 21 Jan 00	07:31	50
DENNIS AND GNASHER	Wed 19 Jan 00	16:59	49
ACE VENTURA	Tue 18 Jan 00	17:31	46
GOOSEBUMPS	Sat 22 Jan 00	10:25	43

NATIONAL GEOGRAPHIC

Programme Title	Date	Start	000's
FACETS OF BRILLIANCE	Fri 21 Jan 00	22:01	26
KING COBRA	Sat 22 Jan 00	20:00	26
REPTILE RESCUE	Wed 19 Jan 00	23:01	23
GRT LAKE/FRAGILE SEA	Sat 22 Jan 00	18:00	22
DON'T SAY GOODBYE	Sun 23 Jan 00	21:55	20
BORNE ON THE WIND	Sat 22 Jan 00	17:00	17
POMPEII	Wed 19 Jan 00	22:01	14
PHANTOM RIVER	Fri 21 Jan 00	20:00	14
WILD WHEELS	Tue 18 Jan 00	19:59	14
IMPERFECT HARMONY	Tue 18 Jan 00	19:00	14

UK HORIZONS

Programme Title	Date	Start	000's
AIRPORT	Fri 21 Jan 00	21:03	99
SECRETS/LOST EMPIRES	Sat 22 Jan 00	11:02	55
AIRPORT	Tue 18 Jan 00	21:03	54
AIRPORT	Mon 17 Jan 00	21:02	49
AIRPORT	Fri 21 Jan 00	17:26	48
CAR WARS	Mon 17 Jan 00	18:58	48
AIRPORT	Thu 20 Jan 00	21:01	48
TOP GEAR	Sat 22 Jan 00	17:00	47
AIRPORT	Mon 17 Jan 00	17:24	45
AIRPORT	Wed 19 Jan 00	21:01	44

ANIMAL PLANET

Programme Title	Date	Start	000's
CROCODILE HUNTERS	Sat 22 Jan 00	18:58	218
CROC FILES	Sat 22 Jan 00	18:28	208
CROCODILE HUNTERS	Tue 18 Jan 00	17:59	133
CROCODILE HUNTERS	Wed 19 Jan 00	18:28	121
CROCODILE HUNTERS	Thu 20 Jan 00	18:02	113
CROCODILE HUNTERS	Wed 19 Jan 00	17:58	111
AQUANAUTS	Thu 20 Jan 00	16:30	101
CROC FILES	Tue 18 Jan 00	16:00	100
UNTAMED AFRICA	Sat 22 Jan 00	20:59	99
EMERGENCY VETS	Sat 22 Jan 00	19:59	96

FILM FOUR

Programme Title	Date	Start	000's
FISHBELLY WHITE	Sat 22 Jan 00	24:27	15
BEAUTOPIA	Sat 22 Jan 00	18:02	15
THE NATURAL: FILM	Sun 23 Jan 00	18:02	11
NIEL JORDAN INTROS	Mon 17 Jan 00	21:59	9
EDUCATING RITA	Sat 22 Jan 00	20:04	8
WIRED	Mon 17 Jan 00	21:39	7
HIGH ART	Fri 21 Jan 00	22:01	5
HOLLYWOOD CONVERSATI	Thu 20 Jan 00	19:32	5
PORTRAIT OF A LADY	Sat 22 Jan 00	22:02	5
AMERICAN JOB	Tue 18 Jan 00	26:12	5

NICK JR

Programme Title	Date	Start	000's
MAGIC MOUNTAIN	Tue 18 Jan 00	16:44	105
WILDLIFE	Sun 23 Jan 00	09:18	77
BANANAS IN PYJAMAS	Mon 17 Jan 00	18:52	76
JAMES THE CAT	Sun 23 Jan 00	09:29	76
LISA	Sun 23 Jan 00	09:11	70
BANANAS IN PYJAMAS	Sun 23 Jan 00	09:35	70
MAGIC ADV/OF MUMFIE	Thu 20 Jan 00	08:04	66
BLUES CLUES	Tue 18 Jan 00	17:30	64
BANANAS IN PYJAMAS	Sun 23 Jan 00	18:53	62
BANANAS IN PYJAMAS	Sun 23 Jan 00	09:40	62

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