Consequences of Network-effects for the Financing of Media Firms

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TO MY PARENTS AND TO MY LOVE HEIKE
FOR MAKING MY LIFE SO PROSPEROUS

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Chapter 1

Preface

At the beginning of the 21st century, the mass media belong to the most relevant forces shaping the social, political and economic environment in developed societies. Firstly, people have more spare time available a day than they spend time on gainful work and study. The consumption of mass media represents the by far most important activity they devote their spare time to. Secondly, the mass media form today's popular culture and our view of the world considerably and they play an important role in the political discourse. Thirdly, advertising in the mass media is one of the major instruments in modern product markets and accounts for a remarkable share of the gross domestic product.

However, there is no reason to believe that markets ensure mass media products to be provided exclusive of distortions and deficiencies. Several market imperfections might warp the incentives of the involved agents. Not surprisingly, many media markets are regulated extensively. Establishing statements how markets of mass media should be designed from an economic perspective is certainly a valuable task. My work aims to contribute to our knowledge about the financing of media firms taking into account particularly the demand dependence between consumers of mass media and advertisers.

In chapter 2, I analyze economic consequences brought forth by public funding of broadcasting in Europe. Particularly, I determine the welfare implications of a duopoly setting, in which a public service broadcaster receives both advertising income and license fees and competes with a commercial station. In such a scenario viewers benefit from decreasing levels of advertising in the programming but suffer from the obligatory payment of license fees compared to pure commercial broadcasting. Advertisers face increasing prices for commercials and part of their rent dwindles away. The overall effect on the rents is ambiguous. Thus, my analysis documents why it cannot be taken for

granted that public service broadcasting improves welfare compared to a situation of commercial broadcasting.

Chapter 3 explores the enormous business downturn that quality newspapers in many developed countries experienced after the year 2000. I investigate a model of a newspaper firm that incorporates more than one category of advertising and that takes into account demand dependencies between all markets that the newspaper serves. It is demonstrated that a decline of demand for advertising that readers like (e.g. classified advertising) leads to revenue losses in all other markets and can - under certain circumstances - annihilate the business of regional quality newspapers.

In chapter 4, I apply a new methodology to investigate empirically the question as to what extent regional newspaper firms that hold a monopoly position in the reader market are able to charge customers in the associated local advertising markets a markup on prices. Thus, the question of whether newspaper firms have market power to extract rents from advertising customers is answered. In my dataset of 783 local newspaper editions in Germany, only weak evidence is found for such behavior. This result is of particular interest for Germany because the federal government proposed a change of the competition guidelines in the newspaper industry to facilitate mergers and acquisitions. My results imply that no significant welfare losses should be expected if the modified competition rules came into force.

In what follows in these introductory remarks, I will substantiate the statements made at the beginning in order to highlight the relevance of the economic analysis of media markets and the methodological difficulties that go along with it. In addition, I will outline the basic literature and I will chart potential market imperfections affecting the outcomes of mass media markets.

1.1 Relevance of Media Markets

Recent time use surveys conducted in developed countries have shown that on average people have more time available for leisure and social life activities per day than they devote time to gainful work and education. Results from such studies for selected countries are reproduced in table 1-1. Note that most time per day is spent on personal care as sleep, meals and hygiene. For women, numbers for gainful work and education as well as for domestic work differ substantially due to their lower labor force participation. The figures represent an overall average. Thus, for employed individuals the data differ significantly.

According to table 1-1, men in Germany work the least and have the most spare time to spend, whereas men in Japan work the most and have the least time available

Table 1-1: Daily Time Usage in Selected Countries

	Gainful work an study		Domestic work		Leisure and social life	
	Men	Women	Men	Women	Men	Women
Australia	4:45	2:40	2:28	4:39	5:25	5:01
France	4:03	2:31	2:22	4:30	4:46	4:08
Germany	3:35	2:05	2:21	4:11	5:53	5:24
Japan	5:53	3:17	0:31	3:34	2:54	2:38
UK	4:18	3:12	2:18	3:42	5:30	5:05
USA	4:35	3:08	2:12	3:48	5:29	5:06

Data in hours per day. For details and data sources see tables 1A-1 to 1A-4 in the appendix of this chapter. Note that the definitions of the categories are not exactly identical for the different studies, so results are likely to be blurred to some extent (particularly for Japan).

for leisure and activities of social life. However, in all countries besides Japan men spend more time on leisure and social life than they devote to gainful work and study. Interestingly, in Germany the sum of time men spend on gainful work and study *and* on domestic work only slightly exceeds the free time they have. Overall, the time use studies document that people in developed economies have plenty of time to spend on recreational activities. Thus, the question arises what do they actually do with the spare time?

There is clear evidence that most time is devoted to the consumption of mass media, particularly to watching television. Table 1-2 reports the average daily viewing time per individual for the countries above. The average daily viewing time is the highest in the US approaching five hours per day. The figures for the other countries are in the range between 3:11 hours for Australia and 3:59 hours for the United Kingdom. Note that people spend additional time consuming other mass media products than television, for example, reading newspapers and magazines, listening to the radio or watching news on the Internet. The average newspaper circulation per 1,000 adults is the highest in Norway with 684 copies, followed by Japan with 647 copies and by Sweden with 590 copies.[1] Radio broadcasts reach 83.6 per cent of the population each day in France, 81.8 per cent in Germany and 80.2 per cent in the UK.[2] According to a consumer survey in the US in 2003, adults spend 258 minutes per day watching TV, 32 minutes reading newspapers, 121 minutes listening to the radio, 18 minutes reading magazines and 66

[1] Data for the year 2003. Source: World Press Trends 2004. Published by the World Association of Newspapers, available at http://www.wan-press.org.

[2] Data for 2002. Source: International Key Facts - Radio 2003. Published by IP Germany, available at http://www.ip-deutschland.de.

Table 1-2: Daily TV Viewing Time

	TV viewing
Australia	3:11
France	3:33
Germany	3:37
Japan	3:27
UK	3:59
USA	4:50

Each entry Monday-Sunday average hours per day for 2003. Figures for Japan from 2002. Sources: Television 2004 – International Key Facts. Published by IP Germany, p. 29, and Australian Film Commission, available at http://www.afc.gov.au.

minutes using the Internet.[3]

Even though, nowadays media consuming activities are often carried out simultaneously, there can be no doubt that people devote most of their spare time to the consumption of mass media. The data above even suggest that people in developed economies spend more time on such activities per day than they spend on gainful work and education. Anderson and Gabszewicz, two economists working in the field of media economics, infer from this: "It may not be too large a stretch of the imagination to say that leisure time use determines much of the quality of life: By extension, the quality of life for many people is thus underpinned by the quality of the media!"[4]

The effects of mass media have been stressed for long in many sciences including political science, communication science, sociology, psychology and philosophy. In particular, in communication science a remarkable body of theories was developed and empirically tested with the rise of the mass media.[5] Comprehensive overviews of such theories are provided by McQuail (2001), Lowery and DeFleur (1995) or Severin and Tankard (1992). The theories aim to explain how communication basically works and to determine the effects of mass media on individuals, groups, institutions or the society as a whole. McQuail maps such approaches according to the intentionality (planned vs. unplanned effects) and the timing (short-term vs. long-term effects). A further distinction is made between effects which are cognitive (having to do with knowledge

[3] Source: Media Comparisons Study. Published by the Television Bureau of Advertising, available at http://www.tvb.org.

[4] Anderson and Gabszewicz (2005), p. 1.

[5] An empirical study dealing with the question of quality in TV programming is provided by Hillve, Majanen and Rosengren (1997).

Table 1-3: Theories of Effects of Mass Media

Propaganda	Deliberate and systematic attempt to shape perception, manipulate cognitions and direct behavior
Media campaigns	Situation in which a number of media are used to achieve a persuasive or informational purpose with a chosen population
Agenda setting	Process by which the relative attention given to news influences the rank order of public awareness
News diffusion	Spread of awareness of particular events through a given population over time
Diffusion of innovations	Process of take-up of technological innovations often on the basis of advertising
Distribution of knowledge	Consequences for the distribution of knowledge as between social groups (knowledge gaps)
Socialization	Contribution of mass media to the learning and adoption of norms, values and expectations of behavior
Social control	Systematic tendencies to promote conformity to an established order or a pattern of behavior
Event outcomes	Role of media in conjunction with institutional forces in the course of major events like elections, revolutions or political upheavals

The list is based on McQuail (2001), p. 425-427.

and opinion), those which are affective (relating to attitude and feelings) and those which influence behavior. It is out of the scope of my work to discuss the theories in detail. However, effects described by the most prominent approaches are documented in table 1-3. Even though this list is not exhaustive and empirical results are far from clear-cut, the theories shed light on the potential power that mass media may have and their importance for the national well-being far beyond monetary magnitudes. In economics, particularly the fifth entry in table 3-1 – the diffusion of innovations and the role of advertising – was considered in the past, for example by a seminal contribution from Dorfman and Steiner (1954). A comprehensive overview of the economic analysis of advertising is provided by Bagwell (2003).

Next, consider the role mass media play as units of economic activity. The major part of their turnover mass media derive from advertising. However, the terms of financing of media firms differ widely. Commercial free-to-air television and radio broadcasting stations are primarily financed by advertising but might derive further revenues from other commercial activities like merchandising and home shopping or from cable fees. Pay-TV and public service broadcasters also derive income from user payments. Press

products like newspapers or magazines gain income from advertisers and copy sales. On the Internet, most media content is provided for free because users are reluctant to pay subscription charges. Thus, providers have to finance their activities primarily by advertising.

Advertising expenditures grew in most developed countries at high rates in the past. In the US, the total advertising expenditures in 2003 amounted to 245.6 billion US Dollars representing a share of 2.26 per cent of the gross domestic product (GDP).[6] The lion's share was spent on advertising in broadcast TV and cable TV (24.8 per cent) and in newspapers (18.3 per cent) followed by radio (7.8 per cent) and magazines (4.7 per cent). In Japan, total advertising expenditures in 2004 had a level of 5,857 billion Yen and accounted for 1.16 per cent of GDP. The largest share was spent on TV with 34.9 per cent. In Germany, the money spent on advertising amounted to 20.6 billion Euros in 2004 accounting for .89 per cent of GDP. Newspapers obtained the largest share of this pie, namely 23.0 per cent, followed by television stations with 19.7 per cent.

1.2 Overview of Basic Literature

The economic analysis of media markets builds on a long history going back to early contributions as those made by Steiner (1952) for the case of radio broadcasting or by Corden (1953) for the case of newspapers. Steiner explored the problem of workable competition in the radio broadcasting industry by analyzing the extent to which market results succeed in conforming to consumer preferences. However, in his model broadcasters only seek to maximize their audience share and listeners do not care about the number of advertising interruptions. Both assumptions were relaxed in later studies. Corden aimed to clarify the factors, a profit maximizing newspaper firm has to take into account. He pointed out that the circulation is the link between the reader market and the advertising markets. In his static model, the demand of advertisers is determined by the corresponding price and the circulation. In contrast, the demand of readers depends on the price of the newspaper (that Corden fixed) and the quality of the printed matter measured by the associated costs. Corden noticed that basically the demand of readers could be dependent on the advertising volume as well. "Readers may buy a newspaper, not only for the editorial matter, but also for the advertising content" he wrote.[7] Accordingly, he sketched already the potential two-sided demand dependence between the reader and the advertising market of a newspaper.

A few years later, Reddaway (1963) laid out five idiosyncrasies of media markets for

[6] For details about these and the following figures in this paragraph see table 1A-5 in the appendix of this chapter.

[7] Corden (1953), p. 182.

the case of newspapers: (1) A newspaper proprietor is selling two different products to two different markets and the demand of advertisers is driven by the characteristics of the readership; (2) there is immense scope for variation of the product, but in general only one "model" is on sale on any one day; (3) the product is perishable and has to be designed anew each day; (4) the demand for copies is rather stable, whereas the demand for advertising is volatile; (5) economies of scale are important. Rosse (1967 and 1970) was the first to outline a full structural model of a newspaper firm comprising two demand functions for newspaper copies and advertising space as well as three first-order conditions representing the profit maximizing behavior of the firm. In his study, he found significant economies of scale for small newspaper firms in the US. Moreover, various contributions were made in the sixties in the field of television broadcasting when the Federal Communications Commission (FCC) considered to introduce pay-TV in the United States.

The authors mentioned above denoted many particularities of media markets that still form the groundwork for our analysis of such markets today. In particular, they recognized that, on the one hand, media products are sold to readers, viewers or listeners and, on the other hand, the attention of the audience is sold to advertisers. Advertising is piggy-backed to the information or entertainment content that interests consumers. Thus, any analysis of media markets has to deal with the question of whether consumers of mass media care about the volume of advertising inserted in the media products or not. If they care the demand dependence between the audience and the advertisers is two-sided. Moreover, if they care about advertising, do they like it or dislike it?[8]

The modern theory of two-sided markets has been pioneered and synthesized by contributions from Caillaud and Jullien (2001, 2003), Rochet and Tirole (2003) and Armstrong (2005a). The interest in the new approach has caused a wave of contributions in the field of media economics because media markets provide an appealing application. I will refer to these contributions in the relevant parts of the following chapters. Basically, the theory of two-sided markets deals with industries in which platforms aim to get two groups of customers on board and each group obtains value from interacting with users from the opposite side.

Wright (2003) listed 36 examples of two-sided markets ranging from well-known examples like credit card payment schemes, entertainment platforms or publishers, to more exotic cases like nightclubs and dating agencies that cater to men and women. Wright determined eight fallacies that can arise when the analysis of two-sided markets is based on conventional wisdom rather than the logic of two-sided markets. Most importantly, Wright pointed out that platforms use the structure of prices between the

[8] A theoretical analysis of the latter question is provided by Becker and Murphy (1993).

two sides of the market as a strategic instrument. According to his analysis, there is no obvious reason to expect competition to lead to a more efficient structure of prices than would be set by a monopoly platform. Note that these network effects represent effects between markets, i.e. they are denoted as inter-market network effects. In contrast, intra-market effects are known particularly from the diffusion of new technologies as fax machines or the Internet.[9]

1.3 Potential Market Imperfections

The two-sided nature of media markets represents the major factor that might distort market outcomes from what is regarded as welfare optimal. If the content of media products is consumed by readers, viewers or listeners but the products are financed not only by their payments but partially by advertising (or even entirely as in the case of free-to-air television), then there is no reason to believe that media firms deliver content that is in line with consumer preferences. Coase noted for the case of broadcasting: "It follows that the programs broadcast are those which maximize the profits to be derived from advertising. The market for broadcast programs is one from which the consumer is barred."[10] Hamilton raised the question: "When news outlets sell 'eyeballs' to advertisers the question becomes, what content can attract readers or viewers rather than what value will consumers place on content."[11] Thus, the willingness of advertisers to pay for contacting viewers within particular target groups determines the type and range of media products that is produced and delivered. Anderson and Gabszewicz state: "This is very different from a traditional market structure where the principle of consumer sovereignty governs the type and range of products offered. [...] in the commercial television context, [...] viewers 'vote' with their eyeballs for the programs they want to watch, and broadcasters need to deliver eyeballs to advertisers."[12] Such effects are of particular importance for those media products that rely heavily on advertising income. Thus, they are more likely to occur in markets of free-to-air television broadcasting but less likely in markets of pay-TV broadcasting or newspapers.

A further reason why the outcome of media markets is not necessarily optimal, is that media products share features of public goods. Firstly, for electronically distributed media content there is no rivalry in consumption. The reception of the signal by

[9] Intra-market network effects might also occur in media markets. For an application see George and Waldfogel (2003) and their study of "preference externalities" in US newspaper markets. They analyzed the case that, when newspaper readers share similar preferences, additional consumers will bring forth products that confer positive "preference externalities" on others.

[10] Coase (1966), p. 446.

[11] Hamilton (2003), p. 29.

[12] Anderson and Gabszewicz (2005), p. 3.

one consumer does not alter the value of the signal received by another consumer. In addition, typically the reception of free-to-air broadcasting cannot be restricted to a certain group of consumers and, thus, no direct pricing to consumers is available. This shortcoming has nowadays been overcome by the technological progress.[13] Nevertheless, most television and radio channels are still distributed without direct charges. Instead, viewers and listeners incur the annoyance from advertising interruptions.[14]

Moreover, the production of mass media products goes along with high fixed costs but small variable costs. Particularly electronic media face negligible costs for delivering media content to an additional individual. In the case of free-to-air broadcasting the costs are virtually zero. Due to this cost structure, the mass media are often denoted as a "blueprint industry." The major part of costs is sunk when the first copy is produced. The resulting decreasing average costs bring forth substantial economies of scale.

In the light of these potential market imperfections, it is not surprising that government interventions in media markets are observed all over the world.[15] Typically, such rules aim to maintain a variety of independent and viable firms supplying consumers with news and entertaining content and to hamper the development of large chain businesses and cross-ownership. Governments attempt to foreclose the concentration process in media markets driven by incentives for horizontal and vertical integration. Moreover, mass media products are often regarded as merit goods whose production and distribution is eyed by governments with a paternalistic attitude. Anderson and Gabszewicz comment on that as follows: "This stance derives from the fact that media constitute a powerful instrument of education whose nature and diversity considerably shape the collective values of society."[16] Consider the following examples of government interventions as an illustration:

- In the US common ownership of a full-service broadcast station and a daily newspaper is prohibited when the broadcast station's service contour encompasses the newspaper's city of publication.[17]

- In Germany the revenue threshold beyond which the competition guidelines apply if two businesses propose a merger is twenty times lower for newspaper firms than

[13] For a discussion see Armstrong (2005b).

[14] In addition, all consumers pay for advertising through the prices charged by firms in the general markets for goods and services. However, this effect could only be displayed by a general equilibrium model that is beyond the scope of the analysis at hand.

[15] For an overview see Motta and Polo (1997).

[16] Anderson and Gabszewicz (2005), p. 3.

[17] These rules about media-ownership in the US have been revised by the Federal Communications Commission (FCC) in 2003. However, the new rules have not been implemented yet because multiple parties appealed the FCC's decision in various federal appellate courts. For details go to http://www.fcc.gov.

for ordinary businesses.[18]

- In France radio stations are obliged to broadcast at least 40 per cent francophonic music (chansons d'expression française).[19]
- In Australia the broadcasting services act from 1992 prohibits foreign persons to control commercial television broadcasting licences. In addition, two or more foreign persons must not have company interests in a commercial television broadcasting licensee that exceed 20 per cent.[20]
- In the United Kingdom the public service broadcaster BBC received licence fee transfers of 2.9 billion British Pounds for the year 2004/2005, 142 millions more than in the period before.[21]

Summing up, media markets contribute key factors affecting the well-being of modern societies. Thus, the economic analysis of markets of mass media embodies an important task and is likely to gain further relevance in the years to come. Media firms act in a rich and complex market environment. Basically, three groups of agents interact: Consumers, advertisers and the providers of the media products. In addition, the two-sided nature of markets has to be taken into account. The outcome of the agents' activities is likely to be distorted even in the case of competition. Not surprisingly, policy interventions are a common feature of media markets. However, despite of a long history of the analysis of media markets, numerous open questions remain.

My analysis proceeds as follows: In chapter two, I present the study about the economic consequences of public funding of broadcasting in Europe. The third chapter shows the model exploring the effects of two-sided demand dependencies on local quality newspapers, given that newspapers contain more than one category of advertising. In chapter four, I present the results of the empirical analysis exploring the question of whether reader market monopolies of regional newspapers result in markups on prices charged in the associated advertising markets. In chapter five, I conclude with remarks about the implications of the technological progress for the analysis of media markets and discuss fruitful areas for further research.

[18] See: Gesetz gegen Wettbewerbsbeschränkungen § 38 (3), available at http://bundesrecht.juris.de.

[19] The rule is controlled by the Conseil Supérieur de l'Audiovisuel (CSA). Details are available at http://www.csa.fr.

[20] See: Broadcasting Services Act 1992 - SECT 57, available from the database of Commonwealth of Australia Consolidated Acts at http://www.austlii.edu.au/au/legis/cth/consol_act/.

[21] See: BBC Annual Report and Accounts 2004/2005, available at http://www.bbcgovernors.co.uk.

1.A Appendix

Table 1A-1: Daily Time Usage in Australia 1997

	Men	Women
Recreation and leisure	283	254
Audio/ visual media	*143*	*118*
Reading	*24*	*26*
Sports and outdoor activities	*33*	*20*
Social life	*42*	*47*
Domestic activities	148	279
Employment and education	285	160
Personal care	658	671

Data in minutes per day. Domestic work includes child care and consumer purchases. Each category includes the associated travel. Source: Australian Bureau of Statistics, How Australians Use Their Time, available at http://www.abs.gov.au.

Table 1A-2: Daily Time Usage in France, Germany and the UK 2003

	France		Germany		United Kingdom	
	Men	Women	Men	Women	Men	Women
Free time	286	248	353	324	330	305
Personal care	706	717	645	662	622	643
Domestic work	142	270	141	251	138	222
Gainful work and study	243	151	215	125	258	192
Travel	63	54	87	78	90	83

Data in minutes per day. Free time includes unspecified time. Source: How Europeans spend their time. Everyday life of women and men. Pocketbook published by the European Commission.

Table 1A-3: Daily Time Usage in Japan 2001

	Men	Women
Recreation and leisure	170	153
Rest and Relaxation	*79*	*81*
Hobbies and Amusements	*50*	*35*
Sports and outdoor activities	*16*	*10*
Social life	*25*	*27*
Domestic activities	31	214
Employment and education	353	197
Personal care	628	642
Travel	73	55

Data in minutes per day. Employment and education include work, schoolwork and studies/researches. Domestic work includes housework, caring/nursing, child care and consumer purchases. Travel includes commuting to work and school. Source: Statistics Bureau of Japan, 2001 Survey on Time Use and Leisure Activities, available at http://www.stat.go.jp.

Table 1A-4: Daily Time Usage in the US 2003

	Men	Women
Recreation and leisure	329	306
Socializing, relaxing and leisure	*288*	*272*
Religious/ spiritual activities	*7*	*10*
Sports, exercise and recreation	*26*	*16*
Volunteer and social activities	*8*	*8*
Household activities	132	228
Employment and education	275	188
Personal care	704	725
Travel	80	74

Data in minutes per day. Household activities include caring for household/non-household members, consumer purchases, professional and personal care services and household services. Source: Hamermesh (2005), p.224.

Table 1A-5: Annual Advertising Expenditures

	Germany	Japan	United States
Total ad expenditures	19.6bn Euros	5,857bn Yen	245.6bn USD
GDP	2,178.2bn Euros	504,589bn Yen	10,828.3bn USD
Total ad expenditures as share of GDP	.89%	1.16%	2.26%
Share of television	19.7%	34.9%	24.8%
Share of newspapers	23.0%	18.0%	18.3%
Share of magazines	8.7%	6.8%	4.7%
Share of radio	3.2%	3.1%	7.8%

Data for Germany and Japan from 2004 and for the US from 2003. Sources for Germany: Zentralverband der Deutschen Werbewirtschaft, Basisdaten Werbebranche, available at http.//www.zaw.de, and Statistisches Bundesamt Deutschland, available at http.//www.destatis.de. Source for Japan: Dentsu Announces 2004 Advertising Expenditures in Japan, press release by Dentsu Inc., available at http.//www.dentsu.com. Sources for the US: Newspaper Association of America, Facts about Newspapers 2004, available at http.//www.naa.org, and U.S. Government Printing Office, available at http.//www.gpoaccess.gov.

Chapter 2

Economic Distortions Caused by Public Funding of Broadcasting in Europe

2.1 Introduction

In most member states of the European Union commercial television broadcasters and public service broadcasters (PSB) coexist.[1] The commercial stations derive their income basically from advertising. In contrast, most PSB in the EU are financed by a mixture of advertising income and public funds.[2] Nevertheless, the commercial stations and the PSB compete in the same viewer and advertising markets. For a long time, commercial broadcasters in the EU claim that publicly funded broadcasters that collect advertising in addition to state aid distort markets in excess of what is acceptable to the public interest.[3]

Until now, contributions from economics have neither explored the consequences caused by the coexistence of publicly funded and commercially funded broadcasters nor determined how to avoid distortion of competition in the markets. In addition, it is still unclear how public funding of broadcasting affects the welfare of viewers and advertisers.

[1] The analysis relates to the situation before the accession of ten new member states to the EU on May 1st, 2004. Note that the abbreviation "PSB" in the following sections denotes the singular as well as the plural of the term "public service broadcaster."

[2] This scheme of financing is denoted as "mixed-funding." Note that some PSB are purely fee financed as the BBC in Great Britain or TVDanmark in Denmark. In contrast, the British PSB Channel4 is financed by commercial income only. See section 2.2 for further details.

[3] See: Safeguarding the Future of the European Audiovisual Market. A Whitepaper on the Financing and Regulation of Publicly Funded Broadcasters. Published by the Association of Commercial Television in Europe (ACT), the Association Européenne des Radios (AER) and the European Publishers Council (EPC), March 2004, p. 4.

Anderson and Gabszewicz stated in their recent survey article: "One thorny problem for future research concerns the appropriate modeling of the behavior and objectives of a Public Broadcaster."[4] In this chapter, a duopoly model is presented in which a commercial broadcaster competes with a public service broadcaster that receives state funds in addition to its advertising revenue. I show that compared to a scenario of two commercial stations, the public service broadcaster attracts viewers from its rival by lowering the level of advertising in its programming. The welfare implications of public service broadcasting with respect to viewers and advertisers are complex and ambiguous. Nevertheless, I am able to determine conditions that ensure that public funding of broadcasting improves welfare.

Nowadays the economics of television are embedded into the theory of two-sided markets and inter-market network effects that I charted in the preface of this thesis. The interdependence between the television audience and the advertising market was recognized rather early and often described. Vaglio, for example, stated it this way: "Broadcasting firms then face a trade-off. Either they capture large audiences by keeping the advertising rate low or they stuff programs with advertising interruptions, thereby losing audience."[5] Thus, in television economics advertising is typically regarded as nuisance to viewers.

I explore the literature related to my work in this chapter in two steps: In the first place, I present the work concerned with the provision of broadcasting that is commercially financed either by advertising, subscription fees or both. In the second place, I document the literature that focuses on public service broadcasting.[6]

Since the middle of the 20th century a rich literature has developed addressing the issues of programming diversity, financing of activities and competition in broadcasting markets. In the fifties and sixties the financing of television in the US and the associated policy by the Federal Communications Commission (FCC) attracted a lot of attention. In those days the FCC considered whether to allow pay-TV operators to enter the market by restricting the reception of TV signals to subscribers by the use of unscramblers. Samuelson (1958) argued that the use of unscramblers would not transform television broadcasting from a public good to a true-blue private good. He noted that television broadcasting is, by its nature, a case of decreasing costs. He stated that the marginal cost of one extra family tuning in to the program is literally zero and, thus, the principle of

[4] Anderson and Gabszewicz (2005), p. 41. There are some studies investigating questions of public service broadcasting. However, with one exception (Barrowclough (2001)), these analyses employed a verbal and non-formal approach. The studies will be presented below.

[5] Vaglio (1995), p. 34/35.

[6] Note that I present only theoretical contributions. In contrast to the economics of newspapers, empirical studies are rather rare for the cases of television and radio broadcasting. Noteworthy exceptions are Hillve, Majanen and Rosengren (1997), Ekelund, Ford and Jackson (1999), Berry and Waldfogel (1999a and 1999b) and Goettler and Shachar (2001).

marginal cost pricing does not apply to television. This view was criticized by Minasian (1964) who claimed that a comparison between free-to-air-TV and pay-TV has economic meaning only if both systems produced the same quantity and quality of broadcasting. He indicated that the value of programs is determined by the productivity of advertisements. Coase (1966) stated in a remarkable essay about the optimal public policy in the field of broadcasting in keen and furious words that neither the broadcasting industry itself nor the Federal Communications Commission would be able to perform "the task of charting a sensible future for the broadcasting industry."[7]

Spence and Owen (1977) further investigated into this question by comparing the market outcomes of advertising-supported broadcasting and pay-TV with both a limited number of channels and with an unlimited number. The authors demonstrated that any of these private market systems resulted in a bias against certain types of programs. Programs that were likely to be omitted were minority taste programs and programs that were expensive to produce. "The cause of this bias is the failure of prices, as marginal signals, to reflect fully the average intensity of preferences for certain programs," the authors noted.[8] Beebe (1977) argued that for advertising-supported broadcasting an expansion of channels was a necessary condition for viewers' attainment of preferred choices. His views challenged the earlier findings of Steiner (1952).

Masson, Mudambi and Reynolds (1990) provided the first formal model that explicitly linked the advertising time in broadcasts as having value to advertisers and having disutility for viewers. They assumed that the advertising density negatively affects the demand for broadcasts and that, if some audience goes to rivals, this may alter significantly the results of competition. They noted: "This is because lost audiences are not lost consumers, but 'factors of production' in the market for selling audiences to advertisers."[9] Wright (1994) explored the effects of advertising caps on viewer welfare and programming quality by using a first-order approach. With his symmetric duopoly setup he showed that the caps can reduce programming quality and that the effect on viewer welfare is ambiguous. Vaglio (1995) set up a model in which broadcasters choose the quality of the broadcast and its type as well as the level of advertising. He pointed out that the decision concerning advertising rates made by broadcasting firms resembles price-making decisions. He concluded: "The relationship between advertising rates and other program characteristics can be modeled in the same way as the relationship between price and other relevant characteristics in models with differentiated products."[10]

In more recent studies a canonical setup has emerged to model television broadcasting

[7] Coase (1966), p. 446.
[8] Spence and Owen (1977), p. 122.
[9] Masson, Mudambi and Reynolds (1990), p. 3.
[10] Vaglio (1995), p. 51.

markets within the framework of the theory of two-sided markets. For my own work the studies by Anderson and Coate (2005), Gabszewicz, Laussel and Sonnac (2004) and Gal-Or and Dukes (2003) are most relevant. These papers share a number of theoretical underpinnings: Advertising is modeled as nuisance to viewers; broadcasters compete over Hotelling-style viewer preferences; broadcasters sell the advertising spots in their channels as monopolists; competition for viewers takes place in a duopoly setting between two symmetric commercial broadcasters; variable costs are assumed to be zero.[11]

Anderson and Coate were mainly concerned with the optimal provision of advertising and the nature of market failure in the industry. In their approach viewers face a discrete choice of either watching one station or the other station or of not watching at all. The authors found that advertising can either be undersupplied or oversupplied and that there is no clear-cut rule for regulating advertising levels. Note that they allowed the advertising levels to affect the viewer utility as well as the advertising prices. In addition, they explicitly incorporated the social cost of advertising in their welfare analysis. Gabszewicz, Laussel and Sonnac showed that advertising ceilings reduce programming differentiation. In contrast to Anderson and Coate, they allowed viewers to make up a personal mixture of the two stations' programming. Moreover, they introduced an explicit advertising demand function. Gal-Or and Dukes also allowed viewers to watch a mixture of both stations. In addition, they endogenized the location choice of the broadcasters on the Hotelling interval. They assessed the incentives of commercial media firms to reduce programming differentiation and the incentives for media mergers. A shared feature of the models is that the viewing demand depends exclusively on the advertising levels of the channels but not on the programming quality. An alternative setup is provided by Nilsson and Sørgard (2001). In their model TV channels can invest in programming to attract additional viewers.

Next, I document the literature that primarily deals with questions of public service broadcasting. Note that this strand of literature is considerably smaller than the one about the commercial provision of broadcasting. Berry and Waldfogel (1999b) considered the potential underprovision of broadcasting and whether public service broadcasting actually corrects a market failure. Underprovision of broadcasting is possible because - as mentioned earlier - broadcasters of over-the-air channels can capture only part of the actual value of their products as revenue. The authors addressed the questions whether public and commercial radio stations in the US compete for listeners and revenue as well as whether public stations crowd out commercial ones. The authors found empirical

[11] Note that recently the economics of media markets and particularly the economics of television have attracted a lot of attention and - primarily based on the setup sketched above - a considerable number of working papers and articles has been published after 2000. Thus, the overview provided in the following paragraphs is certainly not exhaustive.

evidence from 165 major US markets that public broadcasting crowded out commercial programming in large markets, particularly in markets for classical music and, to a lesser extent, in markets for jazz music.

Barrowclough (2001) investigated into spill-over effects that a public broadcaster can have upon commercial broadcasters. Her work shares many features with the studies mentioned above: Advertising in the programming is modeled as an annoyance to viewers; viewers regard the broadcasts as differentiated products with two dimensions: the programming distinctiveness and the level of advertising; viewer tastes are uniformly distributed; broadcasters compete for viewers by altering the levels of advertising; viewers make a discrete choice and are restricted to choosing one channel. The author considered scenarios with different levels of product differentiation between the broadcasters. She showed that if constraining total television advertising is the social planner's priority, it is best if the public broadcaster has programs that are identical to those of commercial broadcasters but without advertising. In contrast, if distinctiveness is the planner's priority, then this brings with it higher levels of advertising on the commercial channels. Barrowclough applied in her analysis a first-order approach and used numerical examples without examining the existence of equilibria. In addition, she did not consider at all that public service broadcasters receive license fee transfers in addition to their advertising income.

In a recent non-formal contribution, Armstrong (2005b) discussed the traditional rationales for public intervention in broadcasting markets. Most importantly, he argued that the technological progress makes broadcasting markets less prone to market failures. The expansion of the number of available channels overcomes the limited capacity that was typical for analogue transmission technologies, particularly for the case of over-the-air transmission. In addition, the opportunity of broadcasters to charge viewers directly by pay-TV, levels off the problem that broadcasters do not show those programs that maximize viewer utility but those that draw the largest audience.[12]

In this chapter of my thesis, I extend the canonical duopoly setup from above to the case of public service broadcasting. My analysis is the first formal treatment in which a TV station receives state funds in addition to its advertising revenue. In my model the amount of public transfers received by the PSB depends, firstly, on the level of the license fee that is levied on the viewers and, secondly, on the success of the public service broadcaster in the viewer market. Under such circumstances the symmetric equilibrium from the canonical setup is substituted by an asymmetric one. My following welfare analysis is inspired by the work of Anderson and Coate. I can show that the benefits of viewers may increase or decrease if one station receives public funds compared to the

[12] Additional non-formal treatments dealing with the case of public service broadcasting are Gambaro (2004) and Hargreaves Heap (2005).

case that both stations are financed by advertising. The direction of the change depends on the relation of the level of the license fee to the nuisance cost of advertising and the substitutability of the channels. The rent of the advertising firms is unambiguously reduced due to a cutback in the number of advertising spots that is sold by the TV channels. Frictions from the license fee transfer mechanism lead to an additional reduction of welfare.

The chapter proceeds as follows: Section 2.2 presents an overview of empirical findings from the television markets in the European Union. The canonical setup based on the work of Anderson and Coate is outlined in section 2.3. In section 2.4, the new model of public service broadcasting is introduced and the asymmetric equilibrium is derived. The welfare implications of the new equilibrium are analyzed in section 2.5. In section 2.6, extensions and applications of the model are derived. The conclusion in section 2.7 provides policy recommendations with respect to the situation of the television markets in the European Union.

2.2 European TV Broadcasting Markets

In the European Union public service broadcasting still plays an important role. In 2002, public service broadcasting on average attained a daily audience market share of 41 per cent.[13] The market share was the lowest in Greece with 11 per cent and the highest in Denmark with 70 per cent. In the large member states Germany, France, Great Britain and Italy the average market share of public service broadcasting reached between 45 and 48 per cent.[14]

The terms of financing of public service broadcasting in the EU are highly heterogenous. Viewers in Greece, Spain, Portugal, the Netherlands and the Flemish part of Belgium pay no license fees for broadcasting.[15] In Greece, there is a markup charge on the price for electricity to finance public broadcasting activities. In the four other cases, public service television is financed by direct transfers from the state's general budget.[16] In all other member states (besides Luxembourg) some form of license fee transfers exists for television. But the annual amount of the fees varies significantly: In the year 2000, average annual license fees per capita were highest in Denmark (79 €), Germany (74 €) and Sweden (71 €). In contrast, average fees were low in Ireland (22 €), Italy (23 €)

[13] This number represents an unweighted average across all EU member states not controlling for each country's audience size.

[14] Source: Yearbook of the European Audiovisual Observatory 2003, Vol. 2, table 8.2, p. 60.

[15] License fees are here understood as a charge levied by the government on viewers or households for the ownership of TV sets and typically paid per month or per year.

[16] For these facts and the following figures see: The Financial Situation of Public Radio-Television Companies in Europe is Deteriorating. Press release by the European Audiovisual Observatory, April 9, 2002.

and the Walloon part of Belgium (35 €).[17] Overall, the share of commercial income in the public service broadcasters' budget rose from 28 per cent in 1995 to 32 per cent in 2000. During the same period the share of public funds in the budgets decreased from 69 per cent to 66 per cent. Accordingly, public service broadcasters in Europe became increasingly financed by advertising income.

The rules about advertising for public service broadcasters differ significantly in the EU member states. In Great Britain, the BBC must not broadcast any advertising. In Germany, ARD and ZDF are allowed to show advertising but less than their commercial rivals. In Denmark, one of the two public service broadcasters, TV2, is allowed to deliver the same amount of advertising as its commercial competitor TVDanmark2.

The differences in the financing schemes of public service broadcasting and in the advertising rules lead to a highly heterogeneous environment of broadcasting in Europe. Commercial stations face a different competitive structure in each EU member state.[18] However, the regulatory role of the EU Commission is limited. An amendment to the EC Treaty, the so called "Amsterdam Protocol," assigns discretion over the terms of financing of public service broadcasting to the member states. The Commission's department for competition is only concerned with fundamental errors in the definition and entrustment of public service broadcasting as a service of general economic interest. In addition, the Commission checks whether a PSB has been overcompensated for its extra cost from the public service obligations and if trade among member states has been affected thereby.[19]

In line with its communication on the application of state aid rules to public service broadcasting, the Commission carried out state aid decisions on RAI in Italy, on France 2 and 3 as well as on RTP in Portugal.[20] In a remarkable case of the year 2004, the Commission ordered the mixed-funded Danish public service broadcaster TV2 to reimburse 84.4 million Euros of overcompensation to the Danish state. The Commission found that this amount of public financing was not proportionate to the net cost of providing the public service and ruled it as illegal state aid.[21]

[17] These figures were calculated including both TV and radio broadcasting.

[18] A non-formal analysis of pluralism and media concentration in Europe is provided by Kaitatzi-Whitlock (1996).

[19] See Depypere, Broche and Tigchelaar (2004) for an article dealing with state aid and broadcasting from the EU Commission's point of view.

[20] See: Communication on the Application of State Aid Rules to Public Service Broadcasting. European Commission Official Journal C320, November 15, 2001, 5-11.

[21] See: Commission Orders Danish Public Broadcaster TV2 to Pay Back Compensation for Public Service Task. Press release by the EU Commission, May 19, 2004, IP/04/666.

2.3 Canonical Setup

In this section, a canonical setup of television markets is introduced that has recently been brought forth within the theory of two-sided markets. My presentation of the setup builds on a symmetric duopoly model of commercial broadcasters used by Anderson and Coate (2005) and Armstrong (2005a). Based on this setup, a new model is developed in section 2.4 that deals with the case of public funded broadcasting.

In the model of Anderson and Coate, two symmetric commercial stations compete for viewers. Both broadcasters are commercial firms and solely financed by advertising. The broadcast companies render the advertisements palatable by bundling them with programs that are the viewers' ultimate objective. The viewing demand is modeled by using a classical setup of spatial competition following Hotelling (1929). Accordingly, there is a mass of N viewers whose preferences for broadcasting are uniformly distributed over a line segment of length one. The two broadcasters, indexed by i, $i = A, B$, are located at the ends of the interval, i.e. at the "addresses" zero and one. The model abstracts from an endogenous choice of the locations and from market entry by new broadcasters.

2.3.1 Viewing Demand

A viewer's preference for broadcasting is represented by his position on the unit interval and indexed by $\lambda \in [0, 1]$, the distance from the left end of the segment. Viewers have unit demand, facing a discrete choice between either watching channel A or channel B. They choose their preferred station in a one-period context, so that each viewer consumes only one channel. TV consumption provides them with a positive gross utility of β.

The channels can carry advertising, measured by the number of producers that decides to advertise on channel i, denoted as a_i. It is assumed that TV viewers feel annoyed by advertising messages inserted in the broadcast.[22] This disutility for viewers is measured by the term γa_i. In addition, viewers face disutility from not watching their

[22] Mittal (1994) reported from a survey that 48% (of 300 interviewees from a consumer panel) either strongly or somewhat disliked TV advertising overall. Only 23% liked it either somewhat or strongly. 61% of the interviewees said that newspaper advertising is less annoying than TV advertising. (For a more general treatment of how advertising works see Vakratsas and Ambler (1999)). In a more recent survey in Germany, 83.1% of the respondees said that there is too much advertising in television. In contrast, 27.1% replied that there is too much advertising in radio and only 19.5% think so about newspapers (see: TV-Spots nerven am meisten. In: Horizont 27, 2001). A logic argument why TV advertising bothers viewers is the following: Free-to-air television is provided to viewers without direct charges. Viewers may face some fixed costs for installing a TV set but the reception itself is for free. The viewers "pay" by their attention to advertising. No money is exchanged, but eyeballs are. It seems that TV broadcasting in particular subsidizes viewers with content for watching advertising. If viewers liked advertising, TV station could charge them for attending broadcasting programs stuffed with advertising.

perfectly preferred programming. This effect resembles the well-known transportation cost in the classic Hotelling setup. The cost of this preference mismatch is τ. The parameter describes the substitutability in consumption between the two stations, A and B.

In the absence of any license fee payments, a viewer of type λ gains utility from watching channel A of

$$u_A(\lambda, a_A) = \beta - \gamma a_A - \tau\lambda$$

and from watching channel B of

$$u_B(\lambda, a_B) = \beta - \gamma a_B - \tau(1 - \lambda)$$

The point at which a type-λ viewer is indifferent between the two channels, $\widehat{\lambda}$, is the point where

$$\widehat{\lambda} = \frac{1}{2} + \frac{\gamma(a_B - a_A)}{2\tau} \tag{2.1}$$

To induce the type-λ viewer in the symmetric setup to watch TV at all, the condition $\beta - \frac{\tau}{2} \geq \gamma a$ must hold. For an interior solution of $\widehat{\lambda}$ the advertising levels have to fall within the interval $a_i \in \left[a_i - \frac{\tau}{\gamma}, a_i + \frac{\tau}{\gamma}\right]$.

Accordingly, the viewing demand functions for the broadcasters are

$$V_A(a_A, a_B) = N\left[\frac{1}{2} + \frac{\gamma(a_B - a_A)}{2\tau}\right] \tag{2.2}$$

and

$$V_B(a_A, a_B) = N\left[\frac{1}{2} - \frac{\gamma(a_B - a_A)}{2\tau}\right] \tag{2.3}$$

where V_i denotes the number of viewers of station i.

The functions 2.2 and 2.3 are linear in a_i with $\frac{\partial V_i}{a_i} = -\frac{N\gamma}{2\tau} < 0$. Accordingly, the partial derivative of a station's viewer demand function with respect to its volume of advertising is negative and independent of a_i. In addition, there is a cross-effect with $\frac{\partial V_i}{a_j} = \frac{N\gamma}{2\tau}$ for $i \neq j$. Note that in my stylized model, viewers derive no net benefits from purchasing the goods and services that are sold by advertising.[23]

2.3.2 Advertising Demand

Producers insert advertising messages into the broadcasters' programming in order to enhance the sales of their goods and services. The producers are ranked over an interval

[23] Basically, these benefits would reduce the nuisance that viewers incur from watching advertisements in the station's programming (and could even lead to a gain of viewers in the case of informative advertising).

according to an exogenous type denoted as σ. The type represents the willingness to pay for advertising per viewer, e.g. the net value of the good or service that the firm delivers. Thus, advertisers are ranked by a scale of high to low profits from contacting a viewer. The quantity of fixed-length advertisements that a producer can purchase from a channel is normalized to one.

The distribution of types is denoted as F and depends on the total number of advertising messages that a stations broadcasts. I assume that if $a_A < a_B$ then the distribution $F_A(\sigma)$, representing the willingness to pay per viewer if $a = a_A$, first-order stochastically dominates the distribution $F_B(\sigma)$, representing the willingness to pay if $a = a_B$ for any σ, i.e. $F_A(\sigma) \leq F_B(\sigma)$. In addition, let $F(\cdot)$ be an increasing and continuously differentiable function with a concave density. The producers' willingness to pay is limited by the highest type in the distribution, denoted as $\overline{\sigma}$.

Given the assumptions about $F(\cdot)$, the inverse per-viewer demand function for advertising on channel i, denoted as $p(a_i)$, is decreasing in a_i. Let this function be twice differentiable with $\frac{\partial p(a_i)}{\partial a_i} < 0$ and $\frac{\partial^2 p(a_i)}{\partial a_i^2} \leq 0$. Given a_i, some fraction of producers finds it profitable to place an advertisement on channel i. The total mass of producers is denoted as M and sufficiently large such that the demand schedule is approximately continuous. Producers can buy advertising airtime from one station or both stations or they can decide not to buy any airtime at all.

The inverse per-viewer advertising demand function $p(a_i)$ is concave because the efficiency of advertising decreases with the quantity of advertising that is seen by an individual. Producers dislike being one among many advertisers in a station's programming. They prefer a unique positioning that generates higher attention of the viewers and promotes sales in a more valuable way.[24] Put differently, for advertisers broadcasting is an excludable public good with congestion. This effect should not be confused with the annoyance caused by advertising for viewers or the preference of the advertisers to reach as many viewers as possible.

According to the preceding paragraph, each viewer is of equal value to an advertiser.[25] There are no diminishing returns since for an advertiser all viewers within a target group are equally likely to purchase a good or service. If an advertiser wants to contact viewers in the group aged 14-29, all viewers within this target group are of equal value. Here it is simply assumed that the target group is the entire population N.

[24] An empirical analysis of the effectiveness of television advertising is provided by Shachar and Anand (1998).

[25] The demand for advertising on channel i is not directly dependent on the number of viewers of channel i but on the price per viewer that the station charges. The price per viewer is decreasing in the total number of viewers. This assumption resembles the code of practice in TV advertising markets. The producers' decisions to buy airtime is typically dependent on the so-called "costs per rating point" (CPP) of a station. A CPP represents the cost to reach one percent of the population or a specific target group via channel i with an advertising message.

In my stylized approach, viewers and advertisers are not interrelated explicitly by purchases of the goods and services that are advertised. In contrast, Anderson and Coate provide a more sophisticated model of advertising demand that results in an equivalent demand schedule. In their setup, monopoly producers of new goods buy advertising slots in order to inform viewers about the price of their good. The producers extract all rents of trade from the viewers by skimming their willingness to pay entirely. Accordingly, viewers derive no informational benefits from watching television advertising. In addition, each consumer's willingness to pay for any particular good is independent of the information received about any other good. These restrictions matter for the welfare analysis in that the inverse demand function measures correctly the marginal social benefits of advertising. Anderson and Coate discuss the implications of the restrictions in their paper.

2.3.3 Symmetric Equilibrium

In this section, the symmetric equilibrium is presented that arises in the canonical setup between the two broadcasters in the absence of any public transfers. The two broadcasters choose the advertising quantities in their programming.[26] The revenues from advertising increase proportionally to the number of viewers. The broadcasters' per-viewer revenue curve is $R(a) = p(a) \cdot a$. According to the specification of the advertising demand in 2.3.2, the distribution of the producers is such that $R(a)$ is concave with $R'(a) < \frac{R(a)}{a}$ and $R''(a) \leq 0$ for $a > 0$. In addition, $R'(a)$ is decreasing when positive. Note that the inverted comma denotes a partial derivative, i.e. $R'(a) = \frac{\partial R(a)}{\partial a}$.

The broadcasters objective functions are

$$\pi_A(a_A, a_B) = R(a_A) \cdot V_A(a_A, a_B) \tag{2.4}$$

and

$$\pi_B(a_A, a_B) = R(a_B) \cdot V_B(a_A, a_B) \tag{2.5}$$

Thus, the broadcasters maximize profits by choosing the appropriate advertising level. A firm's profits are composed of its per-viewer advertising revenue, $R(a_i)$, multiplied by its number of viewers, V_i. Variable and fixed costs are assumed to be zero. Put differently, all costs are assumed to be sunk. This assumption is a reasonable approximation for the case of broadcasting where the first-copy-costs and the fixed costs of running a network are particularly high. Furthermore, the variable cost of reaching another viewer or selling

[26] Accordingly, non-advertising content simply accounts for the remaining time. A model that explicitly determines the level of non-advertising broadcasting produced and consumed is provided by Cunningham and Alexander (2004).

another advertising slot are negligible.

The first-order condition (FOC) of firm A's objective function (2.4) with respect to its advertising volume a_A (assuming that $a_A > 0$) is

$$\frac{\partial \pi_A (a_A, a_B)}{\partial a_A} = R' (a_A) \cdot V_A (a_A, a_B) + R (a_A) \cdot V_A' (a_A, a_B)$$

Setting the condition equal to zero and using $V_A' (a_A, a_B) = -\frac{N\gamma}{2\tau}$ from (2.2) results in

$$R' (a_A) \cdot V_A (a_A, a_B) = \frac{N\gamma}{2\tau} \cdot R (a_A) \tag{2.6}$$

For firm B an equivalent condition can be derived.

Basically, the optimality conditions feature two opposite effects. The first effect in (2.6), $R' (a_A) V_A (a_A, a_B)$, is known from models of monopolistic competition. Note that the stations control a monopolistic bottleneck with respect to advertisers who wish to contact their viewers.[27] Accordingly, the first effect can be regarded as marginal revenue of the firm when changing the advertising volume. The second term in (2.6), $\frac{\gamma N}{2\tau} R(a_A)$, represents the change in profits due to the change in the station's number of viewers. This term can be regarded as the marginal cost of a change of the advertising level. Note that it depends positively on the advertising revenue.[28] The problem's second-order condition and a check for uniqueness of the equilibrium are provided in the appendix in section 2.A.1.

Given that the viewer preferences are distributed uniformly and the firms are identical, the outcome of the game is symmetric. In equilibrium, both broadcasters set identical advertising rates and share the viewer market by half. If all individuals watch TV, the number of viewers of each station is equal to $\frac{N}{2}$. Thus, competition results in identical profits for the two firms. The equilibrium level of a_i is denoted by $\widehat{a}$.

Using these insights condition (2.6) can be rewritten for both broadcasters as

$$R' (\widehat{a}) = \frac{\gamma}{\tau} R (\widehat{a}) \tag{2.7}$$

Applying the definition of the per-viewer advertising revenue $R(\widehat{a})$, the condition can

[27] The bottleneck results from the static nature of the model. Viewers do not switch between the stations. Thus, in this model they "single-home." An advertiser can contact a certain viewer only by one or the other station. Anderson and Coate denote this kind of competition "degenerated." In a robustness check of their model they demonstrate how the analysis can be extended to a dynamic two-period framework in which viewers can switch between the stations. However, they are unable to specify a full equilibrium of the approach. Another interesting contribution has been made by Reisinger (2004) who allows the platforms to compete for advertisers.

[28] Schmidtke (2005) calls this kind of externality in two-sided markets "participation externality" and notes that it is caused by a reaction in the viewer market. He develops a model that also incorporates a "pecuniary externality" that is caused by a reaction in the advertising market.

be further transformed to[29]

$$\widehat{a} = \frac{\tau}{\gamma}\left(1 - \frac{1}{\varepsilon_a}\right)$$

where $\varepsilon_a = -\left[\frac{\partial p(\widehat{a})}{\partial \widehat{a}}\right]^{-1} \frac{p(\widehat{a})}{\widehat{a}}$ is the price elasticity of advertising demand. Note that ε_a must be greater than one for $\widehat{a} > 0$, implying that the broadcasters choose the equilibrium advertising level such that the corresponding demand is elastic. The broadcasters' equilibrium choice of the advertising level is increasing in the channels' substitutability (τ) and decreasing in the nuisance cost of advertising (γ). The total amount of advertising slots sold by the stations is $2\widehat{a}$. The broadcasters ask the market clearing price for $\widehat{a}$ because marginal costs are zero and, therefore, the marginal revenue is always positive at $\widehat{a}$.

Recall that the per-viewer revenue function $R(a)$ is concave. The function has its global maximum at $R'(a) = 0$. This condition is fulfilled in the case of a monopoly with full viewing coverage. For future reference, denote the level of a that maximizes $R(a)$ under such circumstances by $\widetilde{a}$. Note that for all cases where externalities are present, the advertising level will be lower than $\widetilde{a}$. This implies that for all such cases $R'(a) > 0$.

2.4 Model of Public Service Broadcasting

In the following section, I develop a novel approach of public service broadcasting based on the setup above. Basically, I assume that one of the two stations receives public funds in addition to its advertising income. Then I compare the emerging equilibrium with the symmetric results from above. Note that in this study I do neither discuss the rationales for public service broadcasting nor do I consider effects of public transfers on the investments in programming. My approach focuses on the financial consequences of the coexistence of the two types of broadcasters and investigates the welfare implication brought forth by changes of the stations' advertising levels.

2.4.1 Collection and Transfer of License Fees

Assume that the station at position zero, station A, is a public service broadcaster (PSB) that is financed by both public funds and advertising income. Such a mixed financing scheme for public service broadcasting is common in many EU member states (see section 2.2). For this purpose, the government installs a system of license fee transfers. Each viewer has to pay an amount f regardless of whether he actually watches the PSB or not. The license fees are collected by an independent authority and then partially forwarded to the PSB dependent on its number of viewers. Before a more detailed description and

[29] See section 2.A.2 in the appendix for the associated proof.

reasoning for this setup is provided, I present the modified form of the viewers' utility and of the broadcasters' objective functions.

A viewer of type λ gains utility from watching the public service broadcaster, station A, of

$$u_A(\lambda, a_A) = \beta - \gamma a_A - \tau\lambda - f$$

and from watching the commercial station, channel B, of

$$u_B(\lambda, a_B) = \beta - \gamma a_B - \tau(1-\lambda) - f$$

The license fee f has no direct impact on the location of the marginal viewer. As in the canonical setup, viewers for whom $\lambda \leq \frac{1}{2} + \frac{\gamma}{2\tau}(a_B - a_A)$ watch channel A, and the remainder watches channel B, i.e. the viewing demand functions are both unaltered compared to (2.2) and (2.3). Note that I maintain the assumption that everybody watches TV in order to obtain continuous demand schedules.

The PSB's modified objective function is

$$\pi_A(a_A, a_B) = R(a_A) \cdot V_A(a_A, a_B) + V_A(a_A, a_B) \cdot \theta f \tag{2.8}$$

The PSB's revenue now depends on advertising income and license fees.[30] In (2.8) the parameter $\theta \in [0, 1]$ captures the efficiency loss caused by collecting and transferring the license fees. The commercial station's objective function is unchanged compared to the case of symmetric broadcasters.

In this setup, the amount of fees that is transferred to the public service broadcaster depends directly on its number of viewers. Even though this mechanism might not be observed in reality, it resembles the common way of PSB financing. When public authorities decide about the amount of fees that they transfer to a PSB, they base this decision certainly on the station's success in reaching a large audience. A public service broadcaster with a small and shrinking audience is likely to be closed down by the ruling political power. In contrast, public funding might be high if the broadcaster attracts a large audience and, thereby, generates political goodwill.

This setup distinguishes my analysis from pay-TV models and tax-transfer models. If only the viewers of the PSB had to pay the fees and others were excluded from receiving the broadcast by technical measures, the model would represent the competition between a pay-TV station and a commercial free-to-air station.[31] In contrast, if the entire amount

[30] Note that in the asymmetric setup of this section the same notation is used as in the preceding section. Of course, this does not imply that the variables, for example the firm's profits π_A, represent the same solutions. Adding further subscripts to differentiate the cases would make the notation simply too complex. They were suppressed for the ease of exposition.

[31] A number of recent studies explored such a setup. Peitz and Valletti (2004), for example, compared

of fees was transferred to the PSB regardless of its viewer share, the approach would result in a tax-transfer model.

Note that in my model the viewer preferences are unchanged compared to the case of pure commercial broadcasting and the PSB simply replaces station A. Thus, the station is not offering niche programming but broadcasts a programming of general interest (as most PSB do like ARD and ZDF in Germany, TV2 in Denmark or RAI in Italy) targeting the viewers close to the address zero on the unit interval.

Recall that the payment of the fee is mandatory for all TV viewers regardless of whether they actually watch the PSB or not. Accordingly, the total amount of fees collected is $N \cdot f$. However, the distribution of the fees depends on the number of viewers of the PSB. The share that is transferred to the PSB is $V_A \cdot \theta f$. The remainder of the available fees, $(N - V_A) \cdot \theta f$, is spent by the state on other broadcasting activities that do not affect the choice of the viewers which station to tune in to.[32] Note further, that an amount of $N \cdot (1 - \theta) f$ is entirely lost. This loss represents inefficiencies of the license fee transfer mechanism that I will deal with in the welfare analysis as well as in the extensions of the model.

2.4.2 Asymmetric Equilibrium

In the following section, the effects caused by the license fee transfers on the broadcasting markets are analyzed in detail. As soon as $f > 0$, station A's profit function (2.8) exhibits two revenue components: Revenue from advertising and revenue from the license fees. Both firms are pushed away from the initial symmetric equilibrium and a new asymmetric equilibrium materializes.

From the previous section it is clear that the PSB's profits increase directly by $V_A(a_A, a_B) \cdot \theta f$, when the station receives license fee transfers. However, the license fee transfers cause a series of additional effects on both firms and in both types of markets.

To see this, consider the PSB's first-order condition (FOC) of the profit function (2.8) with respect to the station's advertising level a_A. By using $V_A'(a_A, a_B) = -\frac{N\gamma}{2\tau}$ the condition can be written as

$$V_A(a_A, a_B) \cdot R'(a_A) = \frac{\gamma N}{2\tau} \cdot [R(a_A) + \theta f]$$

the advertising intensity and content of programming in markets with pay-TV platforms that have two sources of revenues and free-to-air TV platforms that rely on advertising income only. They showed that if viewers strongly dislike advertising, then the advertising intensity is greater under free-to-air television and that free-to-air television tends to provide more similar content compared to pay-TV stations. Other recent contributions in this field were made by Anderson (2003) and by Kind, Nilssen and Sørgard (2005).

[32] At a first glance, this mechanism may look artificial. But it resembles the code of praxis. In Germany, for example, about five per cent of the fees are spent on the "Deutschlandradio" and the "Landesmedienanstalten." My setup approximates this idea.

and by substituting in the viewer demand function (2.2) modified to

$$R'\left(a_A^*\right) = \frac{\gamma}{\tau + \gamma\left(a_B^* - a_A^*\right)} \cdot \left[R\left(a_A^*\right) + \theta f\right] \tag{2.9}$$

where a_i^* denotes the PSB's optimal choice of the advertising level in equilibrium.

The public service broadcaster sets a_A^* to satisfy condition (2.9) given the value of a_B. Compared to the situation of the symmetric equilibrium, the modified PSB's optimality condition comprises an additional effect, namely $\frac{\gamma N}{2\tau} \cdot \theta f$. This term represents the change of the PSB's license fee revenue if its number of viewers changes. The PSB's marginal profit is increasing in f with $\frac{\partial^2 \pi_A}{\partial a_A \partial f} = \frac{\gamma N}{2\tau} \cdot \theta$.

The private broadcaster's FOC is now

$$V_B\left(a_A, a_B\right) \cdot R'\left(a_B\right) = \frac{\gamma N}{2\tau} \cdot R\left(a_B\right)$$

that can be rewritten by using (2.3) as

$$R'\left(a_B^*\right) = \frac{\gamma}{\tau + \gamma\left(a_A^* - a_B^*\right)} \cdot R\left(a_B^*\right) \tag{2.10}$$

Conditions (2.9) and (2.10) jointly determine the solution to the modified advertising quantity game. Solving them explicitly for the choice variables would provide the corresponding reaction functions. Accordingly, for any quantity choice of its rival, let $b_i\left(a_j\right)$ be station i's optimal set of quantity choices. Thus, $b_i\left(\cdot\right)$ is station i's best response correspondence. A pair of quantity choices $\left(a_A^*, a_B^*\right)$ is a Nash equilibrium if and only if $a_i^* \in b_i\left(a_j^*\right)$ for $i \neq j$ (mixed-strategy solutions are excluded). Hence, the optimal solution is implicitly defined by the rival firm's choice. From the FOC it becomes clear, that for $f > 0$ the equilibrium of the game can no longer be symmetric. Setting equal advertising levels cannot be in the solution set of this game, i.e. $a_A^* \neq a_B^*$ in equilibrium.

The PSB's optimality condition points out that for $f > 0$ the PSB puts additional weight on its viewer share. The right-hand side of condition (2.9) is strictly and linearly increasing in f. Thus, the station is put up to attract viewers from its rival. The only way the PSB can do so is by lowering the advertising level in its programming. When a_A is reduced, the producers' willingness to pay for advertising increases and the marginal per-viewer advertising revenue $R'\left(a_A\right)$ goes up.

Lowering the advertising level has opposing effects on the advertising revenue and the license fee revenue. In equilibrium, the station balances the two effects by choosing the optimal advertising level, a_A^*, such that the marginal revenue from advertising equals the marginal costs associated to the change of a_A. The marginal costs are determined by the nuisance cost of advertising, the substitutability between the two channels and the

level of the license fee transfers. Note that the higher the nuisance cost of advertising (large γ) and the substitutability between the channels (small τ) are, the easier the PSB can attract viewers from the commercial operator.

Due to the strategic nature of the game, the change of the advertising level by the PSB carries over to the optimal decision of the commercial operator. Because of the reduced advertising level in the PSB's programming, the commercial station loses viewers. It turns out that the advertising levels in the two channels are strategic complements for the firms, implying that the cross-derivative of firm $A's$ marginal profit function is strictly positive , i.e. $\frac{\partial^2 \pi_A(a_A,a_B)}{\partial a_A \partial a_B} > 0$. The associated proof is provided in the appendix in section 2.A.3 by an application of the Implicit Function Theorem.

To get an intuitive insight into this mechanism, consider a loss of the number of viewers faced by the commercial operator due to the measures undertaken by the PSB. If the operator would not react, its viewers would be exposed to more advertising that the viewers of the PSB. Thus, the commercial station has to reduce its advertising level as well to mitigate the loss of viewers.

Because the stations are both local monopolists when selling their audience ratings to advertisers, the commercial station is unable to take over those advertisers that have been excluded from the market by the PSB and vice versa. As Anderson and Coate pointed out competition in the advertising market is degenerated and channels set prices independently. In this game of full information, the reaction by the commercial operator is fully anticipated by the PSB and the new asymmetric equilibrium reveals immediately.

This mechanism is summarized in proposition 1:

Proposition 1 *License fee transfers enable the public service broadcaster to attract viewers from its commercial rival by reducing the level of advertising in its programming. Because advertising levels in the two channels are strategic complements, the commercial operator is forced to follow suit and to lower its level of advertising as well. In the new asymmetric equilibrium, the commercial station shows more advertising than the public service broadcaster and has, therefore, the lower number of viewers.*

For a proof of the last statement in proposition 1 see section 2.A.4 in the appendix. Note that the total amount of advertising sold by the stations is $(a_A^* + a_B^*) < 2\widehat{a}$. Due to the congestion effect of advertising in the stations' programming, the PSB can charge advertisers a higher price than its commercial rival. Nevertheless, both stations set again market-clearing prices because the marginal costs are zero. The equilibrium prices at (a_A^*, a_B^*) are such that advertisers are indifferent between the two stations and randomize their choice.[33]

[33]Note that if a producer's willingness to pay exceeds the sum of the prices the two stations charge,

From the broadcasters' optimality conditions (2.9) and (2.10), one can derive the firms' per-viewer revenue at the equilibrium as

$$R\left(a_A^*\right) = \left(\frac{\tau}{\gamma} + a_B^* - a_A^*\right) \cdot R'\left(a_A^*\right) - \theta f$$

and

$$R\left(a_B^*\right) = \left(\frac{\tau}{\gamma} + a_A^* - a_B^*\right) \cdot R'\left(a_B^*\right)$$

where $R\left(a_B^*\right) > R\left(a_A^*\right)$ for $a_B^* > a_A^*$.

Due to the implicit specification of the advertising demand, the optimality conditions (2.9) and (2.10) cannot be solved explicitly for (a_A^*, a_B^*). However, the advertising levels depend on the amount of the license fee, i.e. a_i can be expressed dependent on f. Recall that the producers' willingness to pay is limited from above by the type $\overline{\sigma}$. Then station A's advertising level can be expressed as

$$a_A\left(f\right) = \begin{cases} \widehat{a} & \text{if } f = 0 \\ a_A^* & \text{if } 0 < f \leq \overline{\sigma} \\ 0 & \text{if } f > \overline{\sigma} \end{cases} \tag{2.11}$$

Note that here $a_A\left(f\right) = 0$ is a profit maximizing choice of the PSB and not a ban of advertising imposed by a regulator (for this case see section 2.6.2).

The advertising level of the commercial broadcaster can be expressed in terms of f as well. Recall that $a_B^* > a_A^*$ for all $f > 0$. Then

$$a_B\left(f\right) = \begin{cases} \widehat{a} & \text{if } f = 0 \\ a_B^* & \text{if } 0 < f \leq \overline{\sigma} \\ \underline{a}_B & \text{if } f > \overline{\sigma} \end{cases} \tag{2.12}$$

where $\underline{a}_B$ is the advertising level that the commercial operator chooses when the PSB sets an advertising level of zero. Accordingly, the commercial station will always set $a_B > 0$.

As can be seen from function (2.12) the commercial station stays in business even if the PSB chooses not to show any advertising. However, the station might be driven out of the market for another reason: Namely, the PSB attracts all of its viewers, i.e. $V_A = N$ and $V_B = 0$ (keeping the assumption of full viewer coverage). The viewer

it is optimal for the firm to broadcast its messages on both channels, i.e. it is optimal to "multi-home." Accordingly, advertisers "single-home" if $\overline{\sigma} \leq p(a_A^*) + p(a_B^*)$.

demand function (2.3) implies for station B that $V_B \geq 0$ requires for $\gamma > 0$ that

$$\frac{N}{2} \geq \frac{N\gamma}{2\tau}(a_B - a_A)$$

which can be modified to

$$a_A \geq a_B - \frac{\tau}{\gamma} \Leftrightarrow a_B \leq a_A + \frac{\tau}{\gamma}$$

Plugging this condition into the viewing demand functions (2.2) and (2.3) gives $V_A = N$ and $V_B = 0$ when $a_A \leq a_B - \frac{\tau}{\gamma}$. Accordingly, the commercial station is driven out of business when it sets an advertising level that exceeds the PSB's advertising level by more than $\frac{\tau}{\gamma}$. This markup is growing in the channels' substitutability and shrinking in the nuisance cost of advertising. If the PSB shows no advertising, then $\underline{a}_B$ is bounded from above by $\frac{\tau}{\gamma}$.

An interesting question arising from proposition 1 is, what happens to the broadcasters' profits due to the license fee transfers. It can be shown by using the stations' profit functions (2.5) and (2.8) that the asymmetric cutback in the advertising levels results in a competitive advantage for the PSB that makes higher profits as the stations in the symmetric duopoly setup. In contrast, the commercial station's profits fall below the level from the symmetric framework.

Proposition 2 *The public service broadcaster makes higher profits in the case of license fee transfers compared to the duopoly profits of the symmetric canonical setup. In contrast, the commercial operator's profits fall below the level of the symmetric equilibrium.*

To see this, assume first that $f = 0$. Then the equilibrium is symmetric with $\pi_A = \pi_B = \widehat{\pi}$. When the broadcasters move away from the symmetric equilibrium because of the license fee transfers, then the direct marginal effect on the public service broadcaster's revenue is given by $\frac{\partial \pi_A}{\partial f} = \widehat{V}\theta = \frac{N}{2}\theta > 0$. Thus, $\pi_A^* > \widehat{\pi}$. As was shown, the PSB has an incentive to foster this effect by increasing its number of viewers to the detriment of the rival station. For $a_B^* < \widehat{a}$ and $a_B^* > a_A^*$ it is clear that $\pi_B^* < \widehat{\pi}$. Note that the correctness of proposition 2 depends on the assumption that all viewers watch.

2.5 Welfare Analysis

From an economic point of view, public service broadcasting should only be introduced or continued if it is beneficial to welfare. A benevolent government might focus on the welfare of viewers only or take the welfare of all involved agents into consideration, i.e. consider the rents of advertisers and broadcasters as well. The model focuses on welfare

effects caused by the presence of advertising in the programming. It abstracts from welfare effects related to the general attitude of viewers with respect to the programming. Thus, the gross utility from tuning in, captured by the parameter β, is exogenous.

For the case of a symmetric equilibrium with equal viewer shares and no license fees presented in section 2.3.3, the sum of benefits from watching TV and from advertising, denoted as $W(\widehat{a})$, can be written as

$$W(\widehat{a}) = 2\left[N\int_0^{1/2}(\beta - \gamma\widehat{a} - \tau\lambda)\,d\lambda + \frac{N}{2}\int_0^{\widehat{a}} p(a)\,da\right]$$

and by integration simplified to

$$W(\widehat{a}) = N\left(\beta - \gamma\widehat{a} - \frac{\tau}{4}\right) + N\int_0^{\widehat{a}} p(a)\,da \tag{2.13}$$

The first part of equation (2.13) represents the net benefits of the viewers from watching TV, whereas the latter part represents the gross benefits of the producers from advertising. This part includes the profits of both broadcasters. This specification of benefits from television broadcasting was developed by Anderson and Coate (2005).[34]

Note that neither the TV viewers nor the advertisers are at a global maximum of their rents at the symmetric equilibrium. Viewing benefits would be maximized in the absence of any advertising, i.e. $\widehat{a} = 0$, and equal viewer shares. In contrast, benefits from advertising would be maximized if all advertisers had the opportunity to broadcast their advertising messages and the corresponding price was zero (because the marginal costs are zero).

Accordingly, in any equilibrium at least one party will be away from its welfare optimal level of advertising. There is an insoluble conflict of interests between viewers and advertisers: Advertisers like viewers but viewers dislike advertisers. Any choice of a results in welfare detrimental effects. A regulator that values the viewers' and the advertisers' rents equally would choose the advertising level, denoted as $\widehat{a}_{reg}$, such that the advertisers' willingness to pay per viewer equals to the nuisance cost of advertising, i.e. $\gamma = p(\widehat{a}_{reg})$. In contrast, if the regulator cared about the welfare of viewers only, he would ban any advertising from both channels by setting $\widehat{a}_{reg} = 0$.

[34] Another contribution that considered welfare from broadcasting in a similar fashion is Hansen and Kyhl (2001).

2.5.1 Welfare Effects on Viewers

The license fee transfers and the resulting asymmetric equilibrium with (a_A^*, a_B^*) cause overall three different effects on the viewers' utility compared to the situation of two commercial stations. Two of the effects lead to a loss of viewer welfare, whereas one effect increases the benefits from watching television. Note that the gross viewing benefit β is unchanged.

Firstly, the viewers face a loss in utility from paying the mandatory license fee. Recall from the setup in section 2.4.1 that each viewer has to pay f regardless of whether he actually watches the PSB or not. The collected fees amount to Nf. The share $V_A \cdot \theta f$ is transferred to the budget of the public service broadcaster.[35] As long as $V_A < N$ some part of the total amount of fees is left over. Recall that I assumed that this part of the fees, $(N - V_A) \cdot \theta f$, is returned to the viewers in such a way that their decision which station to watch is not altered. A reasoning for this mechanism was provided in section 2.4.1. Accordingly, each viewer's net disutility from the license fee is

$$f \cdot \left[1 - \theta\left(1 - \frac{V_A}{N}\right)\right]$$

Denote this expression by the term ψf. To obtain the effect for all viewers the term has to be multiplied by N, resulting in $f \cdot [N - \theta(N - V_A)]$.

The second detrimental effect is caused by the move from the symmetric equilibrium at which $V_A = V_B = \frac{N}{2}$. As soon as $V_A > V_B$ the marginal viewer is pushed away from the middle of the unit interval towards the end at which the commercial broadcaster is located. Each viewer (to the right of the center of the interval) who switches from the commercial station to the public service broadcaster because of the lower level of advertising in the programming incurs higher preference mismatch costs from watching.[36] Note that for linear mismatch costs the aggregate welfare loss increases from $\frac{\tau}{4}N$ to τN when moving from $V_A = \frac{N}{2}$ to the extreme case of $V_A = N$. Thus, the aggregate welfare loss when comparing the asymmetric setup with the symmetric one falls into the interval $\left[\frac{\tau}{4}N, \tau N\right]$.

In contrast to the first two effects, the third one enhances welfare. This positive effect stems from the reduction of advertising in both channels. It was shown in proposition 1 that in the new asymmetric equilibrium $a_A^* < a_B^* < \widehat{a}$. Thus, $V_A \cdot \gamma a_A^* + V_B \cdot \gamma a_B^* < N\gamma\widehat{a}$.

The effects on the benefits from watching TV when comparing the two scenarios can be displayed in more detail by separating the viewers into three groups:

[35] For the sake of simpler notation I write V_i for $V_i(a_i, a_j)$ thereinafter.

[36] The term "to switch" is in so far misleading that the model is static and viewers do not actually switch between the stations.

- Group 1: Existing viewers of station A (the PSB)
- Group 2: Remaining viewers of station B (the commercial station)
- Group 3: Viewers who switch from the commercial station to the PSB.

The three groups will be analyzed in the following subsections.

Group 1: Existing Viewers of Station A

When comparing the two scenarios, those viewers who watch station A benefit the most from (or get harmed the least by) public service broadcasting. The members of this group are allocated within the interval $\lambda \in \left[0, \frac{1}{2}\right]$. They suffer from the license fee but they benefit from the reduction of advertising in the PSB's programming from $\widehat{a}$ to a_A^*. The change of utility is the same for each member of the group and given by

$$\gamma\left(\widehat{a} - a_A^*\right) - \psi f$$

This change is positive if $\gamma\left(\widehat{a} - a_A^*\right) > \psi f$. Thus, the gain of utility from the cutback of advertising has to exceed the disutility caused by the net license fee payment. The aggregated change of utility for the entire group amounts to $\frac{N}{2}\left[\gamma\left(\widehat{a} - a_A^*\right) - \psi f\right]$. The disutility from the preference mismatch does not change for this group of viewers.

Group 2: Remaining Viewers of Station B

Recall that station B loses some fraction of its audience, explicitly $N\left(\widehat{\lambda} - \frac{1}{2}\right)$ viewers. However, as long as a_A^* and a_B^* are such that $V_B > 0$ some viewers remain with the commercial station. They like commercial broadcasting so much more than the PSB's programming that they accept the higher level of advertising. These viewers are of type $\lambda \in \left[\widehat{\lambda}, 1\right]$, where $\widehat{\lambda}$ is the viewer who is indifferent between the channels and determined by condition (2.1). Each viewer who sticks to station B faces a change of utility of

$$\gamma\left(\widehat{a} - a_B^*\right) - \psi f$$

which is positive if $\gamma\left(\widehat{a} - a_B^*\right) > \psi f$. In line with the condition for the existing viewers of station A, viewers gain utility if the benefits from the reduction of advertising outweigh the mandatory license fee. The aggregated change of utility for the group is $N\left(1 - \widehat{\lambda}\right)\left[\gamma\left(\widehat{a} - a_B^*\right) - \psi f\right]$.

Group 3: New Viewers of PSB

Some viewers of station B from the symmetric setup decide to watch the public service broadcaster in the asymmetric framework because of the lower level of advertising. The viewers of this group are located between the two other groups and are of type $\lambda \in \left[\frac{1}{2}, \widehat{\lambda}\right]$. They like the lower level of advertising in the PSB's programming so much that they accept the higher preference mismatch costs. The number of these viewers is $N\left(\widehat{\lambda} - \frac{1}{2}\right)$. Each of them individually faces a change of utility of

$$\gamma\left(\widehat{a} - a_A^*\right) - 2\tau\left(\lambda - \frac{1}{2}\right) - \psi f$$

where the term in the middle, $-2\tau\left(\lambda - \frac{1}{2}\right)$, shows the increase of the viewer's preference mismatch cost. The utility change is positive if $\gamma\left(\widehat{a} - a_A^*\right) - 2\tau\left(\frac{1}{2} - \lambda\right) > \psi f$. The left-hand side of this condition is dependent on the viewer's location on the unit interval with $\lambda - \frac{1}{2} > 0$ for $\lambda \in \left[\frac{1}{2}, \widehat{\lambda}\right]$.

For the first two groups the direction of the change of utility is unique within the group, e.g. all existing viewers of station A are either better off or worse off. For the members of the third group this is not true. It might be that some fraction of this group faces an increase of utility, whereas the remainder faces a decrease.

To see this, consider the following example: Assume that $\gamma a_A^* + \psi f < \gamma\widehat{a} < \gamma a_B^* + \psi f$. Under these circumstances the members of the first group, the existing viewers of station A, are all better off in the case of public funding of broadcasting. The members of second group, the remaining viewers of station B, are all worse off. Thus, what happens to the viewers who have switched to the PSB? The answer: Some do benefit, some do not. The marginal viewer in this group is located at $\widetilde{\lambda} = \frac{1}{2} + \frac{1}{2\tau}\left[\gamma\left(\widehat{a} - a_A^*\right) - \psi f\right]$. Thus, viewers in the interval $\lambda = \left[\frac{1}{2}, \widetilde{\lambda}\right]$ are better off and viewers in the interval $\lambda = \left[\widetilde{\lambda}, \widehat{\lambda}\right]$ are worse off, given the example from above.

For that reason the utility change cannot be aggregated in the same way as for the first two groups. Alternatively, consider the following: All viewers in the group are better off if

$$N\int_{\frac{1}{2}}^{\widehat{\lambda}} u\left(a_A^*, f, \lambda\right) d\lambda - N\int_{\frac{1}{2}}^{\widehat{\lambda}} u\left(\widehat{a}, \lambda\right) d\lambda > 0$$

which can be transformed by integration into a condition independent of λ and in line with the first two groups of viewers as

$$\gamma\left(\widehat{a} - a_A^*\right) - \frac{\gamma}{2}\left(a_B^* - a_A^*\right) > \psi f$$

Concerning all groups, the results can be summarized as follows: The viewers from

the different groups are better off in the case of public funding of television compared to pure commercial broadcasting if the following conditions hold true:

$$u\left(a_i^*, f, \lambda\right) > u\left(\widehat{a}, \lambda\right) \text{ if } \begin{cases} \gamma\left(\widehat{a} - a_A^*\right) > \psi f & \text{for } \lambda \in \left[0, \frac{1}{2}\right] \\ \gamma\left(\widehat{a} - a_B^*\right) > \psi f & \text{for } \lambda \in \left[\widehat{\lambda}, 1\right] \\ \gamma\left(\widehat{a} - a_A^*\right) - \frac{\gamma}{2}\left(a_B^* - a_A^*\right) > \psi f & \text{for } \lambda \in \left[\frac{1}{2}, \widehat{\lambda}\right] \end{cases}$$

The second and the third condition in this statement both imply the first because $a_A^* < a_B^*$ (which was proven in proposition 1). The first group, the existing viewers of station A, do best under all circumstances. In contrast, it is not obvious whether the members of the second or the third group are more likely to gain. The third condition can be modified to $\gamma\left(\widehat{a} - \frac{a_A^*}{2} - \frac{a_B^*}{2}\right) > \psi f$. The left-hand side of this condition exceeds $\gamma\left(\widehat{a} - a_B^*\right)$ because $\frac{a_A^*}{2} + \frac{a_B^*}{2} < a_B^*$. Thus, the members of the second group, i.e. the remaining viewers of station B, are always worse off compared to the members of the third group. Accordingly, those viewers who like the commercial station's programming at position B the most, benefit the least from (or are harmed the most by) mixed funding of public service broadcasting.

These results are documented by the following proposition:

Proposition 3 *Compared to the symmetric canonical setup, the viewers of the public service broadcaster (PSB) benefit the most from (or are harmed the least by) the license fee transfers, followed by the viewers who switch from the commercial station at position B to the PSB. The remaining viewers of the commercial station at position B benefit the least (or get harmed the most).*

According to proposition 3, three cases can be distinguished:

- Case 1: All viewers are better off
- Case 2: All viewers are worse off
- Case 3: Mixed effects

Before turning to the overall effect of public service broadcasting on the viewing benefits, these cases will be analyzed separately in the proceeding subsections.

Case 1: All Viewers Better Off

All viewers are better off if the condition $\psi f < \gamma\left(\widehat{a} - a_B^*\right)$ holds. In this case, the net license fee payment ψf is low compared to the utility gain of viewers from the cutback of advertising in the channels' programming. The condition assures that all remaining

viewers of the commercial station at position B, i.e. the members of group 2 above, benefit from the license fee system. At the same time, this condition implies that all other viewers are better off as well.

Case 2: All Viewers Worse Off

All viewers are worse off if $\psi f > \gamma(\widehat{a} - a_A^*)$, thus, if the net license fee payment ψf is high compared to the utility gain of viewers from the reduction of advertising. The condition implies that the existing viewers of station A, i.e. the members of group 1 above, lose utility, which in turn means that neither of the two other groups of viewers benefits.

Case 3: Mixed Effects

Case 1 and 2 are both clear-cut. The utility change of all viewers is directed into the same direction, either they all gain or they all lose utility. Such a unique result is not assured. It could well be that some viewers benefit, whereas other viewers suffer. Mixed effects arise if $\gamma a_A^* + \psi f < \gamma\widehat{a} < \gamma a_B^* + \psi f$. In this case, the group of existing viewers of station A is better off. In contrast, each viewer who remains with the commercial station at position B incurs a loss of utility. The effect on viewers who switch, i.e. the members of group 3 above, is two-fold.

Aggregate Effect on Viewers

In line with the presentation of the net viewing benefits in the symmetric case in equation (2.13), the net viewing benefits in the asymmetric equilibrium, denoted as $B_V(a_A^*, a_B^*)$, can be written as

$$\begin{aligned} B_V(a_A^*, a_B^*) &= N\int_0^{\widehat{\lambda}} (\beta - \gamma a_A^* - \psi f - \tau\lambda)\, d\lambda \\ &\quad + N\int_{\widehat{\lambda}}^1 (\beta - \gamma a_B^* - \psi f - \tau(1-\lambda))\, d\lambda \end{aligned}$$

The first term on the right-hand side shows the net viewing benefits for the viewers of the public service broadcaster (including those viewers who switched), whereas the second term shows the net viewing benefits for the viewers of the commercial station. Recall from equation (2.1) that $\widehat{\lambda} = \frac{1}{2} + \frac{1}{2\tau}\gamma(a_B - a_A) > \frac{1}{2}$ for $a_A^* < a_B^*$. By integration, the equation above can be simplified to

$$B_V(a_A^*, a_B^*) = N\left[\beta - \psi f - \frac{1}{4}\tau - \frac{\gamma}{2}(a_A^* + a_B^*) + \frac{\gamma^2}{4\tau}(a_B^* - a_A^*)^2\right]$$

The benefits of the viewers are dependent on a_A^* and a_B^*. However, the advertising levels enter the viewing benefits in two ways: Firstly, by the term $-\frac{\gamma}{2}(a_A^* + a_B^*)$. Accordingly, the larger the cutback in both stations' advertising the larger the utility gain for the viewers. Secondly, by the term $\frac{\gamma^2}{4\tau}(a_B^* - a_A^*)^2$. This term represents the net welfare improvement caused by viewers who switch from the commercial station to the PSB. Even though they face an increase in the mismatch costs they gain from the lower advertising level in the PSB's programming. The further the marginal viewer $\widehat{\lambda}$ is pushed towards the commercial station's location, the larger is the utility gain. Put differently, welfare increases when the commercial station's number of viewers falls. This effect is weakened by the substitutability parameter τ.

Now, consider the question of whether the net viewing benefits increase, decrease or stay unchanged when the license fee payments are imposed on the viewers. Recall that the net viewer benefits in the case of the symmetric duopoly in equation (2.13) were $N\left(\beta - \gamma\widehat{a} - \frac{\tau}{4}\right)$. Then viewer benefits are higher in the case of public service broadcasting compared to the symmetric case if

$$\psi f < \gamma\left(\widehat{a} - \frac{1}{2}(a_A^* + a_B^*) + \frac{\gamma}{4\tau}(a_B^* - a_A^*)^2\right) \tag{2.14}$$

The effects on the viewers' benefits are summarized in proposition 4:

Proposition 4 *The net benefits of viewers are higher in the case of partially public funded broadcasting compared to pure commercial broadcasting if the license fee payment is such that*

$$\psi f < \gamma\left(\widehat{a} - \frac{1}{2}(a_A^* + a_B^*) + \frac{\gamma}{4\tau}(a_B^* - a_A^*)^2\right)$$

Accordingly, viewers are more likely to gain utility if the license fee payment is (1) small in relation to the cutback of the advertising levels, $\widehat{a} - \frac{1}{2}(a_A^* + a_B^*)$, and (2) small in relation to the spread in the two stations' advertising level, $a_B^* - a_A^*$.

Thus, the overall benefits from viewing increase if the sum of the aggregated disutility from the license fee and the additional preference mismatch are less than the aggregated utility gain from the reduction of the advertising volumes.

Optimal License Fee for the Viewers

The preceding analysis raises the question of what level of the license fee maximizes the welfare of viewers. If the welfare loss from the increase in the preference mismatch is higher than the welfare gain from the lower levels of advertising, i.e. if

$$\gamma\left(\widehat{a} - \frac{1}{2}(a_A^* + a_B^*) + \frac{\gamma}{4\tau}(a_B^* - a_A^*)^2\right) < 0$$

then any level of $f > 0$ decreases welfare and the optimal level is $f = 0$. But if the left-hand side of the inequality is greater than zero, the license fee can enhance welfare. A maximization of the viewer benefits with respect to f is not feasible under the current setup that is lacking specific solutions for the optimal advertising quantities.

2.5.2 Welfare Effects on Advertisers and Broadcasters

Under the asymmetric framework aggregate advertising benefits, denoted as $B_A(a_A^*, a_B^*)$, generated by the broadcasters are

$$B_A(a_A^*, a_B^*) = V_A \int_0^{a_A^*} p(a_A)\, da_A + V_B \int_0^{a_B^*} p(a_B)\, da_B$$

The first term of the equation's right-hand side represents the advertising benefits generated by the public service broadcaster, whereas the second term shows the advertising benefits brought forth by the commercial station. Note that $B_A(a_A^*, a_B^*)$ includes the share of advertising benefits which ends up with the broadcasters, i.e. $V_A \cdot R(a_A^*)$ and $V_B \cdot R(a_B^*)$.

So far, the welfare aggregation is as usual: The producers (here the broadcasters) get the revenue "quantity times price" and the consumers (here the advertisers) get the value corresponding to the remaining area under the demand curve. One complication is caused by the fact that the PSB has an additional revenue source, the license fee transfers. Thus, to get the total benefits of advertisers and broadcasters, the fees $V_A \cdot \theta f$ that are used up by the PSB have to be added.

At the asymmetric equilibrium, the benefits from advertising are strictly less compared to the symmetric case. Some firms that bought advertising slots in the symmetric framework are excluded from the market and their rent is lost.

Proposition 5 *Mixed-funded public service broadcasting reduces the volume of advertising in both channels compared to the case of pure commercial broadcasting. A number of* $(2\widehat{a} - a_A^* - a_B^*)$ *firms is excluded from the advertising market and their rent is lost. The higher the license fee, the more both stations reduce the level of advertising in their programming and the higher is the loss of benefits in the advertising market.*

To see this, recall that in the asymmetric equilibrium $a_A^* < a_B^* < \widehat{a}$ and $R(a_A^*) < R(a_B^*) < R(\widehat{a})$. Then

$$N \cdot R(\widehat{a}) > V_A \cdot R(a_A^*) + V_B \cdot R(a_B^*)$$

which is true because for $N = V_A + V_B$ it strictly holds that

$$V_A \cdot [R(\widehat{a}) - R(a_A^*)] + V_B \cdot [R(\widehat{a}) - R(a_B^*)] > 0$$

Note, that the scale of the loss of benefits depends on the slope of the per-viewer advertising demand curve, $p(a)$. The welfare detrimental effect is small if the advertising demand curve is relatively flat.

The overall effect on both producers and broadcasters can basically be positive if the license fee transfer to the PSB, $V_A \cdot \theta f$, exceeds the loss of advertising benefits. Thus, the overall welfare effect on advertisers and broadcasters is positive if

$$\begin{aligned} V_A \cdot \theta f \quad > \quad & V_A \left[\int_0^{\widehat{a}} p(a)\, da - \int_0^{a_A^*} p(a_A)\, da_A \right] \\ & + V_B \left[\int_0^{\widehat{a}} p(a)\, da - \int_0^{a_B^*} p(a_B)\, da_B \right] \end{aligned} \tag{2.15}$$

where the left-hand side of the inequality represents the license fee transfer to the public service broadcaster.

2.5.3 Effects on Overall Welfare

In the two preceding sections, the welfare effects of mixed-funded public service broadcasting on viewers as well as on advertisers and broadcasters have been analyzed separately. Next, the overall welfare effect will be evaluated.

Using conditions (2.14) and (2.15) from above, overall welfare is enhanced if

$$\begin{aligned} f(1-\theta) \quad < \quad & \gamma \left(\widehat{a} - \frac{1}{2}(a_A^* + a_B^*) + \frac{\gamma}{4\tau}(a_B^* - a_A^*)^2 \right) \\ & - \left(\frac{1}{2} + \frac{\gamma}{2\tau}(a_A^* + a_B^*) \right) \left[\int_0^{\widehat{a}} p(a)\, da - \int_0^{a_A^*} p(a_A)\, da_A \right] \\ & - \left(\frac{1}{2} - \frac{\gamma}{2\tau}(a_A^* + a_B^*) \right) \left[\int_0^{\widehat{a}} p(a)\, da - \int_0^{a_B^*} p(a_B)\, da_B \right] \end{aligned}$$

Note that both sides of the inequality have been divided by N such that each term represents the relevant per-viewer term. Thus, the left-hand side of the first line of the inequality shows the net efficiency loss caused by the license fee per viewer, whereas the

right-hand side of the first line reproduces the change in the viewers' utility (net of license fee transfers). The second and third line represent the welfare loss in the advertising markets. If the sum of the three latter elements is greater than $f(1-\theta)$, overall welfare is higher under the PSB system compared to the symmetric duopoly of two commercial stations.

Note that the public transfers reduce advertising rents and the redistribution of license fees causes a welfare loss as well. Thus, the PSB system can enhance overall welfare compared to pure commercial broadcasting only if the benefits of viewers increase (see proposition 4). Note further that the parameters γ and τ enter the expressions for viewing and advertising benefits. As such their effects are ambiguous in the model.

2.6 Extensions and Applications

In the following section, the model of public service broadcasting will be extended and applied to a number of policy relevant questions. Firstly, the financing mechanism of the PSB and the related welfare loss of $Nf(1-\theta)$ are discussed in the light of the example of Germany. Then the effects of advertising ceilings are considered. Finally, a scenario is analyzed in which both stations broadcast identical programs.

2.6.1 PSB Financing Mechanism

As stated in the welfare analysis as well as in section 2.4.1, the financing of the public service broadcaster leads to an unambiguous welfare loss caused by costs for collecting and distributing the license fees and for monitoring the ownership of TV sets. The scale of this loss is measured by the efficiency parameter $\theta \in [0,1]$. Basically, the regulator has the duty to keep θ close to one by designing an efficient system of public transfers.

The significance of the welfare loss can be displayed by the example of Germany. In Germany, license fees are collected by a public authority called "Gebühreneinzugszentrale" (GEZ). The authority collected 6.85 billion Euros of fees in 2004 for 42.2 million registered radio devices and 36.7 million registered TV sets.[37] At the same time, the authority spent 142.4 million Euros for its operations and had 993 employees on the payroll. According to the authority, 2.1 per cent of the total fees were expended for administrative activities in 2004, whereas this share was only 1.8 in 2002 and 2.0 in 2003.

This welfare loss for the TV viewers could be avoided if the authority was abolished and the PSB in Germany were financed from the government's general budget as in

[37] Figures taken from the authority's annual report 2004, which can be downloaded from the institution's website at http://www.gez.de.

Spain, Portugal or the Netherlands (see section 2.2). Since the middle of the nineties, in Germany about 98 per cent of the population lives in a household that has access to a TV set.[38] Under such circumstances, monitoring the ownership of TV sets seems pointless. In addition, there is serious concern that the activities of the GEZ harm the privacy of viewers. For example, the GEZ is granted access to official registration data of citizens which it compares to its registration data of TV sets. Moreover, the behavior of the GEZ's investigators to detect unlicensed viewers is rather disputed.

A serious concern about financing PSB activities from the general budget is the independency of the programming from political influence. The independency has to be assured by the broadcasting framework. In Germany, for example, the PSB budget planning is to be confirmed by a council of finance and media experts, the so-called "Kommission zur Ermittlung des Finanzbedarfs der Rundfunkanstalten" (KEF). Such a safeguard could be sufficient. Another fundamental issue is the production efficiency of the public service broadcaster. In its 13th report the KEF expressed the opinion that further opportunities of saving overhead costs existed in several PSB units in Germany in 2001.[39] However, the question of efficiency of the PSB can not be answered within my framework because of the abstraction from production costs and technology.

2.6.2 Advertising Caps

Upper ceilings on advertising levels are a common regulatory feature of television markets. The European Commission has imposed a maximum share of 20 per cent of advertising content of any given clock hour in commercial broadcasting.[40] In addition, public service broadcasters are subject to more restrictive rules in many member states, for example in Denmark, Germany or Great Britain (see section 2.2).

Assume that the public service broadcaster can no longer choose the advertising level in its programming itself. Instead, the regulator imposes a maximum level of advertising, denoted as a_{reg}, on the broadcaster. The rule is only binding when it is set below the advertising level that would be chosen by the broadcaster in absence of the regulation, i.e. $a_{reg} < a_A^*$.[41] The equilibrium is now determined by the regulator's rule and by the corresponding choice of the advertising level of the commercial station. If the regulator imposes an advertising ceiling such that $a_{reg} < a_A^*$, it follows that a_B falls below the optimal value a_B^*, because the advertising levels are strategic complements (see

[38] See: Medien Basisdaten 2004, available at http://www.ard-werbung.de/mp.

[39] See: 13. Bericht der Kommission zur Ermittlung des Finanzbedarfs der Rundfunkanstalten. Mainz, 2001, p. 176, available at http://www.kef-online.de.

[40] This rule is based on the new "Television without Frontiers" Directive of the EU Commission, avaliable at http://www.europa.eu.int/comm/avpolicy/regul/twf/newtwf-e.htm.

[41] A more detailed and sophisticated analysis of the effects of different advertising regulations in a setup of pure commercial TV broadcasting is provided by Anderson (2004).

proposition 1). Thus, if f is unchanged the advertising ceiling reduces the profits of both stations and drives the rent of the advertisers further down. In contrast, viewers benefit unambiguously from the advertising ceiling because of the lower volume of advertising they are exposed to. The regulator may use advertising ceilings to limit the profits of the PSB. However, the profits of the commercial station are reduced even more.

If the regulator sets a common advertising ceiling, then, according to my model, a system of license fee transfers is not meaningful anymore. A symmetric duopoly of commercial broadcasters with a common advertising ceiling would be more efficient since it avoids the welfare loss of the redistribution of fees. If $a_A^* \leq a_{reg} < a_B^*$ then the rule only applies to the commercial station B. The station is forced to reduce the level of advertising in its programming below the profit maximizing choice. Even though the firm attracts some viewers from the PSB, its profits are not at their maximum.

A special case of an advertising ceiling is the complete ban of advertising from the PSB's programming, i.e. $a_{reg} = 0$ for station A, as in Great Britain for the BBC. In this case, the viewing demand functions in my model are modified to $V_A(a_B) = N\left(\frac{1}{2} + \frac{\gamma}{2\tau}a_B\right)$ and $V_B(a_B) = N\left(\frac{1}{2} - \frac{\gamma}{2\tau}a_B\right)$. Accordingly, the viewing demand of the commercial station becomes more sensitive with respect to advertising and even more viewers are likely to switch to the PSB. In contrast to the case without an advertising ban, now the commercial station chooses a_B^* such that its marginal revenue meets the condition $R'(a_B^*) = \frac{\gamma}{\tau - \gamma a_B} \cdot R(a_B^*)$. Recall from equation (2.12) that the commercial operator's choice of the optimal advertising volume is limited by the interval $a_B \in \left(0, \frac{\tau}{\gamma}\right]$. Thus, the smaller the nuisance cost of advertising is, the less the commercial station is hurt by the advertising ban in the PSB's programming.

2.6.3 Zero Programming Differentiation

In my model, there is no endogenous location choice of the firms on the unit interval. So far I assumed that the broadcasters were ex-ante located at the extremes of the unit interval, zero and one. These "addresses" provide the maximum level of product differentiation. The other extreme, i.e. zero product differentiation, is obtained if both broadcasters settle at the same position on the interval. Next, a case will be analyzed in which both firms are positioned exogenously in the center of the interval.

Thus, assume that both broadcasters are located at position $\frac{1}{2}$ and they cannot move from that position in the short run. Then a type-λ viewer obtains utility from watching

channel A of

$$u_A(\lambda, a_A) = \begin{cases} \beta - \gamma a_A - \tau\left(\frac{1}{2} - \lambda\right) - f & \text{if } 0 \leq \lambda < \frac{1}{2} \\ \beta - \gamma a_A - f & \text{if } \lambda = \frac{1}{2} \\ \beta - \gamma a_A - \tau\left(\lambda - \frac{1}{2}\right) - f & \text{if } \frac{1}{2} < \lambda \leq 1 \end{cases}$$

and analogously from watching channel B. If $a_A = a_B$ then all viewers are indifferent between the two stations and randomize which station to watch.

As soon as $a_i < a_j$ station i attracts all viewers and nobody watches station j. Thus, in the absence of costs and collusion, competition between the stations drives the advertising levels down to the bottom. The only stable solution is $a_A = a_B = 0$. In this case, the public service broadcaster still receives fees of $V_A \cdot \theta f$, i.e. $\pi_A > 0$. In contrast, the commercial station loses its advertising revenues entirely and makes zero profits. Put differently, the commercial broadcaster is eliminated from the market.

Proposition 6 *In the absence of any programming differentiation, competition between the two stations drives both advertising levels down to zero. Until the solution $a_A = a_B = 0$ is reached, the two stations undercut each other to attract the rival's viewers. In this case, the commercial station is eliminated from the market, whereas the public service broadcaster can attract all viewers.*

Note that in this scenario the commercial station has a strong incentive to move away from the public service broadcaster's position and to differentiate its programming. The PSB, in contrast, might opt for a zero level of programming differentiation if its ultimate goal is to harm the private broadcaster but not to maximize its revenues. This mechanism calls for the regulator to make sure that the public service broadcaster does not duplicate the commercial stations' programming. The public service broadcaster needs a distinct, clear-cut programming remit. In particular, the PSB should target those viewers that are undersupplied by the commercial stations or not supplied at all.

An example of minimum programming differentiation and a move of a public service broadcaster towards the taste position of its commercial rivals is provided by the German ARD. This public service broadcaster is allowed to show advertising only prior to eight o'clock p.m.. In the slot between 5 and 8 p.m. the ARD presents a game show, a people news magazine and soap operas. As such, the station duplicates the commercial stations' programs and may abuse public funds for such activities.

2.7 Conclusion

This chapter addressed economic consequences in the television viewer and advertising markets caused by public funding of broadcasting in the European Union. By extending the canonical duopoly model of broadcasting, I demonstrated that license fee transfers do not imply per se a welfare improvement compared to the case of pure commercial broadcasting. Instead, they cause a series of ambiguous effects on viewers, advertisers and broadcasters. Depending on the relation between the level of the license fee, the nuisance cost of advertising, the substitutability between the two channels and the demand curve for advertising overall welfare may increase or decrease.

The viewers suffer a loss of benefits from the mandatory payment of the license fee. In contrast, they enjoy a reduced level of advertising on the channels. The overall effect on viewers is ambiguous: I am able to describe cases in which all viewers gain utility, cases in which all viewers lose utility and cases in which some viewers gain and some lose utility. In contrast, the impact on the advertising market is clear-cut: The two stations reduce the number of advertising spots to balance the detrimental effect of the license fee to their viewers. Thus, some advertisers are excluded from the market and their rent is lost. Finally, the effects on the broadcasters are opposed: The commercial station loses both viewers and advertising revenues. In contrast, the public service broadcaster can attract viewers from the rival station and receives a higher income.

In the light of these results the complaints from commercial broadcasters in the European Union are certainly legitimate. In many EU member states, public service broadcasters show programs of general interest and compete with commercial stations for eyeballs and advertising Euros. However, my model demonstrated that a ban of advertising from the PSB's programming does not resolve the conflict but might even aggravate it! The PSB might be able to attract additional viewers who feel annoyed by the commercial programs being stuffed with advertising.

Basically, it became clear that market distortions cannot be avoided by any broadcasting system as long as the different types of stations coexist. Thus, if the government decides to finance broadcasting by public funds, a regulator has to ensure that such stations provide a service of general economic interest that is not delivered by commercial stations. The model shows that public service broadcasting needs a clear-cut programming remit. Otherwise, publicly funded stations can have an incentive to penetrate the viewer markets of commercial stations. In the worst case, a PSB would simply duplicate the commercial stations' programming and might abuse public funds for doing so.

In addition, the model points out that if nearly each household in a country possesses a TV set, a mechanism of license fee transfers as it is present in many EU member states today cannot be optimal. Instead, public broadcasting activities should be financed

from the government's general budget. By this means welfare losses stemming from collecting and distributing the fees and from monitoring the ownership of TV sets can be prevented.

From my point of view, there are two valuable directions to further develop my approach: Firstly, it would be interesting to see whether the public service broadcaster actually has appropriate incentives to invest its revenues from the license fees in higher programming quality compared to a commercial station. A second interesting issue would be the question what outcome the model would predict if firms were free to choose their location on the Hotelling interval endogenously.

2.A Appendix

2.A.1 Second-order Condition and Uniqueness Check

For the symmetric setup of section 2.3.3, the second-order condition (SOC) of the broadcasters' objective functions (2.4) and (2.5) for $a_A = a_B = \widehat{a}$ is

$$\frac{\partial^2 \widehat{\pi}}{\partial \widehat{a}^2} = 2 \cdot V'(\widehat{a}) \cdot R'(\widehat{a}) + V(\widehat{a}) \cdot R''(\widehat{a})$$

Recall from the last paragraph of section 2.3.3 that the advertising level that maximizes the per-viewer advertising revenue is denoted as $\widetilde{a}$. Any level of advertising, however, that takes into account the detrimental effect of advertising to the viewers' utility must be lower than $\widetilde{a}$. Then the SOC is strictly less than zero for $a < \widetilde{a}$ because $R''(\widehat{a}) \leq 0$.

Consider next the uniqueness of the symmetric equilibrium at $a_A = a_B = \widehat{a}$. Under a symmetric setup both cases $a_i = 0$ and $a_i < a_j$ can never be optimal. They will always emerge to the symmetric equilibrium. To see this, firstly, consider the case that $a_A = a_B = 0$. Then $V_A = V_B = \frac{N}{2}$ and $\pi_A = \pi_B = 0$. This is a not stable equilibrium. Each firm has an incentive to sell a first unit of advertising by setting a such that $p(a) = \overline{\sigma}$. Since there are no inframarginal units, no costs are associated to the increase in a. Secondly, consider the case that $a_A = 0$ and $a_B > 0$. Then $V_A > V_B$ and $\pi_A = 0$. Firm A now has an incentive to increase the level of advertising in its programming. Finally, both firms will choose equal levels of advertising that satisfy the optimality condition (2.7) and result in $V_A = V_B$. Deviations from this equilibrium never pay off because the marginal cost of deviating is higher than the marginal revenue. Thus, the equilibrium is unique and corner solutions do not occur.

2.A.2 Manipulation of First-order Condition

Recall that the optimal advertising rate in the symmetric framework, $\widehat{a}$, was determined by condition (2.7) reproduced below

$$R'(\widehat{a}) = \frac{\gamma}{\tau} R(\widehat{a})$$

The per-viewer revenue function in the model is $R(a_i) = p(a_i) \cdot a_i$. Accordingly, $R'(a_i) = p(a_i) + \frac{\partial p(a_i)}{\partial a_i} a_i$. By using this expression the condition can be modified to

$$p(\widehat{a}) + \frac{\partial p(\widehat{a})}{\partial \widehat{a}} \widehat{a} = \frac{\gamma}{\tau} p(\widehat{a})\, \widehat{a}$$

where the left-hand side represents the classical marginal revenue of a monopolist, i.e.

$$p\left(\widehat{a}\right)\left(1-\frac{1}{\varepsilon_a}\right)=\frac{\gamma}{\tau}\cdot p\left(\widehat{a}\right)\widehat{a}$$

where $\varepsilon_a=-\left[\frac{\partial p(\widehat{a})}{\partial \widehat{a}}\right]^{-1}\frac{p(\widehat{a})}{\widehat{a}}$. Dividing both sides by $p\left(\widehat{a}\right)$ and solving for $\widehat{a}$ provides the equation documented in section 2.3.3

$$\widehat{a}=\frac{\tau}{\gamma}\left(1-\frac{1}{\varepsilon_a}\right)$$

2.A.3 Strategic Complementarity of Advertising Levels

In the asymmetric setup in section 2.4.2, the optimal value of a_A was implicitly defined by the optimal value of a_B and vice versa, i.e. $a_A^*=b_i\left(a_B^*\right)$. Thus, the question arises how a change of a_A affects the choice of a_B. An answer can be provided by applying the Implicit Function Theorem

$$\frac{da_B}{da_A}=-\frac{\frac{\partial^2\pi(a_A,a_B)}{\partial a_A^2}}{\frac{\partial^2\pi(a_A,a_B)}{\partial a_A\partial a_B}}$$

If the right-hand side of this equality is positive, then the two advertising levels are strategic complements.

Recall from condition (2.9) that the partial derivative of the public service broadcaster's profit function (2.8) with respect to its level of advertising a_A was given by

$$\begin{aligned}\frac{\partial\pi_A\left(a_A,a_B\right)}{\partial a_A} &= p\left(a_A\right)\cdot V_A\left(a_A,a_B\right)+\frac{\partial p\left(a_A\right)}{\partial a_A}V_A\left(a_A,a_B\right)\cdot a_A\\ &\quad+\frac{\partial V_A\left(a_A,a_B\right)}{\partial a_A}\cdot p\left(a_A\right)a_A+\frac{\partial V_A\left(a_A,a_B\right)}{\partial a_A}\cdot\theta f\\ &= V_A\cdot R'\left(a_A\right)+\frac{\partial V_A}{\partial a_A}\left[R\left(a_A\right)+\theta f\right]\end{aligned}$$

The second partial derivative of the profit function with respect to a_A was already reported in section 2.A.1 of the appendix. Below, I reproduce the condition in more detail

$$\begin{aligned}\frac{\partial^2\pi_A\left(a_A,a_B\right)}{\partial a_A^2} &= \underbrace{2\cdot\partial p_A/\partial a_A\cdot V_A}_{<0}+\underbrace{2\cdot\partial V_A/\partial a_A\cdot p_A}_{<0}\\ &\quad+\underbrace{2\cdot\partial p_A/\partial a_A\cdot\partial V_A/\partial a_A\cdot a_A}_{>0}+\underbrace{\partial^2 p_A/\partial a_A^2\cdot V_A a_A}_{<0}\\ &= 2\frac{\partial V_A}{\partial a_A}\cdot R'\left(a_A\right)+V_A\cdot R''\left(a_A\right)\end{aligned}$$

The partial cross-derivative with respect to the rival's volume of advertising, a_B, is

$$\begin{aligned}\frac{\partial^2 \pi_A(a_A, a_B)}{\partial a_A \partial a_B} &= \partial V_A/\partial a_B \cdot p_A + \partial p_A/\partial a_A \cdot \partial V_A/\partial a_B \cdot a_A \\ &= \frac{\partial V_A}{\partial a_B} \cdot R'(a_A)\end{aligned}$$

By using the two latter derivatives the Implicit Function Theorem gives as solution to $\frac{da_B}{da_A}$

$$\begin{aligned}\frac{da_B}{da_A} &= -\frac{2 \cdot \partial p_A/\partial a_A \cdot V_A + 2 \cdot \partial V_A/\partial a_A \cdot p_A}{\partial V_A/\partial a_B \cdot p_A + \partial p_A/\partial a_A \cdot \partial V_A/\partial a_B \cdot a_A} \\ &\quad \frac{+\partial^2 p_A/\partial a_A^2 \cdot V_A a_A + 2 \cdot \partial p_A/\partial a_A \cdot \partial V_A/\partial a_A \cdot a_A}{\partial V_A/\partial a_B \cdot p_A + \partial p_A/\partial a_A \cdot \partial V_A/\partial a_B \cdot a_A} \\ &= -\frac{2\frac{\partial V_A}{\partial a_A} \cdot R'(a_A) + V_A \cdot R''(a_A)}{\frac{\partial V_A}{\partial a_B} \cdot R'(a_A)}\end{aligned}$$

The denominator of the term on the right-hand side of this equation is strictly positive for $R'(a_A) > 0$. Thus, for $\frac{da_B}{da_A} > 0$ to hold, the nominator must be negative, i.e.

$$2\frac{\partial V_A}{\partial a_A} \cdot R'(a_A) + V_A \cdot R''(a_A) < 0$$

which can be rewritten as

$$V_A \cdot R''(a_A) < 2\frac{\gamma N}{2\tau} \cdot R'(a_A)$$

The inequality is always true because $R''(a_A) \leq 0$ and $R'(a_A) > 0$ for all $a < \widetilde{a}$, where $\widetilde{a}$ is the advertising level that maximizes $R(a)$ s.t. $R'(a) = 0$. Thus, the right-hand side of the equation is strictly positive and the two advertising levels are strategic complements.

2.A.4 Proof of Proposition 1

In this section, I demonstrate that in the asymmetric equilibrium the public service broadcaster sells less advertising than the commercial station. Note that the fact that $a_A^* < \widehat{a}$ follows directly from the PSB's optimality condition, condition (2.9). The fact that $a_B^* < \widehat{a}$ if $a_A^* < \widehat{a}$ was demonstrated by the application of the Implicit Function Theorem in section 2.A.3. The proof that $a_A^* < a_B^*$ is now given by contradiction.

Subtracting the optimality condition (2.10) from condition (2.9) results in

$$V_A(a_A, a_B) \cdot R'(a_A) - V_B(a_A, a_B) \cdot R'(a_B) = \frac{\gamma N}{2\tau} \cdot [R(a_A) - R(a_B) + \theta f]$$

Now, assume that $a_A > a_B$. Then it follows from the concavity of the advertising demand that $V_A(a_A, a_B) \cdot R'(a_A) < V_B(a_A, a_B) \cdot R'(a_B)$. Thus, the left-hand side of the equality above is strictly negative. However, $a_A > a_B$ also implies that $R(a_A) > R(a_B)$. From this follows that the right-hand side of the equality is strictly positive. Thus, for $f > 0$ and $a_A > a_B$ the equation cannot hold and it must be that $a_A^* < a_B^*$. Accordingly, the public service broadcaster sets the lower advertising level in equilibrium. Finally, under the assumption of full viewing coverage it follows from the viewing demand functions (2.2) and (2.3) that $V_A(a_A^*, a_B^*) > V(\widehat{a}) > V_B(a_A^*, a_B^*)$.

Chapter 3

Two-sided Demand Externalities Annihilating Regional Quality Newspapers

3.1 Introduction

At the beginning of the new century, newspapers in Germany got into serious economic difficulties: Between 2000 and 2004 they lost about a third of their advertising turnover. Their annual advertising income declined from 6.56 billion to 4.50 billion Euros. Although the overall advertising market also experienced a significant decline, the losses of newspapers were far above average. Their share of the total advertising expenditures fell from 28.0 per cent in 2000 to 23.0 per cent in 2004.[1] The decline was most significant in sections of classified advertising. The volume of classified advertising for jobs fell by 71 per cent from 2000 to 2004, the downturn in the sections for real estate and cars was 30 per cent and 27 per cent, respectively.[2] In addition, in Germany the average daily circulation of quality newspapers sold typically by subscriptions decreased from 19.9 million in 1993 to 17.2 million in 2004 (minus 13.6 per cent).[3]

The dramatic changes in the newspapers' reader and advertising markets were not only caused by the weak overall economic performance in Germany, but also due to structural changes in demand. Major causes were the success of the Internet offering

[1] Source: Zentralverband der Deutschen Werbewirtschaft, Jahresanzeigenstatistik 2000-2004, available at http://www.zaw.de.

[2] Source: Own calculations based on the "Anzeigenstatistik der Zeitungen in Deutschland" published by the Zeitungs-Marketing Gesellschaft, Frankfurt/Main 2005, available at http://www.zeitungen-online.de.

[3] Source: Bundesverband Deutscher Zeitungsverleger, Auflagenstatistik, available at http://www.bdzv.de.

an alternative platform for classified advertising messages, the increasing circulation of weekly advertising newspapers distributed for free and the turning away of young readers from the newspapers. It is the aim of the theoretical analysis at hand to explore the consequences of the structural demand changes for the business of regional quality newspapers. Such newspapers are often regarded as essential contributors to the public opinion. Particularly on a local and regional level, newspapers inform citizens about political, cultural or social events and positions. Not surprisingly, there is growing concern that the variety of independent local and regional newspapers will vanish in the years to come.

In the fifties and sixties of the last century, primarily three authors put down a solid groundwork for the economic analysis of the newspaper firm. Corden (1953), Reddaway (1963) and Rosse (1967 and 1970) described the complex framework of markets in which newspapers carry out their business. Their analyses were outlined in the preface. The authors pointed to the fact that newspaper firms serve several markets with basically the same product: On the one hand, individuals buy copies of the newspaper to read the content. On the other hand, advertisers purchase space in the newspaper to contact readers in order to enhance the sales of goods and services. The authors explained that the demand of the readers and the demand of the different groups of advertisers can be interrelated in two ways. Under such circumstances, advertisers prefer to reach a large audience and, at the same time, readers care about the volume of advertising in the newspaper.

Even though most later work in the field had an empirical focus, some noteworthy theoretical contributions were brought forth as well.[4] In Sweden, the theory of the "circulation spiral" attracted a lot of attention in the sixties and seventies while parliamentary commissions were inquiring into the press and the causes of the growing concentration in the industry. Furhoff (1973) argued that the larger of two competing newspapers tends to gain grounds by a process of mutual reinforcement between the circulation and advertising. Accordingly, an increase in the circulation attracts more advertising and the increase in advertising in turn attracts additional readers (given that readers like newspaper advertising). This process might continue until a monopoly market has emerged. In contrast, the inferior newspaper experiences ever-increasing difficulty in holding its own on the market. It moves along the downward part of the spiral until it has lost so many readers and advertisers that it is forced to exit the market. It was uttered that, in principle, the spiral effect could also be got going by the increase of financial resources gained from increased advertising sales. The additional resources could be used by the firm to improve the editorial quality to attract readers. The theory was criticized at

[4] An overview of empirical studies about newspaper markets is provided in the introduction of the next chapter.

the time it was published and modified by several authors, see Gustafsson (1978) and Engwall (1981). Basically, it was argued that in competition among newspapers simply a quantitative lead of a larger edition does not necessarily cause the spiral effect to occur. In addition, the circulation spiral requires that the changes on each side of the market take place with considerable time lags and that markets participants do not fully foresee the development. Furthermore, how does the spiral get started?

Based on the theoretical underpinnings provided by Corden, Reddaway and Rosse, Blair and Romano (1993) developed a model of the newspaper monopolist that faces two-sided demand dependencies between the reader and the advertising market. Thus, they allowed the advertisers' demand to depend on the circulation as well as the readers' demand to depend on the volume of advertising in the newspaper. The authors derived first-order conditions from the firm's maximization problem and showed that for a newspaper monopolist the classical measure of the price elasticity of demand is not appropriate if demand dependencies exist and the firm optimizes profits by choosing prices. In a more specific setup of their work, they examined conditions under which it is optimal for the firm to price newspaper copies - despite of the monopoly position - in the inelastic region of demand in order to expand the circulation and to foster advertising sales. However, the specific part of their analysis is restricted to the case that the demand of the readers is independent of the volume of advertising. In contrast, Chaudri (1998) solved the monopolist model for the case of two-sided demand dependencies, but he assumed that at least in one market the newspaper firm faces perfect competition and acts as a price taker. In a welfare analysis he showed that under certain circumstances social welfare is higher in the case of a monopoly newspaper than in the case of a hypothetical perfectly competitive market.

A methodologically different approach was developed by Baye and Morgan (2000) to explain why mass media typically derive the major part of their revenues from advertisers rather than from subscribers. They considered a certain product market consisting of a continuum of consumers and of two firms producing identical products at zero costs. In their setup, advertising in a newspaper allows the firms to transmit price information to consumers. Accordingly, advertising is informative and the only source of price information for consumers. Given this setup, Baye and Morgan showed that a newspaper has an incentive to set advertising fees above subscription fees and to earn the bulk of revenue from advertisers.

Häckner and Nyberg (2000) developed a duopoly setup of two media firms in which the market structure is endogenous and multiple equilibria emerge. They derived conditions under which the strategic interaction between firms leads to a symmetric duopoly outcome as well as conditions under which the interaction results in asymmetric out-

comes. In their asymmetric results, either both firms obtain a positive market share or one firm holds a natural monopoly. In particular, they showed that if products are strongly differentiated, the equilibrium beliefs are symmetric and the outcome is a symmetric duopoly. In contrast, if products are closer substitutes, asymmetric equilibria and natural monopolies are equally plausible outcomes.

Several interesting contributions in the field were made by Gabszewicz, Laussel and Sonnac. In a study from 2002, they investigated the case of two newspapers that are rivals in both the circulation and the advertising market. In addition, they allowed readers to have different attitudes towards advertising in the newspaper. In their setup, some fraction of readers likes advertising messages, whereas the remainder dislikes them. The authors explored how the equilibria depend on the number of "ad-avoiders" and "ad-lovers" as well as on the intensity of the readers' attraction or repulsion feelings towards the advertising messages.

In contrast to the studies above, I develop a model in which a monopoly newspaper firm serves more than one advertising market and the reader market is interrelated with each advertising market by two-sided demand dependencies.[5] I allow readers to like certain categories of advertising in the newspaper, for example classified advertising, but to dislike other categories, for example persuasive brand advertising.[6] Accordingly, the optimal choice of a variable of the newspaper firm is determined not only by the corresponding marginal cost and the price elasticity in the market at hand. In my setup, the firm has to take into account the price elasticities and marginal costs in all related markets and the demand interdependence between the markets. Thus, my approach deals with the question, how the demand dependencies between the reader and several advertising markets affect the optimal financing of the newspaper firm.

The major insight from my analysis is that a decline of the demand for advertising that readers like can basically annihilate the entire business of regional quality newspapers if the two-sided demand dependencies are sufficiently strong and fixed costs are high.[7] The decrease in the volume of advertising that readers like drives the circulation of the newspaper down and, thereby, harms the demand in all advertising markets that the firm serves. Under certain circumstances it can be an optimal strategy for the

[5] Multiple advertising markets should not be confused with the concept of multi-homing in the theory of two-sided markets. Instead, there are distinct markets on the advertisers' side that the newspaper provides with the attention of the readers.

[6] The only studies that investigated the case that newspapers publish more than one category of advertising are - to the best of my knowledge - Rosse (1967) and Bucklin, Caves and Lo (1989). However, in their empirical analyses reader demand was either not considered at all (Rosse) or independent of the advertising volumes (Bucklin, Caves and Lo).

[7] Rosse (1980) provided several non-formal explanations why newspapers might fail. He suggested that the fundamental long-run cause of newspaper failure was a loss of effective newspaper market segmentation. He explained the loss by the entry of alternative media in advertising markets, the weakening of advertiser preferences for differentiated products and a downward shift in subscriber demand.

newspaper firm to publish advertisements that readers like for free. In contrast, it might be optimal for the firm to hold the volume of advertising that readers dislike down to benefit from an increase in the circulation. I explore such scenarios by an explicit version of the framework with linear demand schedules and numerical values. According to my analysis, the dramatic decline of the demand for classified advertising can lead to a new wave of mergers and acquisitions in the German newspaper industry.[8] Thus, the variety of independent newspapers at a local and regional level is considerably threatened.

The chapter continues in section 3.2 with the basic model of a local newspaper monopolist and the derivation of general demand functions for the reader and advertising markets. In section 3.3, the case of one category of advertising is analyzed for the cases of one-sided and two-sided demand dependence. The analysis is then extended in section 3.4 to the case of two categories of advertising, again for the scenarios of one-sided and two-sided demand dependencies. In section 3.5, the model is explicitly specified by linear demand functions and solutions for a numerical example are calculated. In section 3.6, I derive implications for the newspaper firm resulting from my model for two scenarios: First, I assume that the demand for advertising that readers like decreases due to exogenous factors and, second, I assume that the volume of the category of advertising that readers dislike declines. The conclusions of the analysis are provided in section 3.7.

3.2 General Model of a Newspaper Monopolist

Basically, two types of daily newspapers can be distinguished: National newspapers and regional newspapers. National newspapers compete with each other nationwide. In Germany, there are national quality newspapers that are primarily sold by subscriptions and national tabloid newspapers that readers typically buy at newsstands. Regional newspapers serve a restricted geographical area. They are tailored to a particular region by the local and regional news coverage and the corresponding advertising sections.[9] Based on Chamberlin's theory of monopolistic competition, Rosse (1967) coined the term of an "industry of isolated competitors" for non-national newspapers.

The markets for national quality and tabloid newspapers in Germany are characterized by an oligopolistic structure. A limited number of firms competes for a large number of readers and advertisers. However, for regional newspapers things look different: According to Schütz (2005), in 58 per cent of Germany's 439 cities and districts

[8] Actually, in 2004 the German federal government proposed an amendment of the idiosyncratic competition rules for newspapers in order to facilitate mergers and acquisitions in the industry. See the introduction of the next chapter for details.

[9] The number of titles in each category of newspapers and the average circulation are provided in table 4-2 in the next chapter.

only one regional quality newspaper was available in 2004.[10] Twenty years earlier, the share of one-newspaper cities and districts was only 47 per cent. The average number of local quality newspaper editions available in Germany's districts and cities has fallen from 2.7 in 1954 to 1.5 in 2004. In addition, 35 out of 82 large German cities (>100,000 residents) were served by a local monopoly quality newspaper in 2004. Such concentration tendencies have been observed in other countries as well.[11] In line with these facts, the following analysis deals with the case of a regional quality newspaper that serves its geographical area as a monopolist.[12]

As was sketched in the introduction, newspapers operate in different markets with basically the same product. They serve the reader market with the newspaper containing news and several categories of advertising. In addition, the newspapers sell the attention of their readers to advertisers. Therefore, I differentiate between the circulation market of the readers and the several advertising markets. In a broader sense, I regard the newspaper firm as a multiproduct monopolist with dependent demand and separable costs.[13]

3.2.1 Circulation Market

The utility of newspaper readers depends on numerous attributes. The most obvious attribute is the price of the newspaper, here denoted as p^r. My analysis abstracts from the facts that newspaper firms set different prices for subscriptions and for single copy sales and that they make use of price discrimination in the subscription market. Thus, the newspaper firm charges a unit subscription price and the utility of readers is decreasing in this price. Readers face a binary choice of either subscribing or not subscribing to the monopoly newspaper.[14] Potential effects from substitutes are neglected.

The utility of the readers also depends on the volume of the different categories of advertising in the newspaper, represented by the vector $\mathbf{a} = (a_1, ..., a_k, ..., a_K)$, where a non-bold letter a_k denotes the volume of advertising of category k. There are K categories of advertising. Readers may have different attitudes towards different categories of advertising. They may regard persuasive brand advertising in the editorial cover part as nuisance or may feel neutral about it. In contrast, readers may like local retail ad-

[10] In this share of Germany's cities and districts lived about 42 per cent of the population.

[11] Rosse (1980), for example, reported for the US that the share of cities having more than one newspaper declined from 38.7 per cent in 1923 to 2.3 per cent in 1978.

[12] According to Engwall (1981, p. 147), competition among newspapers is also hampered by inertia, caused by the learning costs involved in the consumption of an unfamiliar newspaper, i.e. the need to become familiar with the structure of a paper in order to exploit its advantages: selective reading.

[13] See Tirole (2002), p. 69-72, for a discussion.

[14] Note that it is implicitly assumed that each copy of the newspaper is read only by the subscriber. Thus, the number of subscriptions equals the number of readers.

vertising or classified advertising for real estate, cars, jobs and the like.[15] Accordingly, the demand for subscriptions is increasing in the volume of advertising that readers like, decreasing in the volume of advertising that they dislike and unaffected by the volume of advertising they feel neutral about.

Basically, there are additional attributes of a newspaper that alter the product's attractiveness to the readership. Some of these characteristics can be quantified as the total volume of the newspaper or the linage of the local news coverage. Other characteristics are harder to grasp as the editorial quality or the newspaper's political view. Even though the firm may change these characteristics in the long run, they are neglected in the partial equilibrium analysis at hand.

Accordingly, the demand of the readers depends on the price of the newspaper and the volume of the different categories of advertising in the newspaper, i.e.

$$r = D^r\left(p^r, \mathbf{a}\right) \tag{3.1}$$

where r denotes the circulation of the newspaper and $D^r\left(\cdot\right)$ is the corresponding demand function. Note that superscripts represent the type of a variable, either belonging to the reader market or the advertising markets.

There is a distribution of types of potential subscribers that determines the circulation demand such that the demand curve is downward sloping in its own price and twice differentiable. Thus, assume that the number of individuals is large and their gross utility from subscribing is sufficiently high such that the demand schedule can be assumed to be continuous.[16]

3.2.2 Advertising Markets

In the business of regional newspapers, basically three advertising categories can be distinguished: national advertising, local business advertising and classified advertising. In 2004, the most important category for regional quality newspapers in Germany was classified advertising accounting for 43.1 per cent of the total advertising linage. The most important sections were real estate advertising and family announcements. Local business advertising contributed a share of 38.2 per cent to the annual advertising linage, whereas national advertising contributed 8.6 per cent. The remaining share of 10.1 per cent was due to other types of advertising.[17]

The different categories of advertising are demanded by different groups of customers.

[15] Sonnac (2000) provides a theoretical analysis of the question of whether readers like or dislike advertising messages in the newspaper and discusses some empirical results.

[16] Equivalent assumptions are made also for the advertising demand curves in the following section.

[17] Source: BDZV (2005), p. 89.

National advertising, typically published as display advertising in the editorial part of the newspaper, is primarily demanded by nationwide brands. Local business advertising is booked by shop-owners or retail chains from the area in which the newspaper is distributed. Classified advertising is requested by local craftsmen, shop-owners as well as by families and private individuals. Obviously, the characteristics of the demand for each category of advertising are idiosyncratic.[18]

In my model, the demand of advertisers for each category depends on the corresponding price and the newspaper's circulation. Advertisers face a binary choice of either to advertise or not. The newspaper charges advertisers in each category a unit lump-sum price for advertising (thus, not a per-copy price). Therefore, the advertisers' demand depends positively on the newspaper's circulation.

In general, there are additional determinants of the demand for advertising. It has been observed that the price of advertising varies significantly for different newspapers even if one controls for the average circulation (or more precisely, for the average issue readership). The advertisers' willingness to pay also depends on the profile of the readership and the newspapers' characteristics.[19] Moreover, the advertisers' demand is affected by the availability of alternative media vehicles. However, for the following analysis these effects are neglected. The newspaper is a monopoly supplier of its advertising markets.[20]

According to these assumptions, the demand for advertising of category k can be specified as

$$a_k = D_k^a\left(p_k^a, r\right) \tag{3.2}$$

where p_k^a represents the price for advertising of category k. Note that it is assumed that no arbitrage between the advertising markets is possible and that the advertisers' demand is independent of the total volume of advertising. The latter implies that in this approach an advertising customer does not care about the total volume of advertising in the newspaper and no congestion effects occur (in contrast to the setup in chapter 2).

3.2.3 Profit Maximization

For the aforementioned demand specifications the monopoly newspaper's profits are

$$\Pi = p^r r + \sum_{k=1}^{K} p_k^a a_k - TC\left(r, \mathbf{a}\right) \tag{3.3}$$

[18] The fact that readers may be identical with advertisers if they demand classified advertising is neglected in the analysis.

[19] The first issue was explored, for example, by Thompson (1989) who investigated the relation between the circulation and the readership profile using a sample of British and Irish daily and Sunday newspapers.

[20] This assumption will be picked up again in the analysis in chapter 4.

The firm's revenue is composed of two sources: Revenue from selling copies of the newspaper and revenue from selling advertising space. The firm's total costs can be decomposed in fixed and variable costs with $TC(r, \mathbf{a}) = FC + v^r r + \sum_{k=1}^{K} v_k^a a_k$, where FC represents the fixed costs of producing the first copy of a newspaper and v^r and v_k^a represent the variable costs of printing and distributing copies of the newspaper and to publish advertising messages within these copies, respectively.[21]

In the absence of any demand dependence between the circulation and advertising, the firm would set the standard monopoly prices in all markets according to the inverse elasticity rule of $\frac{p-v}{p} = \frac{1}{\varepsilon}$. Note that the firm has to exit the market if $p^r r + \sum_{k=1}^{K} p_k^a a_k < TC(r, \mathbf{a})$. Accordingly, the demand of readers and advertisers has to be sufficiently large to cover the fixed and variable costs.

3.3 Newspaper with one Category of Advertising

To start with the analysis, I assume that the newspaper firm publishes only one category of advertising, i.e. the advertising volume is represented by a scalar with $a_k = a$ for $K = 1$. This case has been explored by Blair and Romano (1993) as well as by Chaudri (1998). The crucial issue for the resulting demand system is the nature of the demand dependence between the reader and the advertising market. There can be no doubt that the demand of advertisers reacts positively to an increase of the circulation. If the newspaper expands its readership, advertisers are willing to pay more to reach the higher number of potential customers.

However, as mentioned earlier, the attitude of the readers towards the quantity of advertising in the newspaper is not clear-cut. Readers may feel neutral about the advertising messages (at least for a certain proportion of editorial content to advertising), they may dislike them or they may like them. If they feel neutral about the messages, I refer to this case as one-sided demand dependence. If they either like them or dislike them, I denote the cases as cases of two-sided demand dependence. Sometimes, the latter case is also referred to as demand interdependence.

3.3.1 One-sided Demand Dependence

Firstly, I assume that readers feel neutral about advertising in the newspaper. In this case of one-sided demand dependence, the readers' demand is independent of the advertising

[21] In general, the variable costs of producing a newspaper issue depend on the volume and characteristics of the advertising messages within that issue. Accordingly, v^r would be a function of $\mathbf{a}$. However, here I assume that publishing additional advertising messages does not alter the volume of the newspaper and that the variable costs v^r and v_k^a are independent and constant.

volume and the corresponding partial derivative of the demand function (3.1) $\frac{\partial D^r}{\partial a}$ is zero.

In my approach, the monopolist optimizes his profits by choosing quantities. The corresponding prices are determined by the inverse demand constraints. Thus, in this section the firm's choice variables are the circulation and the advertising volume. As Blair and Romano pointed out, quantity setting implies that the firm varies the volume of one variable while holding the volume of the other choice variable(s) constant. For example, if the firm changes the circulation marginally, it holds the advertising volume constant and lets the advertising price adjust to capture the change in demand of the advertisers.[22]

The optimization by choosing quantities requires an inversion of the demand functions (3.1) and (3.2). The inverse demand for newspaper copies in the case of one category of advertising is

$$p^r = d^r(r)$$

where $d^r(\cdot)$ denotes the inverse circulation demand function. Analogously, the inverse demand for advertising is given by

$$p^a = d^a(a, r)$$

According to these demand constraints, the newspaper profits in the case of one category of advertising are given by

$$\pi = p^r r + p^a a - (FC + v^r r + v^a a)$$

The optimal level of the circulation is determined by the first-order condition of the profits with respect to r (while holding a constant)

$$\frac{\partial \pi}{\partial r} = p^r + \frac{\partial p^r}{\partial r} r + \frac{dp^a}{dr} a - v^r$$

where $\frac{dp^a}{dr}$ represents the change of the inverse advertising demand caused by the marginal change of the circulation.[23] The condition is set equal to zero and rewritten as (for a proof see section 3.A.1 in the appendix)

$$p^r \left(1 - \frac{1}{\varepsilon^r}\right) + \frac{\partial D^a}{\partial r} \frac{p^a}{\varepsilon^a} = v^r \tag{3.4}$$

[22] It can be evidenced by substitution that quantity setting and price setting result in identical final conditions for the optimal circulation and advertising volume. This result has been shown by Blair and Romano. It is driven by the fact that the newspaper serves both markets as a monopolist.

[23] Assume that the second-order conditions are such that the solution to the problem provides a global maximum. This assumption is made for all optimization procedures in the analysis at hand.

In condition (3.4), ε^r and ε^a denote the price elasticity of demand in the reader market and the advertising market, respectively, i.e. $\varepsilon^r = -\frac{\partial D^r}{\partial p^r}\frac{p^r}{r}$ and $\varepsilon^a = -\frac{\partial D^a}{\partial p^a}\frac{p^a}{a}$.[24]

Condition (3.4) represents a typical "marginal revenue equals marginal cost" condition from a monopolist's optimization problem. The marginal revenue on the left-hand side of the equation is composed of two terms: Firstly, the marginal revenue in the monopoly market at hand (here the circulation market), $p^r\left(1-\frac{1}{\varepsilon^r}\right)$, and, secondly, the marginal revenue from the related market (here the advertising market), $\frac{\partial D^a}{\partial r}\frac{p^a}{\varepsilon^a}$. The marginal revenue from the advertising market is increasing in the sensitivity of advertisers with respect to the circulation, $\frac{\partial D^a}{\partial r}$, and the volume of advertising, a.

In contrast, the optimality condition for the advertising rate is unchanged compared to the case of no demand externalities. The inverse elasticity rule still applies. i.e.

$$p^a\left(1-\frac{1}{\varepsilon^a}\right) = v^a \tag{3.5}$$

Solving condition (3.5) for p^a and using the solution in conjecture with condition (3.4) provides

$$p^r\left(1-\frac{1}{\varepsilon^r}\right) = v^r - \frac{1}{\varepsilon^a - 1}\frac{\partial D^a}{\partial r}v^a \tag{3.6}$$

Condition (3.6) has to be handled with care because the variables p^r and p^a are both endogenous and such are the elasticity terms. Recall that the optimality condition for the advertising market, condition (3.5), implies that it can never be optimal for the firm to sell an advertising volume that results in an inelastic advertising demand. Accordingly, the price elasticity in the advertising market is always greater than one, i.e. $\varepsilon^a > 1$. If $\varepsilon^a > 1$ the term $\frac{1}{\varepsilon^a - 1}\frac{\partial D^a}{\partial r}v^a$ in condition (3.6) is positive implying that the traditional marginal revenue is below the corresponding marginal cost, i.e. that $p^r\left(1-\frac{1}{\varepsilon^r}\right) - v^r < 0$.

A closer inspection of condition (3.6) reveals that the firm's choice of the circulation can basically result in three price levels for subscribers:

1. **Above marginal cost pricing**, i.e. $p^r > v^r$: Case one occurs if

$$\frac{v^r}{\varepsilon^r} > \frac{1}{\varepsilon^a - 1}\frac{\partial D^a}{\partial r}v^a$$

   Accordingly, a subscription price above the marginal cost results if the marginal cost of the newspaper production weighted by the corresponding price elasticity exceeds the marginal revenue from the advertising market. The statement can be true for cases of elastic and inelastic newspaper demand, i.e. for cases in which $\varepsilon^r > 1$ or cases in which $0 < \varepsilon^r < 1$.

[24] To keep things tractable, I assume that the price sensitivity in the different groups of customers is unchanged under all specifications, i.e. $\frac{\partial D^a}{\partial p^a}$ and $\frac{\partial D^r}{\partial p^r}$ are both constants.

2. **Positive but below marginal cost pricing**, i.e. $0 < p^r < v^r$: The second case requires that
$$\frac{v^r}{\varepsilon^r} < \frac{1}{\varepsilon^a - 1}\frac{\partial D^a}{\partial r}v^a$$
which is the condition from above with a reversed inequality sign. Again, the condition can be true for all values of $\varepsilon^r > 0$.

3. **Negative subscription price**, i.e. $p^r < 0$: The third case is a special scenario of case two and - obviously - implies below marginal cost pricing. Note that the price elasticity of demand changes its sign if $p^r < 0$. Thus, ε^r provides no meaningful interpretation anymore. The condition for case three to occur is
$$v^r < \frac{1}{\varepsilon^a - 1}\frac{\partial D^a}{\partial r}v^a + \left|\frac{\partial p^r}{\partial r}\right| r$$
Thus, negative pricing is optimal if the marginal cost of the newspaper production is less than the marginal revenue from the advertising market plus the indirect revenue effect from the reader market when changing the circulation at the margin, $\left|\frac{\partial p^r}{\partial r}\right| r$. There are several reservations related to negative pricing. These and additional issues will be discussed in detail in section 3.4.2.

Basically, two more scenarios can result from the firm's optimization procedure: It can happen by accident that the resulting subscription price is exactly equal to the marginal cost of the newspaper production or that the resulting price is exactly equal to zero.

3.3.2 Two-sided Demand Dependence

In his early work Corden pointed out that in the analysis of media markets the demand externalities between the reader and advertiser markets should basically be explored in both directions. Accordingly, the assumption that readers feel neutral about advertising in the newspaper is abolished, i.e. $\frac{\partial D^r}{\partial a} \neq 0$. However, in this section I still limit the number of categories of advertising to one.

In this case of two-sided demand dependence, the modified inverse subscription demand writes as[25]
$$p^r = d^r(r, a)$$

[25] Note that even though I use the same notation of variables (e.g. p^r, p^a, r, a and so on) in the different sections of my analysis, the values of the variables are different in the cases I am looking at. Adding further subscripts or superscripts to the variables in order to differentiate the cases formally, would make the notation simply too complex.

In this scenario, two cases have to be distinguished: Readers can either like the advertising messages, i.e. $\frac{\partial D^r}{\partial a} > 0$, or they can dislike them, i.e. $\frac{\partial D^r}{\partial a} < 0$. If readers like advertising messages in the newspaper, I denote them - following Sonnac (2000) - as "ad-lovers." In contrast, if readers dislike the messages, I refer to them as "ad-avoiders."

Firstly, consider the condition for the optimal circulation. Formally, it looks the same like condition (3.4) that was derived under the assumption of a neutral attitude of readers towards advertising, i.e.

$$p^r \left(1 - \frac{1}{\varepsilon^r}\right) + \frac{\partial D^a}{\partial r} \frac{p^a}{\varepsilon^a} = v^r$$

Again, the marginal revenue resulting from a change of the circulation is composed of two effects: Marginal revenue from the market at hand, the circulation market, and marginal revenue from the related market, the advertising market. The marginal revenue from the dependent advertising market, $\frac{\partial D^a}{\partial r} \frac{p^a}{\varepsilon^a}$, is positive regardless of whether readers like or dislike the advertising messages.

However, in the case that readers feel non-neutral with respect to advertising, the optimal advertising volume differs and so do the corresponding price and the price elasticity. The first-order condition of the profits with respect to the advertising volume results in (while holding r constant)

$$p^a \left(1 - \frac{1}{\varepsilon^a}\right) + \frac{\partial D^r}{\partial a} \frac{p^r}{\varepsilon^r} = v^a \tag{3.7}$$

Formally, condition (3.7) is equivalent to the one from the reader market above. However, the sign of the marginal revenue from the related market (here the circulation market), $\frac{\partial D^r}{\partial a} \frac{p^r}{\varepsilon^r}$, depends on the question of whether readers like or dislike the advertising messages, i.e. on the sign of $\frac{\partial D^r}{\partial a}$.

In the case of ad-loving readers, i.e. $\frac{\partial D^r}{\partial a} > 0$, the demand system is basically symmetric. The advertising messages have a positive effect on the readers' demand and the circulation has a positive effect on the advertisers' demand. Accordingly, no statement can be made a priori whether the firm sets the circulation or the advertising volume or neither one such that the resulting prices are below the corresponding marginal costs. The firm's optimal choices depend on the marginal costs, the price elasticities and the strength of the demand interdependence. Note that if readers like advertising, the result that the demand for advertising is strictly elastic collapses. Thus, ε^a can be less or greater than one at the optimum.

Recall from the introduction of this chapter, that the phenomenon of the "circulation spiral" was explained by Furhoff using a setup similar to the one above. The circulation

drives the advertising demand up and vice versa. However, in the analysis at hand, the idea of a "circulation spiral" is misleading. In my approach, the firm is a monopolist and has full information and certainty about the reactions of the involved agents. Thus, it changes the quantities of all variables only once and simultaneously and the new market equilibrium emerges right away.

Things turn out differently if the readers dislike the exposure to advertising messages in the newspaper, i.e. if $\frac{\partial D^r}{\partial a} < 0$. In this case, the demand system is no longer symmetric. Advertisers like a high circulation, but readers do not like the presence of advertising messages. Thus, the marginal revenue from the circulation market in condition (3.7) is negative. If readers feel annoyed by advertising messages, the firm limits the volume of advertising. Note that, in contrast to the case above, it cannot be optimal for the firm to choose the advertising volume such that the corresponding demand is inelastic because $v^a - \frac{\partial D^r}{\partial a}\frac{p^r}{\varepsilon^r} > 0$ if $\frac{\partial D^r}{\partial a} < 0$, i.e. if readers dislike advertising then $\varepsilon^a > 1$ at the optimum.

Until now the analysis has aggregated the insights from the economics of the newspaper monopolist for the case of one category of advertising. I explored scenarios of one-sided and two-sided demand dependence and of ad-loving and ad-avoiding readers. Based on these underpinnings, I next expand the model to capture the idea that the firm sells more than one category of advertising.

3.4 Newspaper with two Categories of Advertising

Recall from section 3.2.2 that newspapers sell several categories of advertising, which are typically categorized as national advertising, local retail advertising and the different sections of classified advertising. Each category is sold to a distinct group of commercial or private customers and affects the reader demand in a different way. Therefore, I develop a model that examines cases of two categories of advertising in the newspaper.[26] Again, I distinguish the cases of one-sided and two-sided demand dependencies.[27]

3.4.1 One-sided Demand Dependencies

In the first step, two categories of advertising are introduced both of which readers feel neutral about. As such, the vector $\mathbf{a}$ equals (a_1, a_2) and the demand dependencies

[26] Adding further categories of advertising is methodologically feasible but does not alter the basic results.

[27] In order to keep the analysis concise, I present the model again assuming that the newspaper firm chooses quantities. As in the case of one category of advertising, it is possible to solve the model by applying either price or quantity setting. By substitution it can be shown that the resulting optimality conditions are identical.

between the reader market and each advertising market are one-sided with $\frac{\partial D^r}{\partial a_k} = 0$ for $K = 2$. The inverse demand constraints in this case are given by

$$\begin{aligned} p^r &= d^r(r, a_1, a_2) \\ p_1^a &= d_1^a(a_1, r) \\ p_2^a &= d_2^a(a_2, r) \end{aligned}$$

and the firm's profits are

$$\Pi = p^r r + p_1^a a_1 + p_2^a a_2 - [FC + v^r r + v_1^a a_1 + v_2^a a_2]$$

The first-order condition of the profits with respect to the circulation r is (while holding a_1 and a_2 constant)

$$\frac{\partial \Pi}{\partial r} = p^r + \frac{\partial p^r}{\partial r} r + \frac{dp_1^a}{dr} a_1 + \frac{dp_2^a}{dr} a_2 - v^r$$

I assume that the circulation affects the demand in the both advertising markets the same way, i.e. $\frac{\partial D_1^a}{\partial r} = \frac{\partial D_2^a}{\partial r} = \frac{\partial D^a}{\partial r}$. This assumption also applies to the analysis in the next section. Then by setting the condition equal to zero I can write[28]

$$p^r \left(1 - \frac{1}{\varepsilon^r}\right) + \frac{\partial D^a}{\partial r} \left(\frac{p_1^a}{\varepsilon_1^a} + \frac{p_2^a}{\varepsilon_2^a}\right) = v^r \tag{3.8}$$

Condition (3.8) accounts for the effect of the change of the circulation in both advertising markets. Compared to the situation of one category of advertising (see condition 3.4), the expression for the marginal revenue from advertising is modified in an additive fashion, $\frac{\partial D^a}{\partial r} \left(\frac{p_1^a}{\varepsilon_1^a} + \frac{p_2^a}{\varepsilon_2^a}\right)$. The additional advertising market that the firm is able to serve amplifies the effect of the marginal revenue from advertising. Because of the one-sided nature of the demand dependencies, the optimal advertising volumes are again determined by the inverse elasticity rule.

An in-depth analysis of condition (3.8) results in implications similar to those that were derived in section 3.3.1 for the case of one category of advertising and readers feeling neutral about advertising messages. Note that the marginal revenue from the advertising markets, $\frac{\partial D^a}{\partial r} \left(\frac{p_1^a}{\varepsilon_1^a} + \frac{p_2^a}{\varepsilon_2^a}\right)$, is higher in the case of two categories of advertising compared to the case of one category if $\frac{p_1^a}{\varepsilon_1^a} + \frac{p_2^a}{\varepsilon_2^a} > \frac{p^a}{\varepsilon^a}$, resulting in a higher circulation and a lower subscription price (all other things equal). If the optimal values of the advertising prices are plugged into condition (3.8), it can be shown that below marginal cost pricing in the

[28] The manipulation follows basically the same steps as presented in section 3.A.1 in the appendix for the case of one category of advertising.

subscription market occurs if

$$\frac{v^r}{\varepsilon^r} < \frac{\partial D^a}{\partial r}\left(\frac{v_1^a}{\varepsilon_1^a - 1} + \frac{v_2^a}{\varepsilon_2^a - 1}\right)$$

Note that in this condition the price elasticities of demand for both categories of advertising, ε_1^a and ε_2^a, are greater than one. This is clear from the inverse elasticity rule. Thus, the corresponding demand is elastic at the optimum for both categories of advertising. Again, the major reason why below marginal cost pricing in the circulation market can be optimal is that advertisers value a high circulation a lot, i.e. $\frac{\partial D^a}{\partial r}$ is large.

3.4.2 Two-sided Demand Dependencies

Next, consider the case that the newspaper carries two categories of advertising and the demand-dependencies are both two-sided. Assume that the first category has a positive effect on the readers' demand, whereas the second category has a negative influence. Put differently, readers like the first category but dislike the second one. In this section, firstly, I explore the optimal circulation and the corresponding subscription price. Secondly, an analogous analysis is carried out for the two categories of advertising.

The first-order condition of the firm's profits with respect to the newspaper's circulation looks formally equivalent to condition (3.8) that is reproduced below.

$$p^r\left(1 - \frac{1}{\varepsilon^r}\right) + \frac{\partial D^a}{\partial r}\left(\frac{p_1^a}{\varepsilon_1^a} + \frac{p_2^a}{\varepsilon_2^a}\right) = v^r \tag{3.9}$$

However, the economic interpretation of the condition differs considerably from the case of one-sided demand dependencies. At the optimum, the values of the variables can differ significantly, in particular, it is not at all clear that the price elasticities of demand in the advertising markets, ε_1^a and ε_2^a, are greater than one.

In condition (3.9) the marginal revenue from the advertising markets, $\frac{\partial D^a}{\partial r}\left(\frac{p_1^a}{\varepsilon_1^a} + \frac{p_2^a}{\varepsilon_2^a}\right)$, is strictly positive. To see this, firstly, recall that $\frac{\partial D^a}{\partial r} > 0$ and, secondly, that $\frac{p_k^a}{\varepsilon_k^a} = \frac{a_k}{\frac{D_k^a}{p_k^a}} > 0$ for $a_k > 0$ and advertising being a normal good. In addition, in the case of quantity setting, the marginal revenue from the advertising markets is not altered by a marginal change of the circulation. Note that $\frac{\partial D^a}{\partial r}\left(\frac{p_1^a}{\varepsilon_1^a} + \frac{p_2^a}{\varepsilon_2^a}\right)$ can be rewritten as $\frac{\partial D^a}{\partial r}\left(\frac{a_1}{\frac{D_1^a}{p_1^a}} + \frac{a_2}{\frac{D_2^a}{p_2^a}}\right)$, which is independent of the advertising prices. Recall that the firm holds the advertising volumes constant when optimizing the circulation.

As in all other cases so far, the subscription price is decreasing in the marginal revenue from advertising. The marginal revenue from advertising is increasing in the sensitivity of advertisers with respect to the circulation, $\frac{\partial D^a}{\partial r}$, and the two advertising volumes, a_1 and

a_2. The latter implies that if the firm expands the circulation and advertising demand is high, the firm can charge higher advertising rates over a larger number of advertising customers. In addition, the traditional measure of the monopolist's marginal revenue minus marginal cost, $p^r\left(1-\frac{1}{\varepsilon^r}\right)-v^r$, is negative (if ε_1^a and ε_2^a are less than infinity, i.e. they are not perfectly elastic).

Basically, if the firm optimizes the circulation then in line with the presentation in section 3.3.1 three price levels can be described:

1. **Above marginal cost pricing**, i.e. $p^r > v^r$: Case one requires that

$$\frac{v^r}{\varepsilon^r} > \frac{\partial D^a}{\partial r}\left(\frac{p_1^a}{\varepsilon_1^a}+\frac{p_2^a}{\varepsilon_2^a}\right)$$

   which can be derived from condition (3.9) by analyzing the case of $p^r = v^r$. Accordingly, case one occurs if the marginal cost of the newspaper production weighted by the corresponding price elasticity is greater than the marginal revenue from the two advertising markets. The marginal revenue from the advertising markets is small if advertisers do not care a lot about the circulation (resulting in a small value of $\frac{\partial D^a}{\partial r}$) and/or if the advertising volumes are low. Note that in the condition above, the marginal cost is multiplied by the inverse of the price elasticity of newspaper demand. Thus, above marginal cost pricing can result from cases of elastic demand or inelastic demand. The left-hand side of the condition is decreasing in the elasticity. Thus, a less elastic demand increases the likelihood of above marginal cost pricing. If demand is elastic, i.e. $\varepsilon^r > 1$, then the inequality above can only be true if $v^r > \frac{\partial D^a}{\partial r}\left(\frac{p_1^a}{\varepsilon_1^a}+\frac{p_2^a}{\varepsilon_2^a}\right)$.

2. **Positive but below marginal cost pricing**, i.e. $0 < p^r < v^r$: Case two occurs if

$$\frac{v^r}{\varepsilon^r} < \frac{\partial D^a}{\partial r}\left(\frac{p_1^a}{\varepsilon_1^a}+\frac{p_2^a}{\varepsilon_2^a}\right)$$

   Thus, case two requires that the marginal cost of the newspaper production weighted by the corresponding price elasticity is less than the marginal revenue from the advertising markets. The marginal revenue from the advertising markets is high if advertisers care a lot about the circulation (resulting in a high value of $\frac{\partial D^a}{\partial r}$) and/or the advertising volumes are high. Case two can materialize for cases of elastic and inelastic newspaper demand. If demand is inelastic, i.e. $\varepsilon^r < 1$, then it must hold that $v^r < \frac{\partial D^a}{\partial r}\left(\frac{p_1^a}{\varepsilon_1^a}+\frac{p_2^a}{\varepsilon_2^a}\right)$.

3. **Negative subscription price**, i.e. $p^r < 0$. Again, case three is the extreme scenario of case two implying a price below the marginal cost of production. In

this case it is optimal for the newspaper firm to expand the circulation so much that the firm pays the readers for subscriptions. In the case of a negative price, the price elasticity of demand has no meaningful interpretation. Thus, rewrite condition (3.9) as

$$p^r + \frac{\partial p^r}{\partial r} r = v^r - \frac{\partial D^a}{\partial r} \left(\frac{p_1^a}{\varepsilon_1^a} + \frac{p_2^a}{\varepsilon_2^a} \right)$$

For $p^r < 0$ to be optimal it must hold that

$$v^r < \left| \frac{\partial p^r}{\partial r} \right| r + \frac{\partial D^a}{\partial r} \left(\frac{p_1^a}{\varepsilon_1^a} + \frac{p_2^a}{\varepsilon_2^a} \right)$$

implying that the marginal cost of the newspaper production has to fall below the sum of the marginal revenue from advertising and the indirect revenue in the circulation market, $\left| \frac{\partial p^r}{\partial r} \right| r$. However, negative pricing is more or less only a theoretical option for the firm. If the firm paid readers for subscriptions, their demand would jump to infinity. Readers would simply subscribe to the newspaper again and again and dispose the issues, at least as long as the payment of the firm exceeds the costs associated to multiple subscriptions. Thus, if the firm is not capable of restricting the number of subscriptions per individual, $p^r = 0$ is a lower bound and the firm ends up at a corner solution where its optimality conditions do not hold with equality.[29]

The results for the optimal circulation and the corresponding price are summarized by the following proposition:

Proposition 7 *Assume that a monopoly newspaper sells two categories of advertising. Readers like the first category but they dislike the second category. Then the firm's optimal choice of the circulation results (1) in a subscription price above the corresponding marginal cost if* $\frac{v^r}{\varepsilon^r} > \frac{\partial D^a}{\partial r} \left(\frac{p_1^a}{\varepsilon_1^a} + \frac{p_2^a}{\varepsilon_2^a} \right)$, *(2) in a positive subscription price below the marginal cost if* $\frac{v^r}{\varepsilon^r} < \frac{\partial D^a}{\partial r} \left(\frac{p_1^a}{\varepsilon_1^a} + \frac{p_2^a}{\varepsilon_2^a} \right)$ *or (3) in a subsidy for the subscribers (i.e. a negative price) if* $v^r < \left| \frac{\partial p^r}{\partial r} \right| r + \frac{\partial D^a}{\partial r} \left(\frac{p_1^a}{\varepsilon_1^a} + \frac{p_2^a}{\varepsilon_2^a} \right)$. *In the first two cases the resulting subscription demand can either be elastic or inelastic.*

Of course, subscription pricing below marginal cost is only feasible if the profits from the advertising markets are sufficient to cover not only the fixed and variable costs but also the losses stemming from the reader market. Note that it is basically possible that it is optimal for the firm to charge a subscription price of exactly zero, requiring that

[29] Newspaper firms may pay for subscriptions by indirect measures. In Germany, for example, it is common that publishing houses remunerate subscribers who recruit news subscribers by cash or valuable goodies. Such remunerations are typically transferred from the recruiter to the new subscriber.

$v^r = \frac{\partial D^a}{\partial r}\left(\frac{p_1^a}{\varepsilon_1^a} + \frac{p_2^a}{\varepsilon_2^a}\right)$. Moreover, marginal cost pricing could also be optimal. Such a case occurs if $\frac{v^r}{\varepsilon^r} = \frac{\partial D^a}{\partial r}\left(\frac{p_1^a}{\varepsilon_1^a} + \frac{p_2^a}{\varepsilon_2^a}\right)$.

Next, consider the optimal volume of the first category of advertising, a_1, that the readers like. The first-order condition of the profits with respect to the volume of first category of advertising, a_1, is (while holding r constant)

$$p_1^a\left(1 - \frac{1}{\varepsilon_1^a}\right) + \frac{\partial D^r}{\partial a_1}\frac{p^r}{\varepsilon^r} = v_1^a \tag{3.10}$$

In condition (3.10) the total marginal revenue is composed of two sources: The classical marginal revenue of a monopolist, $p_1^a\left(1 - \frac{1}{\varepsilon_1^a}\right)$, and the marginal revenue from the feedback of the circulation market, $\frac{\partial D^r}{\partial a_1}\frac{p^r}{\varepsilon^r}$. Note that the marginal revenue from the circulation market is always positive because $\frac{\partial D^r}{\partial a_1} > 0$ implying that the marginal revenue from the advertising market, $p_1^a\left(1 - \frac{1}{\varepsilon_1^a}\right)$, minus the marginal costs is negative.

If the newspaper firm increases the volume of the first category of advertising marginally, then the utility of the readers increases and the firm can skim the increase of their willingness to pay by a higher subscription price (which still might be negative though). The marginal revenue from the reader market is increasing in the sensitivity of the readers with respect to advertising of category one, $\frac{\partial D^r}{\partial a_1}$, and in the circulation. The latter statement expresses the fact that if the firm expands the volume of the first category of advertising and r is high, it can charge the increased subscription price over a larger number of newspaper subscribers.

For the price of advertising of category one, three cases can be derived from condition (3.10), which are equivalent to the three cases for the subscription price presented above:

1. **Above marginal cost pricing**, i.e. $p_1^a > v_1^a$: Case one requires that

$$\frac{v_1^a}{\varepsilon_1^a} > \frac{\partial D^r}{\partial a_1}\frac{p^r}{\varepsilon^r}$$

   In this case the marginal cost of advertising weighted by the corresponding price elasticity is greater than the marginal revenue from the circulation market. The marginal revenue from the circulation market is small if readers like but not like strongly the advertising of category one (resulting in a positive but small value of $\frac{\partial D^r}{\partial a_1}$) and/or the circulation is low. Again, the condition can be true for cases of elastic demand and inelastic demand, where the left-hand side of the inequality is decreasing in ε_1^a. Note that if demand is elastic, the condition above can only hold if $v_1^a > \frac{\partial D^r}{\partial a_1}\frac{p^r}{\varepsilon^r}$.

2. **Positive but below marginal cost pricing**, i.e. $p_1^a > 0$ and $p_1^a < v_1^a$. This scenario requires that

$$\frac{v_1^a}{\varepsilon_1^a} < \frac{\partial D^r}{\partial a_1}\frac{p^r}{\varepsilon^r}$$

For the condition to hold, the marginal cost weighted by the price elasticity has to be smaller than the marginal revenue from the circulation market. The marginal revenue from the circulation market is high if readers strongly appreciate the advertising of category one (resulting in a large value of $\frac{\partial D^r}{\partial a_1}$) and/or the circulation is high. Case two is possible for cases of elastic and inelastic demand. An elastic demand requires that $v_1^a < \frac{\partial D^r}{\partial a_1}\frac{p^r}{\varepsilon^r}$.

3. **Negative advertising rate**, i.e. $p_1^a > 0$. A negative price occurs if

$$v_1^a < \left|\frac{\partial p_1^a}{\partial a_1}\right| a_1 + \frac{\partial D^r}{\partial a_1}\frac{p^r}{\varepsilon^r}$$

requiring that the marginal cost of the first category of advertising is lower than the sum of the marginal revenue from the circulation market and the indirect revenue effect in the first advertising market, $\left|\frac{\partial p_1^a}{\partial a_1}\right| a_1$. As in the circulation market, negative pricing for advertising is not easy to implement. The demand of advertisers would immediately jump to infinity, given that the payment of the newspaper is higher than the cost for the advertisers of publishing messages repeatedly. Thus, a more realistic strategy would to publish the messages for free.

The results for the price of the first category of advertising are summarized as follows:

Proposition 8 *Assume that a monopoly newspaper publishes two categories of advertising and the readers like the first category but dislike the second category. Then the firm's optimal choice of the volume of the first category of advertising results (1) in an advertising rate above the corresponding marginal cost if* $\frac{v_1^a}{\varepsilon_1^a} > \frac{\partial D^r}{\partial a_1}\frac{p^r}{\varepsilon^r}$*, (2) in an advertising rate below the marginal cost if* $\frac{v_1^a}{\varepsilon_1^a} < \frac{\partial D^r}{\partial a_1}\frac{p^r}{\varepsilon^r}$ *or (3) in a subsidy for the customers if* $v_1^a < \left|\frac{\partial p_1^a}{\partial a_1}\right| a_1 + \frac{\partial D^r}{\partial a_1}\frac{p^r}{\varepsilon^r}$*. The resulting demand in case one and two can either be elastic or inelastic.*

In the economics of media advertising, it is sometimes assumed that the marginal cost of advertising is zero or negligible. In the model at hand, if v_1^a was zero, the firm would choose the advertising volume such that the sum of the marginal revenue from both affected markets is equal to zero, i.e. such that

$$p_1^a\left(1 - \frac{1}{\varepsilon_1^a}\right) + \frac{\partial D^r}{\partial a_1}\frac{p^r}{\varepsilon^r} = 0$$

Because the marginal revenue from the circulation market, $\frac{\partial D^r}{\partial a_1}\frac{p^r}{\varepsilon^r}$, is strictly positive, this implies that the marginal revenue from the advertising market, $p_1^a\left(1-\frac{1}{\varepsilon_1^a}\right)$, has to be negative and demand is always inelastic at the optimum.

Next, consider the optimal volume of the second advertising category, a_2, that the readers dislike. The first-order condition of the profits with respect to the second category of advertising is (while holding r constant)

$$p_2^a\left(1-\frac{1}{\varepsilon_2^a}\right)+\frac{\partial D^r}{\partial a_2}\frac{p^r}{\varepsilon^r}=v_2^a \tag{3.11}$$

In contrast to the first category of advertising, the marginal revenue from the circulation market in (3.11) is negative because readers dislike the advertising messages, i.e. $\frac{\partial D^r}{\partial a_2}<0$. If the newspaper firm expands the volume of the second category of advertising marginally, the readers' willingness to pay is reduced and the firm has to set a lower subscription price in order to hold the circulation constant. Again, this effect is increasing in the strength of feelings readers have towards the advertising messages, $\left|\frac{\partial D^r}{\partial a_2}\right|$, and in the circulation.

Note that in the second advertising market, the difference between the marginal revenue from the market at hand, $p_2^a\left(1-\frac{1}{\varepsilon_2^a}\right)$, and the corresponding marginal cost is positive because $\frac{\partial D^r}{\partial a_2}\frac{p^r}{\varepsilon^r}<0$. Below marginal cost pricing cannot occur in the second advertising market and demand is always elastic, i.e. $p_2^a>v_2^a$ and $\varepsilon_2^a>1$. This result holds even in the case that the marginal cost of producing advertising of category two is zero.

Proposition 9 *If a newspaper monopolist sells two categories of advertising and readers regard the first category as a good and the second category as a bad, then the firm chooses the volume of the second category of advertising such that the corresponding price is above marginal cost and demand is elastic.*

With the presentation of the case of two categories of advertising with two-sided demand dependencies the theoretical groundwork is complete. In the next step, the general model is specified explicitly by using linear demand schedules for readers and advertisers. Despite of the restrictions linear demand functions impose on the framework, the application provides an illustration of the basic mechanics at work. Based on the linear model, a numerical example is calculated.

3.5 Explicit Specification and Numerical Example

The general framework presented in the preceding sections results easily in expressions of tedious complexity if explicit demand functions are applied for the circulation and the

different categories of advertising. For that reason, the following explicit version of the framework is specified by using linear demand functions.

3.5.1 Specification of Model with Linear Demand

To provide an overview of how the demand dependencies affect the model's outcomes, altogether five cases are considered that parallel those from the general framework (except of case I):

- Case I: One category of advertising and no demand dependencies
- Case II: One category of advertising and one-sided demand dependence
- Case III: One category of advertising and two-sided demand dependence
- Case IV: Two categories of advertising and one-sided demand dependencies
- Case V: Two categories of advertising and two-sided demand dependencies

The formal results for these five cases are presented in the appendix in section 3.A.2. There I show for each case the demand functions, the inverse demand constraints, the firm's profits, the first-order conditions, the conditions for below marginal cost pricing and the solutions for the choice variables. For the ease of exposition, I reproduce below only parts of the results for the most interesting case, namely case V.

Accordingly, in the case of two categories of advertising and two-sided demand dependencies the demand functions are

$$\begin{aligned} r &= \alpha_0 - \alpha_1 p^r + \mu_1 a_1 - \mu_2 a_2 \\ a_1 &= \beta_0 - \beta_1 p_1^a + \delta r \\ a_2 &= \gamma_0 - \gamma_1 p_2^a + \delta r \end{aligned}$$

Note that in this specification readers like the first category of advertising but dislike the second category. In section 3.A.2 of the appendix, I present a table providing the economic interpretation of all parameters in the model (table 3A-1). The demand functions can be rewritten as inverse demand constraints of the form

$$\begin{aligned} p^r &= \tfrac{\alpha_0}{\alpha_1} - \tfrac{1}{\alpha_1} r + \tfrac{\mu_1}{\alpha_1} a_1 - \tfrac{\mu_2}{\alpha_1} a_2 \\ p_1^a &= \tfrac{\beta_0}{\beta_1} - \tfrac{1}{\beta_1} a_1 + \tfrac{\delta}{\beta_1} r \\ p_2^a &= \tfrac{\gamma_0}{\gamma_1} - \tfrac{1}{\gamma_1} a_2 + \tfrac{\delta}{\gamma_1} r \end{aligned}$$

The first-order condition (FOC) of the firm's profits with respect to the circulation (while holding a_1 and a_2 constant) results in

$$\underbrace{\frac{\alpha_0}{\alpha_1} - \frac{1}{\alpha_1}r + \frac{\mu_1}{\alpha_1}a_1 - \frac{\mu_2}{\alpha_1}a_2}_{p^r} - \frac{1}{\alpha_1}r = v^r - \delta\left(\frac{a_1}{\beta_1} + \frac{a_2}{\gamma_1}\right) \tag{3.12}$$

The left-hand side of condition (3.12) represents the marginal revenue from the circulation market if the firm changes the circulation. The expression can be rewritten as $p^r\left(1 - \frac{1}{\varepsilon^r}\right)$ in line with condition (3.9) in section 3.4.2. The corresponding manipulation of the FOC is shown as an example for case III in the appendix (see the third subsection in 3.A.2). The right-hand side of (3.12) represents the difference between the marginal cost of the newspaper production and the marginal revenue from the two advertising markets. This expression can be transformed to $v^r - \frac{\partial D^a}{\partial r}\left(\frac{p_1^a}{\varepsilon_1^a} + \frac{p_2^a}{\varepsilon_2^a}\right)$, also paralleling the expression in condition (3.9).

Analogously, the FOC with respect to the volume of first category of advertising (while holding r constant) can be written as

$$\underbrace{\frac{\beta_0}{\beta_1} - \frac{1}{\beta_1}a_1 + \frac{\delta}{\beta_1}r}_{p_1^a} - \frac{1}{\beta_1}a_1 = v_1^a - \frac{\mu_1}{\alpha_1}r \tag{3.13}$$

and the FOC with respect to the volume of the second category of advertising (while holding r constant) can be expressed as

$$\underbrace{\frac{\gamma_0}{\gamma_1} - \frac{1}{\gamma_1}a_2 + \frac{\delta}{\gamma_1}r}_{p_2^a} - \frac{1}{\gamma_1}a_2 = v_2^a - \frac{\mu_2}{\alpha_1}r \tag{3.14}$$

Both conditions can be interpreted in a similar fashion as condition (3.12) above. The left-hand side shows the marginal revenue from the market at hand, whereas the right-hand side represents the difference between the marginal cost and the marginal revenue from the dependent market.

By modifying (3.12) I can show that in the subscription market below marginal cost pricing results as an optimal strategy if[30]

$$\frac{r}{\alpha_1} < \delta\left(\frac{a_1}{\beta_1} + \frac{a_2}{\gamma_1}\right)$$

[30] For details see the full presentation of case V in section 3.A.2 in the appendix.

Accordingly, the firm chooses a circulation resulting in a subscription price below the corresponding marginal production cost if the circulation weighted by the price sensitivity of subscribers, $\alpha_1 = \frac{\partial D^r}{\partial p^r}$, is smaller than the marginal revenue from the related advertising markets.

Condition (3.13) shows that in the first advertising market below marginal cost pricing emerges from an optimal strategy of the firm if

$$\frac{a_1}{\beta_1} < \mu_1 \frac{r}{\alpha_1}$$

Thus, the advertising volume, a_1, weighted by the price sensitivity of the buyers of the first category of advertising has to be less than the marginal revenue from the subscription market. In contrast, in the second advertising market below marginal cost pricing cannot be optimal because condition (3.14) implies that

$$p_2^a - v_2^a = \frac{a_2}{\gamma_1} + \frac{\mu_2}{\alpha_1} r > 0 \quad \text{for} \quad a_2, r > 0$$

These results confirm the statements made in propositions 7, 8 and 9 for the general framework.

Conditions (3.12), (3.13) and (3.14) can be written jointly as a system of linear equations of the form

$$\begin{bmatrix} -\frac{2}{\alpha_1} & \left(\frac{\delta}{\beta_1} + \frac{\mu_1}{\alpha_1}\right) & \left(\frac{\delta}{\gamma_1} - \frac{\mu_2}{\alpha_1}\right) \\ \left(\frac{\delta}{\beta_1} + \frac{\mu_1}{\alpha_1}\right) & -\frac{2}{\beta_1} & 0 \\ \left(\frac{\delta}{\gamma_1} - \frac{\mu_2}{\alpha_1}\right) & 0 & -\frac{2}{\gamma_1} \end{bmatrix} \begin{bmatrix} r \\ a_1 \\ a_2 \end{bmatrix} = \begin{bmatrix} v^r - \frac{\alpha_0}{\alpha_1} \\ v_1^a - \frac{\beta_0}{\beta_1} \\ v_2^a - \frac{\gamma_0}{\gamma_1} \end{bmatrix}$$

and be solved for the choice variables by applying Cramer's rule. Each solution expresses the optimal value as a function of the marginal costs v^r, v_1^a and v_2^a as well as of the parameters α_0, α_1, β_0, β_1, γ_0, γ_1, δ, μ_1 and μ_2 (see table 3A-1 for descriptions). Accordingly, the solutions comprise a large number of terms. As mentioned earlier, they are provided in the appendix in section 3.A.2.

3.5.2 Solution of Model with Numerical Example

In order to explore the quantitative effects of the five specifications above, I chose a numerical example. I assigned a value to the marginal cost of each variable and to all parameters in the model. These values were chosen such that:

- The demand curves for advertising are identical for both categories, i.e. $\beta_0 = \gamma_0$ and $\beta_1 = \gamma_1$.

- The demand curve for subscriptions is less steep than the demand curves for advertising, i.e. $\beta_1 > \alpha_1$, and has a higher intercept at the vertical axis, i.e. $\alpha_0 > \beta_0$.
- For both categories of advertising the sensibility of demand with respect to the circulation is identical. In addition, advertising demand is more sensitive to changes in the circulation than the circulation is sensitive to changes in the advertising volume(s), i.e. $\delta > |\mu_k|$.
- The variable production costs are the same for both categories of advertising and half the variable cost of the newspaper production, i.e. $v_1^a = v_2^a = \frac{1}{2}v^r$.

The actual numbers I used are reproduced in table 3A-2 in section 3.A.3 in the appendix. By applying these values, I was able to calculate explicit solutions for the choice variables as well as for the firm's profits for the five cases described above. The results of the calculations are reproduced below in table 3-1. Note that case III had to be solved twice: Firstly, for the case that readers like advertising in the newspaper (case IIIa) and, secondly, for the case that they dislike advertising (case IIIb). Basically, the results in table 3-1 confirm the implications derived from the general framework. Of course, the results depend critically on the values I chose for the variable costs and the parameters of the model. In particular, it matters that advertisers react more sensitive to changes in the circulation than readers react to changes in the advertising volumes.

According to the results in table 3-1, the firm's profits are the highest in the case of two categories of advertising and two-sided demand dependencies (case V). In this case, the firm also sells the highest circulation and the largest volume of the first category of advertising.

Interestingly, profits in case V exceed the profits in cases IIIa and IV even though in the latter cases readers do not feel disturbed by the second category of advertising. Compared to case IIIa profits are higher in case V, because the firm sells 12.5 units of the second category of advertising and, thereby, benefits more from the positive effect of the circulation on the advertising volume than it suffers losses caused by the annoyance of the readers. The readers are compensated for the exposure to the second category of advertising by a lower subscription price. Compared to case IV profits are higher in case V, because readers appreciate the messages of the first category of advertising more than they feel bothered by the messages of the second category. In case V, the firm sells 44.7 units of the first category of advertising but only 12.5 units of the second category of advertising.

Table 3-1: Solutions of Model Specifications for Cases I-V

	Case I	Case II	Case IIIa	Case IIIb	Case IV	Case V
r	49.5	54.2	63.3	50.2	59.6	64.2
a or a_1	4.5	24.8	44.0	10.8	28.8	44.7
a_2	-	-	-	-	28.8	12.5
p^r	50.5	45.9	47.8	47.1	40.4	43.8
p^a or p_1^a	2.8	12.9	6.7	18.4	13.9	6.8
p_2^a	-	-	-	-	13.9	22.8
ε^r	1.0	.85	.76	.94	.68	.68
ε^a or ε_1^a	1.2	1.0	.30	3.4	.97	.30
ε_2^a	-	-	-	-	.97	3.6
π	2,461	2,736	3,231	2,508	3,069	3,308

Variables	Description
r	Circulation of the newspaper
a or a_1	Volume of advertising or of the first category of advertising
a_2	Volume of the second category of advertising
p^r	Newspaper subscription price
p^a or p_1^a	Advertising rate or rate for the first category of advertising
p_2^a	Rate for the second category of advertising
ε^r	Own price elasticity of the demand for newspaper copies
ε^a or ε_1^a	Own price elasticity of the demand for advertising or for the first category of advertising
ε_2^a	Own price elasticity of the demand for the second category of advertising
π	Newspaper profits

Cases	Description
Case I	One category of advertising and no demand dependence in either direction
Case II	One category of advertising and one-sided demand dependence
Case IIIa	One category of advertising and two-sided demand dependence (reader like ads)
Case IIIb	One category of advertising and two-sided demand dependence (reader dislike ads)
Case IV	Two categories of advertising and one-sided demand dependencies
Case V	Two categories of advertising and two-sided demand dependencies

Note that the subscription price is rather stable in all specifications compared to the advertising rates. This result is driven by the fact that advertisers always prefer a higher circulation (except in case I) but readers either feel neutral about advertising (cases I, II and IV), like it (case IIIa), dislike it (case IIIb) or do both (case V). In addition, given my numerical example, advertising demand is particularly low if advertisers do not care about the level of the circulation (case I).

Eventually, consider the results for the price elasticities. The firm chooses the circulation such that the resulting demand of readers is inelastic in all cases except of case I. Thus, the marginal revenue from the circulation market is negative, i.e. $p^r\left(1-\frac{1}{\varepsilon^r}\right)<0$. If readers like advertising, the corresponding price elasticity is also less than one (inelastic demand). In contrast, if readers dislike advertising, the corresponding price elasticity is greater than one (elastic demand).

In the next step, both the general framework as well as the example with linear demand functions are applied to the dramatic changes in the newspaper markets that have been highlighted in the introduction of this chapter. In particular, the following issues will be discussed: Why are the consequences for regional newspapers so severe if the classified advertising sections erode and what is the optimal reaction of the firm to this trend? In contrast, what happens if the market for brand advertising declines?

3.6 Implications for the Newspaper Firm

In the introduction, I outlined that regional quality newspapers in Germany recently experienced a substantial downturn in the advertising and reader markets. In the sections to follow, I apply my approach to two scenarios that resemble the current developments in the newspaper markets: In scenario one, the demand for classified advertising declines due to exogenous factors, whereas in scenario two the demand for national brand advertising does so. For this analysis, the specification of the model with two categories of advertising and two-sided demand dependencies is employed. I assume that readers like classified advertising but dislike national brand advertising. In addition, I determine the quantitative effects of the demand shocks on the choice variables and on the firm's profits by using the numerical example from above.

3.6.1 Demand Shock in Market for Classified Advertising

Regional quality newspapers in Germany lost between 2000 and 2004 up to 70 per cent of their turnover in the markets for classified advertising, e.g. for jobs, cars, housing and the like. The dramatic decline was not only due to the weak overall economic conditions in Germany but, more importantly, to a structural change of demand in these markets.

Accordingly, the downturn is - at least partly - permanent and will not vanish entirely if the economy recovers. As stated in the introduction, the most important causes for the structural change of demand have been the success of Internet platforms substituting classified advertising messages in newspapers, the increase of the circulation of weekly advertising newspapers distributed for free and the turning away of the youth from the newspapers.

In line with these facts, assume that the demand for advertising of category one erodes by exogenous factors.[31] The corresponding demand schedule is shifted parallel inwards. If the firm did not react and held the advertising volume a_1 constant, the demand decline would only result in a decrease of the advertising price p_1^a.

However, such a behavior cannot be optimal for the firm because it violates condition (3.10). Recall that condition (3.10) implied that the marginal revenue has to equal the marginal cost at the optimum, i.e. that

$$p_1^a \left(1 - \frac{1}{\varepsilon_1^a}\right) + \frac{\partial D^r}{\partial a_1} \frac{p^r}{\varepsilon^r} = v_1^a$$

Note that if the (inverse) demand decreases, the marginal revenue in the advertising market declines as well, i.e. $p_1^a \left(1 - \frac{1}{\varepsilon_1^a}\right)$ falls. Thus, the firm has to reduce the advertising volume a_1 to mitigate the detrimental effect on the marginal revenue.

If the firm reduces a_1, the newspaper's choice of the circulation is no longer optimal either. This problem is caused by two effects:

1. The readers' utility decreases because there is less classified advertising in the newspaper.

2. The incentive for the newspaper to sell a high circulation is decreased because the positive demand dependence affects fewer advertising customers.

Recall that the optimal circulation was determined by condition (3.9) reproduced below

$$p^r \left(1 - \frac{1}{\varepsilon^r}\right) + \frac{\partial D^a}{\partial r} \left(\frac{p_1^a}{\varepsilon_1^a} + \frac{p_2^a}{\varepsilon_2^a}\right) = v^r$$

Accordingly, if the volume of advertising of category one decreases, both the inverse circulation demand, p^r, and the marginal revenue from the advertising sales, $\frac{\partial D^a}{\partial r} \left(\frac{p_1^a}{\varepsilon_1^a} + \frac{p_2^a}{\varepsilon_2^a}\right)$, decrease. If the change is substantial, then it is optimal for the firm to reduce the circulation and to limit both effects thereby. However, the effect does not stop yet because the reduction of the circulation affects the marginal revenue in both advertising markets.

[31] Note that here the availability of demand substitutes does not result in competition but in a shift of the demand schedule towards the origin.

The willingness to pay of both types of advertisers and the marginal revenue from the circulation market decline and the firm has to reduce the volume of both categories of advertising.[32]

The analysis shows that a structural decline of the demand for classified advertising harms the newspaper in many respects. Not only the corresponding revenue declines but also the revenues in both related markets, the reader market and the market for brand advertising, decrease. This result is summarized in the following proposition:

Proposition 10 *If the demand for advertising that the readers like (e.g. classified advertising) declines due to exogenous factors, the newspaper has to decrease not only the volume of that category of advertising but also the circulation and the volume of all other categories of advertising. Accordingly, the goods in the related markets react like complements.*

Assume next that the demand for classified advertising becomes weaker and weaker. Then, from a certain point onwards, it would be optimal for the firm to choose the volume of classified advertising such that the corresponding price is negative. This scenario was formally described by the condition $v_1^a < \left|\frac{\partial p_1^a}{\partial a_1}\right| a_1 + \frac{\partial D^r}{\partial a_1}\frac{p^r}{\varepsilon^r}$ in proposition 8. A negative price implies that the newspaper firm pays the customers of that category of advertising for publishing their advertisements. There are two reservations related to this business practice: First, the demand of advertisers would jump to infinity if the payment by the newspaper exceeded the costs associated to multiple insertions. Thus, the newspaper firm would have to apply a mechanism to restrict the maximum number of publications of each advertisement. Secondly, the revenue from the reader market and the other advertising markets would have to be sufficiently large to cover the fixed and variable costs as well as the losses produced in the market for classified advertising. Probably, a more realistic approach would be to publish classified advertisements for free.[33] However, in such a scenario the advertising volume is too low and the newspaper firm is caught at a corner solution where $p_1^a = 0$ and $p^a\left(1 - \frac{1}{\varepsilon^a}\right) > v_1^a - \frac{\partial D^r}{\partial a_1}\frac{p^r}{\varepsilon^r}$.

Proposition 10 demonstrates why the decline of demand for classified advertising has dramatic consequences for the firms' business model. The decline carries over to all related markets in a negative fashion. According to the model, the decline of demand for subscriptions and brand advertising, outlined in the introduction, could have been caused basically by an initial decrease of the demand for classified advertising.

[32] Recall that in my setup, such a chain of effects does not resemble the effect of the "circulation spiral." All changes take place simultaneously and the new equilibrium emerges right away (see section 3.3.2 for details).

[33] Such business models are applied, for example, by directories published in large metropolitan areas that have specialized on classified advertisements for "room to rent." Typically, they derive the bulk of their income from buyers of the directory but not from advertisers.

3.6.2 Demand Shock in Market for Brand Advertising

In contrast to the analysis above, assume next that the exogenous negative demand shock occurs in the other advertising market, the market for persuasive brand advertising (that the readers dislike). If the firm has to reduce the volume of the second category of advertising, a_2 because of an inward shift of the corresponding demand schedule, two effects occur:

1. The readers' utility increases because there is less advertising of category two in the newspaper.

2. The incentive for the newspaper to sell a high circulation is decreased because the positive demand dependence affects fewer advertising customers.

Here, the two effects have opposing signs. If the firm reduces the volume of the second category of advertising, the (inverse) demand of the readers increases because they feel less annoyed by the advertising messages. This effect increases the marginal revenue in the reader market. In contrast, the marginal revenue from the related advertising markets is reduced. Thus, if the positive change of $p^r \left(1 - \frac{1}{\varepsilon^r}\right)$ exceeds the negative change of $\frac{\partial D^a}{\partial r} \frac{p_2^a}{\varepsilon_2^a}$, the firm increases the circulation. In contrast, if the change of the marginal revenue in the reader market is less than $\frac{\partial D^a}{\partial r} \frac{p_2^a}{\varepsilon_2^a}$, then it is optimal for the firm to decrease the circulation. Accordingly, the circulation can react either like a substitute or like a complement. If the firm expands the circulation, it benefits from the effect on the advertisers' demand. Again, the changes of all variables occur simultaneously and instantly due to the model's setup.

Proposition 11 *If exogenous factors drive the demand for advertising down that the readers dislike (e.g. national brand advertising), the consequences for the optimal level of the circulation are two-fold. If the positive effect on the marginal revenue in the reader market outweighs the negative effect on the marginal revenue in the advertising markets, the firm can increase the circulation and the volume of the other category of advertising. In this case the goods in the related markets react like substitutes. In contrast, if it is optimal for the firm to lower the circulation, then the goods in the related markets react like complements.*

According to proposition 11, a negative shock on the demand for advertising that the readers dislike has less severe consequences compared to a decline in the market for classified advertising. It can even be that the related markets are affected positively by the demand decline.

3.6.3 Application of Numerical Example

The consequences of both demand shocks can be quantified by applying the numerical example derived in section 3.5.2. Assume that the demand shock for classified advertising halves the gross utility of customers of this category of advertising. The demand shock for brand advertising is modeled by an equivalent reduction in the associated market. All other parameters of the model are unchanged. The quantitative results of this simulation are displayed in table 3-2. In the second column of the table I reproduced the results from case V of table 3-1. Column three shows the effects on quantities, prices, price elasticities and the firm's profit for the case that the demand for classified advertising declines, whereas the fourth column reports the effects from a downturn of the demand for brand advertising.

Table 3-2: Effects of Demand Shocks

	Case V	Shock of a_1	Shock of a_2
r	64.2	63.3	64.0
a or a_1	44.7	41.5	44.5
a_2	12.5	12.4	10.0
p^r	43.8	44.0	44.6
p^a or p_1^a	6.8	5.5	6.8
p_2^a	22.8	22.5	21.5
ε^r	.68	.70	.70
ε^a or ε_1^a	.30	.27	.31
ε_2^a	3.6	3.6	4.3
π	3,308	3,201	3,280

The description of the variables complies with the information in table 3-1.

As predicted by the propositions 10 and 11, the demand shock for classified advertising has more severe consequences for the newspaper firm than the demand shock for brand advertising. The effects on the firm's revenues from the three markets are reported in table 3-3. Accordingly, the decline of demand for classified advertising drives both the circulation revenue and the revenue from advertising of the second category down (from 2,812 to 2,785 and from 285 to 279, respectively). In contrast, if the demand for the second category of advertising declines exogenously, the circulation revenue increases and the revenue from the first category of advertising changes only marginally (from 2,812 to 2,854 and from 304 to 303, respectively).

Accordingly, given the specification of the numerical example, profits decrease more if the demand for classified advertising decreases compared to an equivalent decline of the demand for brand advertising. If the profit margins in the newspaper business are low, the decrease of profits of about three per cent from the shock in the demand of classified advertising explored above can be sufficient to annihilate the business of the affected firm (in the example in table 3-2 if the fixed costs are between 3,202 and 3,280).

Table 3-3: Revenue Effects of Demand Shocks

	Case V	Shock of a_1	Shock of a_2
Circulation revenue	2,812	2,785	2,854
Revenue from first advertising market	304	228	303
Revenue from second advertising market	285	279	215

3.7 Conclusion

In order to examine the dramatic business downturn that regional quality newspapers have faced in Germany since 2000, I extended the existing theoretical framework of the newspaper firm in two directions. Firstly, in my model the newspaper contains two distinct categories of advertising that readers have different attitudes about and, secondly, all markets are interrelated by two-sided demand dependencies.

The model demonstrated that an exogenous decline of the demand for advertising that readers like leads to a decrease of demand in all related markets. The firm has to lower the quantity of both categories of advertising as well as the circulation. Thus, in relation to the first category of advertising, the other goods react like complements. In contrast, if the demand for the other category of advertising that readers dislike declines, it can be that the firm has to lower the circulation and the volume of both advertising categories, too. However, it can also happen that the firm is able to expand the circulation and, thereby, benefit from a positive externality on the advertising demand. Accordingly, in relation to the second category of advertising, the other goods can react like complements or like substitutes.

The most important result in this chapter is that a decline of the demand for classified advertising affects all other markets that the newspaper serves in a negative fashion. Basically, it is possible that the decrease of demand in the markets for subscriptions and brand advertising is solely caused by an inward shift of the demand for classified advertising. If the downturn in the classified advertising sections is permanent, the related markets will not completely recover even if the overall economic conditions improve. These results were demonstrated by an explicit application of the model with linear demand functions and numerical values for the model's parameters.

The second contribution of my work is to have shown that under certain circumstances it can be optimal for the newspaper firm to pay customers of classified advertising for inserting their messages or - if negative pricing is not feasible - to publish the messages for free. However, such a strategy requires that the profits in the reader market and the other advertising markets are sufficiently high to cover the losses caused by a negative or zero pricing strategy. If the publishing firm sells the copies of the newspaper already below the average costs of production (what is often observed in print media markets), it could be that the firm is not able to recover its fixed cost of the newspaper production and has to exit the market. Thus, the forces of the two-sided demand dependencies can finally annihilate the business of regional quality newspapers.

However, my suggestions have to be handled with care because they were derived by applying a model with rather strict assumptions. The analysis abstracted from any form of competition between newspapers as well as from any form of competition between

newspapers and alternative media vehicles. In addition, to keep things tractable the quantitative results were calculated by using a model with linear demand specifications. Thus, I regard my findings more as an illustration of the mechanics underlying the complex environment in which newspapers carry out their business. Nevertheless, if the results above are at least approximately correct, the variety of independent regional newspapers in Germany is considerably threatened.

3.A Appendix

3.A.1 Manipulation of First-order Condition

In this section, I document the derivation of condition 3.4. An equivalent manipulation was applied to other first-order conditions in section 3.3 as well.

Recall from section 3.3.1 that in the case of one category of advertising and one-sided demand dependence the first-order condition (FOC) with respect to the circulation was (while holding a constant):

$$p^r + \frac{\partial p^r}{\partial r} r + \frac{dp^a}{dr} a - v^r = 0$$

The condition can be written as

$$p^r + \frac{\partial p^r}{\partial r} r = v^r - \frac{dp^a}{dr} a$$

which is equivalent to

$$p^r + \frac{\partial p^r}{\partial r} \frac{r}{p^r} p^r = v^r - \frac{dp^a}{dr} \frac{a}{p^a} p^a$$

Note that $\frac{\partial p^r}{\partial r}$ is the partial derivative of the inverse demand function for subscriptions with respect to the circulation. Given the specification of the circulation demand in section 3.2.1, I can write $\frac{\partial p^r}{\partial r} = \left[\frac{\partial D^r}{\partial p^r}\right]^{-1}$. Thus, the term $\frac{\partial p^r}{\partial r} \frac{r}{p^r} p^r$ can be rewritten as $\frac{p^r}{\varepsilon^r}$ where $\varepsilon^r = -\frac{\partial D^r}{\partial p^r} \frac{p^r}{r}$.

On the right-hand side, $\frac{dp^a}{dr}$ represents the change of the inverse demand for advertising with respect to a change of the circulation holding the advertising volume a constant. If a is held constant, then the demand function for advertising, $D^a(p^a, r)$ can be totally differentiated and set equal to zero to obtain

$$\frac{\partial D^a}{\partial p^a} dp^a + \frac{\partial D^a}{\partial r} dr = 0$$

which can be written as

$$\frac{dp^a}{dr} = -\frac{\frac{\partial D^a}{\partial r}}{\frac{\partial D^a}{\partial p^a}}$$

The expression $\frac{dp^a}{dr} \frac{a}{p^a} p^a$ is then $-\frac{\partial D^a}{\partial r} \frac{p^a}{\varepsilon^a}$ where $\varepsilon^a = -\frac{\partial D^a}{\partial p^a} \frac{p^a}{a}$. It follows that I can write

$$p^r - \frac{p^r}{\varepsilon^r} = v^r - \frac{\partial D^a}{\partial r} \frac{p^a}{\varepsilon^a}$$

Accordingly, the initial equation can be rewritten as condition 3.4

$$p^r \left(1 - \frac{1}{\varepsilon^r}\right) + \frac{\partial D^a}{\partial r} \frac{p^a}{\varepsilon^a} = v^r$$

3.A.2 Specification of Model with Linear Demand Functions

The presentation of the explicit model with linear demand functions follows the same structure as the general model in the chapter. I start out with the case of one category of advertising and, afterwards, analyze the model for the cases of two categories of advertising. For perspicuity, the case that no demand dependence is present at all is added to the scenarios of one category of advertising.

Accordingly, the linear model is specified for five cases:

- Case I: One category of advertising and no demand dependencies
- Case II: One category of advertising and one-sided demand dependency
- Case III: One category of advertising and two-sided demand dependencies
- Case IV: Two categories of advertising and one-sided demand dependency
- Case V: Two categories of advertising and two-sided demand dependencies

Despite of the application of simple linear demand schedules below, the resulting system of equations becomes very complex, particular for the cases of two-sided demand dependencies. For that reason, a numerical example was chosen to show the quantitative effects of the different specifications of the model. The result of this example was presented in section 3.5.2.

The full specification of the model in case V with two categories of advertising and two-sided demand dependencies comprises a large set of parameters. The demand functions in this case look as follows:

$$\begin{aligned} r &= \alpha_0 - \alpha_1 p^r + \mu_1 a_1 - \mu_2 a_2 \\ a_1 &= \beta_0 - \beta_1 p_1^a + \delta r \\ a_2 &= \gamma_0 - \gamma_1 p_2^a + \delta r \end{aligned}$$

An interpretation of each parameter in the demand schedules is provided in table 3A-1. Note that in all cases presented below, the first-order conditions can be manipulated such that they have the same functional form as in the general presentation of the model. As an example this modification in terms of price elasticities is provided at the end of case III.

Table 3A-1: Model Parameters

Parameter	Economic interpretation
α_0	Gross utility of a reader from subscribing to a newspaper
α_1	$\frac{\partial D^r}{\partial p^r}$, i.e. the sensitivity of the circulation demand with respect to its own price
μ or μ_1	$\frac{\partial D^r}{\partial a}$ or $\frac{\partial D^r}{\partial a_1}$, i.e. the sensitivity of the circulation demand with respect to the volume of advertising (of the first category of advertising in the case of two advertising categories)
μ_2	$\frac{\partial D^r}{\partial a_2}$, i.e. the sensitivity of the circulation demand with respect to the volume of the second category of advertising
β_0	Gross utility of an advertising customer from placing his advertisement (of the first category) in the newspaper
β_1	$\frac{\partial D^a}{\partial p^a}$ or $\frac{\partial D_1^a}{\partial p_1^a}$, i.e. the sensitivity of the demand for advertising (of the first category) with respect to its own price
γ_0	Gross utility of advertising customer from placing an advertisement of the second category in the newspaper
γ_1	$\frac{\partial D_2^a}{\partial p_2^a}$, i.e. the sensitivity of the demand for the second category of advertising with respect to its own price
δ	$\frac{\partial D^a}{\partial r}$, i.e. the sensitivity of the demand for advertising with respect to the circulation (identical for both categories of advertising)
v^r	variable cost of newspaper production
v^a / v_1^a	variable cost of advertising (of the first category)
v_2^a	variable cost of advertising of the second category

Solution of Case I

Assume that the newspaper contains one category of advertising and no demand dependencies exist in either direction. In this case the demand functions are

$$r = \alpha_0 - \alpha_1 p^r$$
$$a = \beta_0 - \beta_1 p^a$$

resulting in inverse demand constraints of the form

$$p^r = \frac{\alpha_0}{\alpha_1} - \frac{1}{\alpha_1} r$$
$$p^a = \frac{\beta_0}{\beta_1} - \frac{1}{\beta_1} a$$

and profits for the firm of

$$\pi = \left(\frac{\alpha_0}{\alpha_1} - \frac{1}{\alpha_1} r\right) r + \left(\frac{\beta_0}{\beta_1} - \frac{1}{\beta_1} a\right) a - v^r r - v^a a$$

The first order conditions (FOC) with respect to the circulation and the advertising volume are

$$\frac{\partial \pi}{\partial r} = \frac{\alpha_0}{\alpha_1} - \frac{1}{\alpha_1} r - \frac{1}{\alpha_1} r - v^r = 0$$

and

$$\frac{\partial \pi}{\partial a} = \frac{\beta_0}{\beta_1} - \frac{1}{\beta_1} a - \frac{1}{\beta_1} a - v^a = 0$$

Because no demand dependencies exist, below marginal cost pricing cannot be an optimal strategy in either market.

The FOC can be manipulated to provide directly the solutions to the case as

$$r^* = \tfrac{1}{2}\left(\alpha_0 - \alpha_1 v^r\right)$$
$$a^* = \tfrac{1}{2}\left(\beta_0 - \beta_1 v^a\right)$$

Solution of Case II

Assume that the newspaper contains one category of advertising and readers feel neutral about the amount of advertising in the newspaper. However, advertisers prefer a higher circulation. In this case the demand functions are

$$r = \alpha_0 - \alpha_1 p^r$$
$$a = \beta_0 - \beta_1 p^a + \delta r$$

resulting in inverse demand constraints of the form

$$\begin{aligned} p^r &= \tfrac{\alpha_0}{\alpha_1} - \tfrac{1}{\alpha_1} r \\ p^a &= \tfrac{\beta_0}{\beta_1} - \tfrac{1}{\beta_1} a + \tfrac{\delta}{\beta_1} r \end{aligned}$$

and profits of the firm of

$$\pi = \left(\frac{\alpha_0}{\alpha_1} - \frac{1}{\alpha_1} r \right) r + \left(\frac{\beta_0}{\beta_1} - \frac{1}{\beta_1} a + \frac{\delta}{\beta_1} r \right) a - v^r r - v^a a$$

The FOC with respect to the circulation r is (while holding a constant)

$$\frac{\partial \pi}{\partial r} = \underbrace{\frac{\alpha_0}{\alpha_1} - \frac{1}{\alpha_1} r}_{p^r} - \frac{1}{\alpha_1} r + \frac{\delta}{\beta_1} a - v^r = 0$$

and the FOC with respect to the advertising volume a is (while holding r constant)

$$\frac{\partial \pi}{\partial a} = \underbrace{\frac{\beta_0}{\beta_1} - \frac{1}{\beta_1} a + \frac{\delta}{\beta_1} r}_{p^a} - \frac{1}{\beta_1} a - v^a = 0$$

According to the first FOC, below marginal cost pricing in the subscription market is optimal if

$$\frac{r}{a} < \frac{\alpha_1}{\beta_1} \delta$$

In the advertising market below marginal cost pricing cannot result from an optimal strategy because from the second FOC follows that

$$p^a - v^a = \frac{1}{\beta_1} a > 0 \quad \text{for} \quad a > 0$$

Writing the two FOC as a system of linear equations

$$\begin{bmatrix} -\frac{2}{\alpha_1} & \frac{\delta}{\beta_1} \\ \frac{\delta}{\beta_1} & -\frac{2}{\beta_1} \end{bmatrix} \begin{bmatrix} r \\ a \end{bmatrix} = \begin{bmatrix} v^r - \frac{\alpha_0}{\alpha_1} \\ v^a - \frac{\beta_0}{\beta_1} \end{bmatrix}$$

and solve for the choice variables in terms of the parameters and the marginal costs. Applying Cramer's rule (assume that the determinant is different from zero) gives as solutions

$$\begin{aligned} r^* &= \tfrac{2\alpha_0\beta_1 + \delta\alpha_1\beta_0 - 2\alpha_1\beta_1 v^r - \delta\alpha_1\beta_1 v^a}{4\beta_1 - \delta^2\alpha_1} \\ a^* &= \tfrac{\beta_1(2\beta_0 + \delta\alpha_0 - 2\beta_1 v^a - \delta\alpha_1 v^r)}{4\beta_1 - \delta^2\alpha_1} \end{aligned}$$

Solution of Case III and FOC Modification

Assume that the newspaper contains one category of advertising but readers feel non-neutral about the volume of advertising in the newspaper. In the case that readers like the advertising messages, the derivative of the demand function for subscriptions with respect to the advertising volume is positive, i.e. $\mu > 0$, whereas if they dislike advertising it is negative, i.e. $\mu < 0$.

In this case the demand functions are

$$r = \alpha_0 - \alpha_1 p^r + \mu a$$
$$a = \beta_0 - \beta_1 p^a + \delta r$$

resulting in inverse demand constraints of the form of

$$p^r = \frac{\alpha_0}{\alpha_1} - \frac{1}{\alpha_1} r + \frac{\mu}{\alpha_1} a$$
$$p^a = \frac{\beta_0}{\beta_1} - \frac{1}{\beta_1} a + \frac{\delta}{\beta_1} r$$

and profits for the firm of

$$\pi = \left(\frac{\alpha_0}{\alpha_1} - \frac{1}{\alpha_1} r + \frac{\mu}{\alpha_1} a \right) r + \left(\frac{\beta_0}{\beta_1} - \frac{1}{\beta_1} a + \frac{\delta}{\beta_1} r \right) a - v^r r - v^a a$$

The FOC with respect to the circulation is (while holding a constant)

$$\frac{\partial \pi}{\partial r} = \frac{\alpha_0}{\alpha_1} - \frac{1}{\alpha_1} r + \frac{\mu}{\alpha_1} a - \frac{1}{\alpha_1} r + \frac{\delta}{\beta_1} a - v^r = 0$$

and the FOC with respect to the advertising volume is (while holding r constant)

$$\frac{\partial \pi}{\partial a} = \frac{\beta_0}{\beta_1} - \frac{1}{\beta_1} a + \frac{\delta}{\beta_1} r - \frac{1}{\beta_1} a + \frac{\mu}{\alpha_1} r - v^a = 0$$

Below marginal cost pricing occurs in the subscription market if

$$\frac{r}{a} < \frac{\alpha_1}{\beta_1} \delta$$

and in the advertising market if

$$\frac{a}{r} < \frac{\beta_1}{\alpha_1} \mu$$

Note that below marginal cost pricing in the advertising market can only occur as an optimal strategy if readers like the advertising messages, i.e. if $\mu > 0$.

Writing the FOC as a system of linear equations

$$\begin{bmatrix} -\frac{2}{\alpha_1} & \left(\frac{\delta}{\beta_1}+\frac{\mu}{\alpha_1}\right) \\ \left(\frac{\delta}{\beta_1}+\frac{\mu}{\alpha_1}\right) & -\frac{2}{\beta_1} \end{bmatrix} \begin{bmatrix} r \\ a \end{bmatrix} = \begin{bmatrix} v^r - \frac{\alpha_0}{\alpha_1} \\ v^a - \frac{\beta_0}{\beta_1} \end{bmatrix}$$

and solve by applying Cramer's rule (assuming that the determinant is non-zero)

$$r^* = \frac{\alpha_1\left(2\alpha_0\beta_1+\mu\beta_0\beta_1+\delta\alpha_1\beta_0-2v^r\alpha_1\beta_1-v^a\mu\beta_1^2-v^a\delta\alpha_1\beta_1\right)}{4\alpha_1\beta_1-2\mu\delta\alpha_1\beta_1-\mu^2\beta_1^2-\delta^2\alpha_1^2}$$
$$a^* = \frac{\beta_1\left(2\alpha_1\beta_0+\delta\alpha_0\alpha_1+\mu\alpha_0\beta_1-2v^a\alpha_1\beta_1-v^r\delta\alpha_1^2-v^r\mu\alpha_1\beta_1\right)}{4\alpha_1\beta_1-2\mu\delta\alpha_1\beta_1-\mu^2\beta_1^2-\delta^2\alpha_1^2}$$

Alternatively, the FOC can be written in terms of the price elasticities of demand in line with the presentation of the general model. For case III this modification is provided here as an example. Note that the FOC for all cases can be manipulated in a similar fashion such that they are identical to the ones known from the general model. Recall that an interpretation of all parameters is found in table 3A-1. For case III the FOC with respect to the circulation was

$$\underbrace{\frac{\alpha_0}{\alpha_1}-\frac{1}{\alpha_1}r+\frac{\mu}{\alpha_1}a}_{p^r}-\frac{1}{\alpha_1}r+\frac{\delta}{\beta_1}a = v^r$$

Note that the first three terms on the left-hand side represent the subscription price. The term $\frac{1}{\alpha_1}$ is the derivative of the demand for subscriptions with respect to its own price, i.e. $\frac{1}{\alpha_1} = \frac{\partial D^r}{\partial p^r}$. The term $\frac{\delta}{\beta_1}$ represents the change in the inverse advertising demand caused by the change of the circulation, i.e. $\frac{\delta}{\beta_1} = \frac{dp^a}{dr}$ (for further information about this expression see section 3.A.1 of the appendix). Using these insights, the FOC can be rewritten as

$$p^r\left(1-\frac{1}{\varepsilon^r}\right)+\frac{\partial D^a}{\partial r}\frac{p^a}{\varepsilon^a} = v^r$$

This equation is identical to condition 3.4 from the general model. According to an analogous reasoning, I can write the FOC with respect to the advertising volume as

$$p^a\left(1-\frac{1}{\varepsilon^a}\right)+\frac{\partial D^r}{\partial a}\frac{p^r}{\varepsilon^r} = v^a$$

From these manipulations one can see instantly, why the interpretation of the conditions in the general setup has to be done with care and why the other quantities have to be held constant when a partial derivative of an objective function is calculated. The specification of the inverse demand constraints shows that both p^r and p^a depend on the circulation and on the advertising volume and so do the corresponding price elasticities.

Solution of Case IV

Assume that the newspaper contains two categories of advertising but readers do not care about the presence of advertising in the newspaper. However, advertisers prefer a higher circulation. In this case the demand functions are

$$\begin{aligned} r &= \alpha_0 - \alpha_1 p^r \\ a_1 &= \beta_0 - \beta_1 p_1^a + \delta r \\ a_2 &= \gamma_0 - \gamma_1 p_2^a + \delta r \end{aligned}$$

and result in inverse demand constraints of the form

$$\begin{aligned} p^r &= \tfrac{\alpha_0}{\alpha_1} - \tfrac{1}{\alpha_1} r \\ p_1^a &= \tfrac{\beta_0}{\beta_1} - \tfrac{1}{\beta_1} a_1 + \tfrac{\delta}{\beta_1} r \\ p_2^a &= \tfrac{\gamma_0}{\gamma_1} - \tfrac{1}{\gamma_1} a_2 + \tfrac{\delta}{\gamma_1} r \end{aligned}$$

and profits for the firm of

$$\begin{aligned} \pi \;=\; & \left(\frac{\alpha_0}{\alpha_1} - \frac{1}{\alpha_1} r\right) r + \left(\frac{\beta_0}{\beta_1} - \frac{1}{\beta_1} a_1 + \frac{\delta}{\beta_1} r\right) a_1 \\ & + \left(\frac{\gamma_0}{\gamma_1} - \frac{1}{\gamma_1} a_2 + \frac{\delta}{\gamma_1} r\right) a_2 - v^r r - v_1^a a_1 - v_2^a a_2 \end{aligned}$$

The FOC with respect to the circulation is (while holding $a_1$and a_2 constant)

$$\frac{\partial \pi}{\partial r} = \frac{\alpha_0}{\alpha_1} - \frac{1}{\alpha_1} r - \frac{1}{\alpha_1} r + \frac{\delta}{\beta_1} a_1 + \frac{\delta}{\gamma_1} a_2 - v^r = 0$$

and with respect to the advertising volumes (while holding r constant)

$$\frac{\partial \pi}{\partial a_1} = \frac{\beta_0}{\beta_1} - \frac{1}{\beta_1} a_1 + \frac{\delta}{\beta_1} r - \frac{1}{\beta_1} a_1 - v_1^a = 0$$

and

$$\frac{\partial \pi}{\partial a_2} = \frac{\gamma_0}{\gamma_1} - \frac{1}{\gamma_1} a_2 + \frac{\delta}{\gamma_1} r - \frac{1}{\gamma_1} a_2 - v_2^a = 0$$

In the subscription market below marginal cost pricing occurs if

$$r < \alpha_1 \delta \left(\frac{a_1}{\beta_1} + \frac{a_2}{\gamma_1}\right)$$

In contrast, the firm will always set $p_k^a > v_k^a$ because from the FOC

$$p_1^a - v_1^a = \frac{1}{\beta_1} a_1 > 0 \quad \text{for} \quad a_1 > 0$$

and

$$p_2^a - v_2^a = \frac{1}{\gamma_1} a_2 > 0 \quad \text{for} \quad a_2 > 0$$

Writing FOC as a system of linear equations

$$\begin{bmatrix} -\frac{2}{\alpha_1} & \frac{\delta}{\beta_1} & \frac{\delta}{\gamma_1} \\ \frac{\delta}{\beta_1} & -\frac{2}{\beta_1} & 0 \\ \frac{\delta}{\gamma_1} & 0 & -\frac{2}{\gamma_1} \end{bmatrix} \begin{bmatrix} r \\ a_1 \\ a_2 \end{bmatrix} = \begin{bmatrix} v^r - \frac{\alpha_0}{\alpha_1} \\ v_1^a - \frac{\beta_0}{\beta_1} \\ v_2^a - \frac{\gamma_0}{\gamma_1} \end{bmatrix}$$

and solve by applying Cramer's rule (assume that the determinant is different from zero)

$$\begin{aligned} r^* &= \frac{4\alpha_0\beta_1\gamma_1 + 2\delta\alpha_1\beta_0\gamma_1 + 2\delta\alpha_1\beta_1\gamma_0 - 4v^r\alpha_1\beta_1\gamma_1 - 2\delta\alpha_1\beta_1 v_1^a\gamma_1 - 2\delta\alpha_1\beta_1\gamma_1 v_2^a}{8\beta_1\gamma_1 - 2\delta^2\alpha_1\beta_1 - 2\delta^2\alpha_1\gamma_1} \\ a_1^* &= \frac{\beta_1\left(4\beta_0\gamma_1 + 2\delta\alpha_0\gamma_1 - 2\delta v^r\alpha_1\gamma_1 - \delta^2\alpha_1\beta_0 + \delta^2\alpha_1\gamma_0 - 4\beta_1 v_1^a\gamma_1 - \delta^2\alpha_1\gamma_1 v_2^a + \delta^2\alpha_1\beta_1 v_1^a\right)}{8\beta_1\gamma_1 - 2\delta^2\alpha_1\beta_1 - 2\delta^2\alpha_1\gamma_1} \\ a_2^* &= \frac{\gamma_1\left(4\beta_1\gamma_0 + 2\delta\alpha_0\beta_1 - 2\delta v^r\alpha_1\beta_1 + \delta^2\alpha_1\beta_0 - \delta^2\alpha_1\gamma_0 - 4\beta_1\gamma_1 v_2^a - \delta^2\alpha_1\beta_1 v_1^a + \delta^2\alpha_1\gamma_1 v_2^a\right)}{8\beta_1\gamma_1 - 2\delta^2\alpha_1\beta_1 - 2\delta^2\alpha_1\gamma_1} \end{aligned}$$

Solution of Case V

Assume that the newspaper contains two categories of advertising and that the readers like advertising of the first category but they dislike advertising of the second category. In this case the demand functions are

$$\begin{aligned} r &= \alpha_0 - \alpha_1 p^r + \mu_1 a_1 - \mu_2 a_2 \\ a_1 &= \beta_0 - \beta_1 p_1^a + \delta r \\ a_2 &= \gamma_0 - \gamma_1 p_2^a + \delta r \end{aligned}$$

resulting in inverse demand constraints of the form

$$\begin{aligned} p^r &= \tfrac{\alpha_0}{\alpha_1} - \tfrac{1}{\alpha_1} r + \tfrac{\mu_1}{\alpha_1} a_1 - \tfrac{\mu_2}{\alpha_1} a_2 \\ p_1^a &= \tfrac{\beta_0}{\beta_1} - \tfrac{1}{\beta_1} a_1 + \tfrac{\delta}{\beta_1} r \\ p_2^a &= \tfrac{\gamma_0}{\gamma_1} - \tfrac{1}{\gamma_1} a_2 + \tfrac{\delta}{\gamma_1} r \end{aligned}$$

and profits of the firm of

$$\begin{aligned} \pi \;=\; & \left(\frac{\alpha_0}{\alpha_1} - \frac{1}{\alpha_1} r + \frac{\mu_1}{\alpha_1} a_1 - \frac{\mu_2}{\alpha_1} a_2\right) r + \left(\frac{\beta_0}{\beta_1} - \frac{1}{\beta_1} a_1 + \frac{\delta}{\beta_1} r\right) a_1 \\ & + \left(\frac{\gamma_0}{\gamma_1} - \frac{1}{\gamma_1} a_2 + \frac{\delta}{\gamma_1} r\right) a_2 - v^r r - v_1^a a_1 - v_2^a a_2 \end{aligned}$$

The FOC with respect to the circulation (while holding a_1 and a_2 constant) is

$$\frac{\partial \pi}{\partial r} = \frac{\alpha_0}{\alpha_1} - \frac{1}{\alpha_1} r + \frac{\mu_1}{\alpha_1} a_1 - \frac{\mu_2}{\alpha_1} a_2 - \frac{1}{\alpha_1} r + \frac{\delta}{\beta_1} a_1 + \frac{\delta}{\gamma_1} a_2 - v^r = 0$$

with respect to the volume of the first category of advertising (while holding r constant)

$$\frac{\partial \pi}{\partial a_1} = \frac{\beta_0}{\beta_1} - \frac{1}{\beta_1} a_1 + \frac{\delta}{\beta_1} r - \frac{1}{\beta_1} a_1 + \frac{\mu_1}{\alpha_1} r - v_1^a = 0$$

and with respect to the volume of the second category of advertising (while holding r constant)

$$\frac{\partial \pi}{\partial a_2} = \left(\frac{\gamma_0}{\gamma_1} - \frac{1}{\gamma_1} a_2 + \frac{\delta}{\gamma_1} r \right) - \frac{1}{\gamma_1} a_2 - \frac{\mu_2}{\alpha_1} r - v_2^a = 0$$

In the subscription market below marginal cost pricing occurs if

$$r < \alpha_1 \delta \left(\frac{a_1}{\beta_1} + \frac{a_2}{\gamma_1} \right)$$

In the first advertising market below marginal cost pricing is an optimal strategy if

$$\frac{a_1}{r} < \frac{\beta_1}{\alpha_1} \mu_1$$

In contrast, in the second advertising market below marginal cost pricing cannot be optimal because

$$p_2^a - v_2^a = \frac{1}{\gamma_1} a_2 + \frac{\mu_2}{\alpha_1} r > 0 \quad \text{for} \quad a_2, r > 0$$

Writing FOC as a system of linear equations

$$\begin{bmatrix} -\frac{2}{\alpha_1} & \left(\frac{\delta}{\beta_1} + \frac{\mu_1}{\alpha_1}\right) & \left(\frac{\delta}{\gamma_1} - \frac{\mu_2}{\alpha_1}\right) \\ \left(\frac{\delta}{\beta_1} + \frac{\mu_1}{\alpha_1}\right) & -\frac{2}{\beta_1} & 0 \\ \left(\frac{\delta}{\gamma_1} - \frac{\mu_2}{\alpha_1}\right) & 0 & -\frac{2}{\gamma_1} \end{bmatrix} \begin{bmatrix} r \\ a_1 \\ a_2 \end{bmatrix} = \begin{bmatrix} v^r - \frac{\alpha_0}{\alpha_1} \\ v_1^a - \frac{\beta_0}{\beta_1} \\ v_2^a - \frac{\gamma_0}{\gamma_1} \end{bmatrix}$$

and solve by applying Cramer's rule (assuming that the determinant is non-zero)

$$r = \frac{\alpha_1 (4\alpha_0\beta_1\gamma_1 + 2\beta_0\beta_1\gamma_1\mu_1 - 2\beta_1\gamma_0\gamma_1\mu_2 + 2\delta\alpha_1\beta_0\gamma_1)}{8\alpha_1\beta_1\gamma_1 - 4\delta\alpha_1\beta_1\gamma_1\mu_1 + 4\delta\alpha_1\beta_1\gamma_1\mu_2 - 2\delta^2\alpha_1^2\beta_1 - 2\delta^2\alpha_1^2\gamma_1 - 2\beta_1^2\gamma_1\mu_1^2 - 2\beta_1\gamma_1^2\mu_2^2}$$
$$+ \frac{\alpha_1 \left(2\delta\alpha_1\beta_1\gamma_0 - 4v^r\alpha_1\beta_1\gamma_1 - 2\delta\alpha_1\beta_1 v_1^a\gamma_1 - 2\delta\alpha_1\beta_1\gamma_1 v_2^a - 2\beta_1^2 v_1^a\gamma_1\mu_1 + 2\beta_1\gamma_1^2 v_2^a\mu_2\right)}{8\alpha_1\beta_1\gamma_1 - 4\delta\alpha_1\beta_1\gamma_1\mu_1 + 4\delta\alpha_1\beta_1\gamma_1\mu_2 - 2\delta^2\alpha_1^2\beta_1 - 2\delta^2\alpha_1^2\gamma_1 - 2\beta_1^2\gamma_1\mu_1^2 - 2\beta_1\gamma_1^2\mu_2^2}$$

$$a_1 = \frac{\beta_1 (4\alpha_1\beta_0\gamma_1 + 2\delta\alpha_0\alpha_1\gamma_1 + 2\delta\alpha_1\beta_0\gamma_1\mu_2 - \delta\alpha_1\gamma_0\gamma_1\mu_2 + 2\alpha_0\beta_1\gamma_1\mu_1 + \delta\alpha_1\beta_1\gamma_0\mu_1)}{8\alpha_1\beta_1\gamma_1 - 4\delta\alpha_1\beta_1\gamma_1\mu_1 + 4\delta\alpha_1\beta_1\gamma_1\mu_2 - 2\delta^2\alpha_1^2\beta_1 - 2\delta^2\alpha_1^2\gamma_1 - 2\beta_1^2\gamma_1\mu_1^2 - 2\beta_1\gamma_1^2\mu_2^2}$$
$$+ \frac{\beta_1 \left(-2\delta v^r\alpha_1^2\gamma_1 - 4\alpha_1\beta_1 v_1^a\gamma_1 - 2v^r\alpha_1\beta_1\gamma_1\mu_1 - \beta_1\gamma_0\gamma_1\mu_1\mu_2 - \delta\alpha_1\beta_1\gamma_1\mu_1 v_2^a - 2\delta\alpha_1\beta_1 v_1^a\gamma_1\mu_2\right)}{8\alpha_1\beta_1\gamma_1 - 4\delta\alpha_1\beta_1\gamma_1\mu_1 + 4\delta\alpha_1\beta_1\gamma_1\mu_2 - 2\delta^2\alpha_1^2\beta_1 - 2\delta^2\alpha_1^2\gamma_1 - 2\beta_1^2\gamma_1\mu_1^2 - 2\beta_1\gamma_1^2\mu_2^2}$$
$$+ \frac{\beta_1 \left(+\delta\alpha_1\gamma_1^2 v_2^a\mu_2 - \delta^2\alpha_1^2\beta_0 + \delta^2\alpha_1^2\gamma_0 - \beta_0\gamma_1^2\mu_2^2 - \delta^2\alpha_1^2\gamma_1 v_2^a + \beta_1\gamma_1^2\mu_1 v_2^a\mu_2 + \delta^2\alpha_1^2\beta_1 v_1^a + \beta_1 v_1^a\gamma_1^2\mu_2^2\right)}{8\alpha_1\beta_1\gamma_1 - 4\delta\alpha_1\beta_1\gamma_1\mu_1 + 4\delta\alpha_1\beta_1\gamma_1\mu_2 - 2\delta^2\alpha_1^2\beta_1 - 2\delta^2\alpha_1^2\gamma_1 - 2\beta_1^2\gamma_1\mu_1^2 - 2\beta_1\gamma_1^2\mu_2^2}$$

$$a_2 = \frac{\gamma_1(4\alpha_1\beta_1\gamma_0+2\delta\alpha_0\alpha_1\beta_1+\delta\alpha_1\beta_0\beta_1\mu_1-2\delta\alpha_1\beta_1\gamma_0\mu_1-2\alpha_0\beta_1\gamma_1\mu_2-\delta\alpha_1\beta_0\gamma_1\mu_2)}{8\alpha_1\beta_1\gamma_1-4\delta\alpha_1\beta_1\gamma_1\mu_1+4\delta\alpha_1\beta_1\gamma_1\mu_2-2\delta^2\alpha_1^2\beta_1-2\delta^2\alpha_1^2\gamma_1-2\beta_1^2\gamma_1\mu_1^2-2\beta_1\gamma_1^2\mu_2^2}$$
$$+\frac{\gamma_1\left(-2\delta v^r\alpha_1^2\beta_1-4\alpha_1\beta_1\gamma_1 v_2^a-\beta_0\beta_1\gamma_1\mu_1\mu_2+2v^r\alpha_1\beta_1\gamma_1\mu_2-\delta\alpha_1\beta_1^2 v_1^a\mu_1+\delta\alpha_1\beta_1 v_1^a\gamma_1\mu_2\right)}{8\alpha_1\beta_1\gamma_1-4\delta\alpha_1\beta_1\gamma_1\mu_1+4\delta\alpha_1\beta_1\gamma_1\mu_2-2\delta^2\alpha_1^2\beta_1-2\delta^2\alpha_1^2\gamma_1-2\beta_1^2\gamma_1\mu_1^2-2\beta_1\gamma_1^2\mu_2^2}$$
$$+\frac{\gamma_1\left(+2\delta\alpha_1\beta_1\gamma_1\mu_1 v_2^a+\delta^2\alpha_1^2\beta_0-\delta^2\alpha_1^2\gamma_0-\beta_1^2\gamma_0\mu_1^2-\delta^2\alpha_1^2\beta_1 v_1^a+\beta_1^2 v_1^a\gamma_1\mu_1\mu_2+\delta^2\alpha_1^2\gamma_1 v_2^a+\beta_1^2\gamma_1\mu_1^2 v_2^a\right)}{8\alpha_1\beta_1\gamma_1-4\delta\alpha_1\beta_1\gamma_1\mu_1+4\delta\alpha_1\beta_1\gamma_1\mu_2-2\delta^2\alpha_1^2\beta_1-2\delta^2\alpha_1^2\gamma_1-2\beta_1^2\gamma_1\mu_1^2-2\beta_1\gamma_1^2\mu_2^2}$$

3.A.3 Values of Numerical example

The values of the numerical example explored in the sections 3.5.2 and 3.6.3 are documented in the table 3A-2.

Table 3A-2: Parameter Values of Numerical Example

	Case I	Case II	Case IIIa	Case IIIb	Case IV	Case V
α_0	100	100	100	100	100	100
α_1	1	1	1	1	1	1
μ or μ_1	-	-	1/4	-1/4	-	1/4
μ_2	-	-	-	-	-	-1/4
β_0	10	10	10	10	10	10
β_1	2	2	2	2	2	2
γ_0	-	-	-	-	10	10
γ_1	-	-	-	-	2	2
δ	-	3/4	3/4	3/4	3/4	3/4
v^r	1	1	1	1	1	1
v^a / v_1^a	1/2	1/2	1/2	1/2	1/2	1/2
v_2^a	-	-	-	-	1/2	1/2

Chapter 4

Effects of Circulation Monopolies on Advertising Rates of Local Newspapers in Germany

4.1 Introduction

Newspaper firms in Germany are subject to idiosyncratic competition rules that have been put in place to maintain the variety of independent local newspapers and to hamper the development of large newspaper chains. For example, the revenue threshold beyond which the rules of the merger control apply is 20 times lower for newspaper firm compared to general businesses.[1] The recent crisis of the newspaper industry, however, prompted the German federal government in 2004 to initiate an amendment of these rules in order to facilitate mergers and acquisitions in the industry.[2] The government recommended: Firstly, to lift the revenue threshold mentioned above from 25 to 50 million Euros; secondly, to exempt takeovers of firms with less than 2 million Euros of annual turnover from any form of merger control; thirdly, to give sanction to newspaper mergers even though the new business would obtain a dominant market position if the editorial boards of the editions are kept independent.[3]

[1] See: Gesetz gegen Wettbewerbsbeschränkungen (GWB) from August 26, 1998, § 38,3 in conjunction with § 35, available at http://bundesrecht.juris.de/bundesrecht/gwb/. Idiosyncratic rules for mergers, acquisitions and cooperations of newspaper firms are common in many other developed countries as well. See Knoche and Zerdick (2002) for a comprehensive overview.

[2] Between 2000 and 2004 the annual advertising income of daily newspapers in Germany decreased by about one third from 6.56 billion to 4.50 billion Euros. In addition, the average daily circulation of quality newspapers fell from 19.9 million in 1993 to 17.2 million in 2004 (minus 13.6 per cent). For details and sources see the introduction of chapter 3.

[3] See: Gesetzentwurf der Bundesregierung. Entwurf eines Siebten Gesetzes zur Änderung des Gesetzes gegen Wettbewerbsbeschränkungen. Deutscher Bundestag Drucksache 15/3640 from August 12,

The purpose of the empirical study in this chapter is to examine whether circulation monopolies of local quality newspapers result in higher prices for customers in the associated advertising markets. Surprisingly, in my dataset of 783 local newspaper editions only little evidence is found that the position of an edition in its reader market has an impact on the advertising contact prices that it charges. The results differ somewhat with respect to different categories of advertising, as display advertising, classified advertising or loose inserts, and with respect to the size and geographical location of the circulation area. In my data, advertising prices are primarily determined by characteristics of the newspaper edition and socioeconomic determinants of the circulation area. My findings challenge the results of other empirical studies and question the assumption made in many theoretical papers that newspapers have discretion over the prices they can ask advertisers if they dominate the associated reader market. In addition, they raise only minor objections against the proposed change of the merger guidelines.

The theoretical foundations of the analysis of newspaper markets have been outlined in the introduction of the preceding chapter. Therefore, at the beginning of this chapter, I focus on empirical studies of newspaper markets. Theoretical contributions will be mentioned whenever appropriate in the course of the analysis. Most empirical studies of newspaper markets have been conducted in the United States considering economic reasons for the high level of concentration observed in the press industry since the middle of the 20th century.[4] In the sixties and early seventies two methodological strands emerged for the econometric analysis of newspaper markets primarily based on contributions made by Rosse (1967 and 1970) and by Owen (1973). Rosse developed a full structural model of a profit-maximizing newspaper firm, whereas Owen used a reduced approach that considered only the advertising price as endogenous variable.[5]

A thorough overview of these studies is provided in a review article of Dewenter (2003). Dewenter described the methodology and the results of numerous econometric studies published between 1964 and 2001. To his survey I would like to add six further studies: The work by Owen mentioned above, two studies from the Canadian Newspaper markets by Mathewson (1972) and by Kerton (1973), a study by Simon, Primeaux and Rice (1986) as well as two studies that came out after Dewenter's publication. After sketching the methodology and the results of these additional studies, I will summarize all empirical contributions briefly in table 4-1. For more details the interested reader is referred to the survey of Dewenter.

2004, p. 12, available at http://dip.bundestag.de/.

[4] A discussion of the analysis of the concentration of the press in Germany is documented in Klaue, Knoche and Zerdick (1980).

[5] An empirical analysis of local broadcast television markets is provided by Brown and Alexander (2005) who investigated whether an increase in the concentration of local broadcast markets leads to a decrease or increase of the associated per-viewer advertising price.

Owen's work appeared first in 1969 and was later published in the Antitrust Bulletin in 1973. Numerous following studies applied a framework similar to his. Basically, he regressed the price per line for national advertising charged by newspapers in a certain town on a number of covariates, including the city's population as well as several dummy variables describing the competitive structure that the newspaper faces. As such, he excluded further endogenous variables from the setup, in particular the newspaper's circulation. He argued that the equation he estimated was, in fact, one that would be derived from a complete structural model of a profit maximizing firm. In addition, he assumed that the included explanatory variables were independent of other exogenous variables not present in the specification. One of his results was that competition from one or more local newspapers lead to a price decrease of 15 per cent.

Based on Owen's setup, Mathewson (1972) examined the impact of market power on national advertising prices of Canadian daily newspapers. The author found evidence that joint ownership of local TV stations and newspapers positively influenced the per line price of newspaper advertising by - on average - 24 per cent. No statistically significant support was found for the hypothesis that the absence of competition yielded market power to the local newspaper monopolist. This result was challenged by Kerton (1973) in an article published in the same journal in the following year. On the one hand, Kerton set the dummy variable featuring competition equal to one only if a competing newspaper edition was published in the same language. This modification took into account that Canada is a bilingual country and newspapers are available in English as well as in French. On the other hand, Kerton applied the "milline rate" as dependent variable arguing that this contact price is the decision device used in the industry. Formally, the "milline rate" is the advertising rate per line of advertising per thousand of circulation. In contrast to Mathewson, Kerton found a statistically significant coefficient on the competition dummy variable indicating that newspapers in competitive reader markets charged lower advertising prices. However, Kerton did not consider at all the problem of endogeneity that raises when the advertising price and the circulation are applied in a single equation.

Simon, Primeaux and Rice (1986) investigated the effects on advertising rates charged by morning and evening newspapers being separately owned or jointly owned in US cities using data for 1963 and 1976. They found that it was 8-9 per cent more expensive to advertise in one paper in a one-owner town. But it was considerably cheaper to advertise in both papers, i.e. the morning and the evening paper, where both papers were owned by a single firm. However, the authors were unable to determine whether these patterns resulted from economies of scale or a pricing strategy. In their setup, they also used the "milline rate" as dependent variable, i.e. the advertising rate per line per thousand of

circulation, without mentioning the potential reservations brought forth by endogeneity problems.

Romeo, Pittman and Familant (2003) analyzed the economic consequences of "Joint Operation Agreements" (JOA) in the US newspaper industry. JOA allow newspaper firms in the US to merge their advertising and printing capabilities by legal means but to maintain separate news gathering, news reporting and other editorial functions. The authors provided empirical evidence that shows JOA to have advertising rates that are closer to those of competitive daily newspapers than to those of single newspapers and 2-edition monopolists. They infer from their findings that JOA act as constrained rather than unconstrained monopolists in setting advertising rates and circulation levels. Romeo, Pittman and Familant also used the "milline rate" of national advertising as dependent variable and the circulation as one of the explanatory variables. To circumvent potential problems of endogeneity between the advertising price and the circulation they assumed that both were determined by the newspaper firm independently. They argued that the volume of national advertising in the newspaper did not influence the consumers' decision to buy a newspaper.

Argentesi and Filistrucchi (2005) considered market power for the case of four national newspapers in Italy by using a panel dataset ranging from 1976 to 2003. They set up a structural model that encompasses a demand estimation for differentiated products on the readers' and on the advertisers' side of the market. In addition, they allowed the profit maximization by publishing firms to take into account the interdependence between the markets. They stated that the comparison between their estimated cost-price markups and the observed markups showed some evidence of joint profit maximization on the newspaper cover prices, whereas the advertising market was closer to competition. Argentesi and Filistrucchi took into account the potential endogeneity between the newspapers' decision variables. However, for simplicity they assumed that the reader demand is independent of the advertising volume in the newspaper.

The list of studies in table 4-1 is certainly not exhaustive. However, to the best of my knowledge, the list covers all approaches that were applied to the econometric analysis of the question of whether the competitive structure faced by a newspaper edition in the reader market affects the rates that it charges in the associated advertising markets. Note that this question was not the primary focus of all studies in table 4-1.[6]

[6] In addition, there are empirical studies about newspaper markets that did not consider advertising prices: Reekie (1976), Thompson (1988) and Fisher and Konieczny (2000) analyzed subscription prices or copy prices paid by readers; Lacy (1991) explored effects of group ownership on daily newspaper content; van Kranenburg, Palm and Pfann (2002) investigated the exit and survival decisions in the Dutch daily newspaper industry by estimating exponential and piecewise constant hazard rate models. Moreover, some studies examined both prices paid by readers and advertisers, for example Thompson (1989) and Argentesi and Filistrucchi (2005).

Table 4-1: Overview of Previous Empirical Studies

Reference	Methodology and results
Stigler (1964)	Analyzed newspaper advertising rates from 1939 in 53 cities in the US as a function of the circulation; found that rates were 5% above the average in one-newspapers towns.
Landon (1971)	Determined advertising rates of 120 newspapers in 68 US cities; found that rates were positively influenced by concentration.
Mathewson (1972)	Examined national advertising prices from 1966 of 97 Canadian daily newspapers; found no evidence that competition among newspapers lead to lower rates.
Kerton (1973)	Analyzed national advertising rates from 1972 in 105 Canadian cities; found lower advertising rates in cities if at least one other daily paper published in the same language was available.
Owen (1973)	Considered effects of joint media ownership on newspaper advertising rates for 156 newspaper editions (data from 1966); found mixed results dependent on specification.
Ferguson (1983)	Investigated pricing of 815 daily newspaper editions in the US; found weak evidence that the presence of a competing daily newspaper was associated with higher advertising rates.
Thompson (1984)	Explored pricing of advertising space in 50 weekly provincial newspapers from Ireland; found that concentration emerged as a consistently significant influence on price.
Simon, Primeaux and Rice (1986)	Analyzed different owner-ship structure for morning and evening newspapers from 1963 and 1976 from the US; found that it was 8 to 9 per cent more expensive to advertise in one paper in a one-owner town.
Bucklin, Caves and Lo (1989)	Tested the behavior of 50 major US newspapers; revealed behavior in some markets consistent with games of ruin occurring or having occurred; did not find higher rates charged by monopoly newspapers.
Dertouzos and Trautman (1990)	Presented full structural model of newspaper markets; besides other things found that overlapping newspapers compete vigorously.
Reimer (1992)	Explored the effect of the market structure on newspaper advertising rates in 35 US cities; found negative relationship between concentration and advertising rates.
Abbring and van Ours (1994)	Considered Dutch newspaper market; found that advertising markets were primarily affected by macro-economic conditions.
Dewenter and Kraft (2001)	Investigated advertising pricing of newspaper editions in 531 German cities; reported significant downward pressure on advertising rates in reader markets with more than two newspaper firms.
Romeo, Pittman and Familant (2003)	Analyzed economic consequences of joint operation agreements (JOA) in the US; showed JOA to have advertising rates closer to those of competitive newspapers than to those of single newspapers.
Argentesi and Filistrucchi (2005)	Considered market power of four national newspapers in Italy by using data from 1976 to 2003; stated that the advertising market was closer to competition than the reader market.

Obviously, the results in table 4-1 are far from clear-cut. Some authors found ambiguous results or no significant effects at all. The analysis by Ferguson (1983) even suggested a reversed relationship: Newspapers that face a competitive structure in the reader market charge higher advertising rates. Interestingly, his analysis was based on the largest sample of all studies.

The analysis of Dewenter and Kraft (2001) is closest to mine. For that reason, I sketch their empirical approach briefly: They investigated the advertising pricing of local newspapers in German cities with more than 10,000 inhabitants. They regressed a standardized advertising contact price on several sets of explanatory variables including the circulation, technical print requirements, the number of households and the Herfindahl-Hirschman index. In addition, they used a discrete variable indicating whether the newspaper edition was published in either a monopolistic, a duopolistic or an oligopolistic reader market. They found no price differences between monopolistic and duopolistic reader markets. In reader markets with more than two firms, however, they reported a significant downward pressure on the advertising rates. Their results led them to the conjecture that collusive behavior might exist in duopolistic local newspaper markets.

In fact, the authors partly used the same data sources as I do but chose a different approach. They compared the advertising prices in cities (as many other authors before did as well) but not in the actual circulation areas of the newspaper editions. I doubt that their results are correct for the following reasons:

1. The cities do not correctly represent the circulation area of the newspaper editions. Thus, the market structure variable and the Herfindahl-Hirschman index do not reflect the level of competition that the newspaper edition faces in its actual circulation area.

2. The authors regarded a rival newspaper edition as a competing one if its circulation was higher than 1,000 copies regardless of the actual size of the market. Thus, in small cities they underestimated the number of competing editions, whereas in large cities they might have overestimated it.

3. The measured effects of competition might differ for different categories of advertising. Dewenter and Kraft only used one advertising price and did not specify which category it represented.

4. The dataset was not separately analyzed for the East and West of Germany even though the socioeconomic determinants differ enormously.

In my own approach, I take the four points of criticism above into account. Most importantly, I conduct the analysis in two steps: Before running econometric estimations,

I determine the exact circulation area of each newspaper edition and the corresponding market structure therein. This laborious approach resolves potential distortions mentioned above under point 1 and 2. The third point is incorporated by conducting the analysis for six different categories of advertising separately. Moreover, I categorize and group the data according to certain attributes to identify structural drivers underlying the data and to avoid distortions from the issue raised under point 4. In particular, I analyze newspapers in West and East Germany as well as newspapers with a high circulation and with a low circulation separately.

The chapter proceeds as follows: In the next section, I outline the foundations of the econometric analysis including the research hypothesis, the particularities of regional newspapers as units of investigation and the basics of the dataset. In section 4.3, I present the methodology and the results of the market share analysis. The findings of my empirical estimations are documented in section 4.4. In section 4.5, I discuss my results in detail and provide explanations for the observed effects. Moreover, I shed light on potential drawbacks of the chosen approach. In the conclusion in section 4.6, I consider the implications of my results with respect to the proposed amendment of the rules for newspaper mergers and acquisitions in Germany.

4.2 Foundations of Empirical Analysis

The research hypothesis that is tested in the course of the analysis at hand is: Does a monopoly position of a newspaper edition in its reader market enable the publishing firm to charge higher prices in the associated local advertising markets? Thus, does the newspaper firm control a monopolistic bottleneck, namely the attention of their readers towards local advertising messages. Recall that to simplify matters in chapter 3, I simply assumed at the outset that the newspaper firm possesses a monopoly in the reader market and in the advertising markets. If the newspaper firm controlled a monopolistic bottleneck, then for the analysis in chapter 3 it would have sufficed to assume that the reader market exhibits a monopolistic structure.

4.2.1 Regional Newspapers as Units of Investigation

The Federal Association of German Newspaper Publishers (BDZV) distinguishes five categories of newspapers: Regional quality newspapers, national quality newspapers, tabloid newspapers, weekly newspapers and Sunday newspapers. The number of titles and the average circulation (in millions per day/week) for each category for the year 2004 are documented in table 4-2.

Table 4-2: Newspapers in Germany 2004

	Number of titles	Daily circulation in millions
Regional quality newspapers	329	15.4
National quality newspapers	10	1.6
Tabloid newspapers	8	5.0
Weekly newspapers(i)	27	1.9
Sunday newspapers	7	4.2

(i) The circulation figure represents the weekly average.
Source: BDZV (2004), p. 3.

The annual turnover of the newspapers amounted to 9.0 billion Euros in 2004. 54.2 per cent of this revenue was derived from advertising sales and 45.8 per cent from copy sales.[7] Thus, newspapers still rely more on advertising sales than on copy sales to finance their activities. However, the share of advertising income has fallen since 2000.[8] In 2004, the BDZV counted 1,552 newspaper editions. Note that the number of editions exceeds the number of titles because most regional newspapers publish several local editions that share a joint editorial cover part comprising beats for general news, sports, business and cultural affairs. The analysis at hand focuses on regional quality newspapers exclusively. In 2004, these newspapers sold about 92 per cent of their total circulation by subscriptions. Only 6 per cent of the copies were sold at newsstands.[9]

Regional newspapers are differentiated products that are unique in many respects: The most important features that publishers apply in order to differentiate local newspaper editions, are the size and the location of the circulation area. In the long run, publishers are able to change both, firstly, by adjusting the scope of the local news coverage and, secondly, by altering the scope of the delivery of subscription copies. Note that the location of a consumer in relation to the area that is included by the news coverage determines the utility from reading. Living in the north of a country and subscribing to a local newspaper edition from the south does not make sense for most readers. In addition, a publisher can limit the access of consumers to a particular local edition by the scope of the delivery system for subscriptions. If the paper boy does not pass by your home, you cannot get the latest issue of the edition in the morning. Often the local

[7] See: BDZV (2005), p. 52.
[8] See: Schütz (2005), p. 206.
[9] Source: BDZV (2004), p.11.

editions of a regional newspaper overlap at the edges of the circulation areas because some readers feel more interested in news from the neighboring geographical area.

For the analysis at hand I assume that advertising customers regard the local editions as homogenous goods apart from their circulation and the advertising rates. Further elements of product differentiation that might matter for advertising customers are neglected.[10] In addition, I assume that none of the different newspaper categories from table 4-2 is regarded by advertising customers as substitute to the local editions.[11] In contrast, local radio and TV broadcasting stations as well as weekly advertising newspapers distributed for free and the Internet are likely to play a substantial role either as substitutes or complements for newspaper advertising.[12] However, in my regression analysis their effects as complements or substitutes had to be assumed to be zero because of data limitations. The implications of this shortcoming are explored in more detail in the interpretation of the econometric results in section 4.5.3.

Newspaper firms derive revenues primarily from two sources: Advertising sales and copy sales. Basically, newspaper firms maximize both revenues jointly with respect to the demand interdependencies between the reader and advertising markets, the competitive structure in these markets and the cost functions. However, for the empirical analysis at hand the newspapers' maximization problem is limited to the choice of the optimal advertising rate for a particular category of advertising per thousand copies of circulation. Thus, the price equation I will estimate in section 4.4.3 should be regarded as one of a set of reduced form equations of an unspecified complete structural model of the newspaper firm. Moreover, my approach implies that the firm does not alter the volume of advertising and that the advertising price is independent of the circulation. These restrictions have to be made for the sake of data limitations. If they were not valid, endogeneity between these variables could disturb my results. The reservations associated to this limited approach will be picked up again in the discussion of the results.

[10] In reality, the advertising customers' willingness to pay depends on how well the newspaper edition is able to serve the advertisers' campaign goals. For example, if an advertiser wants to contact high-income consumers, he pays more if the newspaper edition reaches many high-income households. Newspaper firms typically survey their readership regularly to communicate its characteristics to advertising customers. Such data were lacking for the study at hand.

[11] This assumption was actually confirmed by the data. In the econometric analysis in section 4.4.3, the number of both national quality newspapers as well as the number of tabloid newspapers in the circulation area had no statistically significant effect on the advertising contact prices charged by the local newspaper editions. In the documented regression analysis these variables were not included due to problems of multicolinearity with the covariates describing the economic conditions within the circulation areas.

[12] Empirical evidence about this issue is rare and far from clear-cut. Busterna (1987), for example, measured the extent to which eight alternative media compete with newspapers in the market for national advertising. He found for the period between 1971 and 1985 that no other media resided in the same product market as newspapers for national advertising. In contrast, Ekelund, Ford and Jackson (1999) documented in a study about local radio advertising markets that television and newspaper advertising were substitues for radio advertising.

4.2.2 Basics of Dataset

Before turning to the first step of the empirical investigation – namely the market share analysis – basics of the applied dataset are described. The empirical analysis is primarily based on two data sources published by the marketing agency of the Federal Association of German Newspaper Publishers (BDZV). The two publicly available databases usually serve as planning tools for advertising customers. The first tool called "Newspaper Information System" contains the media and tariff data of all daily newspaper editions and their offered combinations available in Germany that can be booked by advertising customers. The database comprises more than 2,000 entries. The second source, the so-called "Circulation Atlas," describes the circulation area of all daily newspaper editions based on the 12,800 communities and cities in Germany.[13] In addition, the marketing agency granted me access to an internal database that allowed me to analyze the behavior of newspaper firms within the actual circulation area of their editions instead of comparing prices and other variables in cities or regions.

Note that my analysis explores prices paid by advertising customers. Publishing firms do not sell advertising customers the same newspaper editions that they offer to subscribers. For advertisers they sometimes bundle certain editions or split them. For that reason, my units of investigation are the so-called "advertising booking units" that can be booked by advertising customers.

In total, I picked 783 local newspaper editions from the databases that matched the following four requirements:

- The edition can be booked by advertising customers separately from other editions.
- The edition does not consist of sub-editions that can be booked separately. Due to this requirement all newspaper combinations were excluded as well as most main editions.
- The edition is published at least 5 times per week.
- The edition is tailored to and distributed in a local or regional circulation area.

To each edition in my dataset I added a set of socioeconomic variables describing the circulation area: The number of households, the population density, the per capita income and the unemployment rate. These figures were taken from the regional statistics

[13] Both sources draw upon newspaper circulation statistics collected by the "Informationsgemeinschaft zur Feststellung der Verbreitung von Werbeträgern" (IVW) that serves similar tasks in Germany as the Audit Bureau of Circulation (ABC) in the US.

2004 published by the German Federal Statistical Office.[14] In addition, I added a discrete purchasing power index provided by the marketing research company GfK ranging from 1 (very low) to 5 (very high).

Newspapers contain different categories of advertising that target different groups of customers. The effects of circulation monopolies on advertising prices might differ among these categories. For that reason, I analyze six different categories of local newspaper advertising separately. Three of these categories are published in the editorial part of the newspaper: run-of-paper advertising in 4-color printing, run-of-paper advertising in black&white printing and text advertising. The first two categories target primarily larger retail businesses and shops in the circulation area. They are typically published as a quarter or half of a page or a full page next to the editorial content. Text advertisements, in contrast, are typically very small and placed right between the lines of an article. In addition, I chose two categories of classified advertising for my analysis, namely for jobs and real estate. Classified advertising is demanded by both local businesses and private individuals. The sixth category that I analyze are loose inserts, that are produced and printed by the advertising customers themselves – typically department and retail stores – and inserted into the newspaper without being bound to it (sometimes also called "blow-in cards").

From the Newspaper Information System the tariffs of each category of advertising were taken for the 783 editions. Note that not all categories of advertising were available in every edition. For example, black&white run-of paper advertisements were offered by all editions, whereas classified advertising for jobs was available only in 234 of the 783 editions. In total, I collected 3,530 advertising prices. Note further, that newspapers typically publish their advertising rates in autumn for the following year. Thus, the rates they publish for the following year are based on circulation data from the previous period. For that reason, I used advertising tariff data from 2005 and circulation figures from the year 2004.

Advertising tariffs in newspapers are a complex matter due to discounts and different page formats. Therefore, I determined the price of an advertisement in each category for a format typically demanded in that category, e.g. a quarter page for job offers or a one column wide and 60mm high advertisement for text advertising. This approach was chosen in order to make sure that the applicable volume discounts start working. Such discounts play an important role in advertising pricing of media firms. The six chosen advertising formats were:

1. 4-color run-of-paper advertising: 1/1 page (feasible in 768 editions)

[14] These data are from the year 2003, but changes to 2005 are minor and are therefore neglected. In contrast to the circulation data, these figures were calculated on a district level and not on a community level.

2. Black&white run-of-paper advertising: 1/1 page (feasible in all editions)
3. Text advertising: 1 column/60 millimeters in black&white (feasible in 751 editions)
4. Job market section: 1/4 page in black&white (feasible in 234 editions)
5. Real estate section: 1 column/100 millimeters in black&white (feasible in 219 editions)
6. Loose inserts: 20 gram maximum weight (feasible in 775 editions)

All analyzed prices were based on national rates for non-local customers and net of applicable volume discounts.[15]

Before I could analyze the newspaper advertising prices, two more methodological issues had to be taken into account: First, the newspaper editions differ in the paper format they are printed on. To correct for this effect the price per column-millimeter had to be determined. For the first, second and fourth category of advertising data about the actual page size of the newspaper editions were applied. The prices of the third and fifth category were simply divided by 60 and 100, respectively.

Second, the advertisers' willingness to pay is increasing in the number of readers. Therefore, in order to compare newspaper advertising rates, typically the cost to contact one thousand readers is calculated, the so-called "Cost per Thousand", abbreviated by "CPM." The CPM was calculated for each category of advertising by applying the formula[16]

$$CPM = \frac{\text{Price} \cdot 1000}{\text{Circulation}} \tag{4.1}$$

Note that for the advertising categories 1-5 the column-millimeter rate derived above was used, thus, I finally obtained the CPM per column-millimeter of advertising.[17]

4.3 Market Share Analysis

According to previous industry studies, the local and regional newspaper markets in Germany are highly concentrated. Schütz reported from his study for the year 2004, that 41.3 per cent of the 334 regional newspaper publishing houses in Germany held a monopoly position in their circulation market. In contrast, 47.0 per cent of the firms shared the market with one or more rival newspaper but were in the leading position,

[15] Newspapers discriminate advertising prices between local and national customers (that book typically by an advertising agency). Discounts for local customers are typically 10-20 per cent.

[16] A more precise measure is obtained if the average issue readerships is applied instead of the circulation. However, in the dataset at hand this figure was not available.

[17] In anglo-american countries the corresponding term is the "millinch rate" or "milline rate."

whereas only 11.7 per cent of the publishing houses were in the second position or beyond.[18] According to Röper, the five largest publishing houses for regional quality newspapers in Germany accounted for 28.8 per cent of the circulation market in 2004.[19] Dewenter and Kraft (2001) found in their dataset of 709 newspaper editions, that 367 editions possessed a monopoly in the reader market, 302 editions faced a duopoly and 40 editions an oligopoly.[20]

4.3.1 Market Structure in Circulation Areas

My analysis differs from former approaches in that I was able to establish the exact circulation area of each newspaper edition according to the 12,800 communities and cities in Germany. Based on the geographical size and location of a circulation area of a particular edition, I identified all daily newspaper editions that reached a market share of more than one per cent within that area. These editions comprised not only the 783 local editions from my dataset but also national quality and tabloid newspapers. The editions besides the edition under investigation were categorized as:

- Additional local edition of own publishing house or chain
- Local edition of hostile publishing house or chain
- Additional local edition of hostile publishing house or chain
- Tabloid newspaper
- National quality newspaper

In order to determine whether a local edition was published by the own publishing house or by a hostile publishing house, information from the Circulation Atlas was used as well as data from the two market studies conducted by Schütz (2005) and by Röper (2004).

By using the categorized data, the gross within-group market share for each edition in its circulation area was calculated.[21] Recall that this gross market share figure contains the circulation of national quality newspapers and tabloid newspapers. For that

[18] Schütz (2005), p. 230.
[19] Röper (2004), p. 270.
[20] Dewenter and Kraft (2001), p. 15.
[21] The sum of the gross market shares in each circulation area did not sum up to one because editions with less than one per cent market share were neglected. However, the effect is negligible. The average sum of the gross markets shares is 96.6% with a minimum of 91.2% and a standard deviation of one percentage point. For the further analysis, the sum of the gross market shares was normalized to one.

reason, the net within-group market share with respect to only local editions was determined. A third market share figure was calculated by adding up the net market shares of overlapping editions from the own publishing house.

In line with recommendations from the German competition authorities, I derived the market share spread between the edition under investigation and the largest local competitor.[22] Furthermore, the Herfindahl-Hirschman index (HHI) and the concentration ratio for the three largest local editions (CR3) were calculated by using the net within-group market shares. Note that the HHI is the sum of the squared net market shares. As such, it takes scale effects into account because larger values enter the sum with a higher weight. In contrast, the CR3 is simply the unweighted sum of the net market shares of the three largest local editions.

The categorization above allowed to describe the competitive structure in the circulation areas in even greater detail. I determined for each circulation area the number of hostile local newspaper editions as well as the number of hostile local newspaper firms. Of course, the number of hostile editions exceeds the number of hostile firms because most firms publish more than one edition. In order to control for the actual size of the rival editions (or rival firms, respectively) I determined their number also under the restriction that the editions (or firms) reached at least a certain share of the market. Furthermore, from the categorization above I also counted the number of national quality newspapers and tabloid newspapers in the circulation areas. The summary statistics of the figures are reproduced in table 4-3.

Not surprisingly, the market share analysis confirmed that the local newspaper circulation markets in Germany are highly concentrated. According to my results, the average market share of a newspaper edition in its circulation area was 56 per cent if all categories of daily newspapers were taken into account (gross market share) and 73 per cent if only local newspaper editions were considered (net market share).[23] If the net market shares of all editions from the own publishing house were summed, the average net market share increased to 77 per cent. The market share spread to the largest local competitor in the circulation area was 52 per cent on average. Note that the standard deviation for all these figures was rather large. The mean of the Herfindahl-Hirschman index reached .71 and the mean of the CR3 even .98.

[22] See: Bundeskartellamt (2000), p. 13-14. In general, the German competition authorities claim that a single attribute like a high market share is not sufficient to evidence a dominant market position (or the opposite). They refer to further structural criteria like barriers of entry, access to vertical factor and product markets, financial resources and the ability to bundle products. See: Bundeskartellamt (2000), p. 39-40.

[23] Note that the largest German tabloid newspaper, the "Bildzeitung," was present in every circulation area under investigation. Its market shares varied mostly between 15 and 25 per cent. Even though national quality newspapers were available in every circulation area as well, their market shares were below one percent in most rural areas.

Table 4-3: Descriptive Results of Market Share Analysis

	Mean	Standard Deviation
Gross market share	.56	.21
Net market share[i]	.73	.27
Net market share of all own editions in circulation area	.77	.27
Net market share spread to largest competitor	.52	.48
HHI for net market shares[ii]	.71	.23
CR3 for net market shares[iii]	.98	.05
Number (#) of hostile local editions in circulation area	1.3 (66%)[iv]	1.3
# of hostile local editions with >10% net market share	.70 (53%)	.79
# of hostile local editions with >20% net market share	.42 (38%)	.58
# of hostile local editions with >30% net market share	.28 (27%)	.46
Number (#) of hostile local newspaper firms in circulation area	1.0 (66%)	.95
# of hostile local newspaper firms with >5% net market share	.69 (53%)	.76
# of hostile local newspaper firms with >10% net market share	.52 (45%)	.63
# of hostile local newspaper firms with >20% net market share	.34 (33%)	.49
# of hostile local newspaper firms with >1,000 copies circulation	.72 (51%)	.87
Number of national quality newspapers with >1% gross market share	.69 (52%)	.79
Number of tabloid newspapers with >1% gross market share	1.4 (100%)	.60

[i] The term "net" indicates that only the copies of local newspaper editions were considered but not the copies of national quality newspapers and tabloid newspapers.
[ii] HHI is the Herfindahl-Hirschman index, here calculated as the sum of the squared net market shares.
[iii] CR3 is the sum of the net market shares of the three largest local newspaper editions in the circulation area.
[iv] The percentage numbers in parentheses indicate the share of newspaper editions for which the argument in that row holds, i.e. 66% implies that 66% of the newspaper editions face at least one hostile local edition in their circulation area.

Despite of the significant concentration in the local circulation markets documented above, there was on average more than one hostile local edition present in each circulation market. The mean number was 1.3 editions. 518 out of the 783 editions of the dataset faced at least one hostile local edition in their circulation area, representing a share of 66 per cent. If only those local hostile editions were considered that reached at least a net market share of 10 per cent, the average number decreased to .70. Accordingly, many hostile editions in the circulation areas held a rather small market share.

The average number of local newspaper competitors (i.e. firms not editions) in a circulation area was 1.0. Again, 518 out of 783 editions faced at least one competitor selling a rival newspaper edition in their circulation area. If only those competitors were considered that had a market share of at least 10 per cent, the average number decreased to .52. Note that in table 4-3 I also reported the average number of hostile local newspaper firms that reached a circulation of more than 1,000 copies in the circulation area under investigation. According to my data, the average number of those competitors was .72. A similar figure was used by Dewenter and Kraft (2001). As mentioned in the introduction of the chapter, this figure does not take the relative market size into account and is, therefore, from my point of view an inappropriate measure of competition.

4.3.2 Determination of Market Positions

The data from table 4-3 allowed me to determine the number of local newspaper editions that operated in their circulation area as monopolists, duopolists or oligopolists with respect to other local newspaper firms. I regarded a local newspaper edition in the dataset as monopolist if it either had a net market share of more than 90 per cent in its circulation area or if it had no hostile newspaper firm active in its market area accounting for more than 10 per cent of the net market. The latter requirement was met by 110 editions in the dataset and denoted as "joint operation monopoly." The term reflects the fact that the remaining market share (that exceeded 10 per cent) was held exclusively by other editions from the same publishing house.[24] The first requirement was matched by 317 editions and was designated as "single operation monopoly."

The 356 remaining editions were distinguished into duopolies and oligopolies. A duopoly existed if one hostile publishing firm was active in the circulation area that accounted with its edition(s) for at least 10 per cent of the circulation market and if, at the same time, the unit under investigation had a market share of at least 10 per cent (summing up all own editions). The duopoly cases were told apart in cases in which the edition under investigation was the market leader and in cases in which the edition was

[24] This categorization of monopoly editions implies that the publishing firms are able to exert joint profit maximization in a circulation area if several editions overlap therein.

the market follower. The oligopoly cases comprised all remaining editions in the dataset. The results from this categorization procedure are documented in table 4-4.

Table 4-4: Market Positions of Newspaper Editions

Market position	Cases
Monopoly	427 (54.5%)
Single operation monopoly	*317 (74.2%)*
Joint operation monopoly	*110 (25.8%)*
Duopoly	302 (38.6%)
Duopoly leader	*197 (65.2%)*
Duopoly follower	*105 (34.8%)*
Oligopoly	54 (6.9%)
Oligopoly leader	*24 (44.4%)*
Oligopoly follower	*30 (55.6%)*

According to table 4-4, 54.5 per cent of the newspaper editions in my dataset possessed a circulation monopoly in the reader market of their circulation area, 38.6 per cent operated in a duopolistic setting and 6.9 per cent in an oligopolistic one. In the duopolistic settings, the majority of editions was the market leader, whereas – not surprisingly – in the oligopolistic setting the majority was among the followers. Compared to the figures from Dewenter and Kraft, in my dataset the share of duopolies is smaller (38.6 to 42.6 per cent) and the share of oligopolies is higher (6.9 to 5.6 per cent).[25]

An interesting issue of competition raises from the question of whether overlapping editions from the same publishing house should be regarded as competitors in relation to the unit under investigation. If an advertiser decides to place his advertising in the overlapping edition instead of the unit under investigation, the revenue remains within the firm. However, if the advertising price that the firm charges for the overlapping edition is relatively lower, the firm incurs a revenue loss. Because the potential effect from this within-firm competition is likely to be small, it is neglected in the analysis. Thus, in the further analysis the monopoly case refers to both single operation and joint operation monopolies if not stated otherwise.

[25] Dewenter and Kraft (2001), p. 15.

4.4 Regression Analysis

Before turning to the econometric estimation, two fundamental problems will be raised concerning newspaper markets in Germany that complicate the empirical analysis. First, the newspaper market structure in East and West Germany differs significantly, and, second, the contact advertising prices are extremely sensitive to the level of the circulation. Note that in my dataset, the average daily circulation of an edition is 20,009 copies. The circulation ranges from a minimum of 1,019 to a maximum of 283,998 copies resulting in a large standard deviation of 26,681 units. The distribution of the circulation is strongly skewed to the right with a median of 13,295 copies.

4.4.1 Differences between East and West Germany

Before the Iron Curtain came down, daily newspapers in Eastern Germany were ruled by the political power under the regime of the "Sozialistische Einheitspartei Deutschlands" (SED). The 15 so-called "SED-Bezirkszeitungen" (district newspapers) controlled most of the regional reader markets in Eastern Germany. After the German reunification these district newspapers were sold in 1991 by the privatization agency "Treuhandanstalt" to Western publishing houses. At the beginning of the nineties, Eastern Germany experienced a wave of newspaper launches, but shortly after a concentration process annihilated most of the new businesses. Nowadays, the regional newspaper markets in Eastern Germany are significantly more concentrated than the markets in the West and even more concentrated than before the reunification.[26] Moreover, the socioeconomic determinants in Western and Eastern Germany still differ enormously even 15 years after the wall came down.

Table 4-5 reports descriptive statistics for the circulation areas including economic determinants and advertising tariffs. Column 2 shows the figures for the entire dataset. Column 3 documents the figures for the 612 observations in the West and column 4 the figures for the 171 observations in the East. Column 5 reports the difference between the figures in the West and in the East. Accordingly, the average circulation of editions in Eastern Germany was 3,967 copies lower compared to the editions in the West, but their net market share was 20 percentage points higher. Furthermore, the share of monopolies was significantly higher in the East with .81 compared to .47 in the West. The number of oligopolistic circulation markets in the East was zero.

[26] A brief overview of the history of the German newspaper industry before and after the German reunification in 1990 is provided by Wilke (1994). Note that the sale of the 15 former SED district newspapers to Western publishing houses was criticized, see Schneider (1992) for details.

Table 4-5: Descriptive Statistics for West and East Germany

	All editions	Editions in West Germany	Editions in East Germany	Spread West vs. East
Number (#) of cases	783	612	171	
Circulation	20,009	20,875	16,908	3,967
Net market share	.73	.69	.89	-.20
# of monopolies[(i)]	427 (54.5%)	288 (47.1%)	139 (81.3%)	
# of duopolies	302 (38.6%)	270 (44.1%)	32 (18.7%)	
# of oligopolies	54 (6.9%)	54 (8.8%)	0	
# of households	61,675	67,177	41,985	25,192
Population density	355	395	212	183
Per-capita income	16,259	16,885	14,017	2,669
Purchasing power	2.5	2.9	1.2	1.7
Unemployment rate	9.6	7.1	18.2	-11.1
CPM 1/1 page 4c	11.7c (768)	12.3c (597)	9.8c (171)	2.5c (-20%)
CPM 1/1 page b&w	7.9c (783)	8.2c (612)	6.6c (171)	1.6c (-20%)
CPM job market	8.0c (234)	8.1c (204)	7.5c (30)	.6c (-7%)
CPM real estate	7.6c (219)	7.8c (169)	7.2c (50)	.6c (-8%)
CPM text ads	31.5c (751)	32.4c (580)	28.5c (171)	3.9c (-12%)
CPM loose inserts	91.3€ (775)	94.5€ (604)	79.8€ (171)	14.7€ (-16%)

Variables	Description
Circulation	Average circulation of editions
Net market share	Average net market share of editions among local newspaper editions
# of households	Average number of households in circulation areas
Population density	Average number of residents per square kilometer in circulation areas
Per-capita income	Average per-capita income (at current prices) in circulation areas
Purchasing power	Average purchasing power index in the circulation areas, ranging from 1 (very low) to 5 (very high)
Unemployment rate	Average unemployment rate in the circulation areas
CPM 1/1 page 4c	Average 'Cost per Thousand' (CPM) per millimeter of a full page advertisement printed in 4-color in Euro cents (number of editions that offer this advertising category in parentheses)
CPM 1/1 page b&w	Average CPM per mm of a full page advertisement printed in black&white
CPM job market	Average CPM per mm of a typical job market advertisement
CPM real estate	Average CPM per mm of a typical real estate advertisement
CPM text ads	Average CPM per mm of a typical text advertisement
CPM loose inserts	Average CPM for a loose insert of 20 gram maximum weight in full Euros

[(i)] Relative frequencies are calculated for columns.

The average number of households in the circulation areas in Eastern Germany was smaller and the corresponding population density was lower. The table also shows that the socioeconomic determinants still differed significantly between Eastern and Western Germany: The annual per capita income (at current prices) in a circulation area in the East was on average 2,669 Euros lower than in the West, the purchasing power index was 1.2 compared to 2.9 and the unemployment rate was 18.2 per cent compared to 7.1 per cent.

The rows with the advertising contact price data read as follows: The average 'Cost per Thousand' (CPM) per column-millimeter of a full page advertisement printed in 4-color for all editions was 11.7 cents.[27] This advertising category was available in 768 out of 783 editions (implying that 15 editions did not offer full pages in 4-color). The average CPM for this advertising category in the West was 12.3 cents (available in 597 editions) compared to 9.8 cents in the East (available in all 171 edition). The spread of 2.5 cents represented a price differential of 20 per cent.

According to table 4-5, the average contact prices for advertising in the Western editions exceeded those for advertising in the Eastern editions in all advertising categories. The gap was most significant for full page advertisements. The CPM in the East was 20 per cent lower for both 4-color and black&white printing of such advertisements. For loose inserts the CPM was 16 per cent lower in the East. Note that the CPM for loose inserts are reported in full Euros and not in Euro cents as the CPM for the other advertising categories. The price difference was 12 per cent for text advertising, 8 per cent for real estate advertising and 7 per cent for job market advertisements.

4.4.2 Differences between Circulation Classes

A first inspection of the data revealed that the newspaper CPM strongly correlated with the circulation of the newspaper editions. The strength of the effect was astonishing because the CPM data already accounted for the editions' circulation. In order to explore this effect in detail, the dataset was divided into five circulation classes. The descriptive statistics for the five circulation classes are documented in table 4-6.

Two important results were observed: Firstly, the average net market share was the highest in the class of newspapers with the second highest circulation (20,000-50,000 copies). Also the share of monopolies was the highest in this class with 65.5 per cent. In contrast, the net market share was the lowest in the class of newspaper editions with the lowest circulation. In this class also the share of monopolies was the lowest with only 25.3 per cent. Secondly, for each advertising category besides loose inserts the CPM was

[27] See equation (4.1) for the formal derivation of the CPM.

strictly decreasing in the circulation. For example, the CPM per column-millimeter in the highest circulation class for full page advertisements in 4-color was only 4.8 cents compared to 28.6 cents in the lowest circulation class. Accordingly, the largest editions charged an advertising contact price for full pages in 4-color printing that was 83 per cent lower compared to the editions in the lowest circulation class! Similar but weaker effects were also observed for full page advertisements in black&white, the two categories of classified advertising and text advertising. These issues will be explored in more detail in the discussion of the estimation results.

Table 4-6: Descriptive Statistics for Circulation Classes

	<5,000 copies	5,000-10,000	10,000-20,000	20,000-50,000	>50,000
Number (#) of cases	75	208	285	168	47
Circulation	3,272	7,545	14,404	29,440	102,149
Net market share	.44	.69	.76	.83	.80
# of East editions	5 (6.7%)	49 (23.6%)	81 (28.4%)	29 (17.3%)	7 (14.9%)
# of monopolies	19 (25.3%)	108 (51.9%)	167 (58.6%)	110 (65.5%)	23 (48.9%)
# of duopolies	40 (53.3%)	88 (42.3%)	102 (35.8%)	51 (30.4%)	21 (44.7%)
# of oligopolies	16 (21.3%)	12 (5.8%)	16 (5.6%)	7 (4.2%)	3 (6.4%)
# of households	27,340	27,737	46,284	84,111	279,793
Population density	380	220	258	466	1,103
Per-capita income	16,822	15,994	16,188	16,337	16,685
Purchasing power	2.7	2.4	2.4	2.6	2.9
Unemployment rate	7.9	9.6	10.0	9.4	10.0
CPM 1/1 page 4c	28.6c (71)	14.2c (206)	9.6c (279)	7.0c (165)	4.8c (47)
CPM 1/1 page b&w	18.4c (75)	9.4c (208)	6.5c (285)	4.9c (168)	3.3c (47)
CPM job market	15.6c (12)	10.8c (64)	7.5c (89)	5.2c (48)	3.5c (21)
CPM real estate	15.1c (13)	10.3c (55)	7.1c (83)	5.1c (46)	3.7c (22)
CPM text ads	70.5c (72)	36.5c (199)	26.7c (271)	20.8c (102)	15.1c (47)
CPM loose inserts	92.8€ (75)	91.3€ (206)	90.3€ (282)	92.0€ (105)	92.3€ (47)

Variables	Description
# of East editions	Number (share) of editions in that circulation class that is published in East Germany
	The description of all other variables complies with the information in table 4-5.

According to tables 4-5 and 4-6, two structural drivers affected the advertising tariffs significantly: First, the advertising contact prices were lower in the East and, second, strongly decreasing in the circulation. It is important to have these underlying effects in mind when designing the estimation strategy.

4.4.3 Regression Estimation

In this section, I present the results of the cross-sectional estimation procedures in order to identify and to quantify the determinants of the advertising contact prices charged by local newspaper editions in Germany. Before turning to the results, the econometric strategy and some technical remarks are provided. Note that I aimed to examine the effects of several independent variables on the contact advertising prices. Thus, the contact prices (CPM) for the six advertising categories were included in the estimations as the dependent (i.e. left-hand) variables.

Accordingly, the contact price CPM_{ij} charged by newspaper edition i for advertising category j was modeled as a function of observed characteristics of the newspaper edition, represented by the vector $PAPER_{ij}$, and determinants of the circulation area, represented by the vector $MARKET_{ij}$. Accordingly, the basic structure of the estimated equations is

$$CPM_{ij} = \alpha_{0j} + \alpha_{1j} PAPER_{ij} + \alpha_{2j} MARKET_{ij} + \varepsilon_{ij} \tag{4.2}$$

where α_{1j} and α_{2j} are scalars if $PAPER_{ij}$ and $MARKET_{ij}$ are scalars (and vectors otherwise) and the error term ε_{ij} captures the effect of unobserved characteristics.

The contact price data for all advertising categories were strongly skewed to the right. Thus, they were far from being normally distributed and would violate the requirements of the ordinary least squares (OLS) estimation technique if they were used in their genuine form. For that reason, all price variables were used after taking the natural logarithm to reduce the variation of the data. The same transformation was applied to the circulation data and all other continuous variables besides the market share spread.

However, when classical OLS regressions were estimated, plots of the residuals vs. the fitted values as well as the Breusch-Pagan test and the White test documented problems of heteroscedasticity despite of the transformation of the variables.[28] Accordingly, the variance of the residuals was not constant as required by the OLS estimation technique but varied across observations. This result should not surprise, actually, it is commonly observed in cross-sectional industry data if the scale of the firms' output (here

[28] The results of these distorted estimations are not documented. They resulted in appealingly high values for the coefficient of determination R^2 of above .70, but both the Breusch-Pagan test as well as the White test rejected the asumption of homoscedasticity at a significance level above 99 per cent. In addition, the scatter plots of residuals vs. the fitted values showed that the variation of the residuals was higher in the middle and on the right-hand end of the plot. Moreover, several outliers were observed.

the circulation) varies considerably within the dataset. Note that this violation of the OLS assumptions is a serious concern. The estimation yields unbiased and consistent estimates. However, the coefficients are no longer efficient. Thus, the error variance is estimated with a bias and the usual inference procedures are no longer appropriate.[29] In order to avoid these distortions, a robust estimation method was applied. I used iteratively re-weighted least squares. This method assigns a weight to each observation with higher weights given to better behaved observations. In addition, extreme outliers can have their weights set to missing so that they are excluded from the analysis.[30]

In their study Dewenter and Kraft estimated regressions with robust standard errors including all newspaper editions of their dataset simultaneously. They explored a number of different sets of explanatory variables and received coefficients that had a unique sign but differed significantly in size. According to their results, newspapers that faced an oligopolistic reader market charged an advertising price that was between 28.2 and 39.9 per cent lower compared to the price charged by editions with a monopoly in the reader market. For editions in duopolistic reader markets they measured no statistically significant effects.[31]

When I tried to reestablish their findings by running estimations including all editions simultaneously, in my data no significant effects showed up for the market structure variables at all. The results of these estimations for all six categories of advertising are documented in table 4-7. None of the estimated coefficients indicating duopolistic or oligopolistic reader markets turned out to be statistically significant different from zero. Note that I applied the population density to proxy the economic determinants in the circulation area for all advertising categories besides loose inserts. For loose inserts, more precise results were obtained by using the per-capita income instead. I explored different sets of explanatory variables, but with neither configuration I obtained consistent results on the market structure covariates in line with the findings of Dewenter and Kraft. Note that the circulation turned out to be highly statistically significant for all advertising categories besides loose inserts. Also the economic determinants affected the contact prices significantly. In table 4-7 all coefficients for the population density as well as the one for the per-capita income are statistically significant different from zero. I believe that my market share analysis documented in section 4.3 is more precise than the approach chosen by Dewenter and Kraft and, for that reason, that my market

[29] Inefficient estimates fail the requirement that OLS provides the "best linear unbiased estimate" (BLUE) of the actual value of a coefficient. Efficiency refers to the size of the standard error. The estimated standard error can either be too large or too small. If the standard error is overestimated, than type II errors may occur. If it is underestimated, than type I errors are likely.

[30] Similar but less precise results were obtained when the regression was run as classical OLS with robust standard errors using the Huber-White sandwich estimators.

[31] Dewenter and Kraft (2001), p. 17.

structure covariates describe the actual competitive situation in the circulation areas more precisely. I infer from this that their results were distorted due to the reasons provided at the end of the introduction in section 4.1.

Table 4-7: Regression Results from Using Full Dataset

	1/1 page 4-color	1/1 page b&w	job market	real estate	text ads	loose inserts
Number of cases	768	783	234	219	751	775
Circulation	-.541***	-.524***	-.509***	-.511***	-.463***	-.002
	(.012)	(.012)	(.024)	(.022)	(.015)	(.004)
Population density	.066***	.075***	.056**	.091***	.082***	
	(.012)	(.012)	(.028)	(.025)	(.014)	
Income						.425***
						(.028)
Duopoly	-.005	.004	.018	.027	-.016	-.001
	(.020)	(.020)	(.034)	(.032)	(.023)	(.007)
Oligopoly	-.060	-.028	.018	.115	-.041	.004
	(.039)	(.038)	(.073)	(.071)	(.045)	(.013)
Constant	2.50***	1.90***	1.94***	1.74***	2.68***	.42
F-value	551.4***	537.3***	159.6***	181.5***	281.5***	63.1***

Independent Variables	Description
Circulation	Natural logarithm of the circulation of an edition
Population density	Natural logarithm of the population density in the circulation area of an edition measured by residents per square kilometer
Income	Natural logarithm of the per-capita income (at current prices) in the circulation area of an edition
Duopoly	Dummy variable indicating editions with a duopolistic reader market
Oligopoly	Dummy variable indicating editions with an oligopolistic reader market

Dependent Variables	Description
1/1 page 4-color	Natural logarithm of the 'Cost per Thousand' (CPM) per millimeter of a full page advertisement printed in 4-color
1/1 page b&w	Natural logarithm of the CPM per mm of a full page advertisement printed in black&white
job market	Natural logarithm of the CPM per mm of a typical job market advertisement
real estate	Natural logarithm of the CPM per mm of a typical real estate advertisement
text ads	Natural logarithm of the CPM per mm of a typical text advertisement
loose inserts	Natural logarithm of the CPM for a loose insert of 20 gram maximum weight

*** indicate a significance level of at least 99 per cent, ** of at least 95 per cent and * of at least 90 per cent. Standard errors in parentheses.

Recall from tables 4-5 and 4-6 that not only the circulation but also the location of a newspaper edition in the West or the East of Germany affects the advertising contact prices considerably. Thus, I ran the regressions documented in table 4-7 again but used a dummy variable indicating whether an edition was published in the East. The

results are documented in table 4-8. Note that in this setup the population density (or the per-capita income, respectively) had to be excluded from the estimation because it highly correlated with the East dummy variable. If both were included simultaneously, multicollinearity would have distorted the results. According to the results in table 4-8, the fact that an edition was published in East Germany had a significant effect on the contact price for full page advertisements as well as on the contact price for loose inserts. These results seem to be reasonable. Such advertising categories are primarily booked by retail businesses and the purchasing power of residents in Eastern Germany is considerably lower. Remember that similar results were observed in table 4-5. However, also in this setup the market structure covariates turned out to be not statistically significant. An exception was observed for contact prices charged by oligopoly editions for real estate advertising. However, the coefficient had a positive sign indicating that the oligopoly editions charged higher prices (instead of lower ones as expected).

Table 4-8: Regression Results Using Full Dataset with East Dummy

	1/1 page 4-color	1/1 page b&w	job market	real estate	text ads	loose inserts
# of cases	768	783	234	219	751	775
Circulation	-.510***	-.487***	-.481***	-.463***	-.421***	.002
	(.011)	(.011)	(.019)	(.019)	(.013)	(.003)
East	-.126***	-.105***	-.029	.017	-.034	-.144***
	(.023)	(.023)	(.049)	(.037)	(.028)	(.006)
Duopoly	-.009	.010	.028	.040	.005	-.002
	(.020)	(.020)	(.034)	(.032)	(.024)	(.005)
Oligopoly	-.053	-.007	.023	.154**	.008	.002
	(.038)	(.038)	(.073)	(.072)	(.046)	(.010)
Constant	2.60***	1.97***	1.98***	1.75***	2.73***	4.54***
F-value	552.0***	511.9***	157.4***	172.2***	259.6***	147.9***
Independent Variables	Description					
East	Dummy variable indicating if an edition is published in Eastern Germany					
	The description of the other independent and the dependent variables complies with the information in table 4-7.					

*** indicate a significance level of at least 99 per cent, ** of at least 95 per cent and * of at least 90 per cent. Standard errors in parentheses.

One could infer from the results obtained in tables 4-7 and 4-8 that the position of local newspaper editions in their reader markets has no effect on the contact prices they charge in the associated advertising markets. However, I doubted that things are that trivial. The effects of the reader market structure could have been blurred in the specifications above by the strong structural drivers underlying the data. Therefore, I

grouped the data first by the fact whether they were published in West Germany or East Germany. Then, in a second step, I split the two groups again according to their circulation median (13,252 in the West and 13,353 in the East). Thus, four groups were obtained and analyzed separately. The descriptive statistics for each group are documented in tables 4A-1 to 4A-4 in the appendix of this chapter. This approach brought about three advantages:

1. The problem of heteroscedasticity was reduced because the variation in the circulation data was further narrowed in each group.

2. Omitted effects of certain covariates could be revealed if they were blurred initially by the strong impact of the circulation or the differences between the West and the East. For example, if an effect was significant only in one group, it could be identified if this group was analyzed separately. In contrast, if all editions were estimated simultaneously, the effect could be dominated by the insignificance in the other groups.

3. The effects could be observed and quantified separately for each group. Most importantly, the effects of the socioeconomic determinants could be explored because they were no longer distorted by the multicollinearity caused by the dummy variable for East Germany.

The four groups multiplied by the six advertising categories resulted in a set of 24 equations to estimate. In order to check the robustness of my approach, I estimated each equation with six different sets of covariates (denoted as *Specifications I-VI*) totaling 144 regressions. Detailed results of these 144 estimations including the significance levels, the standard errors and the F-values are documented in the appendix, see tables 4A-5 to 4A-9. In addition, there I provide information about the six specifications that I estimated.

For ease of exposition, I present in this section only the results from *Specification II* (and *L-I*, respectively) in table 4-9 and from *Specification IV* (and *L-IV*, respectively) in table 4-10. In *Specification II*, the vector $PAPER$ from equation (4.2) only comprised the circulation of the newspaper edition. The vector $MARKET$ consisted of the population density as proxy for the economic determinants in the circulation area and dummy variables indicating either a duopolistic or an oligopolistic reader market structure. Thus, the monopolistic market structure served as base category. Note that for the category of loose inserts the per-capita income was applied instead of the population density. The latter specification was denoted as *Specification L-I*.

Table 4-9: Regression Results from Specifications II and L-I

	1/1 page 4-color	1/1 page b&w	job market	real estate	text ads	loose inserts
	Small editions in the West					
# of cases	297	306	98	78	290	303
Circulation	-.716***	-.675***	-.579***	-.658***	-.626***	.006
Population dens.	-.009	.028	.098*	.178***	.097***	
Income						.184***
Duopoly	-.081***	-.059*	-.037	-.018	-.095**	-.010
Oligopoly	-.111**	-.097**	.024	-.045	-.058	.020
F-value	148.6***	154.4***	22.2***	28.1***	73.8***	4.1***
	Large editions in the West					
# of cases	300	306	106	91	290	301
Circulation	-.407***	-.374***	-.419***	-.455***	-.336***	-.001
Population dens.	.052***	.041**	.020	.103**	.052**	
Income						.226***
Duopoly	-.009	.023	.084	.074	.052	-.006
Oligopoly	-.112*	-.083	-.154	.246	-.091	-.065***
F-value	60.7***	50.9***	27.6***	22.8***	35.9***	7.8***
	Small editions in the East					
# of cases	86	86	13	20	86	86
Circulation	-.560***	-.559***	-.534***	-.537***	-.523***	.030***
Population dens.	.012	.056	-.028	-.024	.071	
Income						-.046
Duopoly	.050	-.025	-.109	-.131**	-.056	-.010
F-value	31.7***	28.8***	10.6***	22.0***	13.1***	4.9***
	Large editions in the East					
# of cases	85	85	16	30	85	85
Circulation	-.339***	-.337***	-.190	-.406***	-.346***	.019**
Population dens.	-.031	-.017	-.069	-.008	-0.18	
Income						-.126
Duopoly	-.033	-.045	-.218	-.033	-.081	-.006
F-value	32.8***	27.4***	9.5***	40.8***	20.6***	2.6*
Variables	Description					
	The description of all independent and dependent variables complies with the information in table 4-7.					

*** indicate a significance level of at least 99 per cent, ** of at least 95 per cent and * of at least 90 per cent.

Table 4-10: Regression Results from Specifications IV and L-IV

	1/1 page 4-color	1/1 page b&w	job market	real estate	text ads	loose inserts
	Small editions in the West					
# of cases	297	306	98	78	290	303
Circulation	-.709***	-.664***	-.587***	-.640***	-.623***	.000
Population dens.	-.012	.021	.093*	.165***	.099***	
Income						.182***
+90% mkt. share	.071*	.025	.008	-.030	.106**	.017
F-value	192.5***	198.8***	29.5***	37.7***	96.8***	4.3***
	Large editions in the West					
# of cases	300	306	106	91	290	301
Circulation	-.409***	-.375***	-.431***	-.454***	-.340***	-.001
Population dens.	.052***	.041**	.024	.097**	.056***	
Income						.240***
+90% mkt. share	.037	.003	-.045	-.082	.021	.024***
F-value	81.6***	67.4***	35.4***	30.4***	46.5***	9.0***
	Small editions in the East					
# of cases	86	86	13	20	86	86
Circulation	-.575***	-.572***	-.512***	-.528***	-.525***	.030***
Population dens.	.027	.064*	-.049	-.057**	.074	
Income						-.051
+90% mkt. share	.039	.078*	.140*	.207***	.101*	.011
F-value	37.2***	34.5***	13.6***	86.3***	14.5***	5.0***
	Large editions in the East					
# of cases	85	85	16	30	85	85
Circulation	-.336***	-.329***	-.190	-.406***	-.333***	.019**
Population dens.	-.036	-.026	-.069	-.008	-.029	
Income						-.140
+90% mkt. share	.044	.078*	.218	.033	.130**	.000
F-value	32.7***	28.0***	9.5***	40.9***	21.3***	2.4*

Variables	Description
+90% mkt. share	Dummy variable indicating if an edition has a net market share in its reader market of above 90 per cent
	The description of all other variables complies with the information in table 4-7.

*** indicate a significance level of at least 99 per cent, ** of at least 95 per cent and * of at least 90 per cent.

In *Specification IV* I also used the circulation and the same proxy variables for the economic determinants as in *Specification II*. However, instead of the dummy variables for duopolistic and oligopolistic markets I applied a dummy variable that had a value of one if the newspaper edition had a net market share of more than 90 per cent in its circulation area. As such, the variable represented the cases of single operation monopolies (see table 4-4 for details). Again, for the category of loose inserts the per-capita income was used (denoted as *Specification L-IV*).

Tables 4-9 and 4-10 show the econometric results for the group of small newspaper editions in the West at the top, followed by the results for the large editions in the West, the small editions in the East and, at the bottom, by the large editions in the East. Accordingly, the contact prices for nearby all types of editions and categories of advertising (besides loose inserts) were significantly decreasing in the circulation. The economic determinants, i.e. the population density and the per-capita income, respectively, affected many of the contact prices of the editions in the West positively, whereas such effects were not measured in the East (with one exception among the large editions). The market structure had a significant impact on the contact prices in 8 out of the possible 36 cases in *Specification II/L-I* and in 8 out of 24 possible cases in *Specification IV/L-IV*. Thus, the separation of the data helped to reveal a number of effects that were disguised in the estimations that included all editions simultaneously. The findings in tables 4-9 and 4-10 will be presented in more detail and discussed in the following section.

4.5 Discussion of Results

From my point of view, it is striking how weakly the position of a newspaper edition in its reader market affects the contact prices it can ask in the associated local advertising markets. But before turning to this issue, the effects of the circulation and of the socioeconomic determinants on the advertising contact prices will be discussed.

4.5.1 Effects of the Circulation

The econometric results for the circulation covariate obtained in *Specification II/L-I* and *Specification IV/L-IV* were rather similar among all groups. For that reason, in this section I discuss the results of *Specification II/L-I* only. According to table 4-9, a significant effect of the circulation on the contact price was measured for all categories of advertising besides for loose inserts (in all four groups) and besides for job market advertisements in large editions in the East.

The effect of the circulation was the strongest for the group of small newspaper

editions in the West. In this group, the estimated coefficient had the highest value for full page advertisements in 4-color (-.716) and the lowest value for job market advertising (-.579). Note that the circulation as well as the CPM were both used after taking logs. Thus, the coefficient of -.716 implies that a 1 per cent change of the circulation leads to a decrease of the CPM of .72 per cent. As evidenced by table 4-9, the circulation also had a strong impact on the CPM charged by the smaller newspaper editions in the East. For this group the coefficients range from -.560 for full page advertisements in 4-color to -.523 for text advertising.

The contact prices charged in the groups of larger newspaper editions in the West and in the East reacted less sensitive to changes of the circulation. In the West I obtained coefficients ranging from -.455 for real estate advertising to -.336 for text advertising. In Eastern Germany I got the largest coefficient for real estate advertising (-.406) and the lowest one for full page advertisements in black&white (-.337). Note that in this group the coefficient for job market advertisements turned out to be not statistically significant (but based on only 16 cases).

The result that the contact prices charged by the larger newspaper editions are less sensitive with respect to the circulation compared to the smaller editions is due to the higher variation in the circulation data of larger editions. According to the data in table 4-11, the standard deviation of the circulation in the two groups of larger newspaper editions is about ten times higher compared to the groups of smaller newspaper editions.

Table 4-11: Descriptive Statistics of Circulation Variable

	Small editions in the West	Large editions in the West	Small editions in the East	Large editions in the East
Mean	7,596	31,154	8,857	25,053
Minimum	1,019	13,287	2,461	13,405
Maximum	13,252	283,990	13,353	178,924
Standard deviation	3,180	35,662	2,698	22,850

Basically, the large coefficients obtained for the circulation covariates in conjunction with the large standard deviation indicate that the variation in the price data is primarily caused by differences in the circulation of the editions. This strong impact was already observed in table 4-6, where the CPM charged by newspaper editions in the largest circulation group for a full advertising page in 4-color was only 17 per cent of the price

that newspaper editions in the smallest of the five circulation groups asked. So, how can this extraordinary strong impact be explained?

It is well known that media products exhibit particularly high costs for the first unit that is produced.[32] For that reason, media industries are denoted as "blueprint industries." The production of further copies of newspapers only causes costs for ink, paper and printing as well as – to some extent – for distribution. Therefore, the average costs of the newspaper production are strongly decreasing in the number of copies produced resulting in significant economies of scale. Substantial economies of scale were reported, for example, by Rosse (1970) among smaller daily newspaper firm in the US and by Dertouzos and Trautman (1990). Reimer even provides a numerical example showing that for newspapers the average costs, and thus the prices charged consumers and advertising customers, might sharply increase when moving from a monopoly to a duopoly setting.[33]

According to my data, the newspapers transfer these lower costs per copy primarily to their advertising customers. Data for subscription prices revealed that typically a newspaper firm charges a unit price across all local editions that it publishes under a common main edition despite of differences in the circulation of the local editions.[34] Thus, the cost reductions from the scale economies are forwarded to the advertising customers but not to the readers.

In addition, another effect could add to this, namely that the advertising customers' willingness to pay is not linearly increasing in the number of readers. Instead, it might be that it increases with diminishing returns. This would imply that the efficiency of a newspaper in delivering the advertisers' campaign goals is lower for editions with a high circulation compared to editions with a low circulation. Spreading losses or information spill-overs between readers may cause such effects.

In addition, table 4-9 revealed that an increase of the circulation did not lead to falling contact prices in the advertising category of loose inserts. For editions in the West no significant impact was measured at all. In contrast, in the East positive effects showed up. However, the coefficient in the group of small newspaper editions in the East had a value of only .030, whereas in the group of larger newspapers the coefficient was

[32] For newspapers in Germany no detailed data about the distribution of fixed costs and variable costs are available. According to data from the Federal Association of German Newspaper Publishers (BDZV), in 2004 on average 28.2 per cent of total costs were due to the production of newspapers (about 8 per cent for paper), the editorial board accounted for 25.1 per cent, the advertisements for 15.7 per cent, the distribution for 22.9 per cent and the overhead costs for 8.1 per cent (source: BDZV (2005), p. 52). However, from these figures one cannot distinguish fixed costs from variable costs.

[33] Reimer (1992), p. 66.

[34] See: Stamm (2005). The subscription price data were not included in the estimation because the prices varied only among main editions of the newspapers but not among the corresponding local editions. But most main editions had to be exluded from tha dataset, see section 4.2.2 for details.

even less with a value of .019. Thus, what is the reason that the circulation does not (or only barely) affect the contact prices charged for loose inserts?

The result is driven by the fact that the newspapers do not incur fixed costs from the production of the loose inserts. Typically, advertising customers let the booklets be printed themselves and the publishing firm only inserts them in the newspaper issues in the course of the printing process. Thus, the loose inserts only increase the costs of delivery due to the additional weight. Therefore, newspapers charge higher prices in accordance with a higher weight of the inserts. I studied the CPM for inserts with a maximum weight of 20 grams. Note that if such booklets are inserted into 100,000 copies of the newspaper, this corresponds to an extra weight of 2 tons that has to be delivered.

4.5.2 Effects of Socioeconomic Determinants

The dataset contains a number of variables that describe the economic conditions within the circulation area of the newspaper editions. Recall that in the tables 4A-1 to 4A-4 in the appendix the mean values of the population density, the per-capita income, the purchasing power and the unemployment rate for each of the four analyzed groups are documented. In addition, the number of households and the household penetration rate are provided.[35] Due to a rather significant correlation among the socioeconomic covariates (see table 4-12), only one of them could be used at a time in the estimations.

Table 4-12: Correlation among Socioeconomic Covariates

	Per-capita income	Purchasing power	Unemployment rate
Population density in the West	.44	.32	.26
Population density in the East	.36	.42	-.14

In *Specifications II* and *IV* the population density was applied to represent the variation in the socioeconomic determinants in the circulation areas. Basically, the population density describes whether an edition is published in a rural or urban area. According to the descriptive statistics in tables 4A-1 and 4A-4, in the West the per-capita income, the purchasing power and the unemployment rate are higher in more

[35] The household penetration rate measures what share of households in a circulation area is reached by the newspaper edition. Formally, I divided the number of households by the number of total copies sold. The penetration rate has been found to be positively related to the newspapers' commercial success by Gustafsson (1978).

urban areas. In the East, the per-capita income and the purchasing power are higher in more urban areas as well, but the unemployment rate is lower. Remember that for the category of loose inserts I applied the per-capita income.

For the editions in the West, the results from *Specification II/L-I* and from *Specification IV/L-IV* differ only marginally. The CPM of small editions in the West was most affected by the economic determinants in the categories of loose inserts and real estate advertising. The newspaper editions in more urban areas asked higher prices for these categories of advertising. A significant effect was also observed for job advertisements and text advertising. No effects showed up for full page advertisements regardless of whether printed in 4-color or black&white. Similar results were obtained for the large newspaper editions in the West. The most significant effects showed up for the CPM of loose inserts and of real estate advertisements. Weaker but still significant effects were brought forth for full page advertisements and text advertising.

The advertising contact prices for newspaper editions in the East reacted less sensitive to changes of the economic determinants. Under *Specification II/L-I* no significant effect showed up at all, neither for small editions nor for large ones. When applying *Specification IV/L-IV* then for small newspaper editions a significant and positive effect of the socioeconomic determinants was observed for full page advertisements in black&white and a significant but negative effect for real estate advertising. Accordingly, socioeconomic determinants play a more important role in the determination of advertising contact prices in the West than in the East.

4.5.3 Effects of the Market Structure

The market structure covariates that I applied in *Specification II/L-I* as well as in *Specification IV/L-IV* were dummy variables. Accordingly, the coefficients from the estimations had to be transformed in order to be interpreted in an intuitive fashion.[36]

According to the results in table 4-9, the market structure covariates in *Specification II/L-I* turned out statistically most significant for the group of small newspaper editions in the West. In this group, editions in a duopolistic circulation market charged for a full page advertisement in 4-color contact prices that were 7.8 per cent lower compared to editions in monopolistic reader markets (holding all other things equal). In an oligopolistic market the contact price was 10.5 per cent lower. Similar but smaller effects emerged for full page advertisements in black&white. For that category the price decrease in the case of a duopoly market was 5.7 per cent and 9.2 per cent in the case of an oligopoly market. In addition, text advertisements were priced 9.1 per cent lower in

[36] Halvorsen and Palmquist (1980) showed that in semi-log estimations the coefficients of dummy variables have to be treated differently compared to those of continous covariates. Following their recommendations, I took the anti-log of the dummy coefficients and substracted one from the result.

duopoly markets. Note that the findings for full page advertisements in 4-color and for text advertising were confirmed by the estimations under *Specification IV*. For classified advertising and loose inserts no effects of the reader market structure on the contact prices were found. These prices only depended on the circulation and the socioeconomic determinants in the circulation area.

According to *Specification II/L-I*, large newspaper editions in the West charged lower contact prices in the case of an oligopolistic reader market for full page advertisements in 4-color (minus 10.5 per cent) and for loose inserts (minus 6.3 per cent). The latter result was confirmed by a significant coefficient with the same sign from *Specification L-IV*.

Recall that in the data for Eastern Germany only monopolies and duopolies were found in the reader markets but no oligopolies. In East Germany, more significant results of the market structure covariates were also obtained for the group of small newspaper editions. *Specification IV/L-IV* revealed that the smaller editions charged higher contact prices in the case of a circulation monopoly for all categories of advertising besides full page advertisements in 4-color and loose insert. The effect was the strongest for the two categories of classified advertising. Accordingly, the markup was 15.0 per cent for job advertisements and 23.0 per cent for real estate advertisements in the case of reader market monopolies. For the larger newspaper editions in the East, significant monopoly markups were determined for the categories of full page advertisements in black&white printing and text advertising (plus 8.1 per cent and plus 13.9 per cent, respectively).

Summing up, the most significant effects of the structure of the reader market on the advertising contact prices were measured for the groups of small newspaper editions in the West and in the East. Two issues will be discussed next. First, are these findings robust? And second, if they were robust, do they actually show monopoly power at work? Recall that I applied six different sets of covariates to estimate each equation. I will regard a result as robust, if it showed up statistically significant in at least three out of these six specifications (see tables 4A-5 to 4A-9). This requirement was met by only six of the results from above: By full page advertisements in 4-color and in black&white and text advertisements in small editions in the West, by real estate advertising and text advertisements in small editions in the East and by text advertisements in large editions in the East. So, let me next consider the question of whether these significant and robust results represent the effects of market power.

Firstly, consider the results for the small editions in the West. By taking a closer look at the descriptive statistics of these editions, I doubt that actually market power caused the observed markups in the monopoly cases. The descriptive statistics for the group are documented in table 4A-1 in the appendix. According to this table, the characteristics of

the circulation areas of the smaller newspaper editions in the West differed enormously with respect to the market structure. In particular, the duopoly editions had on average a 10 per cent lower circulation than the monopoly cases. For the oligopoly editions the difference was even 25 per cent. In addition, consider two other effects: Firstly, the share of duopolies and oligopolies in the group is much higher (50 per cent and 12 per cent, respectively) compared to the three other groups. Secondly, recall that the effect of the circulation on the contact prices of the small newspapers in the West was the strongest among all estimations in the analysis, for example -0.716 for full page advertisements in 4-color.

Now, here is my point: The significant coefficients were not caused by market power of the monopoly editions but by the mere fact that the publishers of duopoly and oligopoly newspaper editions were unable to recover their costs because the circulation of their editions was simply too low. They would have liked to charge higher prices that were more in line with the corresponding level of the circulation. However, this price would have been so high that the advertising customers would not have paid it. I expect these editions to be loss-making. Because typically regional newspaper firms publish several local editions, such losses can be covered by income from profitable editions.

Accordingly, if the effects measured for small editions in the West are not caused by market power, only three significant effects remain. For these the explanation from above does not apply. In particular, the duopoly editions of small newspapers in the East have only a slightly lower circulation than the monopoly editions. Thus, small newspaper editions in the East charge higher contact prices for real estate advertising and text advertising in the case of a circulation monopoly in the reader market. The same is true for large editions in the East for the category of text advertising.

However, these effects represent only a small number of the analyzed cases. Thus, what is the reason that newspaper publishers seem to be unable to charge significantly higher advertising contact prices if editions possess a monopoly in the reader market? The data themselves are too limited to answer this question empirically. Alternatively, three hypotheses are established and their potential effects on the pricing patterns are explored.

Hypothesis one: Demand Substitutes

The local newspaper circulation markets are highly concentrated. However, in the dataset at hand the market structure only took into account hostile editions of local newspapers as well as national quality and tabloid newspapers. But in nearby any circulation area in the dataset, weekly advertising newspapers distributed for free, local

radio stations and local TV stations were present.[37] These alternative media vehicles compete with the local newspaper editions for advertising customers.[38] The same argument holds for Internet platforms that particularly target classified advertising. Trading platforms like Ebay, job market pages like monster.com or real estate platforms like immobilienscout24.de contend with newspapers for classified advertising. These alternative media vehicles may drive the advertising contact prices of newspapers down to a competitive level regardless of whether a newspaper editions possesses a monopoly in its reader market or not.

Hypothesis one could also explain, why many of the newspaper editions are able to charge a markup for text advertising. This category of advertising works only in the case of printed media and if readers actually read the articles. So, broadcasting media as well as the freely distributed weeklies (that are certainly read not very carefully) are weaker demand substitutes for this category of advertising.

Hypothesis two: Supply Substitutes

Newspaper editions serve distinct geographical markets. However, many of them face hostile editions right at the border of their circulation market area. If a publisher would charge too high advertising prices, a rival could enter the market with a hostile neighboring edition and force prices down. The newspaper firm anticipates this potential market entry by supply substitutes and holds advertising prices down.

Hypothesis three: Omitted Markup

Despite of the careful analysis of the available data, my study might suffer from data limitations and be unable to detect omitted firm behavior. For example, the data is insufficient to specify actual cost-markups of the newspaper firms on their advertising rates due to the lack of cost information and advertising volumes. A fully specified structural model comprising demand and supply functions for each market as well as a behavioral function for the newspaper firms could approach the questions at hand in a more profound way. Such models were applied for the case of newspapers by Dertouzos and Trautman (1990), Bucklin, Caves and Lo (1989) and Argentesi and Filistrucchi

[37] This fact was evidenced by data provided by the STAMM Verlag from Essen, Germany. The data comprised the number of advertising newspapers as well as the number of local radio and TV stations based on the 439 districts and cities in Germany. These data were not included in the estimations because the numbers of firms did obviously not reveal the number of readers/listeners they actually reached. According to the German Federal Association of Advertising Newspapers (http://www.bdva.de) reliable circulation data for weekly advertising newspapers is not available for Germany.

[38] They may also have the role of complements to some extent. As an example consider a local shop owner who notifies listeners of a local radio station about sales advertised in the local newspaper.

(2005), for the case of a magazine market by Kaiser (2004) and for the market of yellow pages by Rysman (2004).

In the short-run model of Dertouzos and Trautman, for example, newspaper firms choose a vector of outputs, including advertising space, the circulation and space for news which determine jointly a set of market clearing prices. The authors estimated two demand functions as well as three first-order conditions containing non-linear combinations of five endogenous variables by applying a log-linear two-stage least squares model. However, to estimate the model they had to make a number of rather restrictive assumptions. For example, they assumed that readers value news and advertising content equally at the margin. Furthermore, they had no actual costs data available and did not distinguish the different advertising categories.

For local newspaper markets in Germany the required data for a fully specified and identified structural model are not publicly available. Another potential drawback of my analysis is that I have not determined the actual position of a newspaper firm in the local advertising markets but instead used the position in the circulation market as a proxy.

4.6 Conclusion

The empirical analysis in this chapter provided two major conclusions: Firstly, the circulation markets of regional quality newspapers in Germany are highly concentrated. Even though this fact is known for long, I was able for the first time to describe the concentration by exact figures from the actual geographical circulation areas of the newspaper editions. Secondly, based on this market analysis, I showed that the advertising contact prices charged by these editions do not depend on the structure of the reader markets (with few exceptions). Editions that hold a circulation monopoly are not able to charge higher contact prices for advertising than editions with duopolistic or oligopolistic reader markets (all other things equal). The prices are primarily determined by the circulation of the newspaper editions and socioeconomic factors of the circulation area.

My results do not raise general objections against the proposed amendment of the competition rules for the newspaper industry in Germany. Recall from the introduction of this chapter that the Federal government basically plans two modifications: First, the revenue threshold for the firms involved in a proposed merger shall be lifted such that the competition rules apply to fewer cases and, second, newspaper publishers shall be allowed to merge printing and advertising capabilities - even though they obtain a dominant position in the reader market - if they guarantee to keep the editorial activities independent. Thus, if the editorial boards are kept independent and the advertising

markets are unaffected by a joint profit maximization as evidenced by my results, no significant welfare losses should be expected even if the new rules caused a wave of mergers in the newspaper publishing industry.

Nevertheless, according to my analysis, one serious concern arises. Assume that the modification of the competition rules actually augments the concentration in the newspaper industry and, therefore, that the average circulation of the editions increases. It is known from the past that monopoly publishers often group editions and sell them only as a bundle to advertising customers. Then advertising customers, on the one hand, face higher total cost for advertisements but, on the other hand, falling contact prices. Advertisers who wish to contact all readers in an enlarged circulation area and whose budget is sufficiently large benefit from the decrease of the contact price. For them the monopolization brings forth lower cost for advertising.

But this is certainly not true for all advertising customers, particularly not for small regional and local businesses. Consider the following example: Assume that an advertiser used to pay 1,000 Euros for a certain advertisement inserted in the edition published in the town where his business is located. After a merger took place he can only book an advertisement for 1,500 Euros in an edition that is also published in a neighboring town and that has twice the circulation. If the additional readers are not of interest to him because they live too remote from his business, contacting these readers is pointless for him. Such an advertising customer certainly preferred the advertisement for 1,000 Euros and is worse off after the merger. Accordingly, if two neighboring newspaper firms propose to merge their businesses and the example from above is a serious concern, the competition authorities should oblige the new business to continue selling the former editions separately to local advertising customers.

My empirical results were derived from an econometric specification that is probably distorted by methodological shortcomings due to the limited data at hand. Most importantly, the specification did not take into account the potential endogeneity between the advertising prices, the circulation and the advertising volumes. In addition, I examined the market power of newspaper editions without considering the competitive relationship to alternative media vehicles in the circulation area. Applying richer data to overcome these shortcomings is certainly a valuable task for the future.

4.A Appendix

Table 4A-1: Descriptive Statistics for Small Editions in West Germany

	all	monopolies	duopolies	oligopolies
Cases	306	117 (38.2%)	153 (50.0%)	36 (11.8%)
Circulation	7,596	8,244	7,429	6,198
Net market share	.60	.84	.49	.25
Spread to competitor	.28	.72	.07	-.24
HHI	.61	.79	.52	.43
# of households	33,274	20,804	33,409	73,225
Population density	287	227	284	492
Per-capita income	16,862	16,443	17,092	17,249
Purchasing power	2.85	2.80	2.87	2.92
Unemployment rate	6.8	6.6	6.8	7.0
CPM 1/1 page 4c	17.0c (297)	15.7c (113)	16.8c (150)	22.8c (34)
CPM 1/1 page b&w	11.2c (306)	10.2c (117)	11.2c (153)	14.4c (36)
CPM job market	10.7c (98)	10.4c (39)	10.4c (50)	13.6c (9)
CPM real estate	10.5c (78)	9.6c (32)	10.6c (37)	13.0c (9)
CPM text advertising	43.0c (290)	38.7c (106)	41.7c (149)	61.5c (35)
CPM loose inserts	94.8€ (303)	94.6€ (115)	94.4€ (153)	97.3€ (35)

Variables	Description
Circulation	Average circulation of editions
Net market share	Average net market share of editions among local newspaper editions
Spread to competitor	Net market share spread to the largest local hostile newspaper edition
HHI	Herfindahl-Hirschman index, i.e. the sum of the squared net market shares
# of households	Average number of households in circulation areas
Population density	Average number of residents per square kilometer in circulation area
Per-capita income	Average per-capita income (at current prices) in circulation area
Purchasing power	Average purchasing power index in the circulation areas, ranging from 1 (very low) to 5 (very high)
Unemployment rate	Average unemployment rate in the circulation areas
CPM 1/1 page 4c	Average 'Cost per Thousand' (CPM) per millimeter of a full page advertisement printed in 4-color in Euro cents (number of editions that offer this advertising category in parentheses)
CPM 1/1 page b&w	Average CPM per mm of a full page advertisement printed in black&white
CPM job market	Average CPM per mm of a typical job market advertisement
CPM real estate	Average CPM per mm of a typical real estate advertisement
CPM text ads	Average CPM per mm of a typical text advertisement
CPM loose inserts	Average CPM for a loose insert of 20 gram maximum weight in full Euros

Table 4A-2: Descriptive Statistics for Large Editions in West Germany

	all	monopolies	duopolies	oligopolies
Cases	306	171 (55.9%)	117 (38.2%)	18 (5.9%)
Circulation	34,154	32,614	36,135	35,911
Net market share	.78	.92	.61	.47
Spread to competitor	.61	.87	.31	.19
HHI	.71	.87	.54	.37
# of households	101,080	76,863	127,547	159,116
Population density	504	440	569	683
Per-capita income	16,909	16,731	17,122	17,206
Purchasing power	2.91	2.87	2.93	3.11
Unemployment rate	7.5	7.3	7.7	8.4
CPM 1/1 page 4c	7.6c (300)	7.4c (167)	8.0c (115)	7.1c (18)
CPM 1/1 page b&w	5.2c (306)	5.1c (171)	5.5c (117)	5.0c (18)
CPM job market	5.6c (106)	5.5c (62)	6.1c (40)	3.9c (4)
CPM real estate	5.4c (91)	5.1c (52)	5.8c (37)	7.7c (2)
CPM text advertising	21.8c (290)	20.9c (159)	23.3c (13)	19.5c (18)
CPM loose inserts	94.2€ (301)	94.6€ (167)	94.5€ (16)	89.3€ (18)

The description of all variables complies with the information in table 4A-1.

Table 4A-3: Descriptive Statistics for Small Editions in East Germany

	all	monopolies	duopolies
Cases	86	67 (77.9%)	19 (22.1%)
Circulation	8,857	8,934	8,585
Net market share	.86	.96	.50
Spread to competitor	.72	.92	.05
HHI	.83	.92	.52
# of households	23,636	19,582	37,930
Population density	118	106	161
Per-capita income	13,874	13,832	14,020
Purchasing power	1.14	1.10	1.26
Unemployment rate	18.7	18.7	18.7
CPM 1/1 page 4c	11.6c (86)	11.2c (67)	13.2c (19)
CPM 1/1 page b&w	7.8c (86)	7.7c (67)	8.3c (19)
CPM job market	9.7c (13)	9.4c (7)	10.0c (6)
CPM real estate	9.2c (20)	8.8c (14)	10.0c (6)
CPM text advertising	33.7c (86)	33.4c (67)	34.8c (19)
CPM loose inserts	79.2€ (86)	78.5€ (67)	81.8€ (19)

The description of all variables complies with the information in table 4A-1.

Table 4A-4: Descriptive Statistics for Large Editions in East Germany

	all	monopolies	duopolies
Cases	85	72 (84.7%)	13 (15.3%)
Circulation	25,053	24,004	30,861
Net market share	.92	.96	.68
Spread to competitor	.85	.93	.41
HHI	.89	.94	.59
# of households	60,550	52,723	103,901
Population density	308	293	388
Per-capita income	14,161	14,093	14,537
Purchasing power	1.31	1.28	1.46
Unemployment rate	17.4	18.0	16.6
CPM 1/1 page 4c	7.9c (85)	8.0c (72)	7.2c (13)
CPM 1/1 page b&w	5.4c (85)	5.5c (72)	5.0c (13)
CPM job market	5.9c (17)	6.3c (14)	4.3c (3)
CPM real estate	5.9c (30)	6.0c (25)	5.0c (5)
CPM text advertising	23.2c (85)	23.7c (72)	20.6c (13)
CPM loose inserts	80.4€ (85)	80.1€ (72)	82.0€ (13)

The description of all variables complies with the information in table 4A-1.

Table 4A-5: Estimation Results for Small Editions in West Germany

	1/1 page 4-color	1/1 page b/w	job market	real estate	text ad
Cases	297	306	98	78	290
	Specification I				
Circulation	-.714***	-.678***	-.572***	-.654***	-.630***
	(.030)	(.028)	(.065)	(.067)	(.039)
Income	-.105	.146	.093	.336	.440**
	(.157)	(.150)	(.361)	(.402)	(.208)
Duopoly	-.081***	-.056*	-.024	-.002	-.095**
	(.033)	(.031)	(.054)	(.061)	(.045)
Oligopoly	-.117**	-.084*	.033	-.016	-.032
	(.052)	(.049)	(.093)	(.094)	(.070)
Constant	5.49***	2.30	1.94	.24	.35
F-value	149.3***	153.0***	20.7***	25.1***	68.7***
	Specification II				
Circulation	-.716***	-.675***	-.579***	-.658***	-.626***
	(.030)	(.028)	(.064)	(.065)	(.039)
Population density	-.009	.028	.098*	.178***	.097***
	(.021)	(.020)	(.057)	(.065)	(.028)
Duopoly	-.081***	-.059*	-.037	-.018	-.095**
	(.033)	(.031)	(.053)	(.058)	(.044)
Oligopoly	-.111**	-.097**	.024	-.045	-.058
	(.053)	(.049)	(.092)	(.091)	(.069)
Constant	4.53***	3.55***	2.40***	2.62***	4.08***
F-value	148.6***	154.4***	22.2***	28.1***	73.8***
	Specification III				
Circulation	-.716***	-.674***	-.575***	-.644***	-.627***
	(.030)	(.028)	(.065)	(.066)	(.039)
Population density	-.008	.025	.096*	.176***	.099***
	(.022)	(.020)	(.057)	(.066)	(.028)
Joint operations	-.017	.035	.029	.068	-.062
monopoly	(.049)	(.046)	(.081)	(.084)	(.067)
Duopoly	-.089**	-.043	-.025	.015	-.125**
	(.040)	(.037)	(.064)	(.071)	(.054)
Oligopoly	-.120**	-.083	.037	-.006	-.091
	(.058)	(.054)	(.099)	(.102)	(.077)
Constant	4.54***	3.54***	2.36***	2.48***	4.11***
F-value	118.2***	123.5***	17.5***	22.4***	58.6***
	Specification IV				
Circulation	-.709***	-.664***	-.587***	-.640***	-.623***
	(.030)	(.028)	(.064)	(.064)	(.038)
Population density	-.012	.021	.093*	.165***	.099***
	(.022)	(.021)	(.057)	(.065)	(.028)
+90% mkt. share	.071*	.025	.008	-.030	.106**
	(.038)	(.036)	(.060)	(.067)	(.051)
Constant	4.42***	3.45***	2.48***	2.53***	3.97***
F-value	192.5***	198.8***	29.5***	37.7***	96.8***

- *continued on the next page*

continuation of table 4A-5

	1/1 page 4-color	1/1 page b/w	job market	real estate	text ad
	Specification V				
Circulation	-.710***	-.663***	-.575***	-.623***	-.615***
	(.029)	(.028)	(.064)	(.063)	(.038)
Population density	-.017	.018	.086	.153**	.092***
	(.021)	(.020)	(.056)	(.063)	(.028)
HHI	.100**	.014	-.038	-.086	.077
	(.041)	(.039)	(.064)	(.064)	(.054)
Constant	4.52***	3.47***	2.39***	2.39***	4.01***
F-value	195.1***	198.3	29.5***	39.5***	95.6***
	Specification VI				
Circulation	-.741***	-.693***	-.604***	-.634***	-.623***
	(.031)	(.029)	(.068)	(.071)	(.041)
Population density	.010	.041**	.097*	.168***	.097***
	(.022)	(.021)	(.057)	(.063)	(.029)
Spread to competitor	.120***	.092***	.035	-.026	.035
	(.032)	(.031)	(.056)	(.061)	(.044)
Constant	4.57***	3.57***	2.60***	2.46***	4.00***
F-value	202.5***	210.7***	29.8***	37.9***	94.1***

Independent Variables	Description
Circulation	Natural logarithm of the circulation of an edition
Population density	Natural logarithm of the population density in the circulation area of an edition measured by residents per square kilometer
Income	Natural logarithm of the per-capita income (at current prices) in the circulation area of an edition
Duopoly	Dummy variable indicating editions with a duopolistic reader market
Oligopoly	Dummy variable indicating editions with an oligopolistic reader market
Joint operations monopoly	Dummy variable indicating monopolies based on the joint circulation of all editions from the same publishing house in a circulation area
+90% mkt. share	Dummy variable indicating if an edition has a net market of above 90 per cent
HHI	Natural logarithm of the Herfindahl-Hirschman index
Spread to competitor	Net market share spread to the largest local hostile newspaper edition
Dependent Variables	**Description**
1/1 page 4-color	Natural logarithm of the 'Cost per Thousand' (CPM) per millimeter in Euro Cent of a full page advertisement printed in 4-color
1/1 page b&w	Natural logarithm of the CPM per mm of a full page advertisement printed in black&white
job market	Natural logarithm of the CPM per mm of a typical job market advertisement
real estate	Natural logarithm of the CPM per mm of a typical real estate advertisement
text ads	Natural logarithm of the CPM per mm of a typical text advertisement
loose inserts	Natural logarithm of the CPM in Euros for loose inserts of 20 gram maximum weight

*** indicate a significance level of at least 99 per cent, ** of at least 95 per cent and * of at least 90 per cent. Standard errors in parentheses.

Table 4A-6: Estimation Results for Large Editions in West Germany

	1/1 page 4-color	1/1 page b/w	job market	real estate	text ad
Cases	300	306	106	91	290
	Specification I				
Circulation	-.365***	-.343***	-.412***	-.397***	-.298***
	(.025)	(.025)	(.040)	(.042)	(.026)
Income	.124	.177	.481	1.17***	.236
	(.162)	(.161)	(.326)	(.327)	(.171)
Duopoly	.011	.035	.088	.062	.063*
	(.032)	(.032)	(.056)	(.055)	(.034)
Oligopoly	-.092	-.068	-.140	.252	-.078
	(.065)	(.066)	(.143)	(.182)	(.069)
Constant	-.121	-1.23	-3.44	-10.27***	-.84
F-value	55.8***	48.9***	28.8***	25.8***	33.9***
	Specification II				
Circulation	-.407***	-.374***	-.419***	-.455***	-.336***
	(.028)	(.029)	(.051)	(.052)	(.030)
Population density	.052***	.041**	.020	.103**	.052**
	(.021)	(.020)	(.047)	(.042)	(.022)
Duopoly	-.009	.023	.084	.074	.052
	(.032)	(.032)	(.058)	(.058)	(.034)
Oligopoly	-.112*	-.083	-.154	.246	-.091
	(.065)	(.066)	(.143)	(.189)	(.069)
Constant	1.22***	.57**	1.20***	1.08**	1.55***
F-value	60.7***	50.9***	27.6***	22.8***	35.9***
	Specification III				
Circulation	-.408***	-.375***	-.419***	-.453***	-.339***
	(.029)	(.029)	(.051)	(.052)	(.031)
Population density	.054***	.042**	.019	.100**	.057***
	(.021)	(.021)	(.047)	(.042)	(.022)
Joint operations	-.041	-.019	.013	.046	-.097*
monopoly	(..46)	(.047)	(.078)	(.081)	(.050)
Duopoly	-.020	.017	.088	.088	.028
	(.034)	(.035)	(.063)	(.063)	(.037)
Oligopoly	-.124*	-.088	-.150	.260	-.118*
	(.066)	(.067)	(.146)	(.191)	(.070)
Constant	1.24***	.58**	1.21***	1.06**	1.57***
F-value	48.5***	40.5***	21.7***	18.3***	28.9***
	Specification IV				
Circulation	-.409***	-.375***	-.431***	-.454***	-.340***
	(.028)	(.029)	(.051)	(.052)	(.031)
Population density	.052***	.041**	.024	.097**	.056***
	(.021)	(.020)	(.047)	(.042)	(.022)
+90% mkt. share	.037	.003	-.045	-.082	.021
	(.031)	(.031)	(.056)	(.057)	(.034)
Constant	1.22***	.58**	1.34***	1.16***	1.57***
F-value	81.6***	67.4***	35.4***	30.4***	46.5***

- *continued on the next page*

continuation of table 4A-6

	1/1 page 4-color	1/1 page b/w	job market	real estate	text ad
	Specification V				
Circulation	-.410***	-.374***	-.433***	-.457***	-.338***
	(.028)	(.029)	(.051)	(.051)	(.031)
Population density	.053***	.040**	.030	.104***	.053**
	(.021)	(.021)	(.047)	(.041)	(.022)
HHI	.057	.000	-.022	-.137*	.009
	(.043)	(.043)	(.083)	(.080)	(.046)
Constant	1.26***	.58**	1.31***	1.07**	1.58***
F-value	81.5***	67.3***	34.9***	31.3***	46.3***
	Specification VI				
Circulation	-.413***	-.373***	-.421***	-.448***	-.340***
	(.029)	(.029)	(.051)	(.053)	(.031)
Population density	.054***	.039**	.021	.101**	.054***
	(.021)	(.021)	(.046)	(.042)	(.022)
Spread to competitor	.053	-.009	-.109	-.115	.014
	(.041)	(.041)	(.079)	(.080)	(.043)
Constant	1.23***	.57**	1.32***	1.13***	1.57***
F-value	81.4***	67.1***	36.6***	30.6***	46.3***

The description of all variables complies with the information in table 4A-5.

Table 4A-7: Estimation Results for Small Editions in East Germany

	1/1 page 4-color	1/1 page b/w	job market	real estate	text ad
Cases	86	86	13	20	86
	Specification I				
Circulation	-.562***	-.515***	-.538***	-.557***	-.506***
	(.055)	(.062)	(.099)	(.070)	(.082)
Income	.419	-.240	.499	.411	-.689
	(.348)	(.392)	(.680)	(.480)	(.518)
Duopoly	.035	.015	-.114	-.128**	-.027
	(.047)	(.053)	(.080)	(.058)	(.070)
Constant	-1.09	4.37	-2.26	-1.24	10.02**
F-value	36.1***	23.3***	10.2***	21.7***	13.1***
	Specification II				
Circulation	-.560***	-.559***	-.534***	-.537***	-.523***
	(.060)	(.060)	(.097)	(.072)	(.084)
Population density	.012	.056	-.028	-.024	.071
	(.036)	(.036)	(.064)	(.042)	(.050)
Duopoly	.050	-.025	-.109	-.131**	-.056
	(.050)	(.050)	(.078)	(.057)	(.069)
Constant	2.82***	2.24***	2.59**	2.62***	3.29***
F-value	31.7***	28.8***	10.6***	22.0***	13.1***
	Specification III				
Circulation	-.556***	-.553***	-.495***	-.517***	-.517***
	(.052)	(.057)	(.099)	(.062)	(.083)
Population density	.019	.057*	-.058	-.067*	.076
	(.031)	(.034)	(.066)	(.038)	(.050)
Joint operations	-.219***	-.188***	-	-.215**	-.209**
monopoly	(.065)	(.072)		(.100)	(.103)
Duopoly	.003	-.047	-.131	-.171***	-.096
	(.044)	(.048)	(.077)	(.048)	(.069)
Constant	2.79***	2.21***	2.41**	2.67***	3.25***
F-value	33.8***	26.0***	9.8***	26.6***	11.2***
	Specification IV				
Circulation	-.575***	-.572***	-.512***	-.528***	-.525***
	(.055)	(.057)	(.084)	(.036)	(.081)
Population density	.027	.064*	-.049	-.057**	.074
	(.033)	(.034)	(.058)	(.023)	(.049)
+90% mkt. share	.039	.078*	.140*	.207***	.101*
	(.041)	(.042)	(.068)	(.029)	(.060)
Constant	2.87***	2.27***	2.38**	2.52***	3.22***
F-value	37.2***	34.5***	13.6***	86.3***	14.5***

- *continued on the next page*

continuation of table 4A-7

	1/1 page 4-color	1/1 page b/w	job market	real estate	text ad
	Specification V				
Circulation	-.571***	-.569***	-.511***	-.511***	-.531***
	(.057)	(.058)	(.119)	(.072)	(.080)
Population density	.023	.062*	-.031	-.021	.077
	(.034)	(.035)	(.081)	(.044)	(.048)
HHI	.018	.111	.143	.177*	.197*
	(.072)	(.073)	(.174)	(.103)	(.102)
Constant	2.89***	2.34***	2.39*	2.37***	3.38***
F-value	34.5***	32.5***	6.5***	19.7***	15.2***
	Specification VI				
Circulation	-.572***	-.588***	-.590***	-.628***	-.554***
	(.058)	(.058)	(.108)	(.077)	(.082)
Population density	.024	.071**	-.016	-.001	.076
	(.035)	(.035)	(.062)	(.038)	(.049)
Spread to competitor	.008	.087*	.136	.188***	.129*
	(.049)	(.049)	(.085)	(.061)	(.070)
Constant	2.89***	2.38***	2.92***	3.17***	3.45***
F-value	35.2***	34.9***	11.6***	27.2***	15.4***

The description of all variables complies with the information in table 4A-5. Note that for Eastern Germany no oligopolies in the newspaper reader market were observed.

Table 4A-8: Estimation Results for Large Editions in East Germany

	1/1 page 4-color	1/1 page b/w	job market	real estate	text ad
Cases	85	85	16	30	85
	Specification I				
Circulation	-.383***	-.356***	-.513*	-.418***	-.347***
	(.040)	(.041)	(.260)	(.039)	(.048)
Income	.219	-.170	2.63*	.379	-.829
	(.429)	(.440)	(1.41)	(.681)	(.520)
Duopoly	-.030	-.036	.030	-.045	-.072
	(.055)	(.057)	(.372)	(.069)	(.067)
Constant	-.85	2.24	-22.76*	-2.29	9.90**
F-value	32.0***	27.1***	10.9***	42.3***	21.1***
	Specification II				
Circulation	-.339***	-.337***	-.190	-.406***	-.346***
	(.053)	(.055)	(.128)	(.051)	(.067)
Population density	-.031	-.017	-.069	-.008	-0.18
	(.029)	(.030)	(.052)	(.037)	(.036)
Duopoly	-.033	-.045	-.218	-.033	-.081
	(.054)	(.056)	(.145)	(.066)	(.067)
Constant	.98**	.52	-.50	1.26***	2.07***
F-value	32.8***	27.4***	9.5***	40.8***	20.6***
	Specification III				
Circulation	-.336***	-.334***	-.190	-.406***	-.339***
	(.054)	(.055)	(.128)	(.051)	(.066)
Population density	-.036	-.027	-.069	-.008	-.031
	(.030)	(.031)	(.052)	(.037)	(.037)
Joint operations	-.055	-.120*	-	-	-.173**
monopoly	(.069)	(.071)			(.085)
Duopoly	-.039	-.057	-.218	-.033	-.103
	(.055)	(.056)	(.145)	(.066)	(.068)
Constant	.99**	.55	-.50	1.26***	2.08***
F-value	24.1***	21.1***	9.5***	40.8***	16.0***
	Specification IV				
Circulation	-.336***	-.329***	-.190	-.406***	-.333***
	(.053)	(.055)	(.128)	(.051)	(.066)
Population density	-.036	-.026	-.069	-.008	-.029
	(.030)	(.031)	(.052)	(.037)	(.037)
+90% mkt. share	.044	.078*	.218	.033	.130**
	(.046)	(.047)	(.145)	(.066)	(.057)
Constant	.93**	.42	-.72	1.23***	1.89***
F-value	32.7***	28.0***	9.5***	40.9***	21.3***

- *continued on the next page*

continuation of table 4A-8

	1/1 page 4-color	1/1 page b/w	job market	real estate	text ad
	Specification V				
Circulation	-.336**	-.332***	-.405***	-.414***	-.330***
	(.052)	(.054)	(.079)	(.049)	(.062)
Population density	-.035	-.023	-.067	-.020	-.029
	(.029)	(.030)	(.056)	(.037)	(.034)
HHI	.122	.178**	-.305	-.166	.383***
	(.084)	(.086)	(.381)	(.195)	(.099)
Constant	.98**	.51	1.58**	1.39***	2.01***
F-value	33.5***	29.0***	18.3***	44.7***	26.4***
	Specification VI				
Circulation	-.339***	-.337***	-.407***	-.407***	-.340***
	(.052)	(.054)	(.080)	(.051)	(.062)
Population density	-.031	-.017	-.069	-.011	-.018
	(.029)	(.030)	(.056)	(.038)	(.034)
Spread to competitor	.092	.123	-.315	.078	.299***
	(.074)	(.077)	(.390)	(.125)	(.089)
Constant	.89**	.41	1.93*	1.20***	1.73***
F-value	33.1***	27.9***	18.3***	40.8***	25.0***

The description of all variables complies with the information in table 4A-5. Note that for Eastern Germany no oligopolies in the newspaper reader market were observed.

Table 4A-9: Estimation Results for Loose Inserts

	Small West Editions	Large West Editions	Small East Editions	Large East Editions
Cases	303	301	86	85
	Specification L-I			
Circulation	.006	-.001	.030***	.019**
	(.010)	(.007)	(.009)	(.008)
Income	.184***	.226***	-.046	-.126
	(.052)	(.048)	(.057)	(.086)
Duopoly	-.010	-.006	-.010	-.006
	(.011)	(.010)	(.008)	(.011)
Oligopoly	.020	-.065***	-	-
	(.017)	(.020)		
Constant	2.72***	2.37***	4.58***	5.43***
F-value	4.1***	7.8***	4.9***	2.6*
	Specification L-II			
Circulation	.005	-.001	.022**	.020***
	(.010)	(.007)	(.009)	(.008)
2nd income quarter	.027*	.039***	.005	.011
	(.014)	(.013)	(.009)	(.010)
3rd income quarter	.044***	.052***	.021**	.004
	(.014)	(.013)	(.009)	(.010)
4th income quarter	.052***	.056***	-.006	-.017
	(.014)	(.013)	(.009)	(.011)
Duopoly	-.009	-.001	-.010	-.005
	(.011)	(.009)	(.007)	(.010)
Oligopoly	.019	-.055***	-	-
	(.017)	(.019)		
Constant	4.49***	4.52***	4.20***	4.23***
F-value	3.2***	5.5***	4.9***	2.7**
	Specification L-III			
Circulation	.006	-.003	.029***	.021**
	(.010)	(.007)	(.008)	(.008)
Income	.191***	.244***	-.042	-.146
	(.052)	(.048)	(.053)	(.089)
Joint operations	-.024	-.030**	-.271***	.010
monopoly	(.016)	(.014)	(.011)	(.014)
Duopoly	-.020	-.014	-.011	-.005
	(.013)	(.010)	(.007)	(.011)
Oligopoly	.010	-.073	-	-
	(.019)	(.020)		
Constant	2.66***	2.22***	4.55***	5.61***
F-value	3.8***	7.4***	156.9***	2.1*

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continuation of table 4A·9

	Small Western Editions	Large Western Editions	Small Eastern Editions	Large Eastern Editions
	Specification L-IV			
Circulation	.000	-.001	.030***	.019**
	(.010)	(.007)	(.009)	(.008)
Income	.182***	.240***	-.051	-.140
	(.052)	(.049)	(.057)	(.088)
+90% market share	.017	.024***	.011	.000
	(.012)	(.009)	(.007)	(.009)
Constant	2.78***	2.21***	4.62***	5.58***
F-value	4.3***	9.0***	5.0***	2.4*
	Specification L-V			
Circulation	.002	-.002	.030***	.018**
	(.010)	(.007)	(.009)	(.008)
Income	.179***	.238***	-.037	-.119
	(.052)	(.050)	(.058)	(.088)
HHI	.007	.029**	.018	.009
	(.014)	(.013)	(.012)	(.018)
Constant	2.81***	2.26***	4.50***	5.38***
F-value	4.0***	8.2***	4.9***	2.4*
	Specification L-VI			
Circulation	-.001	-.001	.030***	.022***
	(.010)	(.007)	(.009)	(.008)
Income	.177***	.233***	-.048	-.183**
	(.052)	(.049)	(.057)	(.093)
Spread to competitor	.006	.021*	.007	-.034**
	(.010)	(.012)	(.008)	(.017)
Constant	2.84***	2.28***	4.59***	5.99***
F-value	3.9***	7.6***	4.6***	4.0***

Independent Variables	Description
2nd income quarter	Dummy variable indicating whether the circulation area of an edition belongs to the second income quarter in the group
3rd income quarter	Dummy variable indicating whether the circulation area of an edition belongs to the third income quarter in the group
4th income quarter	Dummy variable indicating whether the circulation area of an edition belongs to the forth income quarter in the group
	The description of all other independent variables as well as of all dependent variables complies with the information in table 4A·5.

Note that for Eastern Germany no oligopolies in the newspaper reader market were observed.

Chapter 5

Concluding Remarks

My thesis addressed three aspects of the financing of media firms when demand dependencies between the audience, i.e. the viewers, readers or listeners, and the advertisers exist. In chapter 2, I analyzed economic distortions caused by public funding of broadcasting in Europe. Particularly, I examined the welfare implications of a duopoly scenario, in which a public service broadcaster receives both advertising income and license fees and competes with a purely commercially financed station. Chapter 3 explored the enormous downturn that regional quality newspapers in Germany experienced in the advertising markets. I demonstrated that the two-sided demand dependencies between the reader and the advertising markets have basically the power to annihilate the business of regional quality newspapers. In chapter 4, I applied a new methodology to investigate the question to what extent local newspaper firms that hold a monopoly position in their reader market are capable of charging customers in the associated local advertising markets inflated prices. This question is of special interest for Germany, because the federal government proposed a change of the competition guidelines in the newspaper industry to facilitate mergers and acquisitions.

Despite of several methodological shortcomings of the static models I developed and applied, the suggestions in my analyses shed light on some of the numerous problems related to the financing of media firms and the pricing of their products. Particularly, I showed that the attitudes of viewers or readers with respect to advertising in the mass media play an important role:

- In my analysis in chapter 2, I assumed that viewers regard advertising interruptions as annoyance. Thus, they gained utility from the reduction of the levels of advertising in the stations' programming brought forth by the license fee transfers. In addition, by setting a lower advertising level than its commercial rival the public service broadcaster was able to offer a more attractive programming.

- In the third chapter, I showed that the newspaper firm suffered considerable losses in all markets it served from the fact that the demand for advertising that readers like declined. This decline reduced the utility that readers gain from subscriptions.
- The analysis in chapter 4 was driven by the question of whether the demand dependence between the reader market and the advertising markets is sufficiently strong such that the newspaper firm controls a monopolistic bottleneck, namely the access of advertisers to its readership.

As can be seen from these applications, demand dependencies determine considerably the optimal decisions of the firms and the utility (or disutility) consumers and advertisers derive from interacting on the media platforms.

From my point of view, it would be a valuable task to make further efforts to synthesize a common theory of the economics of mass media. First attempts in this direction have been made by Armstrong (2005a) and by Anderson and Gabszewicz (2005). But a lot of work still has to be done. Such a theory would have to encompass a large number of features, most importantly the following four:

1. The audience or the readership, respectively, and the advertisers are interrelated by two-sided demand dependencies.
2. Welfare related to the production and consumption of mass media comprises benefits of the audience or the readership, the advertisers and the media firms.
3. The competitive environment is subject to change due to new demand and supply substitutes.
4. Policy interventions are a common feature in the markets.

However, the analysis of media markets is complicated by the rapid technological progress related to the production, transmission and consumption of mass media that alters the market environment at an increasing pace. In television broadcasting, for example, the digitization of the content as well as of the transmission and consumption techniques could empower viewers in the near future to avoid the exposure to advertising completely. By using Personal Video Recorders (PVR) consumers can record programs just-in-time and skip through advertising or other interruptions they do not like. On the other hand, the digitization allows for an expansion of the number of channels and reduces significantly the setup costs of new stations. Moreover, new business models like pay-per-view or video-on-demand become more and more viable. Such developments will certainly foster the role of subscription-based television and direct user charges in the years to come.

Also concerning other types of mass media the digitization is likely to strengthen the position of consumers. For example, pop-up and advertising blockers are typical features of Internet security software. By this means consumers can suppress advertising on websites and consume exclusively the informational - or probably more important - the entertaining content. Overall, the role of advertising in the financing of mass media will certainly level off in the future. Mass media will be compelled to reduce their dependence on advertising income and to rely more on direct consumer charges or on alternative commercial income, for example, from merchandising or home shopping. In such a world, mass media are probably less prone to potential market imperfections and will perhaps deliver content that is more in line with consumer preferences than it used to be. Moreover, governments have to reconsider the aptness of market interventions, in particular, the role of public funding of broadcasting.

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- *Copy Right Questions* (mit F. Horche, V. Kaludjerovic und M. Leu). In: M. Huber, A. Franz und S. Vogel (Hrsg.): *Trend Report. Implications of Digitizing, Miniaturization and Convergence in Media and Entertainment*, München 2001

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- 5th Workshop of the Center for Information and Network Economics (CINE), München 2005
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Stipendien

- Deutsche Forschungsgemeinschaft (DFG)
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- Förderverein Kurt Fordan