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Competitive aspects of the Norwegian Broadcasting Corporation's (NRK) radio services

Advertising and diversity in a two-sided radio market

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Abstract

There has been an ongoing debate in Norway on how the state-owned, commercial-free broadcaster, NRK, influences commercial agents in different media markets. Up to this point, little research has been done on NRK's impact on the radio market. This thesis examines the competitive effects of NRK's radio services when focusing on listener welfare.

Through a content analysis, a double-coverage analysis and a survey revealing diversion ratios, we establish that NRK competes hard with commercial broadcasters in the hit-radio segment, although less fierce with P5 Hits and Kiss than what was expected from the general media coverage. We develop a theoretical model to consider the effects on advertising and diversity, and thereby listener welfare, in a market with the commercial-free broadcaster, NRK, present. We find that NRK's presence would lower the advertising level, and that the commercial stations would differentiate to soften the competition. We further find from the empirical analyses, slight tendencies that NRK may work as a block, forcing the commercial stations to some extent to differentiate in order to be able to air advertising. The content analysis finds that there is a significantly lower level of advertising in the hit-radio market compared to the somewhat comparable market comprising P4 and Radio Norge. We explain this by the presence of NRK in the hit-radio market and that advertising quantities are strategic complements.

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1. Introduction

1.1 Motivation and Purpose

In June 2015, the Minister of Culture of Norway presented a parliamentary white paper (Meld. St. 38 (2014-2015)) concerning public broadcasting in Norway. The purpose of this white paper was to assess the competitive aspects of the presence of the public-owned, license-fee financed broadcaster, the Norwegian Broadcasting Corporation (NRK), in different media markets, on the diversity in said markets. In a continuation of this work, we wish to take a closer look at the radio market in our thesis, and to what extent NRK is contributing to increased listener welfare in the Norwegian radio market.

Advertising level and diversity influence the welfare of the listeners to the radio. In order to assess the effects on listener welfare, we thus need to say something about the advertising level and the diversity in the radio market. In order to do so, we first need to consider the competitive closeness of the radio stations, and secondly, the strategic responses of the commercial radio broadcasters with NRK present in the market. The former we do through a content analysis to detect product similarities, regarding nationwide listener numbers and through a survey to reveal the second choice of radio listeners. The latter is done by both examining a theoretical model and deploying content data. Furthermore, we make use of the survey to quantify the perceived cost of advertising to the listener. Advertising works as an indirect price for the listener. If this cost is high, this will put restrictions on the amount of advertising the commercial broadcasters can air, in order to not lose listeners. This represent the two-sidedness of the radio market.

In the Norwegian radio market, NRK and the commercial radio broadcasters are seemingly competing hard in the market segment for people of average age below 35, which has a high concentration of hit music and less of the traditional content programming. This has been highly debated and criticized by the commercial broadcasters, who argue that NRK – which is free of commercials – makes it harder for the commercial radio broadcasters to collect income from the advertisers.

NRK is a nationwide, public-owned broadcaster which every year recieves 5.2 billion NOK through the license fee (Medienorge, 2016). NRK holds a strong and important position in the media sector in Norway, and has a mandate, given by the politicians, to secure the diversity in

the media markets. In a media market that rapidly changes due to new technology, it is important to define what NRK should look like, and in which markets they should operate to fullfill their social mandate.

There has been done little research in the economic literature on the relationship between advertising and positioning in the radio market, when listeners are averse to advertising. Within this field of economics, we wish to contribute with both a theoretical analysis and empirical analyses.

1.2 Research Question

This master thesis will discuss whether NRK is present in a "commercial" radio market segment, and if so, whether NRK's presence contributes to more or less listener welfare.

The thesis will try to answer the following question:

What are the competitive effects of NRK's radio services when examining listener welfare?

1.3 Outline

The master's thesis is organized as follows. In section 2, we present the fundamentals about the Norwegian radio market. In section 3, we present the economic theories that are relevant for the analysis of the radio market. In section 4, we construct a basic, theoretical model based on the theories presented in the previous section. In section 5, we present the data material and the method, which is to be used in the empirical analyses that are executed in section 6. In section 7, we return to the competition analysis. Finally, in section 8, we sum up and conclude.

2. About the Norwegian Radio Market

In this section, we will introduce the reader briefly to several aspects of the Norwegian radio market. This includes how many that listens to the radio, which stations there are, which niches they cover, and who owns them. We will also touch into some industry-specific aspects, like public service broadcasting requirements, restrictions on advertising, changes in transmission technology and the fact that radio broadcasters serve both listeners and advertisers. We will also discuss the role of the Norwegian cultural policy and the NRK placard, and its impact on the competitive conditions in the radio market.

2.1 Listener habits

According to TNS Gallup's annual report for radio listening in Norway for 2015 (TNS Gallup, 2016), an average of 69 % of the Norwegian population listened to the radio daily in 2015, and they listened on average 89 minutes each day. In the group of age 12-29, the radio listening was stable compared to the previous year, while people in the age of 30-44 listened to more radio in 2015 than in 2014. Nevertheless, this increase was not enough to compensate for the fall in listening among those older than 44, such that Norwegians in total listened to the radio one minute less daily in 2015 compared to 2014.

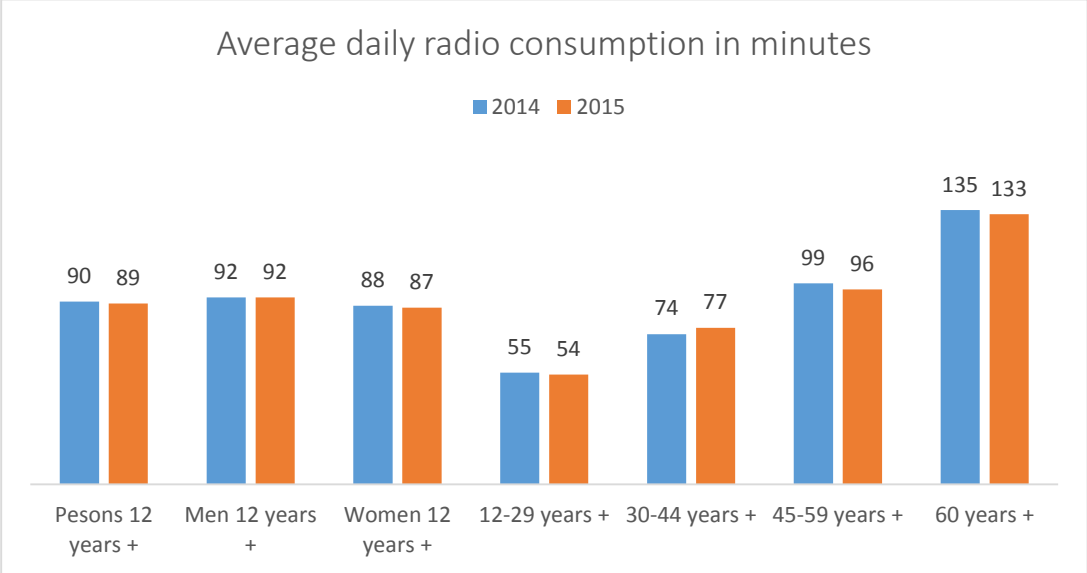

Figure 1: Minutes listened daily, divided by sex and age groups. Source: TNS Gallup's PPM panel (TNS Gallup, 2016).

What is perhaps more interesting, is that young people's radio listening is stable or even increasing, despite the rapid emergence of streaming services of music the latest years. This suggests that the radio medium continue to play an important role in the total media consumption.

As Figure 2 shows, peak hour for radio listening is between 8 a.m. and 5 p.m. Furthermore, the figure shows that 47 % of the radio listening happens outside one's home, for instance at work or in the car.

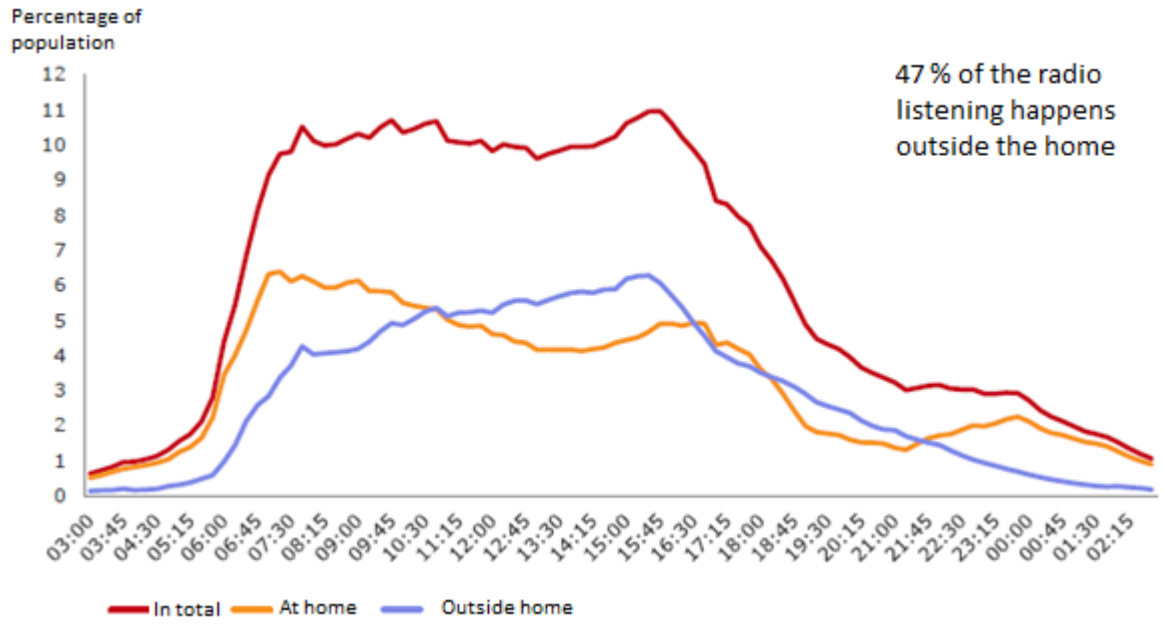

Figure 2: Radio listening throughout the day. Source: TNS Gallup's PPM panel (TNS Gallup, 2016).

2.2 Market Structure

2.2.1 **Agents**

The Norwegian radio market consists of three major, public service radio broadcasters: The state-owned, license-fee financed and commercial-free station Norwegian Broadcasting Corporation (NRK), and the international commercial radio broadcasters Modern Times Group (MTG) and Bauer Media. Each of these major broadcasters have several radio stations in their portfolio. Table 1 provides an overview of the different nationwide radio stations in the Norwegian radio market in 2016.

Table 1: Norwegian Radio Stations 2016. Sources: Norkring, The Norwegian Media Authority, NRK, Medienorge.

Norwegian Radio Stations 2016					
Channels	**Owner**	**Financing**	**Penetration**	**Distribution**	**Year established**
NRK P1	**State**	Licence	100/99	Analogue/DAB	**1933**
NRK P2	State	Licence	99/99	Analogue/DAB	1984
NRK P3	State	Licence	96/99	Analogue/DAB	1993
NRK Klassisk	State	Licence	91	DAB	1995
NRK Alltid Nyheter	State	Licence	99	DAB/analogue	1997
NRK Sápmi	State	Licence	99	DAB+/analogue	1999
NRK mP3	State	Licence	99	DAB+/analogue	2000
NRK Super	State	Licence	99	DAB+	2007
NRK Sport	State	Licence	91	DAB+	2007
NRK Jazz	State	Licence	91	DAB+	2008
NRK P1+	State	Licence	99	DAB	2013
NRK P13	State	Licence	91	DAB+	2014
P4	MTG	Commercials	80/91	Analogue/DAB	1993
P5	MTG	Commercials	91	DAB+	2010
P6 Rock	MTG	Commercials	91	DAB+	2014
P7 Klem	MTG	Commercials	91	DAB+	2011
P8 Pop	MTG	Commercials	91	DAB+	2015
NRJ	NRJ/MTG	Commercials	91	DAB+	2010
Radio Norge	Bauer Media	Commercials	92/91	Analogue/DAB	2004
Kiss	Bauer Media	Commercials	91	DAB+	2012
Radio Rock	Bauer Media	Commercials	91	DAB	2013
Radio Norge Soft	Bauer Media	Commercials	91	DAB+	2015

In 2015, Bauer Media bought Discovery's radio stations in Norway. In January 2016, Bauer relaunched Radio 1 under the name Kiss at the DAB network (Fossbakken, 2015). Kiss is an international brand within Bauer's activity in other countries, among those the U.K.

As we can see from the table above, primarily NRK, but rapidly followed by MTG and Bauer, the broadcasters offer several niche stations. NRK has a station for the kids (Super), for the teenagers (mP3), for young adults (P3 and P13), and for the elderly (P1+); for the sports idiot (Sport) and the Sami people (Sápmi); for the culture conscious (P2), for those who is in for jazz (Jazz) or classical music (Klassisk); for the news junkie (Alltid Nyheter) and even the weather enthusiast (Vær). MTG and Bauer offer own stations for rock music (P6 and Radio Rock), soft music (P7 and Radio Norge Soft), hit music (P5, NRJ and Kiss), pop music (P8) and retro (P9). Moreover, another two new stations, Kisstory and KissFresh, are expected to be launched by Bauer Media within 2016.

2.2.2 Size

We have summarized the market shares in the nationwide radio market in the weeks 2-19 in 2016, based on the weekly, official radio listening numbers provided by TNS Gallup, in Table 2.

Table 2: Market shares 2016. Weeks 2-19, 2016. Source: TNS Gallup's PPM panel.

Station	AVERAGE
Total Radio	**100 %**
NRK TOTAL	**67,8 %**
NRK P1	45,6 %
NRK P2	4,6 %
NRK P3	7,7 %
NRK mP3	3,1 %
NRK Other	6,8 %
Commercial radio TOTAL	**32,2 %**
MTG TOTAL	**22,3 %**
P4	17,8 %
P5	1,6 %
NRJ+	2,2 %
P4 Other	0,7 %
Bauer TOTAL	**9,9 %**
Radio Norge	8,1 %
Kiss (Radio 1)	0,8 %
Radio Rock	0,5 %
Radio Norge Soft	0,5 %

All of NRK's radio stations have in total about 68 % market share, while the commercial radio stations in total sum up to about 32 %, where MTG is more than twice the size of Bauer.

2.2.3 Positioning

Figure 3 shows a mapping of the positioning in the Norwegian radio market in 2015. On the x-axis, we have average age, and on the y-axis, we find the women share. The numbers are weighted for the consumption of radio, meaning that a 20-year-old man listening to a certain station for two hours will have a larger impact on the average age than a 60-year-old man listening to the same station for ten minutes.

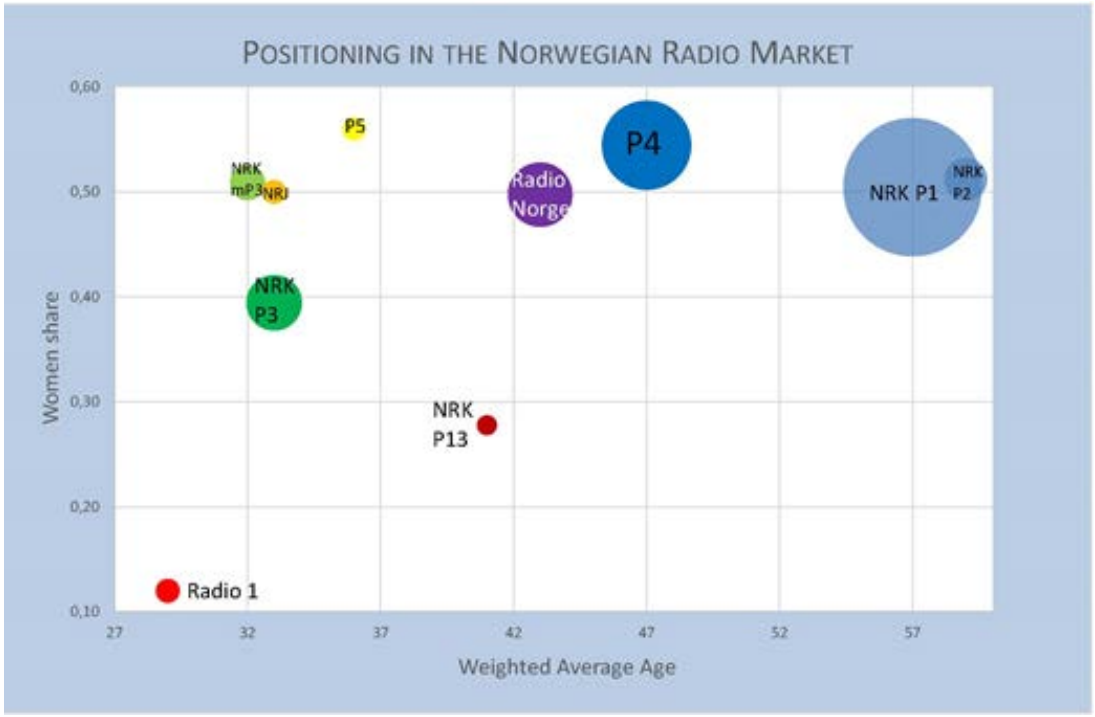

Figure 3: Positioning in the Norwegian radio market in 2015. Source: TNS Gallup's PPM panel.

Recall that Bauer Media rebranded Radio 1 to Kiss from January 2016.

From Figure 3, we identify that the Norwegian radio market is roughly divided into three market segments with respect to average age. NRK "monopolizes" the market segment of age above 50, the biggest commercial radio stations compete hard in the market segment of age around 40-50, while the commercial stations P5 Hits, NRJ and Kiss seemingly are in fierce competition with the publicly owned stations NRK P3 and NRK mP3 in the market segment with an average age below 35. Note also that P5 Hits and NRJ have the same owners.

Gabrielsen et al. (2015) provide a similar plotting to that in Figure 3 – based on similar PPM data – for the year 2014. That plotting suggests that Bauer's radio stations have a higher share of female listeners, than its competitors do. In our figure – again from the same source – this picture is reversed, with all of MTG's and most of NRK's radio stations having a higher share of female listeners than those of Bauer. However, the PPM numbers have some degree of uncertainty, perhaps especially when we decompose on sex and age of small radio stations as Radio 1, NRJ, P5 Hits and NRK mP3.

It might as well be natural to categorize the different radio stations along other dimensions than what has been done above. For instance could it be natural to categorize the market by

different genres of music such as hit music, pop, rock, soft music, classical or jazz, to mention some. Alternatively, it might be natural to categorize by the type of content programming, for instance loose chat, quizzes or serious news programming.

Nevertheless, the nice property of categorizing after age is that age is a relatively precise measure of the suggested categories. Young people typically listen to hit music and little news programming (Ipsos MediaCT, 2010). Middle-aged listeners tend to prefer pop music, quizzes and more news, while classical music and debates might be more popular among the elderly. At the same time, the other dimension included in the figure above, women share, may capture the soft music segment. This way, the above representation includes other aspects than just average age and share of women.

2.3 The Role of Norwegian Cultural Policy

The radio market is, as other media markets, not as any regular market due to the impact of governmental policy and interventions. The government wishes to regulate the media markets in order to ensure diversity of opinion and culture. The Ministry of Culture describes the purpose of this regulation in the following way:

> *"The object of the Norwegian media policy is to ensure an open and diverse exchange of news, information and opinions from all parts of society" (Government.no).*

The Norwegian government has, in the large, two instruments to regulate the media markets:

- NRK and general public service broadcasting
- Support schemes

Support schemes are not relevant in the radio market, but rather in other media markets, such as television and newspapers. In the radio market, NRK and the public-service broadcasting thus play an important role as the main policy instrument in the government's regulations.

The Broadcasting Act regulates public service broadcasting and hence the Norwegian cultural policy. Through licensing the access to the radio market, the government has the possibility to impose requirements on the content of the broadcasters. Among other things, NRK, P4 and Radio Norge, as public service broadcasters, are required to produce news at a certain level

and to play a certain amount of Norwegian-produced music, and there are restrictions on advertising, as described in section 2.4.1.

The Norwegian parliament, Stortinget, adopted in 2007 the NRK placard as a part of NRK's corporate statutes, defining the social mandate of NRK's activities. These are objectives for the NRK activity as a whole, and it is therefore not crucial that each objective is met for each of NRK's services. Nevertheless, NRK should strive for obtaining these objectives for each of their activities.

2.4 Market Conditions

2.4.1 Public service broadcasting reqiurements

The public broadcasters in Norway are subject to specific requirements with respect to, among other things, the Norwegian culture industry and public speech. Such requirements are in the literature known as public service broadcasting (PSB) requirements, and are imposed by the government (Norwegian Media Authority, 2014). Examples of such PSB requirements might be requirements on the amount of Norwegian-produced music, news programming, and news or cultural programming targeted at the indigenous Sami population. On television, programming towards deaf people is another example.

Armstrong and Weed (2007) discuss the justifications of PSB requirements in more detail, and point at PSB requirements being imposed due to two kinds of market failure, where the consumers or individual either do not choose what is best for themselves or what is best for the society as a whole. Former chairman of the BBC, Gavyn Davies, once gave the following definition of public service broadcasting:

> *"Inform, educate and entertain in a way which the private sector, left unregulated, would not do" (Armstrong & Weed, 2007).*

An example of the individuals not choosing what is best for they is children watching violent movies that may harm them, and thus violent movies should not be transmitted until after bedtime (Armstrong & Weed, 2007). An example of the individuals not choosing what is best for the society as a whole, is that the public service broadcasters, NRK, P4 and Radio Norge,

are obliged to play a minimum of 35 % of Norwegian-produced music.[1] Playing more Norwegian music may have a positive externality for the Norwegian culture industry and for the preservation of the Norwegian language.

Figure 4 below shows the development of Norwegian music on the radio in the period of 2004 to 2014, with the black, horizontal line representing the minimum share of Norwegian music allowed. In 2009, NRK P1 played Norwegian music 50 % of the time, while P4 played 34 %. In 2012, the picture was reversed; P4's share of Norwegian music (44 %) exceeded that of NRK P1 (42 %).

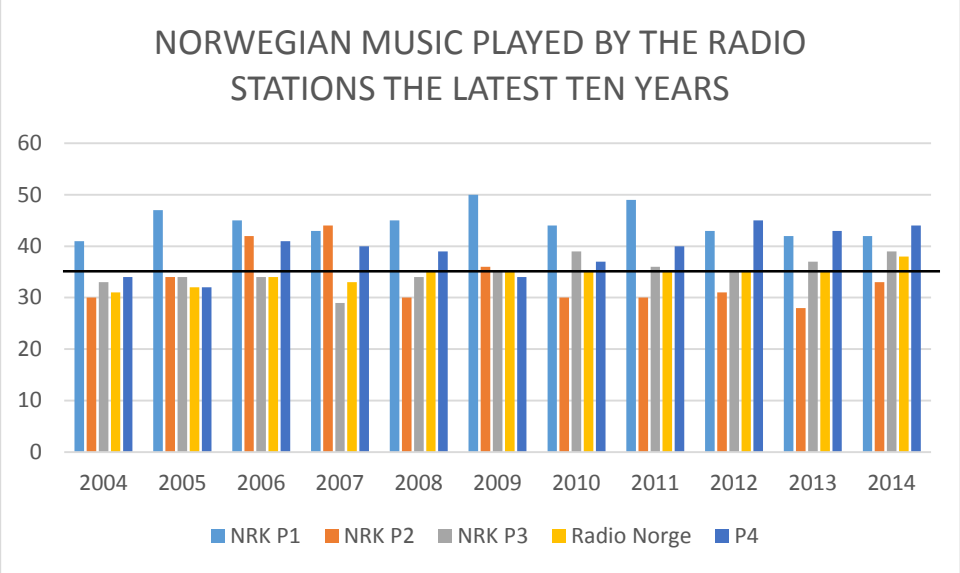

Figure 4: Norwegian music on the radio (Norwegian Media Authority, 2015).

From the figure above, it may seem that the Norwegian-music requirement is binding for Radio Norge, while it is to a less extent binding for NRK and P4. In addition, 73 % of the Norwegian music on Radio Norge is aired by night, and the corresponding number for P4 is 70 % (Norwegian Media Authority, 2014).[2]

[1] As to NRK, the PSB requirements counts overall for the stations P1, P2 and P3. That is, there are no PSB requirements at NRK mP3.

[2] The Norwegian Media Authority has not controlled for the share of Norwegian music aired by night at NRK (Gramart, 2014).

2.4.2 Restrictions on advertising

Another PSB requirement is the restrictions on advertising on the radio. Article 3-1 in the Broadcasting Act of 1992 restricts the advertising level to maximum 15 % of an hour on average, day and night. The corresponding article in the Broadcasting Regulation further restricts the advertising level to no more than 20 % each clock hour, that is, no more than 12 minutes an hour.

In December 2015, the Ministry of Culture proposed, in a consultation document, to remove the day-and-night rule, and thus permit advertising up to 20 %, or 12 minutes, an hour every hour a day (Ministry of Culture, 2015).

The consultation document further states:

> *"The commercial radio stations seem to be pushing to the limit" (Ministry of Culture, 2015, p. 5).*

This means that the radio broadcasters cannot raise the amount of advertising, and hence increase the indirect price to the listener. However, as our content analysis in section 6.1 will show, this is not necessarily the case for the whole radio market. We will return to this matter in sections 6.1 and 7.2.1.

2.4.3 Transmission technology

Radio broadcasting in Norway has traditionally been transmitted through the FM band. In Norway, there are five nationwide licenses, held by NRK P1, NRK P2, NRK P3, Radio Norge and P4 (Norwegian Communications Authority, 2014). The later years, listening to the radio on the Internet and podcasts (radio programming without music) has been more common (NRK Analyse, 2016).

The FM band is space consuming, and limits the number of nationwide radio stations to five. Therefore, digitisation of the radio transmission technology is afoot. Within 2017, the FM band will be partially shut down, leaving the nationwide radio stations to transmit through the Digital Audio Broadcasting (DAB) network and other digital networks (Norwegian Communications Authority, 2013). The DAB network have been built and financed in collaboration between NRK, MTG and Bauer, now covering from 91 to 99 percent of the Norwegian population (Government.no, 2015).

Former Minister of Culture, Thorhild Widvey, describes the advantages of the DAB network this way:

> *"Whereas the FM system only had space for five national channels, DAB already offers 22, and there is capacity for almost 20 more" (Government.no, 2015).*

As discussed in section 2.2.1 above, the explosion of new, niche radio stations that have emerged the later years, is due to the development of the DAB technology and network. Only in 2015, four new nationwide radio stations were established; so far in 2016, we have had three more from Bauer, and yet more stations are concretely expected.

Nevertheless, the closing of the FM band has been subject to heavy discussions in the public debates. Norway is the first and only country in the world that leaves the FM band, and especially small, local radio broadcasters suffer from the extra investments in the new transmission technology required (Medier24, 2015b).

2.5 Radio as an advertiser market

A strong press obtaining large shares of the total ad sales has defined the Nordic advertising markets. Television and especially radio advertising have been comparatively limited. The traditional patterns are seemingly falling apart due to the significant impact of digital media technologies in recent years. Newspaper advertising is dropping, whereas internet advertising is growing rapidly. While advertising revenues have been shrinking in the traditional newspaper market, radio-advertising revenues are growing at a stable pace (Ohlsson, 2015).

Table 3: Advertising revenues in million Euros in the Nordic countries (Ohlsson, 2015).

	Sales, million euros			Per capita, euros			Market share, %		
	2007	2012	%	2007	2012	%	2007	2012	+/-
Denmark	38	37	-3	7	7	-5	1.6	1.9	+0.3
Finland	47	55	+17	9	10	+14	2.8	3.5	+0.7
Norway	68	81	+19	14	16	+12	2.7	3.1	+0.4
Sweden	76	77	+1	8	8	-3	2.2	2.1	-0.1
Total	229	250	+9	9	10	+5	2.3	2.6	+0.3

We can observe that Norway has the largest radio-advertising sector of all the Nordic countries – even before adjusting for relative population size. MTG's radio operations have delivered solid financial results the last 15 years (Medienorge, 2016). Oppositely, Radio Norge has up

to 2015 ran a negative business for several years and lost a total of 700 million NOKs (Dagens Næringsliv, 2016), see Figure 5. Bauer-owned Radio Norge has been through a number of cost-cutting actions leading to their first positive result in 2015.

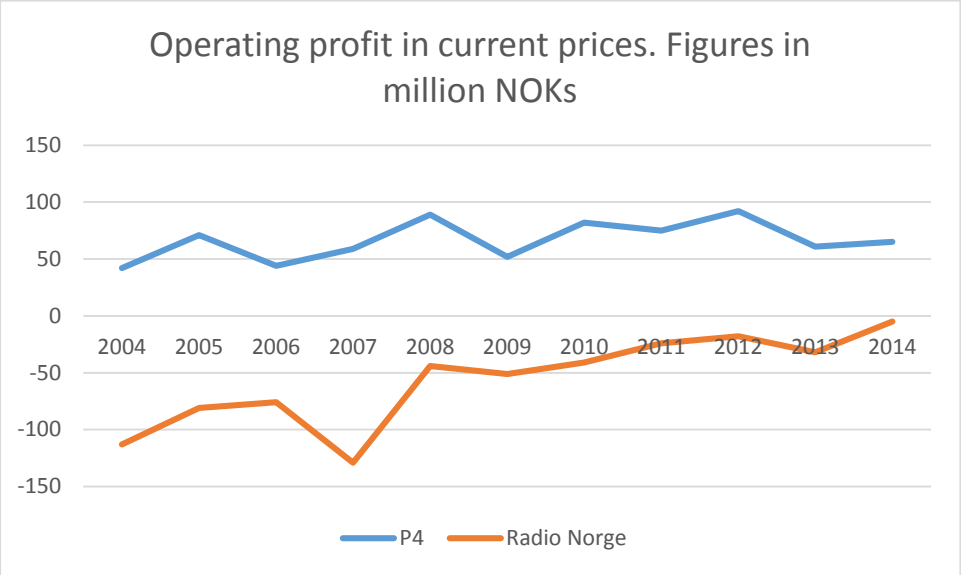

Figure 5: Operating profits. Source: Medienorge

2.6 Radio Broadcasting as a Two-Sided Market

The radio broadcasters offer their product to two distinct costumer groups: listeners and advertisers. The listeners and the advertisers influence each other; more precisely, we say that their demands are interrelated. More listeners attracts more advertisers, while, as listeners tend to dislike advertising, more advertising typically reduces the number of listeners. That is, there are two effects on the radio broadcaster's revenue or profit function, and we thus say that the radio market is a two-sided market.

In section 3.3, we will go more in depth on the theory on two-sided markets. Here, we only establish the fact that radio market is such a two-sided market.

2.7 Reactions on NRK's role in the radio market

Based on the positioning plot (Figure 3) in section 2.2.3, there seems natural with the naked eye to divide the radio market into three different segments. P1 and P2 target a relatively older crowd without competing closely with any commercial players. In the middle segment there seems to be competition between Radio Norge and P4. In addition, we have NRK's new station

P13 aiming to offer an alternative for those feeling too old for P3 and too young for P1. The commercial broadcasters have accepted P13 as a radio channel targeting a certain niche without stealing commercial listeners (Dagbladet, 2015).

The dispute between the commercial and public-owned broadcasters has been about NRK's presence in the segment targeting young adults and youth listeners. Former program director of P4, Trygve Rønningen, expressed his view in a consultation regarding the new NRK placard in 2014:

> *"NRK has launched the radio station mP3 in direct competition with the commercial radio agents. This is principally, and truly, a problem for the development of the total radio market" (Rønningen, 2014).*

The commercial broadcasters argue that NRK misinterprets the NRK placard when they are establishing radio stations in tight competition with commercial stations. Rønningen says that such intervention may lead to weaker commercial agents and overall to a poorer total product for the listener. Thor Gjermund Eriksen, Director-General of NRK, argues that a public-owned broadcaster has to be present in broad and popular markets in order to stay relevant and reach out with their more narrow content (Medier24, 2015a).

The SNF report on NRK from the spring 2015, does not analyze the Norwegian radio market in depth. However, the report points out that, although it might be rational for NRK to spread out their offer, it is not obvious that NRK should offer two stations in the same market segment, as it is expected to give little extra value in terms of diversity (Gabrielsen, et al., 2015, p. 84).

2.8 The way forward

We want to clarify that in the following chapters, we will study the effect of NRK's presence in the radio segment targeting young adults and teenagers. As mentioned above, it seems that this segment has the closest interaction between commercial and public-owned broadcasters. The commercial broadcasters themselves are especially concerned about the situation in the hit-radio market seemingly comprising the three commercial stations P5 Hits, NRJ, Kiss and the public-owned alternative NRK mP3. Based on observable characteristics such as music profile and listener group such a market definition sounds reasonable. Nevertheless, in the analysis, we are most concerned about how the listeners perceive the different channels.

3. Theory

In this section, we go through the relevant theory required to be able to analyze the radio market. First, we need to find the relevant market, and so section 3.1 provides the approach to and the framework for defining the market. In section 3.2, we introduce the concept of product differentiation. Section 3.2.1 provides a model for spatial competition, following Hotelling (1929), and is followed by a discussion of maximal or minimal differentiation of products, in section 3.2.2. In section 3.3, we look at two-sided markets, and how such markets distinguish themselves from regular, one-sided markets. Finally, in section 3.4, we take a closer look at previous studies on relevant media markets.

3.1 The Relevant Market

Defining the relevant market is one of the most important analytical tools in order to evaluate and study the competitive constraints that a firm faces and the impact of its behaviour on competition (OECD, 2012). Several qualitative and quantitative methods could be applied to define the relevant market. The goal is identical for all the methods: to examine which products or firms that could be defined as close substitutes. Nevertheless, it is not sufficient to define whether two products could serve as substitutes, but rather if the consumers perceive the products as sufficiently close substitutes. The purpose with the market definition is to gain knowledge about how intense two or more firms compete with each other and in what degree the existence of one firm puts restrictions on another firms' price and quality decisions. If there is such that a company faces competition from several firms, we will assume that this firm will have limited opportunities to employ market power towards its consumer.

3.1.1 Two dimensions

Defining the relevant market relates to the question about which products or which geographical areas that belong to the same market (Sørgard, 2010). In addition, we have to consider substitution on the demand and supply side when examining which firms that put competitive restrictions on each other.

The relevant *product market* is understood as the market comprising all the products or services, which are regarded as interchangeable or substitutable by the consumers, due to the products' characteristics, their prices and their intended use (DAF/COMP, 2012).

The relevant *geographic area* is defined as "comprising the area which the undertakings concerned are involved in the supply and demand of products or services, in which the conditions of competition are sufficiently homogeneous and which can be distinguished from neighbouring areas because the conditions of competition are appreciably different in those areas" (DAF/COMP, 2012). A traditional approach has been to study trade flows. If only a few consumers decide to shop from an area that is different from where they live, this would be a good indication that the local area is a separate geographic area.

Supply-side substitution is only relevant to consider when an agent is able to alter its production to the relevant product in a short-term perspective. Important factors to consider when estimating the ability of suppliers to switch production are the technical feasibility, regulatory and other barriers. An example of potential supply-side substitution in the radio market could be if MTG were able to offer a new channel targeting elderly, within a reasonable time. The purpose of the assessment of demand-side substitutability is to identify the products or services that are alternatives in satisfying the needs normally served by the product in question in the eye of the relevant customers. When it comes to demand-side substitution, it is only changes in a short-term perspective which is of interest.

The European Commission (1997) warns against putting too much weight on observable product attributes when defining the relevant market. In many cases, it is difficult to say whether the consumers agree on the delamination between the products' attributes and their application (Hjelmeng & Sørgard, 2014). Hence, considering the closeness between two products based on observable characteristics is insufficient.

3.1.2 Market shares

The market shares of a firm serve as an indication of market power. The market shares are often used as a starting point for the competition analysis on a merger's effect on the competition. In cases with high market shares, we will expect a greater risk for competition damage. Nevertheless, in markets with differentiated products, market shares measures will over- or underestimate the market power of firms and the expected competition effects (Hjelmeng & Sørgard, 2014). In most situations, the intensity of competition and substitution between products is a more important measure of market power than market shares.

3.1.3 Diversion ratios

Diversion ratios is a useful tool for measuring which products or firms that are perceived as close substitutes by the consumers (Shapiro, 1996). The diversion ratio is an index that tells us where the customers go if a firm increases its prices or decides to shut down. Formally, we can write the diversion ratio from product A to product B as:

$$D = -\frac{\partial q_b / \partial p_a}{\partial q_a / \partial \mathrm{p}_a}$$

The diversion ratio from product A to B gives us the fraction of the customers who are leaving product A that would switch to product B given a price increase for product A. If this ratio is significant, we would expect that product B serves as a close competitor for product A, and they operate in the same market.

The diversion ratio is a close cousin of the cross-elasticity of demand, but more convenient to obtain (Shapiro, 1996). When obtaining diversion ratios, it is normal to use surveys where consumers are asked about their first and second choice. The second choice tells us where the consumer will go if their preferred product suddenly were taken out of the market. Diversion ratios are both easier to obtain and to understand than cross-elasticity of demand. For this reason, diversion ratios have acquired a central position when evaluating horizontal mergers in recent years.

Diversion ratios could be used as a component in more formal tests such as SSNIP (Small but Significant and Non-transitory Increase in Price) and GUPPI (Gross Upward Pricing Pressure Index). These tests require price-cost-margin data and would try to examine whether it is profitable for a hypothetical monopolist to increase its prices. However, SSNIP and GUPPI are not recommended to use in two-sided markets, or should at least be handled very carefully. A SSNIP test based on one side of the platform alone will not capture the effects of the constraints on a price increase from the interdependence of demand on both side of the market (DAF/COMP, 2012).

The European Commission’s guidelines for defining the relevant market does not give any clear recipe for which documents that are most important:

> *"The Commission follows an open approach to empirical evidence, aimed at making an effective use of all available information, which may be relevant in individual cases. The commission does not follow a rigid hierarchy of different sources of information or types of evidence" (European Commission, 1997).*

Defining the relevant market is not a goal by itself. It is the first step to see whether a change in the competition situation would be damaging or not. In cases where all parties agree on what the relevant market is, the competition authorities rarely use a lot of with this type of analysis (OECD, 2012).

3.2 Product Differentiation

Bertrand price competition, which assumes homogenous products, leads to the elimination of profits. In order to soften price competition, a firm may thus want to differentiate its products from those of its competitors. Economic theory has two concepts of product differentiation: horizontal and vertical product differentiation. Horizontal product differentiation refers to the preferences of the consumer, which very well may differ among consumers. For instance do some consumers like dark and retro-styled radio apparatus while others prefer them to be modern and colourful. On the other hand, vertical product differentiation is something upon which all consumers agree. The latter thus refers to quality. All consumers agree on a radio apparatus with a strong tuner is better than an apparatus that often struggle to find signals. However, the consumer's willingness-to-pay may differ, dependent on their income and wealth, which explains why not all consumers buy an apparatus with a strong tuner.

In the following, we will show how product differentiation can be treated formally in the spatial model of the linear city, introduced by Harold Hotelling (1929). Finally, we discuss the model's results of maximal or minimal differentiation.

3.2.1 Spatial Competition: The linear city (Hotelling)

Harold Hotelling (1929) introduced the economic literature to competition among firms located in a "linear city". To capture the fundamental idea of the model, one may think about two ice-cream vendors on a beach. Both vendors sell the same ice creams, but they may be located on different locations on the beach. *Ceteris paribus*, the consumer will choose the ice-cream vendor that is located closest to himself, because of the higher transportation cost that arises for the consumer buying from the vendor located the farthest away.

Formally, Hotelling's model regards two or more firms which are located on a line segment of length l, where the consumers are uniformly distributed with a density of θ. Often we normalize both l and θ to one. The firms offer the same good, although they may have some different characteristics. Also, the consumer incurs a cost of transportation for firms that are located differently from himself.

Let us normalize the beach's length to $l = 1$. Furthermore, we assume uniform distribution of the consumers, and we normalize the number of consumers, $\theta = 1$. Assume that the vendors sell the same brand of ice cream, and that the only thing that differs them, is their physical location on the beach. Assume further that the vendors initially are located at each endpoint of the Hotelling line, that is, firm 1 is located at $x = 0$ and firm 2 at $x = 1$. Figure 6 illustrates the model.

The indifferent consumer is the consumer that is indifferent between buying from either of the firms. Firm 1's demand (x) is all the consumers to the left of the indifferent consumer, and firm 2's demand ($1 - x$) are those to the right of the indifferent consumer.

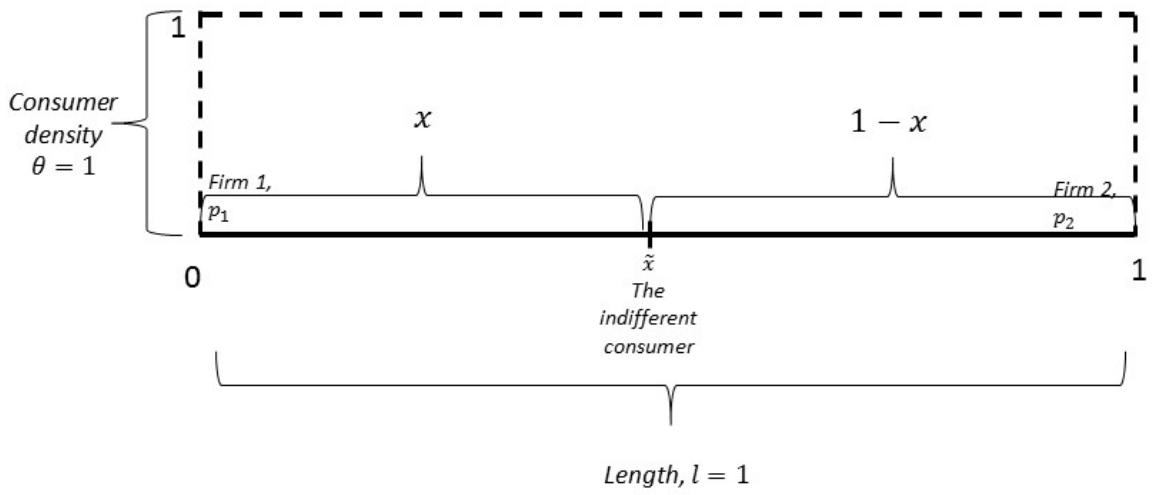

Figure 6: Hotelling's linear city

The indifferent consumer would under these assumptions be located in the middle point, at $x = ½$.

The social-optimum location, where the average distance from consumer to firm is minimized, would thus be at $x^{opt} = 1/4$ and $x^{opt} = 3/4$, which would be realized by a monopolist or a social planner. This is illustrated in Figure 7.

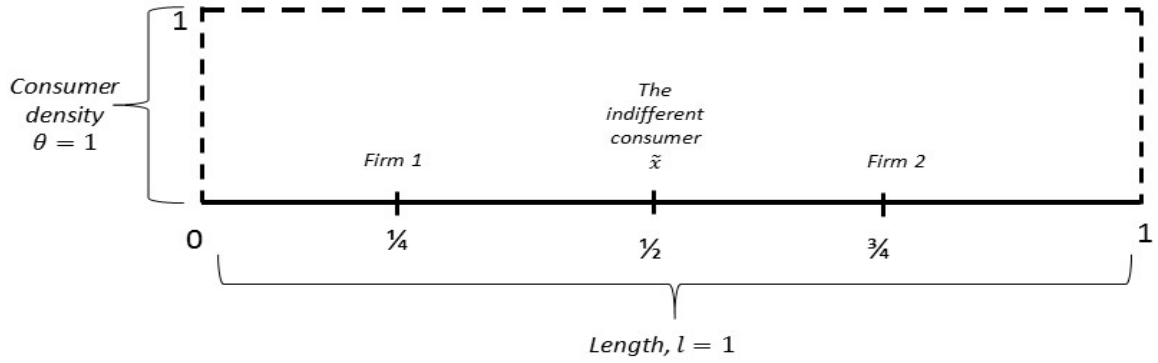

Figure 7: Social optimal location on the Hotelling line.

3.2.2 The principle of differentiation – maximal or minimal differentiation?

When a firm decides upon its location, it has to consider forces going in different directions. First, the firm would wish to be where the demand is. In the model presented above, we assumed uniform distribution of the demand. Therefore, the firms would go to the middle of the line in order to capture more demand. This is the *demand effect*.

Formally, Tirole (1988) categorizes these forces towards the middle, into three groups:

1. To be where the demand is.
2. Positive externalities between firms.
3. Absence of price competition.

If any of these effects are strong, the direct, demand effect dominates, and the firms will locate close up to their competitor.

However, if both firms locate next to each other, Bertrand price competition implies that the price goes to marginal costs, $p \to c$, such that profit goes to zero. Thus, from the linear-city model of Hotelling (1929) emerges the principle of differentiation: Firms want to differentiate in order to soften price competition (Tirole, 1988). This is due to the *strategic effect*. Hotelling

(1929) hence predicts maximal differentiation in markets with strong price competition, that is, where the strategic effect exceeds the demand effect, and thus minimal differentiation in markets absent of price competition.

3.3 Two-Sided Markets

Two-sided markets are markets in which the firms serve two distinct, but interrelated, costumer groups (OECD, 2009). Different types of media markets, for instance, newspapers, television, radio broadcasting or social media like Facebook or Google, are among the leading examples of two-sided markets.[3] These kinds of market platforms typically offer their products to; on the one hand, the traditional consumers like users of social media, readers of newspapers, viewers of television or listeners to the radio; and on the other hand, these firms also offer ad spots on their product platforms, serving advertisers as well.

The basic idea is that the two costumer groups' demands are interrelated. More users, readers, viewers or listeners attract more advertisers. At the same time, more advertising may or may not attract more users, readers, viewers or listeners. This depends on whether the consumers like or dislike advertising. The platform firms thus have to take into account two costumer groups when selling advertising. This change the dynamics of the pricing structure in such markets compared to the one in traditional, one-sided markets. What is optimal in one-sided markets may be highly inefficient in two-sided markets.

More formally, there are three criteria to be met in order to call a market two-sided (Kind & Sørgard, 2011):

1. A platform firm serves two distinct costumer groups on two sides of the market.
2. There are some network externalities between the two sides of the market, and they must be positive in at least one direction.
3. The platform internalizes the network externalities.

[3] See further discussions and definitions of two-sided markets in Kind and Sørgard (2011) and (2013), and Rochet and Tirole (2003).

The effects of a market being two-sided, is represented in Figure 8. The figure is collected from Kind and Sørgard (2011, p. 31), and regards a newspaper's profit functions.

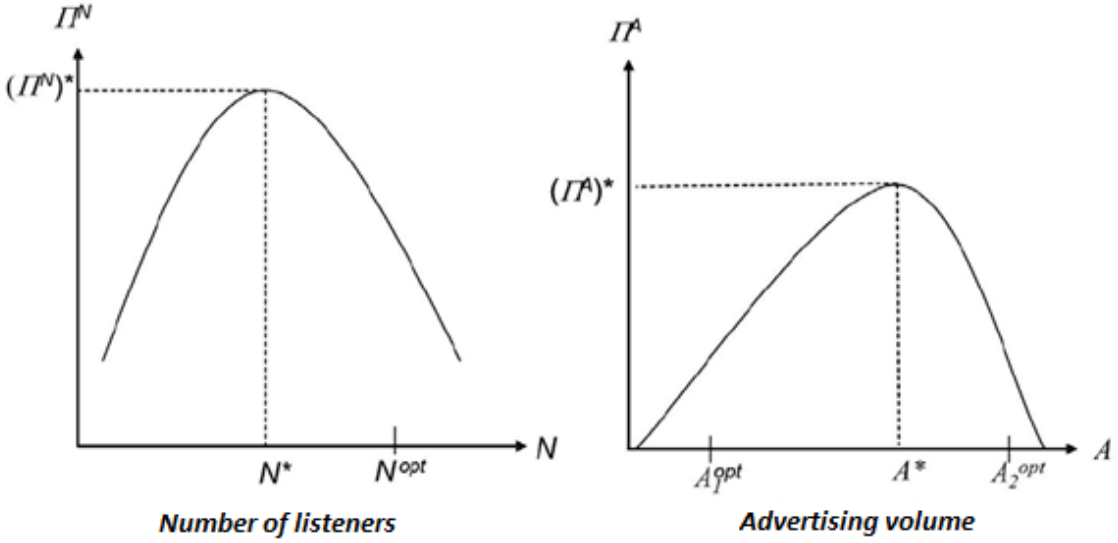

Figure 8: Optimality in two-sided markets (Kind & Sørgard, 2011).

Figure 8 represents the profit functions for each costumer group treated individually, that is, as if they were two independent, one-sided markets. One-sided optimality would yield N^* readers, and A^* advertisers. But, as the two costumer groups' demands are interrelated, the newspaper would wish to attract more readers, $N^{opt} > N^*$, and more or less advertisers depending on whether the readers like or dislike advertising. Here $A_1^{opt} < A^*$ is optimal advertising when listeners *dislike* advertising, and $A_2^{opt} > A^*$ is optimal advertising when listeners *like* advertising.

Let us in the following assume that the readers dislike advertising. More readers will attract more advertisers. In order to attract more readers, the platform firm (here: newspaper) would lower the price to this group. This will drive down prices – perhaps even lower than marginal costs, and this can happen even without presence of competition (Gabrielsen, et al., 2015).

The two-sidedness of the media market will furthermore assure a lower ad volume than what would be optimal if maximizing profit from the advertiser market in isolation. In order to maximize profits, the platform firm needs many readers to attract advertisers. However, as the readers dislike advertising, the media platform needs to reduce the amount of advertising in

order to attract more users, readers, viewers and listeners. This is what we call the *feedback effect*, which limits the radio station's possibility to sell advertisements.

Song (2015) has applied data from TV magazines in Germany to examine the effect of mergers on markups in a two-sided market. He uses a structural model of platform demand to estimate platform markups on both side of the market, and finds with his numerical simulations that equilibrium outcomes in this two-sided market are drastically different from those of one-sided models. The study finds that magazines typically do not make any profit from selling copies. More than eighty percent of the magazines set copy prices below marginal costs. On the other hand, the magazines set huge markups on the advertiser side, about 70 percent on average.

3.4 American Studies on Mergers in the Radio Market

Between 1996 and 2006, the U.S. radio broadcasting industry experienced a massive merger wave. The 1996 Telecommunication Act provided major changes in laws affecting the radio industry. There are several empirical studies that examine the relationship between market concentration and product variety based on data from this period. Berry & Waldfogel (2001) find evidence that the increased concentration reduced station entry without reducing variety. The article also provide some evidence that consolidation increases the amount of programming variety in total. Their argument is that free entry into differentiated product markets with decreasing average costs could lead to too many products and too few varieties, although the consolidation did not significantly increase the radio listenership according to Berry and Waldfogel.

Jeziorski (2014) utilizes data from the same period to study the relationship between market concentration and listener welfare with a structural utility model. He decomposes change in listener welfare into two components: change in variety and change in advertising exposure. Jeziorski finds that the mergers created extra variety. The total time of advertising went down (11%), but the average exposure of advertising increased. More advertising were put on popular stations – while the amount of ad slots were significantly reduced on less popular stations. The total effect of the merger wave was still an increase in listener welfare according to Jeziorski. This study also finds that the mergers lead to higher ad-slot prices and a significant loss in advertiser surplus.

Sweeting (2010) has a different approach when analysing the U.S merger wave. Instead of looking at the relationship between aggregate variety and aggregate ownership concentration, Sweeting is examining changes in positioning among stations in the same format following mergers. The main findings are that common owners seek to differentiate their stations in order to avoid cannibalization. This effect indicates increased variety. Sweeting finds also that common owners tend to reposition their stations close to competitors. Listeners are then redistributed from competitors to the merging parties. Because of these changes, mergers do not necessarily increase variety when competitors are present and they do not increase the total number of people listening to a format.

4. Spatial Competition in a Two-Sided Radio Market

In the following, we develop a theoretical model where we have spatial competition à la Hotelling in a two-sided radio market, in order to examine a hit-radio market comprising the three commercial stations, P5 Hits, NRJ and Kiss; and the license-fee financed, commercial-free station NRK mP3. In accordance with most previous studies on media markets, we use the Hotelling location model to represent the Norwegian radio market.[4] Hotelling is useful to examine changes in positioning and pricing. It seems natural to represent the listeners' preferences by absolute differences in programming characteristics or music profile. This is possible by using a line with two endpoints, as the case is in the Hotelling model. We have two versions of the model: the first a benchmark with four commercial radio stations, and the other where we swap one of the commercial stations with a non-commercial, license-fee financed one. This is because we wish to examine the isolated effect of having a commercial-free radio station in the market, without influencing the positioning through the introduction of an extra actor in the market. By the theoretical model, we thus wish to make some predictions of the competitive effects from having a commercial-free actor in the market. Further, our concern is how these affect listener welfare, through the impact on advertising level and diversity. In the following subsection, we demonstrate the basic model, and in section 4.2, we exercise the analysis of the model.

4.1 Basic Model

Suppose that four radio stations, which are differentiated with respect to their music profile, are localized on a Hotelling line with uniform distribution and of length one, with for instance acoustic music on the one corner, and electronic dance music on the other. The radio stations participate in a two-sided media market, and charge a price to both sides of the market, that is, both a price to the advertisers, and a price to the listeners. First, we assume that the radio stations charge the advertisers on a per-slot basis.[5] Next, we assume that listeners dislike

[4] See Anderson, Foros and Kind (2010, p. 4) for an overview of previous studies using Hotelling on media markets.

[5] We observe that the commercial radio stations in Norway actually charge the advertisers on a per-listener basis. We nonetheless choose to look at per-slot basis in order to get somewhat workable mathematical expressions. We find it reasonable to argue that the advertisers are sufficiently aware of the reach of the ads, such that the uncertainty of discrepancies is reduced to a minimum. The risk the advertisers are running by charging per slot is to reach more or less listeners. Over

advertising, such that the disutility of advertising works as an indirect price to the listeners. At the same time, the stations may have some public service broadcasting requirements, which we assume to be a disturbing element for the representative listener. To simplify, we also assume that there is one single listener in the market.

In the following subsections, we will treat each agent in the two-sided market for itself. We start with the listeners, deriving the listener demand for each radio station for each version of the model. We then continue with the advertisers, deriving the demand for advertising. Thirdly, we show the radio station's profit functions, and finally we show the timing of the model.

4.1.1 Listeners

Four commercial radio stations

Suppose first that we have four commercial radio stations. The stations are initially located in x_1, x_2, x_3 and x_4, where $x_1 < x_2 < x_3 < x_4$. We assume that the stations only compete directly with their next-door neighbors.

The listener's utility from listening to the commercial radio stations, is given by:

$$u_1 = v - \gamma q_1 - (x_1 - z)^2,$$

$$u_2 = v - \gamma q_2 - (x_2 - z)^2,$$

$$u_3 = v - \gamma q_3 - (x_3 - z)^2,$$

$$u_4 = v - \gamma q_4 - (x_4 - z)^2,$$

where $v > 0$ is gross willingness-to-pay, q_i is the amount of advertising at the commercial radio station i for $i = 1,2,3,4$, and $\gamma > 0$ is a parameter that measures the aversion to advertising. If $\gamma = 0$, the listener is neutral to advertising. Only if v exceeds the sum of the indirect price and transportation costs does the listener listen to the radio station. We further assume that the listener listens to only one radio station (single-homer).

time, it is reason to believe that these deviations will cancel out, and thus we can assume that whether the stations charge on a per-listener or a per-slot basis, will not affect the advertiser demand in a noteworthy way.

Furthermore, similar to Brenner (2005), we interpret z as the listener's localization, and thus $(x_i - z)^2$ is the transportation cost[6] or disutility for the listener from being located away from the station, that is, the scope of horizontal product differentiation.

When deriving the listener demands, we need to identify the indifferent listeners between each pair of competing stations:

The indifferent listener between stations 1 and 2, $z_{1,2}$, is then located where $u_1 = u_2$, at

$$z_{1,2} = \frac{x_1 + x_2}{2} + \frac{\gamma(q_2 - q_1)}{2(x_2 - x_1)},$$

the indifferent listener between stations 2 and 3, $z_{2,3}$, is located where $u_2 = u_3$, at

$$z_{2,3} = \frac{x_2 + x_3}{2} + \frac{\gamma(q_3 - q_2)}{2(x_3 - x_2)},$$

and the indifferent listener between stations 3 and 4, $z_{3,4}$, is located where $u_3 = u_4$, at

$$z_{3,4} = \frac{x_3 + x_4}{2} + \frac{\gamma(q_4 - q_3)}{2(x_4 - x_3)}.$$

This gives us the set of listener demands:

$$n_1 = z_{1,2} = \frac{x_1 + x_2}{2} + \frac{\gamma(q_2 - q_1)}{2(x_2 - x_1)},$$

$$n_2 = z_{2,3} - z_{1,2} = \frac{x_3 - x_1}{2} + \frac{\gamma(q_3 - q_2)}{2(x_3 - x_2)} - \frac{\gamma(q_2 - q_1)}{2(x_2 - x_1)},$$

$$n_3 = z_{3,4} - z_{2,3} = \frac{x_4 - x_2}{2} + \frac{\gamma(q_4 - q_3)}{2(x_4 - x_3)} - \frac{\gamma(q_3 - q_2)}{2(x_3 - x_2)}, \text{and}$$

$$n_4 = 1 - z_{3,4} = 1 - \frac{x_3 + x_4}{2} - \frac{\gamma(q_4 - q_3)}{2(x_4 - x_3)}. \qquad (1)$$

[6] We make use of quadratic transportation costs to provide existence of equilibrium with endogenous localization (Peitz & Valletti, 2008).

We see that the demand for the commercial stations falls, as own ad volume, q_i, increases. Oppositely, the demand increases when the rival's ad volume increases. This seems plausible as we assume – and follows directly from – that listeners dislike advertising.

Note as well that as radio provision is free of charge for the listeners, the demand functions do not contain any direct price, but instead we measure the disutility of advertising through the aversion to advertising.

Figure 9 illustrates the listener demands on the Hotelling line.

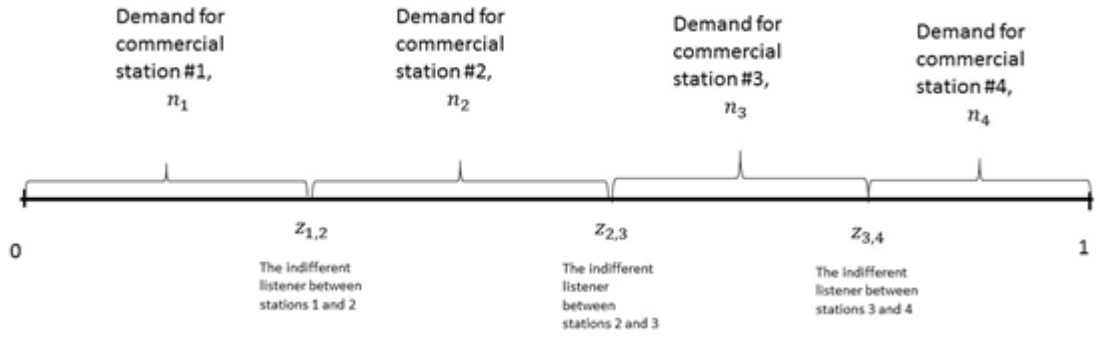

Figure 9: Listener demands for four commercial radio stations.

One non-commercial station and three commercial radio stations

Suppose a parallel model to the one above, only that in this case we swap the second commercial station with a license-fee financed station, which is free of advertising. We label this station with subscript *L* (for *license-fee*) instead of 2. We then still have four radio stations, one financed through a public license fee, and the three commercial radio stations, purely financed by advertisements, as before. We thus need not make any further assumptions on the localizations from the introduction of the commercial-free station. The public, license-fee financed radio station is initially located in x_L, and the commercial radio stations are initially located in x_1, x_3 and x_4, where $x_1 < x_L < x_3 < x_4$.

The listener's utility from listening to the public, license-fee financed radio stations, is given by:

$$u_L = v - \mu k_L - (x_L - z)^2,$$

while the listeners' utility from listening to the commercial radio stations, remains as before.

In the listener's utility function there is a component k_L which signifies the amount of PSB programming on the license-fee financed station. $k_L \geq 0$ is exogenously given, and represent public service broadcasting (PSB) requirements with respect to Norwegian or Sami culture industry or public speech, as discussed in section 2.4.1. We assume these requirements to have a positive value for the society or country as a whole through contributing to the rise of the Norwegian or Sami culture industry and public speech, but may be a disturbing element for the representative listener in the hit-radio market, represented through the parameter $\mu > 0$. This is known as the "citizen rationale" in the literature.[7] Note however that by this reasoning, the representative listener does not explicitly dislike for instance news, but rather prefers listening to music over listening to news, and hence news will be perceived as a disturbing element.

More explicitly, what we mean by PSB requirements in our model, and that we find more plausible, is that NRK mP3 is imposed requirements in terms of the share of Norwegian music or news, similar to the requirements that NRK P3 have today. Again, note that NRK mP3, like P5 Hits, NRJ and Kiss, have no explicit PSB requirements today. Playing Norwegian music creates a positive externality on the society that the platforms themselves do not take into account.[8] We find it reasonable to say that there is less utility gain for the listener from an increased share of Norwegian music than from listening to other music; otherwise, the radio platforms would already have offered more of Norwegian music today. Children watching violent movies, as discussed in section 2.4.1, is another type of externality than what we here talk about. As opposed to violent movies, listening to more popular, foreign-language music will not be harmful for the listener. However, the society as a whole, including the Norwegian culture industry, would gain from such PSB requirements.

We further assume that PSB requirements of playing more Norwegian music will not affect the localization of the license-fee financed station, as the Norwegian music played will still be within the same genre of music.

[7] Armstrong & Weed (2007, p. 2) discussed the citizen rationale for PSB: that "television viewing may have effects on the wider population that are ignored by the individual viewer". We assume this to be the case for radio listening as well.

[8] Ferrari and Waldfogel (2010) provide evidence that sales of local music increased after introduction of similar PSB requirements with respect to share of national music, in Australia, Canada, France and New Zealand.

We assume initial localization $x_1 < x_L < x_3 < x_4$, and we assume that the stations only compete directly with their closest neighbors.

Deriving the listener demands yields the following expressions:

$$n_1 = \frac{x_1 + x_L}{2} + \frac{\mu k_L - \gamma q_1}{2(x_L - x_1)},$$

$$n_L = \frac{x_3 - x_1}{2} + \frac{\gamma q_3 - \mu k_L}{2(x_3 - x_L)} - \frac{\mu k_L - \gamma q_1}{2(x_L - x_1)},$$

$$n_3 = \frac{x_4 - x_L}{2} + \frac{\gamma(q_4 - q_3)}{2(x_4 - x_3)} - \frac{\gamma q_3 - \mu k_L}{2(x_3 - x_L)},$$

$$n_4 = 1 - \frac{x_3 + x_4}{2} - \frac{\gamma(q_4 - q_3)}{2(x_4 - x_3)}. \qquad (2)$$

We again see that the demand for the commercial stations falls, and oppositely that the demand for the license-fee financed radio station increases, as own ad volume, q_i, increases. Now, the same also applies for the aversion to advertising, γ, meaning that the demand for the commercial stations falls as γ increases. Again, this is in line with our assumption that listeners dislike advertising. What is new in this model is that we also see that the demand for the commercial stations increases, while the demand for the license-fee financed station falls, as the disutility of playing Norwegian music or news, μ, increase. We thus have that $\frac{\partial n_i}{\partial \gamma} < 0$ and $\frac{\partial n_i}{\partial \mu} > 0$ for $\forall\, i \neq L$, and that $\frac{\partial n_L}{\partial \gamma} > 0$ and $\frac{\partial n_L}{\partial \mu} < 0$. Figure 10 illustrates the listener demands on the Hotelling line.

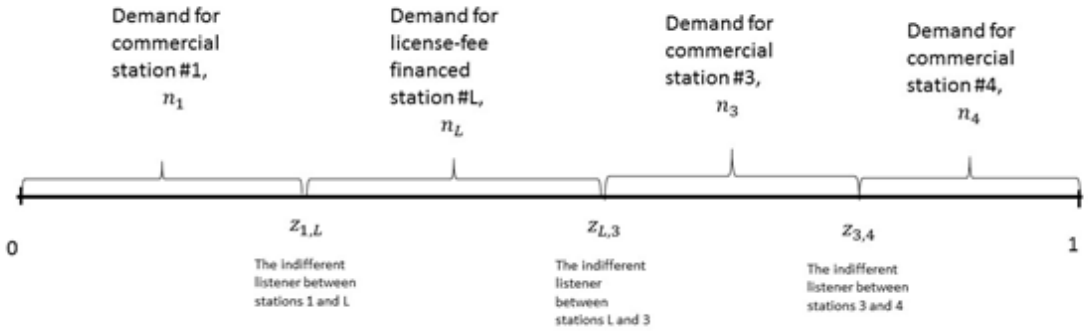

Figure 10: Listener demands with tree commercial stations and one non-commercial.

4.1.2 Advertisers

Advertiser j's profit from advertising at radio station i is given by:

$$\pi_i^j = (\beta n_i - p_i)q_i \tag{3}$$

where $\beta > 0$ is a measure of the willingness-to-pay for an additional listener, and may be different for each advertiser j. Multiplied with the number of listeners, we have the willingness-to-pay for an advertisement. The advertiser pays p_i for each ad slot. We further assume that the advertiser incurs no cost from designing the ad slots. Thus, the parenthesis represent the profit per ad slot on station i.

The advertisers may advertise at all the stations, and advertise if and only if their profits from advertising on a station is positive, i.e. $\pi_i^j \geq 0$. Thus, the total profit of the advertiser is the sum of profit per ad slot, on all radio platforms:

$$\pi^j = \sum_{i=1}^{4} \pi_i = \sum_{i=1}^{4} (\beta n_i - p_i)q_i, \quad \forall\, i = 1,2,3,4. \tag{4}$$

By assuming that the willingness-to-pay for an additional listener is equal across all platforms, and is constant with the number of listeners, we can normalize the number of advertisers to unity without loss of generality.[9] Optimal advertiser behavior is to demand the profit-maximizing number of ad slot at each platform i, where $\frac{\partial \pi_i}{\partial q_i} = 0$. This gives us the inverse advertiser demands for ad slots.

4.1.3 Radio stations

The commercial stations collects all of its revenue from the advertisers at price p_i, which depends on the demands for both advertising and listening. We assume that the radio stations incur no marginal costs in broadcasting ads. Hence, the profit function of the commercial radio station i is simply the advertising revenue:

$$\Pi_i = p_i q_i, \qquad \forall\, i = 1,2,3,4. \tag{5}$$

[9] The advertiser with the highest willingness-to-pay for the first ad slot will also have the highest willingness-to-pay for the following ad slots, and hence we can normalize the number of advertisers to one.

The license-fee financed station, on the other side, collects all of its income through public transfers of the license-fee. As this station does not have any advertising, q_L is exogenously given to be equal to zero, the license-fee financed station's profit-maximizing problem is thus not of any interest to us.

4.1.4 Preliminary sum-up

We have now been through the three groups of agents in the media market, with the radio stations as a platform serving the two costumer groups: the listeners and the advertisers. We have also regarded two different models: one with four commercial radio stations, and the other where we swap one of these with a non-commercial station. The advertisers benefit from more listeners, but at the same time, the listeners dislike advertising. As to the non-commercial station, the listeners also dislike PSB requirements. Figure 11 illustrates the dynamics of our theoretical model.

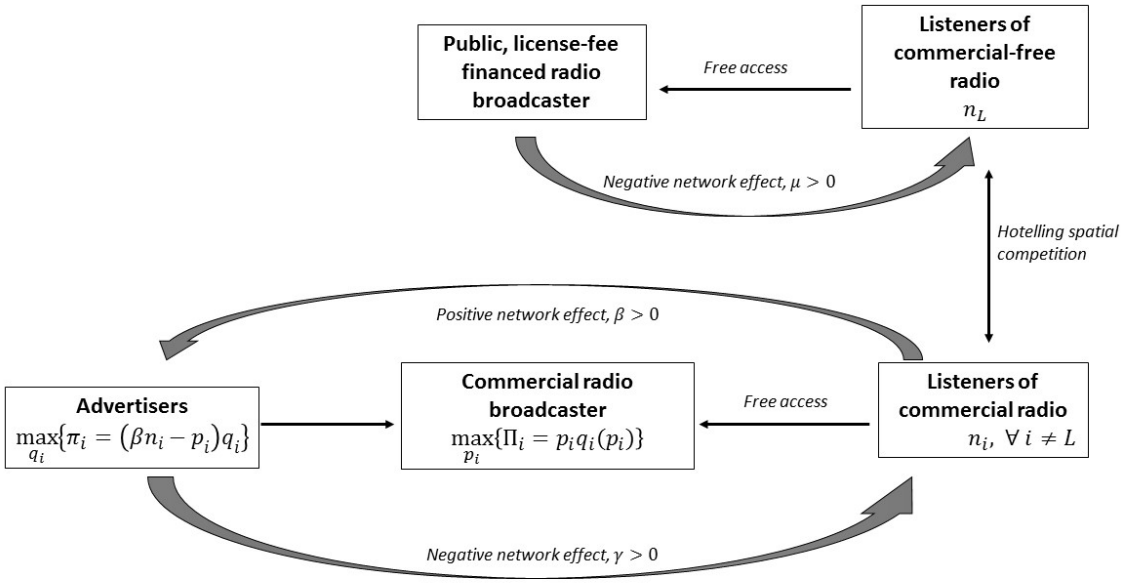

Figure 11: Illustration of theoretical model.[10]

[10] The figure is similar to that of Dietl, Lang and Lin (2013). They considered two different business models: Subscription fee (pay platform) and per ad (free platform).

Before we start on the theoretical analysis, we will sketch how this model ideally should have been solved through a two-stage game.

Two-stage game

Consider a game taking place in two stages, where the radio stations first choose their localization in stage 1, and later sell advertisements and compete for listeners in stage 2. In such a two-stage game, the broadcasters credibly commit to their localization in stage 1 – before selling advertisements and hence indirectly also setting their prices towards the listener group, in the second stage. If the firms could not do so, they would regret *ex post*, having incentives to move closer to their rival. This would in the end lead to the Bertrand paradox, where prices go to marginal costs, profits go to zero, and we would experience minimal product differentiation, as we saw in section 3.2.2.

Hence, we have a two-stage game:

> *Stage 1: The radio stations simultaneously choose localization, i.e. music profile.*
>
> *Stage 2: The commercial radio stations simultaneously sell advertisements and compete for listeners.*

Unfortunately, it has come to our attention that no one has previously been able to solve mathematically such a two-stage game, where we allow the firms to localize endogenously and later sell advertisements, under the assumption that the listeners are averse to advertising. We too have failed in our attempt of solving this problem mathematically. We now turn to our theoretical analysis, where we assume exogenous localizations.

4.2 Theoretical Analysis

In the theoretical analysis, we will regard the two cases, the first with four commercial stations and the latter with three commercial stations and one non-commercial station, separately.

We assume that the radio stations are symmetric, and that the localizations are exogenously given for $x_1 = \frac{1}{8}, x_2 = x_L = \frac{3}{8}, x_3 = \frac{5}{8}, x_4 = \frac{7}{8}$. This way, we lose the dynamic aspect of the model, but the expressions are more manageable, and we will be able to say something sensible about the total advertising in the two cases. These localizations represent the social optimum because the listeners' total transportation cost is minimized. Any deviation from today's

positioning would thus be negative for listener welfare. However, in markets where the radio stations seek towards a preference centre, typically commercial radio markets, then spreading from the middle would be positive for listener welfare. We will therefore handle all reallocations away from the middle as positive from a diversity perspective.

In the basic model above, we already derived listener demand, given by equations (1) and (2). However, advertiser demand remains to be derived. Hence, in the following two subsections, we derive the advertiser demand, and solve for equilibrium ad prices and ad quantities. Finally, we compare the outcomes in the two cases, determining what happens to listener welfare.

4.2.1 Four commercial stations

Suppose there are four commercial radio stations in the market. The advertiser's profit from advertising at radio platform i is given by equation (3). We assume that the advertisers wish to buy the amount of advertisements that maximizes their profit from advertising at each platform. When the advertisers simultaneously maximizes profits with respect to ad quantity, $\max_{q_i}\{\pi_i = (\beta n_i - p_i)q_i\}$, the advertiser demands are characterized by the first-order conditions set equal to zero:[11]

$$\frac{\partial \pi_1}{\partial q_1} = \frac{1}{4}\beta + 2\gamma\beta q_2 - 4\gamma\beta q_1 - p_1 = 0,$$

$$\frac{\partial \pi_2}{\partial q_2} = \frac{1}{4}\beta + 2\gamma\beta q_3 - 8\gamma\beta q_2 + 2\gamma\beta q_1 - p_2 = 0,$$

$$\frac{\partial \pi_3}{\partial q_3} = \frac{1}{4}\beta + 2\gamma\beta q_4 - 8\gamma\beta q_3 + 2\gamma\beta q_2 - p_3 = 0, \text{and}$$

$$\frac{\partial \pi_4}{\partial q_4} = \frac{1}{4}\beta + 2\gamma\beta q_3 - 4\gamma\beta q_4 - p_4 = 0. \qquad (6)$$

For derivations, see Appendix A.1.

Before solving to find the advertiser demand, we take a closer look at the reaction functions:

[11] We can verify that the second-order conditions are satisfied, and that the first-order conditions constitute a maximum, as $\frac{\partial^2 \pi_1}{\partial q_1^2} = \frac{\partial^2 \pi_4}{\partial q_4^2} = -4\beta\gamma < 0$ and $\frac{\partial^2 \pi_2}{\partial q_2^2} = \frac{\partial^2 \pi_3}{\partial q_3^2} = -8\beta\gamma < 0$.

$$q_1^R(q_2) = \frac{1}{16\gamma} + \frac{1}{2}q_2 - \frac{1}{4\gamma\beta}p_1,\ q_2^R(q_1, q_3) = \frac{1}{32\gamma} + \frac{1}{4}q_3 + \frac{1}{4}q_1 - \frac{1}{8\gamma\beta}p_2,$$

$$q_3^R(q_2, q_4) = \frac{1}{32\gamma} + \frac{1}{4}q_2 + \frac{1}{4}q_4 - \frac{1}{8\gamma\beta}p_3 \text{ and } q_4^R(q_3) = \frac{1}{16\gamma} + \frac{1}{2}q_3 - \frac{1}{4\gamma\beta}p_4. \quad (7)$$

From the reaction functions, we can determine that the advertisers are *strategic complements* in ad quantities. This means that any increase in the ad quantity of the neighbour station(s), will be met by increasing own ad quantity. Oppositely, the neighbour station(s) will follow suit on a reduction in advertising.[12] We also see from the reaction function that an increase in the ad price will reduce the ad quantity. An increase in the aversion to advertising will *ceteris paribus*, also reduce advertising.

Advertiser demands

Then, solving the reaction functions simultaneously, we obtain *advertiser demands*:

$$q_1 = \frac{1}{90\beta\gamma}(9\beta - 26p_1 - 7p_2 - 2p_3 - p_4),$$

$$q_2 = \frac{1}{360\beta\gamma}(27\beta - 28p_1 - 56p_2 - 16p_3 - 8p_4),$$

$$q_3 = \frac{1}{360\beta\gamma}(27\beta - 8p_1 - 16p_2 - 56p_3 - 28p_4),$$

$$q_4 = \frac{1}{90\beta\gamma}(9\beta - p_1 - 2p_2 - 7p_3 - 26p_4). \quad (8)$$

As ad quantities are strategic complements, and a price increase will reduce ad quantity, we see that the demanded ad quantity from station i will drop for any price increase, but the harshest for own price increase, and to a lesser extent the farther away the competitor station is located. We see that the advertisers demand a higher ad quantity from the corner stations than from those in the centre on the Hotelling line. This relates to the concept of market power, where the corner stations have more market power towards listeners than the inside stations. The corner stations have a group of listeners with fewer substitution possibilities (the consumers that lie between 0 and $1/8$ or between $7/8$ and 1), and have therefore better

[12] For further discussions of the terms “strategic substitutes” and “strategic complements”, see Bulow, Geanakopolos and Klemperer (1985) or Tirole (1988, pp. 207-208).

opportunities to push the advertising level upwards than the inside stations. Hence, the advertising prices are lower at the corner stations and therefore more attractive for the advertisers.

Radio stations

Radio station i's profit is given by equation (5). Inserting for the advertiser-demand functions, the radio stations maximize their profits with respect to the ad prices they charge the advertisers. The radio stations simultaneously solve $\max_{p_i}\{\Pi_i = p_i q_i\}$, yielding the first-order conditions:[13]

$$\frac{\partial \Pi_1}{\partial p_1} = \frac{9\beta - 52p_1 - 7p_2 - 2p_3 - p_4}{90\beta\gamma} = 0,$$

$$\frac{\partial \Pi_2}{\partial p_2} = \frac{27\beta - 28p_1 - 112p_2 - 16p_3 - 8p_4}{360\beta\gamma} = 0,$$

$$\frac{\partial \Pi_3}{\partial p_3} = \frac{27\beta - 8p_1 - 16p_2 - 112p_3 - 28p_4}{360\beta\gamma} = 0, \text{and}$$

$$\frac{\partial \Pi_4}{\partial p_4} = \frac{9\beta - p_1 - 2p_2 - 7p_3 - 52p_4}{90\beta\gamma} = 0. \qquad (9)$$

The reaction functions:

$$p_1^R(p_2, p_3, p_4) = \frac{1}{52}(9\beta - 7p_2 - 2p_3 - p_4),$$

$$p_2^R(p_1, p_2, p_4) = \frac{1}{112}(27\beta - 28p_1 - 16p_3 - 8p_4),$$

$$p_3^R(p_1, p_2, p_4) = \frac{1}{112}(27\beta - 8p_1 - 16p_2 - 28p_4), \text{and}$$

$$p_4^R(p_1, p_2, p_3) = \frac{1}{52}(9\beta - p_1 - 2p_2 - 7p_3). \qquad (10)$$

[13] Again we can verify that the second-order conditions are satisfied, assuring a maximum:

$\frac{\partial^2 \Pi_1}{\partial p_1^2} = \frac{\partial^2 \Pi_4}{\partial p_4^2} = -\frac{52}{90\beta\gamma} < 0$ and $\frac{\partial^2 \Pi_2}{\partial p_2^2} = \frac{\partial^2 \Pi_3}{\partial p_3^2} = -\frac{112}{360\beta\gamma} < 0.$

The reaction functions are implying that the ad prices are *strategic substitutes.*[14] That is, if one station increases its price charged to the advertisers, the rival stations will respond by lowering their price. This arises from the fact that listeners dislike advertising. When one station increases its price, the advertisers will demand less advertising from that station. This will attract more listeners to that station, and hence less listeners on the rival stations. With less listeners, the advertiser demand will be reduced as well, and the rival stations will end up with reducing the ad price as a response to a price increase from the first station. Hence, ad prices as strategic substitutes.

Equilibrium for four commercial stations

Solving the reaction functions simultaneously, we find the equilibrium ad prices to be:

$$p_1 = p_4 = \frac{909}{6460}\beta, \text{and}$$

$$p_2 = p_3 = \frac{1107}{6460}\beta. \qquad (11)$$

Inserting into the advertiser-demand functions, we find the equilibrium advertising:

$$q_1 = q_4 = \frac{1313}{32300\gamma}, \text{and}$$

$$q_2 = q_3 = \frac{861}{32300\gamma}. \qquad (12)$$

This yields total ad quantity in the market with four commercial radio stations:

$$Q_{four} = \sum_{i=1}^{4} q_i = \frac{1087}{8075\gamma} \qquad (13)$$

4.2.2 One non-commercial and three commercial stations

Suppose now that there are only three commercial stations and one non-commercial station in the market. For the non-commercial, license-fee financed station, the ad quantity is

[14] This is in line with Kind, Nilssen and Sørgard (2009), who consider the television market, and find that ad prices are strategic substitutes and consumer prices are strategic complements. In the radio market, advertising works as a price to the consumer, and hence advertising is strategic complements.

exogenously given to be equal to zero, $q_L = 0$, such that their optimization problem is irrelevant for determining advertiser demand.

When the advertisers simultaneously maximizes profits for advertising at each commercial radio station, with respect to ad quantity, $\max_{q_i}\{\pi_i = (\beta n_i - p_i)q_i\}$, the advertiser demands are characterized by the first-order conditions set equal to zero:[15]

$$\frac{\partial \pi_1}{\partial q_1} = \frac{1}{4}\beta + 2\beta\mu k_L - 4\gamma\beta q_1 - p_1 = 0,$$

$$\frac{\partial \pi_3}{\partial q_3} = \frac{1}{4}\beta + 2\gamma\beta q_4 - 8\gamma\beta q_3 + 2\beta\mu k_L - p_3 = 0, \text{and}$$

$$\frac{\partial \pi_4}{\partial q_4} = \frac{1}{4}\beta + 2\gamma\beta q_3 - 4\gamma\beta q_4 - p_4 = 0. \qquad (14)$$

For derivations, see Appendix A.2. These correspond to the first-order conditions derived for the case with four commercial stations in equation (6), excluding station 2. The reaction functions will be equivalent as well to the ones in equation (7), and we can confirm that ad quantities and PSB requirements are *strategic complements*.

Advertiser demands

Solving the reaction functions simultaneously, we obtain *advertiser demands*:

$$q_1 = \frac{1}{16\beta\gamma}(\beta - 4p_1 + 8\mu k_L\beta),$$

$$q_3 = \frac{1}{56\beta\gamma}(3\beta - 8p_3 - 4p_4 + 16\mu k_L\beta), \text{and}$$

$$q_4 = \frac{1}{56\beta\gamma}(5\beta - 4p_3 - 16p_4 + 8\mu k_L\beta). \qquad (15)$$

Unlike in the case with four commercial stations, when one commercial station is swapped with a non-commercial, the advertiser demand of the neighbouring corner station to the non-

[15] The second-order conditions are satisfied, assuring a maximum, as $\frac{\partial^2 \pi_1}{\partial q_1^2} = \frac{\partial^2 \pi_4}{\partial q_4^2} = -4\beta\gamma < 0$ and $\frac{\partial^2 \pi_3}{\partial q_3^2} = -8\beta\gamma < 0$.

commercial is independent of the price the other stations charge the advertiser. As to stations 3 and 4, the aforementioned dynamics with respect to ad price's impact, remains the same.

Radio stations

The radio stations simultaneously solve $\max_{p_i}\{\Pi_i = p_i q_i\}$, yielding the first-order conditions:[16]

$$\frac{\partial \Pi_1}{\partial p_1} = \frac{\beta - 8p_1 + 8\mu k_L \beta}{16\beta\gamma} = 0, \frac{\partial \Pi_3}{\partial p_3} = \frac{16\beta\mu k_L + 3\beta - 16p_3 - 4p_4}{56\beta\gamma} = 0, \text{ and } \frac{\partial \Pi_4}{\partial p_4} = \frac{8\beta\mu k_L + 5\beta - 4p_3 - 32p_4}{56\beta\gamma} = 0. \quad (16)$$

As in the case with four commercial stations, the reaction functions imply that ad prices are *strategic substitutes*.

Equilibrium for one non-commerical station and three commercial stations

Solving the first-order conditions simultaneously, we find the equilibrium ad prices:

$$p_1 = \frac{1}{8}\beta + \mu k_L \beta,$$

$$p_3 = \frac{19}{124}\beta + \frac{30}{31}\mu k_L \beta, \text{and}$$

$$p_4 = \frac{17}{124}\beta + \frac{4}{31}\mu k_L \beta; \quad (17)$$

and equilibrium advertising

$$q_1 = \frac{1}{32}\frac{8\mu k_L + 1}{\gamma},$$

$$q_3 = \frac{1}{868}\frac{120\mu k_L + 19}{\gamma}, \text{and}$$

$$q_4 = \frac{1}{434}\frac{16\mu k_L + 17}{\gamma}. \quad (18)$$

[16] The second-order conditions are satisfied, assuring a maximum, as $\frac{\partial^2 \Pi_1}{\partial p_1^2} = -\frac{1}{2\beta\gamma} < 0$, $\frac{\partial^2 \Pi_3}{\partial p_3^2} = -\frac{2}{7\beta\gamma} < 0$, and $\frac{\partial^2 \Pi_4}{\partial p_4^2} = -\frac{4}{7\beta\gamma} < 0$.

Total advertising in the market with three commercial stations and one license-fee financed:

$$Q_{three\ plus\ one} = \sum_{i=1}^{4} q_i = \frac{2952\mu k_L + 641}{6944\gamma} \quad (19)$$

4.2.3 Comparison and Discussions

We compare in the following the two cases, with respect to the differences in listeners' utility. We are concerned with the differences in the disutility from total advertising in the market and PSB requirements.

Listener welfare

The listeners' utility functions for listening to each radio station, state that the listeners are averse to advertising on the commercial radio stations and PSB requirements on the license-fee financed station. When we wish to say something about the effects of a license-fee financed, non-commercial actor in the market, we need to compare the listeners' disutility or cost from listening to the market comprising four commercial stations with the market with three commercial stations and one non-commercial station. The difference in listeners' disutility for the two cases is given by:

$$\gamma Q_{Four} > \gamma Q_{Three\ plus\ one} + \mu k_L.$$

Here, the left-hand side refers to the disutility of advertising in the first case, and the right-hand side refers to the disutility of advertising with the three commercial stations, plus the disutility of the license-fee financed, commercial-free station playing for instance Norwegian music, more talk programming or news, in the second case. If the equation holds, the listeners are better off having a commercial-free station in the market.

Thus, for a sufficiently high $\mu k_L > \mu k_L{}^{crit}$ (disutility from PSB requirement), the market with four commercial stations and no commercial-free stations, is preferred to the listener.

We can show that absent of PSB requirements, i.e. if $k_L = 0$ as the case is with NRK mP3 today, the advertising in the market including the non-commercial station is 31.4 % lower than in the market with four commercial stations. We can further decompose this reduction in ad quantity into two effects; the first from having one station less with advertising, and the other because of the competitive responses from having a commercial-free station in the market. We find that the presence of a license-fee financed, commercial-free actor, reduces the advertising

level by 8.6 %, through putting a downward pressure on the ad level.[17] See *Appendix B* for computations. We emphasize that these calculations depend on assumptions we have done regarding the localization of the different agents and the fact that the commercial stations are not able to reposition when the commercial-free actor enters the market.

The presence of the commercial-free actor, thus, drives down the ad level. So far, we have only considered the *direct effect* of the presence of the commercial-free actor. However, there is also a *strategic effect*, through the responses of the commercial stations. As we have not been able to solve the first stage of the two-stage game sketched in section 4.1.4, our model does not capture this latter effect. However, the commercial-free station may work as a block, forcing the commercial stations to differentiate in order to soften the competition on advertising, and yet again increase the ad level. Thus, our estimate of the commercial-free actor reducing the ad level by 8.6 % is an overestimation; hence, the ad level would be reduced to a lesser extent in the presence of a commercial-free actor, than predicted, and the stations will differentiate. This might make the positive effect of the presence of a non-commercial station on listener welfare, higher or lower than what we predict with our theoretical model, depending on which effect is the stronger. Nevertheless, we will see a reduction in ad level, and as we assume that diversity is positive for listener welfare, the presence of a commercial-free station will be positive for listener welfare.

When we further look at the case where the commercial-free station is imposed PSB requirements, we see that the presence of PSB requirements will *per se* increase the listeners' disutility from listening to the market including the license-fee financed station, as we assume that listeners incur a cost from such requirements. In addition, any increase in the PSB requirements, will *a fortiori* increase the listeners' disutility from listening to the market including the license-fee financed station, as an increase in PSB requirements also increase ad quantity, as $\frac{\partial Q_{three\ plus\ one}}{\partial k_L} = \frac{2952\mu}{6944\gamma} > 0$. This increase in ad quantity follows from that the listeners now have poorer substitution possibilities to avoid advertising, and hence the feedback effect of increased advertising on the listener, is weakened. For $k_L > 0$, the listeners'

[17] Clearly, this result relies on our assumption of the license-fee financed station being an inside firm and not a corner firm. If the license-fee financed station instead were located on one of the corners, these effects would be smaller, meaning that the license-fee financed station has a lower downward-pressure on ad level as it would then compete directly with only one commercial station instead of two.

total cost from advertising and PSB requirements, will thus increase, making the relative cost differentials between the two markets, smaller.

Again, we have a strategic effect that is not captured in our model: When the cost of the license-fee financed station increases, the relative cost of advertising decreases. Then, the commercial stations might find it optimal to relocate closer to the license-fee financed station, holding advertising level fixed.

Thus, if the commercial-free station is imposed PSB requirements, the commercial stations have two possible ways of exerting the profits; either through raising advertising, holding localization fixed (*direct effect*), or by moving closer to the license-fee financed station, holding advertising level fixed (*strategic effect*). Figure 12 illustrates these two effects. This way, an increase in PSB requirements may increase advertising and/or reduce the diversity in the market. The total effect of PSB requirements is thus strictly negative for listener utility.

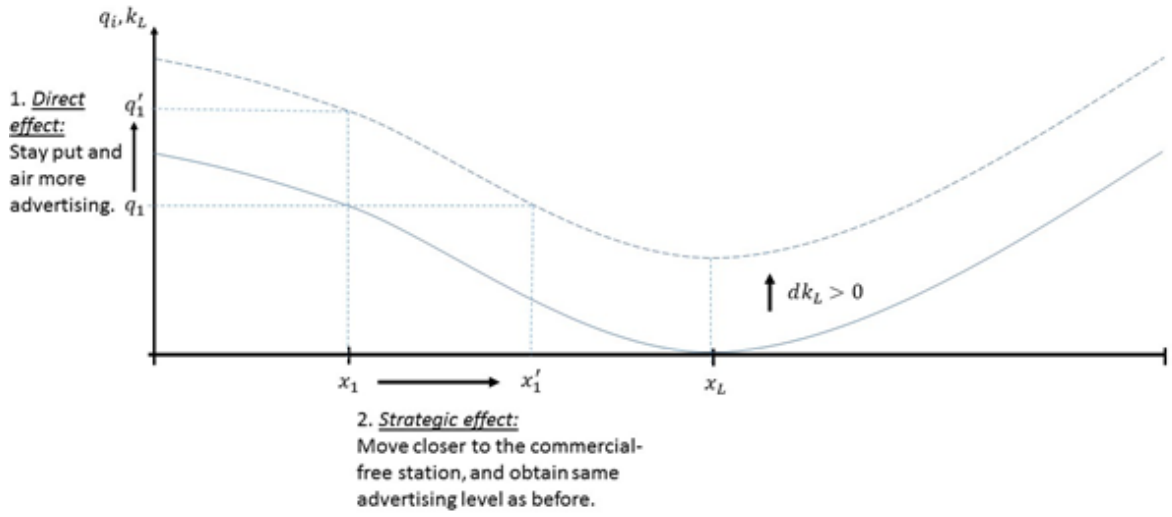

Figure 12: Two effects from an increase in PSB requirements.

5. Data and Methods

This section describes the data we use in our empirical analyses, and the methods used to obtain them. When defining the closeness between NRK and the commercial stations in section 7, we base the analysis on three different components. The starting point is a content analysis for examining whether there are clear content-related similarities between the channels. We will also study actual radio behavior by using a double-coverage table. Finally yet importantly, we have conducted a survey in order to obtain diversion ratios. Utilizing these data together will help us to define the closeness between the radio stations. The same type of data is highly relevant when we are going to study the listener-welfare effects of NRK's presence in the radio market.

5.1 Content analysis

In this section, we obtain information about the stations' music profile and their allocation between talk, music, news and advertising. In addition, the content analysis aims to find if there are any differences in number of premiere songs between the different stations and the rotation intensity among the most popular songs. The latter information will be of interest when discussing diversity aspects later on in the analysis.

We have obtained content data in two ways. Some of the data are registered manually by listening to radio over a certain period in February, March and April 2016. See *Appendix C* for a precise overview of observations. We have collected 55 observations on one hour each. We categorized radio content into nine different elements: Music, advertising, loose talk, current affairs, "in/out" artist talk, contests, news, jingles and self-promotion. In order to avoid systematic skewness in our results we have obtained observations that are uniformly distributed during the time of the day and between different weekdays. All the observations have been collected in the weekdays between 8 a.m. and 5 p.m. – which is defined as the primetime for the radio medium, see Figure 2. We do not have enough observations to state the exact allocation of content for each station, but our measurements give at least a general impression of relative differences between the radio channels.

The other part of the content analysis relies on data we have received from the broadcasters themselves. Bauer, MTG and NRK all use a software that is called RadioAnalyzer. This source provides detailed information about the most played songs, the degree of rotation of most

played songs and number of premiere songs on the different channels. Every song that is played on the radio would have a unique footprint that RadioAnalyzer is able to decode and transform into content statistics (RadioAssistant, 2014). RadioAnalyzer can provide information to radio stations about their own station's content, as well as information about competing stations. As we received data from all the three broadcasters, we were able to control that the numbers matched with each other and were based on the same period of time.

5.2 Double coverage

Daily double coverage provides information about the percentage of a station listeners that also have listened to other stations during a day. To obtain precise estimates on double coverage, data on actual behaviour is required. TNS Gallup uses a technology that is called PPM (The Portable People Meter). The PPM technology is a passive measurement method that is able to register the panel members' radio consumption as long as the PPM chip is exposed for encoded radio stations (TNS-Gallup, 2015). TNS Gallup organizes a panel consisting of 1000 reporting persons at the age of 12 years or older. Every panel member undertakes to carry a chip throughout the day. This chip register codes from radio signals that the panel members are exposed to within an audible distance. Furthermore, this gives information about which station the panel member is listening to and between which stations he/she is switching. The TNS panel aims to be representative for the radio universe - meaning that the real distribution in age, gender, city/non-city listeners and radio preferences is more or less correctly reflected in the panel. Due to the size of the panel, there is a certain degree of uncertainty related to the behaviour of the small stations' listeners.

5.3 Survey

5.3.1 **Questionnaire**

We conducted a survey in order to obtain diversion ratios between the radio stations and measure the degree of advertising aversion among listeners. The survey was financed by MTG and Bauer Media. TNS Gallup collected the data by using its screener bus where the respondents answered the survey on the internet. The screener bus is a balanced sample when it comes to demographical distribution – with a small underrepresentation for young persons and people living in cities.

Conducting a professional survey is costly. In our case, TNS Gallup set a price per respondent that completed the survey. We had thus to make a trade-off between the precision of our upcoming estimates and the number of stations we could obtain diversion ratios from. Since we wish to define the closeness between NRK and the commercial stations, we wanted to obtain the diversion ratios from relevant NRK stations to the commercial hit-music stations. Based on the broadcasters' reactions, NRK mP3 seemed to be the source of the conflict. We decided therefore to find the diversion from NRK mP3 to the other stations.

Two screening questions were conducted in order to distinguish the respondents that had listened to NRK mP3 the last month. The first screening question was related to how often people listened to radio. The next question asked the respondents to specify how often they listened to a list of 13 different stations – of which NRK mP3 was included. Such question design helped us separating the relevant group without telling the respondents what we were studying. When deriving the diversion ratios we used the following questions:

Q004/Q005: *If you were going to listen to the radio, which radio station would be your first choice?*

and

Q006/Q007: *If [answer Q004/Q005] were shut down, which radio station would you then have listened to?*[18]

Later in the survey, we wanted to estimate the advertising aversion in order to say something about the nuisance cost of advertising. Measuring advertising aversion is challenging. Since no radio platforms are setting an explicit price to listeners, we do not have any actual markets where we can observe consumers' willingness-to-pay for avoiding advertising. Therefore, we defined two questions with the purpose of estimating the nuisance cost of advertising. The respondents were first presented a list of 13 radio stations, and then asked to consider which of the stations that have advertising. The next question aimed to examine the listeners' perceived amount of advertising:

[18] This is the same formulation Gabrielsen *et al*. (2015) used when deriving diversion ratios.

Q009: *For the radio stations you marked in the previous question; how many minutes of advertising do you believe these stations broadcast on average during an hour?*

Our hypothesis is that persons who overestimate the amount of advertising would perceive the cost of advertising as substantial. They feel that advertising constitutes for a larger part of the total radio content than what it actual do. This reflects a nuisance cost of advertising. We are aware of that this is a challenging question to answer and could possibly lead to strange results where the numbers should be treated with caution.

The last question in the survey asked the respondents to consider the consequences of an increase in the advertising level.

Q010: *Would an increase of <u>one additional minute an hour</u> in the advertising level make it more or less attractive to listen to these stations?*

The respondents were presented a scale from 1 to 9, where 1 means that a one-minute increase in the advertising level would make it “much less attractive” and 9 “much more attractive”.

5.3.2 Validity and reliability

The goal with a survey is to generalize results from the sample to a larger population by asking standardized questions. When designing a survey it is important to ask how well it is. This is related to its *validity* and *reliability.*

Validity determines whether the research truly measures what it was intended to measure (Golafshani, 2003). The validity of a survey gives us how truthful research results are. A central question researchers have to ask themselves, is whether the questions are able to measure the concepts that are of interest for the research.

The reliability is defined as the extent of which results are consistent over time and a correct representation of the total population. Could the results of a study be reproduced under a similar methodology? If yes, then the research instrument is considered to be reliable (Christoffersen, Johannessen, & Tufte, 2011). We are interested in the degree of repeatability of results given that the survey was performed under different conditions, at different point in time or by other researchers.

5.3.3 Aided vs. unaided awareness

Laurent, Kapferer and Roussel (1995) have examined the relationship between aided awareness (stimuli based) and spontaneous awareness (memory based) when performing a survey. They find that this relationship is non-linear, cf. Figure 13. Popular brands tend to obtain relatively higher awareness on open-ended questions. In these cases, smaller brands are often mentally "blocked out" by the more popular brands. Oppositely, smaller brands tend to score exaggerated high on awareness when options are given. In real life, we face consumption situations both where information about the different products is available and where consumers do memory-based decisions.

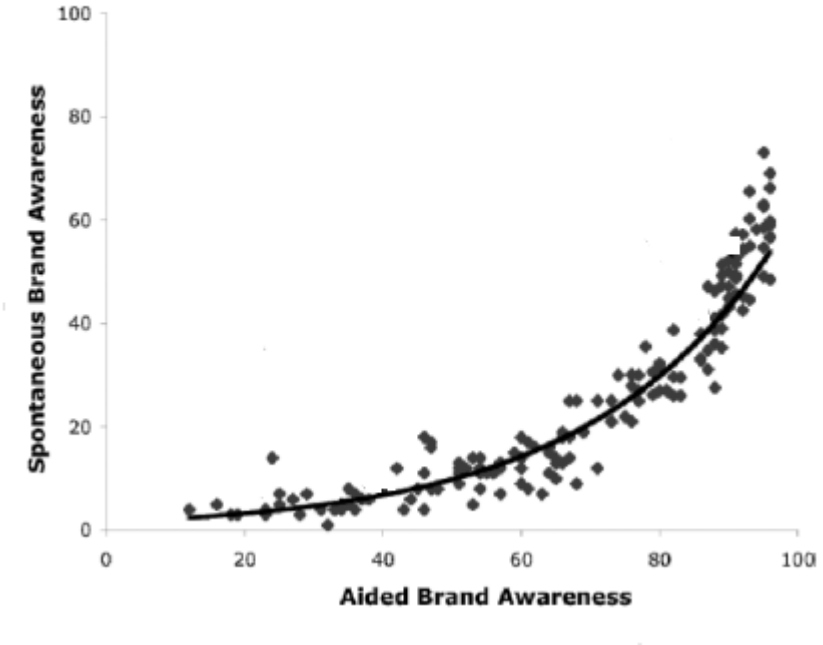

Figure 13: Aided and unaided awareness (Romaniuk et al., 2004).

People listen to the radio in several ways. Some methods require memory-based decision making while other technologies provide the listeners a set of radio stations that are available. New technologies such as DAB+ for example, help listeners to find their preferred radio station through the channel list on the display. Web radio on the other hand requires that the listener would have to remember the station name or alternatively have to search for it. Radio listening with old FM radios or old car radios, where only the FM number is presented, should be handled as a combination of aided and unaided awareness. It is possible to search through the FM interval until you find your preferred station, but it might be too time consuming such

that people listen to the stations they find first – typically the largest stations with the largest frequency coverage. Statistics on how people listen to the radio could give support to the assumption that approximately 50 % of the radio listening is similar to unaided decision-making. A study from 2015 shows that 47 % of the total radio listening is solely done on the FM net while 53 % uses a digital platform (Radio.no, 2015).

Due to the variation of how people listen to the radio, we decided to split the respondents into two groups. The first group were given a list of radio stations (aided) when they were asked to list their first choice and their second choice. The other group did not get this sort of help and had to rely solely on their memory about radio stations. When obtaining diversion ratios in section 6, we use the results from the two groups combined. We could have split the two groups and presented the diversion ratios for each group, but the reason for not doing this is that the number of observations would be apprehensive low.

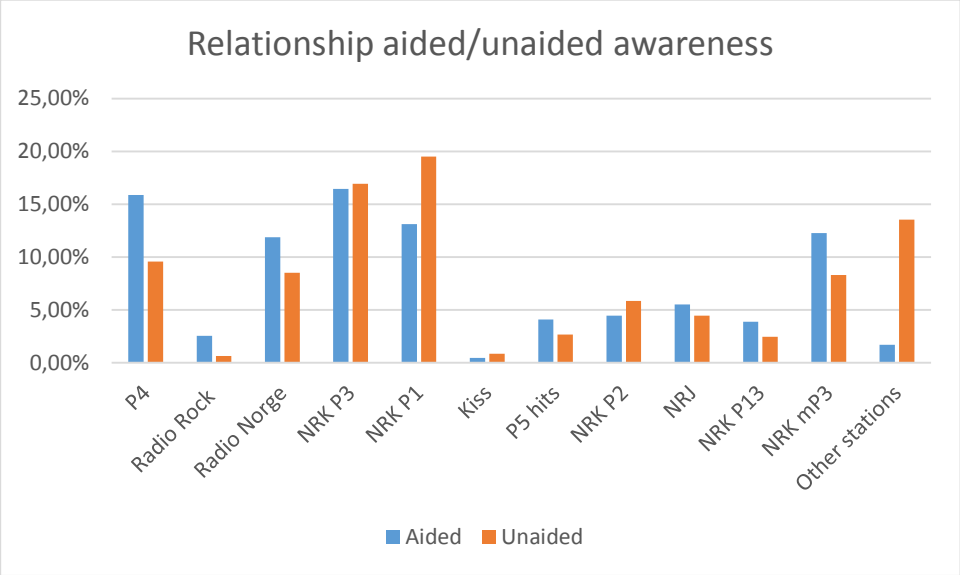

Figure 14: Relationship aided vs. unaided awareness.

In Figure 14, we have presented the distribution of the respondents that have answered certain radio stations as either their first or their second choice. There seems like the relatively small hit-radio stations, as we would expect, obtain higher awareness in the aided group – while the larger stations such as P1, P2 and P3 tend to be relatively more popular in the unaided group of respondents. Somewhat surprisingly, P4 and Radio Norge obtain higher awareness when options were given. These are stations we would expect to obtain relatively high unaided awareness. It could for instance be that NRK P1 in some degree mentally blocks P4 and Radio

Norge out. Based on market shares numbers NRK P1 is more than twice as big as P4 and five times large than Radio Norge.

5.3.4 Descriptive statistics

The survey was conducted by 4909 persons. 89 % of these told that they are listening to the radio on a monthly basis or more often. In total 1004 respondents reported that they listen to NRK mP3. Descriptive statistics for this group is as follows:

Table 4: Descriptive statistics.

Descriptive statistics for the respondents that listen to NRK mP3 monthly or more often
Average age: 41.2 Proportion of women: 54.5 %
One person´s households: 16.0 % Family with children: 40.0 % Family without children: 32.4 % Other: 11.6 %
Elementary School: 5.5 % High School: 24.8 % Vocational education: 12.7 % University up to 4 years: 37.6 % University more than 4 years: 19.4 %
Number of aided respondents: 529 (53%) Number of unaided respondents: 475 (47%)

**The second row gives the respondents' residential status and the third gives highest educational attainment.*

6. Empirical Analyses

In this section, we will present the results from the three empirical analyses that we have executed, and shortly comment on the implications they have for our analysis.

6.1 Content Analysis

Table 5 provides music statistics from the calendar year 2015 for the different stations.[19] Cells that are marked with a star indicate that the NRK stations have an average score that is statistically larger than the average of the commercial stations on a 10 % level.[20]

Table 5: Data RadioAnalyzer 2015

	NRK mP3	Radio 1	NRK P3	P5 Oslo	NRJ
Number of different songs	1982*	680	10234*	834	1059
Avg. Number of A-rotate spins per day	3,5	5,7	1,5	2,8	3,8
Music % total	77	50	62	71	74
Songs played first time on station	1054*	473	6012*	144	487
Songs played first time in Norway	87*	10	961*	7	47

We notice that especially the NRK stations have much higher rotation of songs. P3 plays 10-14 times more songs during a year than the commercial stations do. An A-rotate spin is a song that is among the six to eight most played songs on a certain station the last week (NRK, 2011).

[19] Statistics on Kiss (Radio 1) is more uncertain since Bauer Media decided to rebrand and relaunch its station in January 2016. The Director of Program in Bauer Media has stated that Kiss will in a great extent play the same music with the same program hosts as in Radio 1 (Fossbakken, 2015).

[20] We are interested in examining whether the NRK stations play more music, more varied music and have more new-playings than the commercial stations. Therefore, we conducted a one-sided mean comparison test. None of the observations were statistically significant at a 5 % level. See Appendix D for calculations.

Kiss distinguishes themselves by playing their most popular songs more frequently than the other stations. On average, these stations play music two third of the total radio time. We do also note that mP3, and especially P3, includes more new songs to their music list during a year, and have more premieres than the commercial stations.

Table 6 is compiled by using the lists of the 100 most played songs on each station in 2015. It tells us which stations that have the highest music overlap.

Table 6: Percentage overlap in music in 2015.

	NRK mP3	Radio 1/Kiss	NRK P3	P5	NRJ	Average
mP3	100	33	41	44	69	46.8
KISS	33	100	20	28	35	29.0
P3	41	20	100	33	41	33.8
P5	44	28	33	100	49	38.5
NRJ	69	35	41	49	100	48.5
Sum						39.2

We conclude that mP3 and NRJ do have a great extent of musical overlap with each other. 69 songs are included in both stations' top 100 lists from 2015. Kiss is the station that has the most unique music based on these data. We notice that NRK mP3 is relatively close to the other stations based on music overlap.

In Table 7, we present the statistics we obtained from listening to the radio stations. We observe that NRK mP3 is the station that has the highest concentration of music. This is consistent with the RadioAnalyzer statistics presented in Table 5. P3 have quite a lot of talk programming compared to the other stations. On the advertising side, we can see that Bauer-owned Kiss has the highest level of ads, but none of the commercial stations is on the limit of 20 % yet. By using a mean comparison test (similar to the calculations in Appendix D), we can conclude that Kiss broadcast more advertising than both NRJ and P5 with 99 % certainty.

Table 7: Content analysis. Based on observations from Feb.-Apr. 2016

	Music	Total talk	News	Advertising	Jingles and Self-promotion
P3	70%	24%	4%	0%	2%
mP3	89%	4%	2%	0%	5%
NRJ	80%	9%	0%	7%	4%
P5	81%	4%	2%	10%	3%
Kiss	78%	4%	1%	16%	1%

We obtained a general estimate of the amount of advertising among the larger stations as well. As we did with the hit-radio stations, we listened to P4 and Radio Norge for a certain period and registered the amount of advertising.

Table 8: Amount of advertising

	Average	Highest observation
P4	11 m 25 s (19 %)	12 m 26 s (20.7 %)
Radio Norge	12 m 18 s (20.5 %)	13 m 52 s (23.1 %)
Kiss	9 m 35 s (16 %)	10 m 58 s (18.3 %)
NRJ	4 m 23 s (7.3 %)	6 m 03 s (10.1 %)
P5	6 m 10 s (10.3 %)	8 m 01 s (13.4 %)

We can conclude that P4 and Radio Norge have much more advertising during an hour than the hit-radio stations do.[21] We observed that P4 and Radio Norge often exceeded the 12 minutes limit. Nine out of 16 observations were longer than 12 minutes. There could be some errors in our manual measurements, but the broader picture seems clear; P4 and Radio Norge both push the advertising limit and by several occasions, exceed it.[22]

[21] Similar to what we did in Table 5, we performed a mean comparison t-test in order to check whether P4 and Radio Norge broadcast more advertising than the hit-radio stations. We find that P4 and Radio Norge have more advertising than the hit-radio stations by using a 0.01 % significance level.

[22] We have been in contact with the Norwegian Media Authority that have the responsibility to monitor the stations' amount of advertising. They admit that they do not have any daily routines to control the amount, but rather base their practice on listener tips and self-reporting by the stations.

6.2 Double coverage

Table 9 says that NRK P3 is the station with the highest double coverage with the other stations. This is given in the second column in the table where we study the diversion from the other stations to NRK P3. On the other hand, we can see that the P3 listeners are those who switch the least to the other stations. Further, we can conclude that the commercial listeners prefer to switch to NRK mP3 relative to another commercial station. Of the commercial stations NRJ followed by P5 receive most listeners from the other stations.

Table 9: Average daily double coverage in 2015.

To / From	NRK P3	NRK mP3	P5 Hits	NRJ	Kiss
NRK P3	100 %	11 %	4 %	6 %	3 %
NRK mP3	27 %	100 %	8 %	11 %	4 %
P5 Hits	18 %	13 %	100 %	10 %	6 %
NRJ	24 %	18 %	10 %	100 %	6 %
Kiss	32 %	16 %	14 %	16 %	100 %

**For example: 32 % of the Kiss listeners also listened to NRK P3 during an average day.*

6.3 Survey

6.3.1 Diversion ratios

105 persons from the survey reported NRK mP3 as their first choice. Figure 15 on next page tells us where these listeners would go if NRK mP3 were shut down. Almost one third would have diverted to NRJ if this were the case. The diversion to Kiss and P5 Hits is considerably lower. It is worth mentioning that based on the diversion ratios, NRK P3 seems to be much closer on NRK mP3 than Kiss and P5. Also noteworthy is the fact that the diversion to P4 and Radio Norge is relatively large. This could be a consequence of an unbalanced sample in terms of distribution in age and urban population. If the sample had both older listeners and fewer urban respondents than what is the case for the actual NRK mP3 listeners, we would expect higher diversion to stations with high national frequency coverage and older listeners, such as Radio Norge and P4. We are only able to control for any unbalances in age distribution with the data we possess. The sample has an average age equal to 32.2 years, which is consistent with the official numbers presented in figure 3. Data on the distribution “city versus non-city

listeners" is not available for NRK mP3, but we know that the Gallup panel is slightly underrepresented on urban respondents. This should be considered as a threat to the reliability of the survey, and could explain why Kiss and P5 Hits, as traditional big-city stations, obtain relatively low diversion ratios, and P4 and Radio Norge corresponding large estimates.

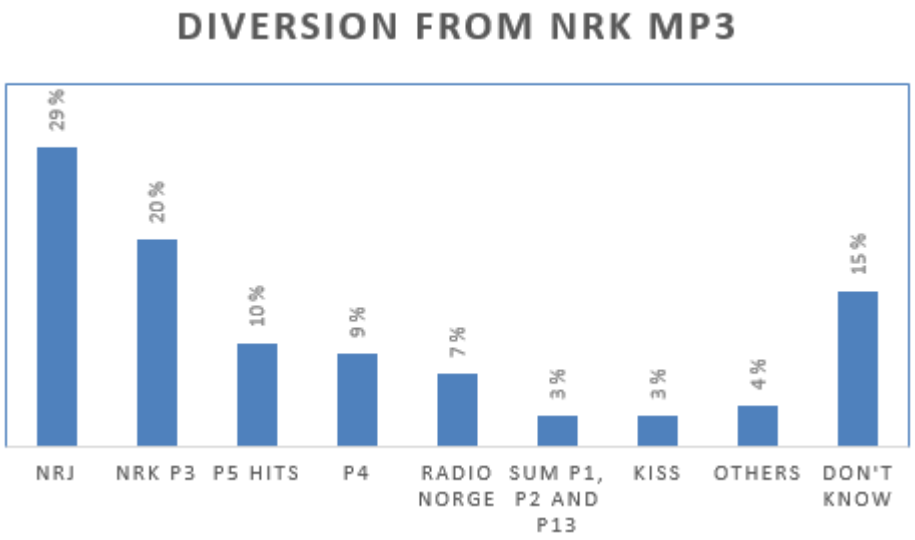

Figure 15: Diversion ratios from NRK mP3 to other stations.

6.3.2 Advertising aversion

In our survey, we included two questions to measure the nuisance cost of advertising. In the first question relating the perceived amount of advertising, we obtained the following frequency plot:

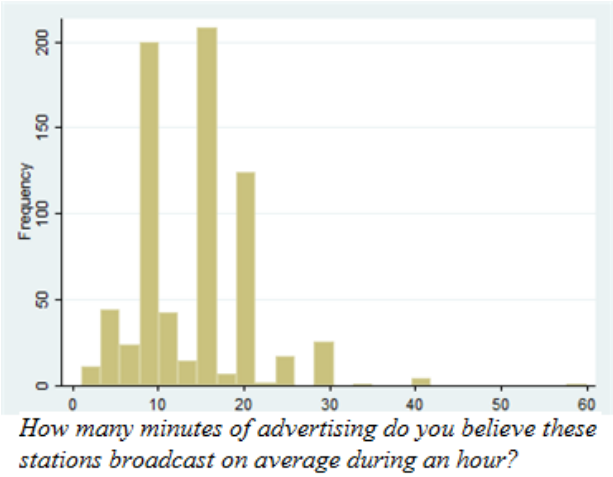

Figure 16: Perceived advertising amount in an hour.

On average, the respondents believe that it is 14 minutes and six seconds with advertising during an hour.[23] A 99 % confidence interval[24] for the average lies between 13.5 and 14.7 and confirms that the perceived amount of advertising is significantly higher than the allowed amount of 12 minutes an hour. Based on our own measurements on advertising level, we can conclude that the gap between perceived and actual amount of advertising is even larger. While the commercial hit-radio stations broadcast advertising between 4 and 9 minutes an hour, we have observed that P4 and Radio Norge are both pushing the 12-minute limit on daytime (8 am - 5 pm). The respondents in the survey are in varying degree exposed for ads related to which stations they listen to and at what time of day they usually listen to the radio. Based on market shares data and our own advertising measurements, we would predict that the average exposure of advertising lies between 10 and 11 minutes an hour for a typical Norwegian radio listener.[25] Our results indicate that the respondents overestimate the amount of advertising by quite a lot. Whether this is due to the challenging form of questioning, or solely represent an expression of disutility for advertising is difficult to say. Almost 80 % of the observations lies in the interval between 10 and 20 minutes and tells us that the spread of observations is not too large. Oppositely, a significant spread in observations would indicate that the question is difficult to answer and produces inconsistent results.

The second question asks the respondents to consider the personal cost of an increase in advertising.

[23] Four observations are above 30 minutes. We have included these outliers in the calculation of the average because their marginal effect on the average is limited.

[24] This confidence interval is provided by the statistical software Stata.

[25] To calculate the listeners' exposure to advertising, we apply the market-share data weighted for radio consumption from Table 2 and actual amount of advertising from Table 8. By weighting with market-shares numbers, we obtain a proxy for total advertising exposure in the radio market.

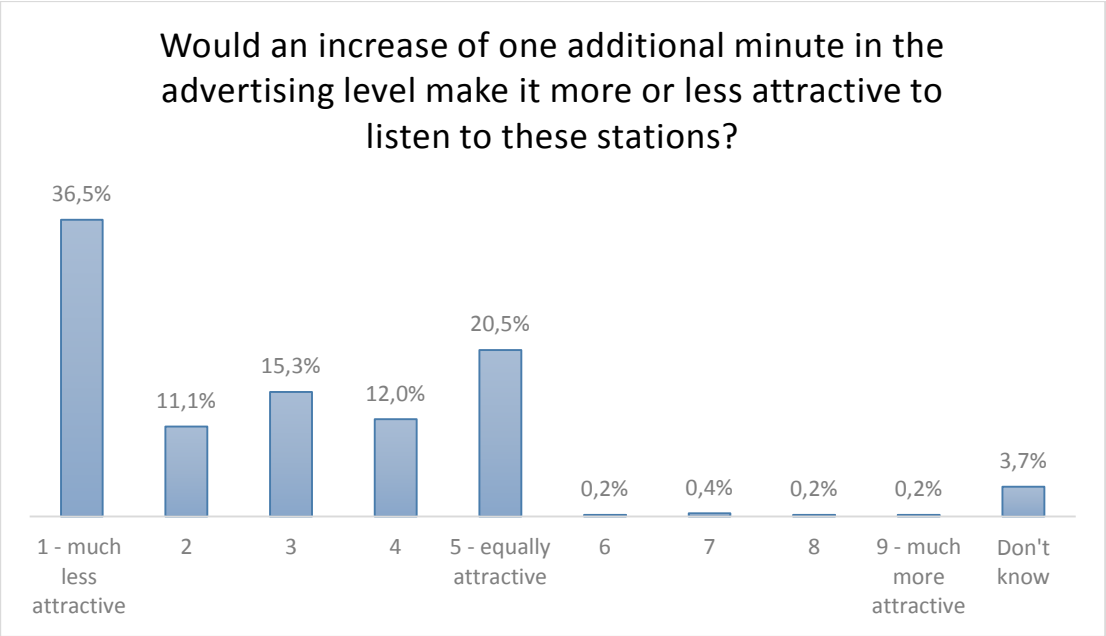

Figure 17: Effects of an increase in advertising level. Based on answers from 1011 respondents.

The majority of the respondents seems clear that an increase in the advertising level would make it less attractive to listen to the radio. 75 % of the respondents report that a one-minute increase in advertising will disrupt their enjoyment of listening to radio. Advertising is then, relative to standard radio content, perceived as a nuisance cost for most of the listeners. A similar study from Australia reports that 61 % of the respondents experience that advertising interrupts their enjoyment of commercial radio (Ipsos MediaCT, 2010). Despite that our questioning focus on change in advertising level, the reported results indicate that Norwegian radio listeners show a relatively strong aversion to advertising. In addition, we examined whether the non-commercial listeners (listen only to NRK) are more averse to advertising than the average radio listener is. Our results confirm that NRK listeners are more averse to advertising, and therefore seem to avoid stations with advertising. There are though no differences between old and young radio listeners with respect to the aversion of advertising. As a concluding remark, we should be careful with interpreting the size of the advertising aversion among the radio listeners. Based on the above results, we can conclude that advertising is perceived as a nuisance cost for most listeners.

7. Competition Analysis and Discussions

Our concern in this thesis is to assess the welfare implications on the listeners due to NRK's radio services.[26] The advertising level and the desire of diversity affect the listeners. In order to determine the advertising level and the diversity in the market, and how this is affected by NRK's radio services, we need to say something about the *strategic responses* of NRK's competitors in the radio market.

In the analysis, we return to the research question of this thesis. We first wish to determine whether NRK is a close competitor to the commercial radio broadcasters. Primarily, our scope is to define the closeness between NRK and the commercial stations playing hit music. Next, given that NRK is a close competitor, we wish to say what the implications are on the listeners' welfare from having an ad-free station in the commercial landscape. The theoretical analysis gives us some predictions about the effects of a commercial-free radio service on listener welfare. We wish to see whether these predictions fit to what we observe in the Norwegian hit-radio market.

We divide the analysis into two. First, we regard the implications with respect to advertising, and secondly with respect to diversity. In addition, we discuss the implications of competition in quality investments. Finally, we sum up and are able to answer the main research question of this master's thesis, and assess the competitive aspects of NRK's radio services.

7.1 Is NRK a Fierce Competitor to the Commercial Stations?

In a traditional market definition, we are concerned about how the listeners perceive the different radio stations, and our goal is to examine whether the listeners perceive the radio stations as sufficiently close substitutes. In order to decide whether NRK is a close competitor to commercial hit-radio stations, we have carried out three different empirical analyses, which each gives us an indication of the scope of the relevant market. First, we make use of our content analysis to tell about product closeness. Secondly, we make use of data on actual

[26] Here, we follow the approach of Gabrielsen et al. (2015).

behavior on how listeners move around, and finally the diversion ratios from our survey to tell about competitive closeness.

7.1.1 Content

The content analysis describes the closeness of the radio stations with respect to the product dimension. The analysis shows that NRK mP3 lies close to NRJ with respect to music and content programming. This points toward NRK mP3 and NRJ competing fiercely. On the other hand, Kiss seems to play, to a certain extent, different kind of music than its competitors, which suggests that NRK mP3 and Kiss are not competing that hard. Kiss has positioned itself as the channel with the highest intensity of electronic dance music (EDM), while NRK mP3 plays a mixture of traditional acoustic pop music and electronic music. NRK P3 distinguishes themselves from the other candidate stations, by having about 25 % talk programming, and playing a higher share of Norwegian music. P5 is somewhere in between, with respect to music, rotation, news and talk shows. We also notice that there are differences in the amount of advertising at the different radio stations, of which Kiss has the highest level followed by P5 and NRJ.

From the content analysis, we can then conclude that all the stations examined, play largely the same music. Consistent with the commercial stations' reactions, it seems like NRK mP3 represents the largest competitive threat for Bauer and MTG. We can also conclude that NRK mP3 lies closest to NRJ with respect to content-related characteristics.

7.1.2 Double coverage

Based on double coverage, it seems that NRK P3 represents the greatest competition for the other stations. There is a tendency that NRK listeners in a greater extent switch between ad-free stations than switching to ad-financed stations compared to listeners from commercial stations. This can be due to advertising aversion among the NRK listeners or the fact that the transportation cost between NRK P3 and NRK mP3 is lower than from a NRK station to a commercial station. When using an app or a web player for listening to NRK stations, for instance, one can easily switch between P3 and mP3.

However, double coverage is not necessarily a precise measure of competitiveness. Large double coverage could rather reflect a desire of diversity in one's radio consumption. After listening to hit music for a while, it may not be natural to switch to another hit-music station,

but rather one may wish to listen to, say, a news program instead. Double coverage could thus be due to both competitiveness and the desire of diversity. We believe that there is some combination of these two explanations. NRK P3's high double-coverage numbers are clearly related to the fact that P3 is a national station easily available for most radio listeners. The large radio coverage is by itself a competitive factor making NRK P3 a good alternative to the commercial radio stations.

On the other hand, the double-coverage numbers reflect the listener's desire to spread out their radio consumption. NRK P3 could offer more varied music and more talk than the other channels and thus represent a good alternative for persons that have gotten tired of hit music. Using this approach NRK P3 might not be the commercial listeners' first choice if their preferred station is shut down, as the perspective often is in merger cases. Nevertheless, a radio listener that switches from a commercial station to a non-commercial station, even just for an hour, would represent a loss in advertising revenues for the commercial stations. The question is then whether a listener who swap to NRK P3 or NRK mP3 would have continued to listen to the commercial station even if the NRK stations were not there. In that case, the NRK stations make it more difficult to collect income from the advertisers.

7.1.3 Diversion ratios

We have so far studied content-related similarities between the stations and actual behaviour using a double-coverage table. This has helped us to draw a better picture of the closeness between the commercial hit stations and the public-owned stations. Now, we will turn to how the listeners themselves perceive the different stations. This is the most relevant component when defining whether NRK is a fierce competitor to the commercial stations. Our focus has been on NRK mP3 and where the mP3 listeners would go if mP3 were to leave the market. We are thus not interested in defining the hit-radio market *per se*, but rather to identify who are the closest competitors to NRK mP3. Our results show that NRJ is perceived as the best alternative to NRK mP3 followed by NRK P3 as the second-best choice. From the diversion-ratio estimates, it seems like mP3 is not perceived as a particular close competitor to P5 and Kiss. There are, however, some uncertainty related to these estimates due to the relatively low number of respondents. We cannot exclude that the closeness between mP3 and Kiss/P5 is larger than our estimates tell.

7.1.4 Preliminary conclusion

So, let us return to this section's question; is NRK a close competitor to the commercial stations? Based on the content analysis, we must say, although we find differences in the music and content programming among the hit-radio stations, that the stations in the traditional hit-radio market are quite similar. NRK P3, however, distinguishes themselves considerably from the rest, but receives still a number of listeners that multi-home, i.e. swap between different stations. NRJ stands out as the station that is located the closest to NRK mP3 with respect to music profile and content programming. The diversion ratios confirms this impression of NRJ being the closest competitor.

7.2 Implications on Listener Welfare

Having established that NRK is a fierce competitor to commercial actors, we are concerned with which implications NRK's radio services have on the listener's utility from listening to radio stations in the hit-radio market segment. Listeners' utility depends on the amount of advertising there is in the market, and on the diversity in music and content programming.

To be able to say something about listener welfare, we need to regard the strategic responses of NRK's competitors when NRK is present in the market. The theoretical analysis in section 4.2 predicts that NRK's presence would lower advertising and increase diversity, and thereby increase listener welfare. Our further concern is whether we actually may observe such effects in the Norwegian hit-radio market.

7.2.1 Advertising

Advertising influences the utility of the listener. Throughout the theoretical analysis, we assumed that the listeners dislike advertising. In our survey about aversion to advertising, we were able to conclude that people dislike advertising. Thus, in a two-sided market as the Norwegian radio market is, where the listeners dislike advertising, the advertising level plays an important role for listener welfare. The radio stations sell ad slots, and internalize this negative externality from the advertisers to the listeners. The radio stations only take into account the marginal listeners when setting the ad quantity, i.e. those listeners that switch to another radio station or stop listening when the amount of advertising is increased, but are not concerned about the welfare of the average listener. We wish to look at the strategic responses

of the commercial stations when NRK is present in the market, and ask whether the commercial stations will respond by increasing or reducing the advertising level.

Advertising as Strategic Complements

Our theoretical model establishes that listener prices, i.e. advertising, are *strategic complements*. That is, if one's rival increases (decreases) its advertising level, a firm will follow suit, increasing (decreasing) its own advertising level as well.

Our tracking of the advertising quantity in the Norwegian radio market, reveals that P4 and Radio Norge push the limit of allowed advertising time each hour in prime time. This can easily be explained by the concept of ad quantity being strategic complements, and is also related to the concept of tacit collusion; both broadcasters, MTG and Bauer, know that if one of them increases its ad level, the other will follow suit. With only two actors competing in the market repeatedly, and over an infinite time horizon, there should thus be no coordination problem on ad quantity, and the firms may collude tacitly.[27] With a public-set advertising cap of 12 minutes an hour, the broadcasters will find its focal point without much trouble. As ad quantities are strategic complements, it is in a firm's best interest to increase its own ad quantity when the rival does so.

In contrast to the market of P4 and Radio Norge, the hit-radio market segment also consists of a commercial-free broadcaster. An additional actor enhances the coordination problem related to tacit collusion, troubling collusion.[28] Nevertheless, the most important factor is that NRK – exogenously given without commercials – pushes the commercial stations to lower their ad quantity, as ad quantities are strategic complements. This downward pressure on advertising is thus a direct consequence of commercial-free NRK's presence in the hit-radio segment. As NRK credibly sets its advertising quantity equal to zero, it is the commercial station's best response to lower their advertising when the stations are strategic complements in advertising.

The content analysis indeed shows that the commercial hit-radio stations broadcast less advertising than P4 and Radio Norge. We have explained this with the presence of NRK

[27] This is due to the Folk theorem. We here may assume that the broadcasters follow a grim-trigger strategy similar to the one stated in Tirole (1988, pp. 245-246), and that the discount factor is sufficiently high.

[28] Note that we here refer to the number of broadcasters and not the number of stations. That is, the hit-radio market consists of NRK, MTG and Bauer, while the market of those of age between 35 and 50 only consist of MTG and Bauer.

disrupting the coordination possibilities between MTG and Bauer, making the tacit collusion we might observe for P4 and Radio Norge, harder to maintain. Another reason may be that these stations have a lower market share of the total radio market. Jeziorski (2014) finds that the advertising level is lower in smaller markets, but does not give any explanation for why this is a rational strategy. There might be that advertisers simply have lower willingness-to-pay for ad spots at smaller stations, and that this pushes down the advertising in these markets.

Alternatively, it could be that young people are more averse to advertising, and that it hence is rational for the radio stations to broadcast less advertising in the hit-radio market. We have controlled for this in our survey, and find that there are no differences in advertising aversion based on age, see Figure 23 in Appendix E.2. However, it is not necessarily so that the survey reveals the true behaviour of the respondents.

Multi-homing and congestion

In the above discussion, we concluded that NRK pushes down the ad quantity in the hit-radio market. Since the radio market is a market where the consumers often switch between several stations, known as *multi-homing*, it is necessary to discuss the implications of congestion problems in such a market. Anderson and de Palma (2009) state that receiver attention is a scarce resource, but may be overutilized as "common property" by advertisers. The consumers can only process and register a limited amount of the advertising message to which they are exposed. This is known as the *congestion problem* in a market with advertising.

Anderson (2015, p. 77) states that allowing a public broadcaster to carry ads, as the case in Germany, has two conflicting effects on commercial platforms. It will increase their demand through ad nuisance, but it also increases the congestion problem. If we then study the effect of NRK's presence in the hit-radio market based on recent studies on multi-homing and congestion, there are reasons to believe that in the absence of advertising on NRK, it would be more attractive for the commercial stations to increase the ad quantity. The commercial platforms should have in mind that a multi-homing listener they receive from a commercial-free station would be more amenable to ads than a listener coming from another commercial station. Hence, introducing the concept of agents that take advertising congestion into account when setting ad quantity, would attenuate part of the competitive effects that NRK causes, as established earlier in this analysis.

Athey, Calvano and Gans (2016) have devolped a model of advertising markets where consumers switch across platforms. They state that multi-homing leads to increased competition among platforms in the advertising market, increasing advertising levels and decreasing ad prices. In addition, multi-homing leads to increased incentives to invest in quality. Athey *et al.* have further examined the effect of having a non-advertising platform in such a market. They argue that a public platform without advertising reduces the duplication problem related to the fact that advertisers have limited value of reaching a consumer twice. A reduction of the duplication problem will thus increase the demand for advertising and hence raise equilibrium prices and profits for advertisers.

We still believe that NRK's impact on ad quantity is positive for the ad-averse listener, but less than in a world where platforms do not take into account congestion effects.

7.2.2 Diversity

Based on the findings in the content analysis, NRK mP3 seems to be positioned close to the middle of the hit-radio market, with a substantial music overlap to NRJ. High content-related overlap will indicate in itself that NRK does not contribute to increased diversity. Thus, it is safe to say that mP3 adds little new content to the hit-radio market. We have conversely concluded that P3 differentiates itself by offering more talk programming and play more Norwegian music as well as acoustic pop music.

In addition to the isolated contribution that the NRK stations give with respect to diversity, it is necessary to consider the strategic effects from the commercial stations. Again, recall the predictions from the theoretical analysis, that the commercial stations will differentiate from the commercial-free one in order to soften price competition. NRK's presence in the market creates tough price competition towards the listener, as NRK is free of advertising. A strategic response to soften the price competition would be to position itself away from NRK. Kind and Sørgard (2004) used this as an important argument when explaining why Kanal 24 (later Radio Norge) found it optimal to position close to P4 instead of NRK P1 when Kanal 24 entered the market in 2004[29], and we predict this equivalent effect in our theoretial analysis. In the content analysis, we provide evidence that NRK works as a block in the hit-radio market, forcing the

[29] Berry and Waldfogel (1999) also find evidence that public broadcasting crowds out commercial programming in large markets.

commercial stations to spread out their offer. Bauer-owned Kiss, is positioned some distance away from the NRK stations in terms of music overlap and content programming; while MTG has one station close to mP3, NRJ; while P5 is postioned away from NRK. This could be explained by the distribution of listeners not being uniform as assumed in the theoretical model, and hence it is rational for MTG to position one of the stations close to the middle of the market.

On the other hand, empirical studies on the radio market has shown that competition is not necessarily positive when it comes to securing diversity in media markets. Competing stations tend to position itself close to each other and compete for the listeners in the most crowded and profitable segments. Sweeting (2010) argues that common owners seek to differentiate their stations in order to avoid cannibalization. Thus, in this regard, NRK's presence that creates more competition in the hit-radio market could be harmful from a diversity perspective.

Musical progression in the hit-radio market

NRK's radio stations play several times more songs, and play many more new songs than the commercial stations do. This should be interpreted as a contribution to the diversity in the market *per se*. We have problematized the large music overlap between NRK mP3 and NRJ. If it is such that the NRK channels are first out with playing new songs and NRJ follows when the songs have obtained a certain awareness by the listeners, it is difficult to criticize NRK for being too close to the commercial stations. If this is the case, it could rather be argued that mP3 and P3 are creating value for the commercial stations by lifting up new songs that commercial stations can take advantage of later on. From the data we possess, it seems like at least NRK P3 takes a more progressive role in the music landscape. We should be careful to conclude that mP3 holds the same position since the amount of new songs on the station are considerable lower.

DAB technology

The commercial stations have the latest years established several new niche stations. This relates to the new DAB technology, which increases the space for national channels from five to 40. A consequence of the national DAB net is that smaller stations would be distributed to a much larger audience. This would most likely make it more profitable for the commercial stations to establish more niche stations relative to a situation where distribution is restricted to local FM spots and web radio. Hence, the argument of having NRK as an important provider

of diversity in the radio market is weakened as the commercial stations manage themselves to create diversity in a larger extent.

7.2.3 Quality competition

So far, we have assumed that the commercial radio stations compete for listeners by setting the lowest ad quantity or offering a certain music profile that listeners demand. We should also discuss whether the competition between the radio stations is expressed through competition in quality investments as well.

Hotelling (1929) predicts maximal differentiation in markets with strong price competition, and minimal differentiation in markets absent of price competition. Regarding the Norwegian radio market, we see that in the market comprising P4 and Radio Norge, there is little price competition towards the listeners, resulting the advertising to push the limit of 12 minutes an hour. This market is characterized by the two radio stations being located close to each other, and they may use quality investments to differentiate themselves from each other.

There is evidence that Kanal 24 and P4 competed in program quality rather than ad quantity, when Kanal 24 entered the market in 2004 (Kvaløy, 2006). The two commercial broadcasters invested a lot of resources in signing high-profile program hosts and inviting famous guests, and they reported that the investments led to more listeners for the relevant radio shows.

In the hit-radio market, however, NRK's presence introduces tough price competition towards the listeners, as NRK has no advertising. We have shown in the content analysis that talk programming constitutes a small share of the total radio time (4-9 %, see Table 7) in the hit-radio market. The corresponding number for Kanal 24 was 37.9 % in 2005 (Norwegian Media Authority, 2006). There seems to be a clear strategy to play as much music as possible in the hit-radio market. Thus, investing heavily in attracting prominent radio hosts would appear to be less favourable in this radio segment. Therefore, the kind of quality competition we experienced between Kanal 24 and P4 is harder to detect in the hit-radio market. A small exception is NRJ, which have hired a couple of famous program hosts in their morning shows (Radionytt, 2012). Quality investments are costly for the stations, but would have a positive impact on the listeners' utility. Thus, if it were such that competitive closeness creates more incentives to invest in program quality, then NRK's presence in the market would secure higher quality.

7.2.4 Does a public-owned broadcaster crowd out commercial media investments?

There has been an international discussion about how a public-owned broadcaster influences private broadcasters. The debate has focused on whether a public-owned broadcaster would make commercial broadcasters better by incentivizing them to invest in high-quality programs, or whether the opposite argument is valid; that high levels of public funding crowd out private investments. BBC (2013) carries out a cross-sectional study where the levels of public and commercial funding, and investments in content programming, are examined. BBC finds a clear positve correlation between the financial strength of the public and private broadcasters in a country. As we can see from Figure 18, the Norwegian TV market fits well with this pattern.

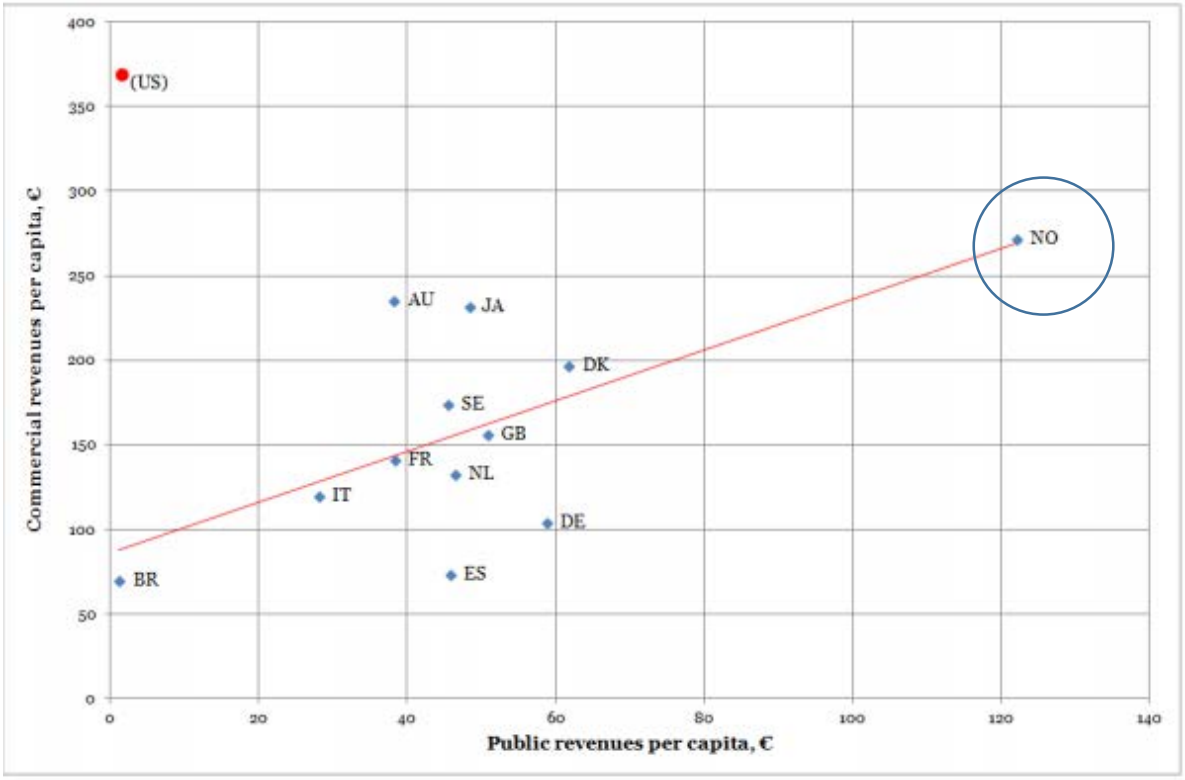

Figure 18: Relationship between public and commercial revenues in different TV markets (BBC, 2013).

The BBC report further argues that PSB requirements are at its most effective when it not only delievers high-quality programs, but also exerts pressure on the commercial competitors to do the same. If we follow this approach, investements in program quality by a public and a commercial broadcaster have to be perceived as strategic complements. Thus, if NRK invests in quality and content programming in the radio market, the commercial broadcasters would

respond by investing in quality as well. This is positive for listener welfare. However, quality investments might be costly, and at a certain point it would be too costly for the commercial broadcasters. Hence, quality investments might be strategic complements up to a certain point. This means that the commercial broacasters would instead lower their quality and content programming from that point on as NRK increases theirs, which would be negative for listener welfare (Gabrielsen, et al., 2015).

Garcia-Pires, Skjeret and Sørgard (2014) argue that the positive correlation could rather be explained with the wealth of a country. Countries with high GDP per capita pay typically more per citizien for the provision of a public broadcaster, and a high GDP per capita is also an important factor explaining the level of commercial revenues. Thus, the positive correlation does not necesarly relate to the strategic substitutability we touched upon.

7.2.5 Preliminary conclusion

In the theoretical analysis, we predict that NRK's presence would be positive for listener welfare, through lowering advertising and increasing diversity. We have established that NRK is a fierce competitor to the commercial stations in the hit-radio market, and we were further concerned with the observed implications on listener welfare from NRK's presence in the market. Firstly, NRK seems to be limiting the amount of advertising in the market, which is good for listener welfare. However, it is less obvious that NRK contributes to diversity in the market, when we consider the station mP3. There seems to be a slight tendency that the commercial broadcasters spread their offer to some extent, although the different radio stations in the hit-radio market are quite similar.

We can summarize parts of our analyses, and illustrate them together in Figure 19, representing the hit-radio market with localization on a Hotelling line, with ad quantity on the y-axis. Localization to the left indicates that the station plays more acoustic music, while a localization to the right indicates more electronic dance music (EDM).

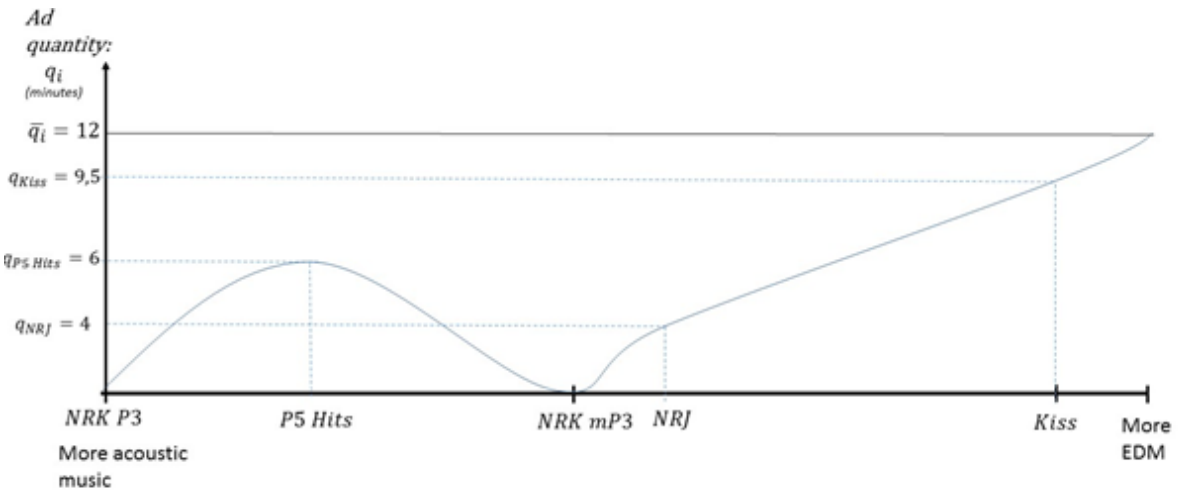

Figure 19: The Norwegian hit-radio market.

8. Conclusion

In our thesis, we have examined the competitive aspects of NRK's radio services, with respect to the welfare of the listeners. We have studied closely the Norwegian hit-radio market, where the public-owned, commercial-free broadcaster, NRK, seemingly competes fiercely with commercial radio stations, and which have caused some debate among the Norwegian radio broadcasters.

Our first contribution to the topic has been a theoretical analysis in order to study advertising level and diversity in a model with four radio stations located on a Hotelling line, similar to the Norwegian hit-radio market, where listeners are averse to advertising. We provide two parallel models: the first a benchmark with four commercial stations, and the other with one non-commercial and three commercial radio stations. We are concerned with the differences in advertising and diversity for the two cases, and what would happen if NRK mP3 were imposed public service broadcasting (PSB) requirements.

Firstly, we find that the presence of a public-owned, commercial-free broadcaster lowers the advertising level in the market, and further forces the commercial broadcasters to differentiate. The result is less advertising and more diversity, which is positive for listener welfare. We further find that the effect of imposing PSB requirements on the commercial-free broadcaster is strictly negative for the listeners, as such an increase allows the commercial stations to either air more broadcasting, holding the positioning fixed, or to move closer to NRK, holding advertising quantity fixed, or somewhere in between.

We have furthermore executed three empirical analyses to determine the actual effects on listener welfare. Firstly, we executed a content analysis to measure the degree of overlap in music and content programming among the stations in the hit-radio market. Secondly, we regard double-coverage tables to measure the actual listener behavior in the market, and finally we conducted a survey to reveal the diversion ratios in the hit-radio market. We find that especially NRJ lies close up to NRK mP3, playing largely the same songs, in addition to be perceived as close substitutes by the listeners. We further find that P5 Hits and Kiss distinguish themselves somewhat in terms of music profile and content programming, and hence they are also able to broadcast more advertising than NRJ is. However, we observe that the advertising level is significantly lower in the hit-radio market than in the market comprising P4 and Radio Norge, where they seem to push the limit of 12 minutes of advertising an hour. This difference

can be explained by the presence of NRK in the hit-radio market and the concepts of advertising being strategic complements and tacit collusion, which manifest themselves in the market of P4 and Radio Norge.

Thus, we find that NRK, in line with the predictions from our theoretical analysis, imposes a downward-pressure on the advertising level, which is important for listener welfare, because, as the survey shows, people dislike advertising. Furthermore, we see tendencies of NRK working as a block forcing the commercial stations to differentiate. This way, we can say that NRK contributes to diversity in the hit-radio market, and thus increases listener welfare, although we cannot say that NRK contributes to diversity with its station mP3 in itself.

Our research shows that listeners are better off in the market including NRK, even those listeners who do not listen to NRK. Because of NRK's offer in the market, the commercial listeners will have a more diverse offer and face less advertising on the commercial stations.

In this thesis, our focus has been on the listener side of the two-sided market. In order to assess fully the competitive aspects of NRK's radio services, we should know more about the advertisers' response in the presence of NRK. Moreover, we should know how the price of an ad slot varies with the number of listeners, and further the impact on the advertising quantity. We leave that for further research on the topic.

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Appendices

Appendix A: Derivation of advertiser demands

A.1 Four commercial stations

Suppose there are four commercial radio stations in the market. Assume localizations exogenously given for $x_1 = \frac{1}{8}, x_2 = \frac{3}{8}, x_3 = \frac{5}{8}, x_4 = \frac{7}{8}$. Inserting x_i into the listener demand functions in equation (1), we get

$$n_1 = \frac{1}{4} + 2\gamma(q_2 - q_1).$$

$$n_2 = \frac{1}{4} + 2\gamma(q_3 - q_2) - 2\gamma(q_2 - q_1),$$

$$n_3 = \frac{1}{4} + \gamma(q_4 - q_3) - 2\gamma(q_3 - q_2), \text{and}$$

$$n_4 = \frac{1}{4} - 2\gamma(q_4 - q_3).$$

The advertiser's profit from advertising at radio platform i is given by (3). Inserting for the listener demands, gives us the following profit functions:

$$\pi_1 = \left[\beta\left(\frac{1}{4} + 2\gamma(q_2 - q_1)\right) - p_1\right] q_1,$$

$$\pi_2 = \left[\beta\left(\frac{1}{4} + 2\gamma(q_3 - q_2) - 2\gamma(q_2 - q_1)\right) - p_2\right] q_2,$$

$$\pi_3 = \left[\beta\left(\frac{1}{4} + 2\gamma(q_4 - q_3) - 2\gamma(q_3 - q_2)\right) - p_3\right] q_3, \text{and}$$

$$\pi_4 = \left[\beta\left(\frac{1}{4} - 2\gamma(q_4 - q_3)\right) - p_4\right] q_4.$$

And hence, differentiating π_i with respect to its respective q_i, yields the first-order conditions and reaction functions in equations (6) and (7). We then have a system of four equations and four unknown, and we are able to solve and find the advertiser demands, given in (8).

A.2 One non-commercial and three commercial stations

Suppose now that we have one non-commercial station and three commercial stations in the market. Assume still localizations exogenously given for $x_1 = \frac{1}{8}, x_L = \frac{3}{8}, x_3 = \frac{5}{8}, x_4 = \frac{7}{8}$. Inserting x_i into the listener demand functions in equation (2), and we get listener demand

$$n_1 = \frac{1}{4} + 2(\mu k_L - \gamma q_1).$$

$$n_3 = \frac{1}{4} + 2\gamma(q_4 - q_3) - 2(\gamma q_3 - \mu k_L), \text{and}$$

$$n_4 = \frac{1}{4} - 2\gamma(q_4 - q_3).$$

Inserting in the advertisers' profit functions from (3), we thus get

$$\pi_1 = \left[\beta\left(\frac{1}{4} - 2\gamma q_1 + 2\mu k_L\right) - p_1\right] q_1,$$

$$\pi_3 = \left[\beta\left(\frac{1}{4} + 2\gamma(q_4 - q_3) - 2\gamma q_3 + 2\mu k_L\right) - p_3\right] q_3, \text{and}$$

$$\pi_4 = \left[\beta\left(\frac{1}{4} - 2\gamma(q_4 - q_3)\right) - p_4\right] q_4.$$

Differentiating these equations gives us the first-order conditions in (14), giving an expression for advertiser demand for station 1, q_1, as expressed in (15):

$$q_1 = \frac{1}{16}\frac{8\beta k_L \mu + \beta - 4p_1}{\beta\gamma},$$

and the reaction functions

$$q_3^R(q_4) = \frac{1}{32}\frac{8\beta\gamma q_4 + 8\beta k_L \mu + \beta - 4p_3}{\beta\gamma}, \text{and}$$

$$q_4^R(q_3) = \frac{1}{16}\frac{8\beta\gamma q_3 + \beta - 4p_4}{\beta\gamma}.$$

We now have a system of two equations and two unknown. Inserting q_3 into $q_4^R(q_3)$, we get

$$q_4 = \frac{1}{16}\frac{8\beta\gamma\left(\left(\frac{1}{32}\right)\frac{8\beta\gamma q_4 + 8\beta\mu k_L + \beta - 4p_3}{\beta\gamma}\right) + \beta - 4p_4}{\beta\gamma}$$

$$\Rightarrow q_4 = \frac{1}{56}\frac{8\beta\mu k_L + 5\beta - 4p_3 - 16p_4}{\beta\gamma},$$

Which is the advertiser demand for station 4 in (15).

Finally, inserting q_4 into $q_3^R(q_4)$, we get the advertiser demand for station 3 as in (15):

$$q_3 = \frac{1}{56}\frac{16\beta\mu k_L + 3\beta - 8p_3 - 4p_4}{\beta\gamma}.$$

Appendix B: Comparison of listeners' disutility in the two models

We were considering the difference in listeners' disutility for the two cases, where listeners' disutility is given by the disutility from advertising in the market comprising four commercial stations, and the sum of disutility from advertising and the disutility from PSB requirements in the market comprising one commercial-free and three commercial stations:

$$\gamma Q_{Four} > \gamma Q_{Three\ plus\ one} + \mu k_L.$$

Inserting for Q_{Four} and $Q_{Three\ plus\ one}$:

$$\gamma\left(\frac{1087}{8075\gamma}\right) > \gamma\left(\frac{2952\mu k_L + 641}{6944\gamma}\right) + \mu k_L.$$

Consider the case where the non-commercial station has no PSB requirements, i.e. if $k_L = 0$. Then the above equation will abbreviate to

$$\left(\frac{1087}{8075}\right) > \left(\frac{641}{6944}\right)$$

$$\Rightarrow 0.1346 > 0.0923.$$

We see that $\frac{(0.0923-0.1346)}{0.1346} = -0.314$, and thus the advertising level in the market with the non-commercial stations is 31.4 % lower than for the market with four commercial stations.

However, it is natural that the advertising level is higher in a market in which one more station airs commercials. We thus are interested to find the average advertising level for each commercial station in the market. If the average advertising is equal, there is no real difference between the two markets, and the commercial-free station does not trigger a different strategic response than a commercial station. We find that $\frac{0.1346}{4} = 0.03365$ and $\frac{0.0923}{3} = 0.03077$, $0.03365 \neq 0.03077$, $\frac{(0.03077-0.03365)}{0.03365} = -0.086$.

We see that the difference in advertising in the two markets is not entirely explained by the number of commercial stations. This means that a commercial-free station has an impact on the commercial station beyond just being free of commercials. Adjusted for the number of commercial stations, we can see that the market with three commercial stations and one ad-free station has 8.6 % less advertising.

Appendix C: Manual registration of content characteristics

Station	Time	Weekday	Week number
mP3	14.00-15.00	Wednesday	7
	15.00-16.00	Thursday	7
	11.00-12.00	Friday	7
	12.00-13.00	Monday	8
	09.00-10.00	Tuesday	8
	13.00-14.00	Wednesday	8
	10.00-11.00	Thursday	8
	16.00-17.00	Friday	8
	08.00-09.00	Monday	9
P3	14.00-15.00	Wednesday	7
	15.00-16.00	Thursday	7
	11.00-12.00	Friday	7
	12.00-13.00	Monday	8
	09.00-10.00	Tuesday	8
	13.00-14.00	Wednesday	8
	10.00-11.00	Thursday	8
	16.00-17.00	Friday	8
	08.00-09.00	Monday	9
P5	15.00-16.00	Thursday	7
	12.00-13.00	Monday	8
	13.00-14.00	Wednesday	8
	10.00-1100	Thursday	8
	16.00-17.00	Friday	8
	14.00-15.00	Monday	14
	08.00-09.00	Tuesday	14
NRJ	14.00-15.00	Wednesday	7
	15.00-16.00	Thursday	7
	11.00-12.00	Friday	7
	12.00-13.00	Monday	8
	09.00-10.00	Tuesday	8
	13.00-14.00	Wednesday	8
	08.00-09.00	Monday	9
Kiss	14.00-15.00	Wednesday	7
	11.00-12.00	Friday	7
	10.00-11.00	Thursday	8
	16.00-17.00	Friday	8
	08.00-09.00	Monday	9
	13.00-14.00	Monday	14
	09.00-10.00	Thursday	14
Radio Norge	09.00-10.00	Wednesday	9
	10.00-11.00	Wednesday	9
	12.00-13.00	Thursday	9
	13.00-14.00	Thursday	9
	11.00-12.00	Monday	10
	14.00-15.00	Wednesday	11
	15.00-16.00	Wednesday	11
P4	07.00-08.00	Wednesday	9
	08.00-09.00	Wednesday	9
	09.00-10.00	Wednesday	9
	10.00-11.00	Wednesday	9
	12.00-13.00	Thursday	9
	13.00-14.00	Thursday	9
	11.00-12.00	Monday	10
	14.00-15.00	Wednesday	11
	15.00-16.00	Wednesday	11

Appendix D: Mean comparison tests. Calculations of t-values.

To compare two groups and examine whether their means are statistically different, we use a t-test with the following null and alternative hypothesis:

$H_0: \mu_{NRK} \leq \mu_{Comercial}, \quad H_a: \mu_{NRK} > \mu_{Comercial}$

We use a one-tailed test, because we want study whether the NRK stations play significantly more songs and have more new songs than the commercial stations.

The T-values are obtained by using the following formula:

$T = \frac{\bar{X}-\bar{Y}}{S/\sqrt{\frac{1}{n_1}+\frac{1}{n_2}}}$, where S is the sample standard deviation and the number of degrees of freedom is $n_1 + n_2 - 2$.

	T-value	P-value
Number of different songs	1.70	9.80 %
Avg. number of A-rotate spins	1.21	15.73 %
Music % total	0.40	35.80 %
Songs played first time on station	1.71	9.31 %
Songs played first time in Norway	2.178	5.89 %

Appendix E: Survey

E.1 Questionnaire

Q001 - Q001: Screening 1 — **Single coded**

Not back

Hvor ofte hører du på radio? *How often do you listen to the radio?*

Normal

1 ❍ Månedlig eller oftere *Monthly or more often*

2 ❍ Sjeldnere enn én gang i måneden *Less often than once a month*

↳ GO TO SCREEN OUT

3 ❍ Aldri *Never*

↳ GO TO SCREEN OUT

Q002 - Q002: Screening 2 – Radiolytting — **Matrix**

Not back | Number of statements: 14 | Number of Scales: 6

Hvor ofte hører du på følgende radiokanaler?

How often do you listen to the following radio stations?

Ett svar pr. Kanal *One answer per channel*

Random

	Daglig *Daily*	Ukentlig Weekly	Månedlig *Monthly*	Sjeldnere *Less often*	Aldri *Never*	Vet ikke *Don't know*
P4	❍	❍	❍	❍	❍	❍
Radio Rock	❍	❍	❍	❍	❍	❍
Radio Norge	❍	❍	❍	❍	❍	❍
NRK P3	❍	❍	❍	❍	❍	❍
NRK P1	❍	❍	❍	❍	❍	❍
Kiss (tidligere / *former* Radio1)	❍	❍	❍	❍	❍	❍
P5 Hits	❍	❍	❍	❍	❍	❍
NRK P2	❍	❍	❍	❍	❍	❍
NRJ	❍	❍	❍	❍	❍	❍
NRK P13	❍	❍	❍	❍	❍	❍
NRK mP3	❍	❍	❍	❍	❍	❍
P6 Rock	❍	❍	❍	❍	❍	❍
P8 Pop	❍	❍	❍	❍	❍	❍
Andre radiokanaler / *Other channels*	❍	❍	❍	❍	❍	❍

Scripter notes: Screening spørsmål 2; Hvis Svaralternativ NRKmp3= daglig, ukentlig eller månedlig = FORTSETT UNDERSØKELSEN, HVIS NRKmp3= sjeldnere eller aldri - SCREEN OUT

Scripter notes: *Screening question 2; If option NRKmp3= daily, weekly or monthly = Continue the survey, if NRKmp3= "less often" or "never" - SCREEN OUT*

Ask only if **Q002 - Q002** ST=14 & SC=1,2,3

Q003 - Q003: Andre kanaler / *Other stations* **Open**

Not back

Hvilke andre radiokanaler hører du på? / *Which other radio stations do you listen to?*

9999 ❍ Vet ikke / *Don´t know* *Position fixed *Exclusive

Q004 - Q004: Førstevalg-hjulpen / *First choice aided* **Single coded**

Not back

Hvis du skal høre på radio, hvilken radiokanal vil være førstevalget ditt?
If you were going to listen to the radio, which radio station would be your first choice?

KUN ett svar mulig / *ONLY one answer is possible*

Normal

1	❍	P4
2	❍	Radio Rock
3	❍	Radio Norge
4	❍	NRK P3
5	❍	NRK P1
6	❍	Kiss (tidligere Radio1)
7	❍	P5 Hits
8	❍	NRK P2
9	❍	NRJ
10	❍	NRK P13
11	❍	NRK mP3
12	❍	P6 Rock
13	❍	P8 Pop
14	❍	Annen kanal / *Other station* *Open *Position fixed

Scripter notes: SPLITT; 50% får Q4 hjulpent spørsmål og 50% får Q5 uhjulpent
Scripter notes: *SPLIT; 50 % are given Q4 as aided and 50% are given Q5 as unaided*

Q005 - Q005: Førstevalg uhjulpen / *First choice unaided* **Open**

Not back

Hvis du skal høre på radio, hvilken radiokanal vil være førstevalget ditt?
If you were going to listen to the radio, which radio station would be your first choice?

KUN ett svar. / *ONLY one answer is possible*

9999 ❍ Vet ikke / *Don't know* *Position fixed *Exclusive

Scripter notes: SPLITT; 50% får Q4 hjulpent spørsmål og 50% får Q5 uhjulpent
Scripter notes: *SPLIT; 50 % are given Q4 as aided and 50% are given Q5 as unaided*

Q006 - Q006: Andrevalg – hjulpen / *Second choice aided* **Single coded**

Not back

Hvis [sett kanal for førstevalget fra spørsmål 4] ble lagt ned, hvilken kanal ville du da hørt på?
If [insert first choice channel from question 4] were shut down, which radio station would you then have listened to?

Kun ett svar mulig / *Only one answer is possible*

Normal

1	❍	P4
2	❍	Radio Rock
3	❍	Radio Norge
4	❍	NRK P3
5	❍	NRK P1
6	❍	Kiss (tidligere Radio1)
7	❍	P5 Hits
8	❍	NRK P2
9	❍	NRJ
10	❍	NRK P13
11	❍	NRK mP3
12	❍	P6 Rock
13	❍	P8 Pop
14	❍	Annen kanal / *Other channel* *Open *Position fixed

Scripter notes: Vis ALLE kanaler fra Q2, minus den kanal som er valgt som førstevalg i Q4
SPLITT; 50% får Q6 hjulpent spørsmål og 50% får Q7 uhjulpent
Dersom Q4=14 (Annen kanal) - kan respondenten få spørsmålet på følgende måte:
Hvis [kanalen som er førstevalget ditt] ble lagt ned, hvilken kanal ville du da hørt på?

Scripter notes: *Show all channels from Q2, excluding the channel that is chosen as the first choice in Q4*
SPLITT; 50% are given Q6 as aided and 50% are given Q7 as unaided.
If Q4=14 (Other channel) – the respondent could have the question as follows:
If [the channel that is your first choice] is shut down, what channel would you then listen to?

Q007 – Q007: Andrevalg-uhjulpen / *Second choice unaided* **Open**

Not back

Hvis [first choice] ble lagt ned, hvilken kanal ville du da hørt på?
If [first choice] were shut down, which radio station would you then have listened to?

Kun ett svar / *Only one answer is allowed*

9999 ❍ Vet ikke / *Don't know* *Position fixed *Exclusive

Q008 - Q008: Reklamekanaler / *Commercial stations* **Multi coded**

Not back

Hvilke(n) av disse radiokanalene mener du har reklame?
Which of the following radio station(s) do you believe broadcast advertising?

Flere svar mulig / *More than one answer is allowed*

Normal

1 ❑ P4
2 ❑ Radio Rock
3 ❑ Radio Norge
4 ❑ NRK p3
5 ❑ NRK P1
6 ❑ Kiss (tidligere Radio1)
7 ❑ P5 Hits
8 ❑ NRK P2
9 ❑ NRJ
10 ❑ NRK P13
11 ❑ NRK MP3
12 ❑ P6 Rock
13 ❑ P8 Pop
14 ❍ Ingen av disse kanalene har reklame /*None of these channels broadcast advertising*
*Position fixed *Exclusive

Q009 – Q009: Minutter med reklame / *Minutes of advertising* **Open**

Not back

For kanalene du krysset av i forrige spørsmål; hvor mange minutter med reklame mener du de gjennomsnittlig har i løpet av en time?
For the radio stations marked in the previous question; how many minutes of advertising do you believe these stations broadcast on average during an hour?

9999 ❍ Vet ikke / *Don´t know.* *Position fixed *Exclusive

Scripter notes: Åpent svar; tillat KUN verdier mellom 1-60
Scripter notes: Open answer; Only values between 1-60 allowed

Q010 – Q010: Økning reklamemengde / ***Increase in advertising amount*** **Single coded**

Not back

Vil en økning i reklamemengden
på ett ekstra minutt i timen gjøre det mer eller mindre attraktivt å høre på disse kanalene?

Would an increase of one additional minute an hour in the advertising level make it more or less attractive to listen to these stations?

Vennligst angi ditt svar på en skala fra 1 til 9, der 1= mye mindre attraktivt, 5= like attraktivt og 9=mye mer attraktivt

Please specify your answer in a scale from 1 to 9, where 1= much less attractive, 5 = equally attractive and 9 = much more attractive

Normal

1	❍	Mye mindre attraktivt / *Much less attractive*
2	❍	2
3	❍	3
4	❍	4
5	❍	5
6	❍	6
7	❍	7
8	❍	8
9	❍	Mye mer attraktivt / *Much more attractive*
10	❍	Vet ikke / *Don't know *Position fixed*

E.2 Results

Q001

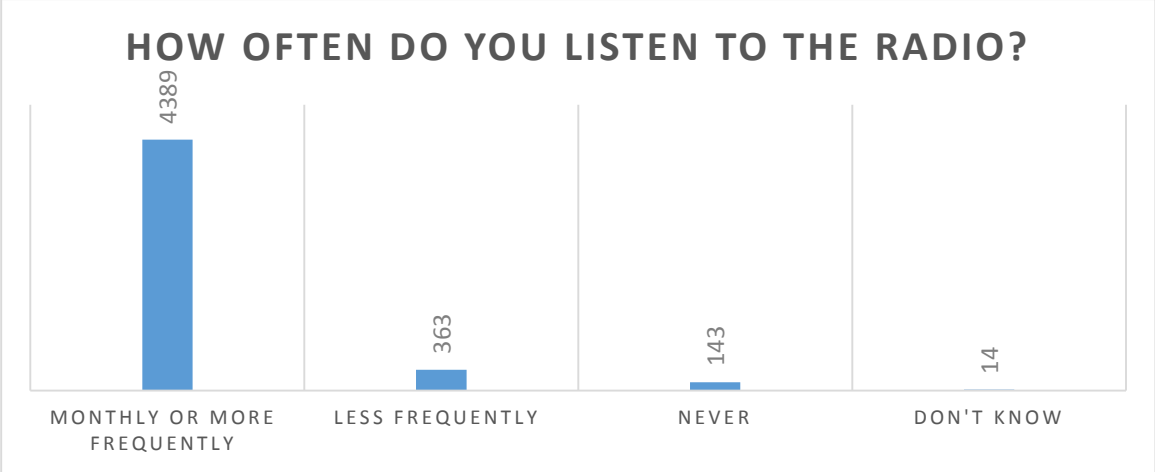

Figure 20: Screening 1. General radio habits.

Q004 and **Q005**

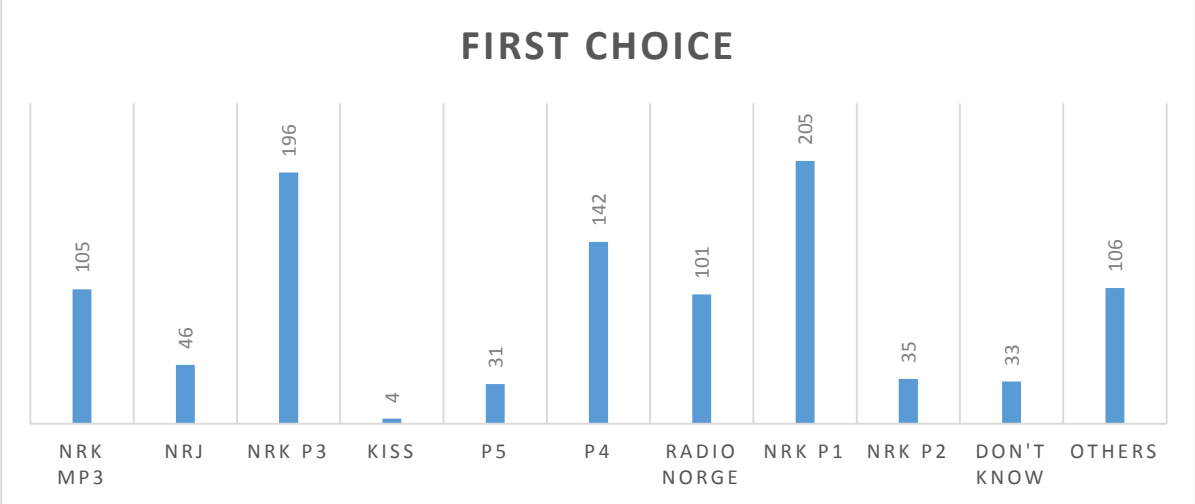

Figure 21: First choice.

**Note that we have screened on monthly mP3 listeners.*

Q008

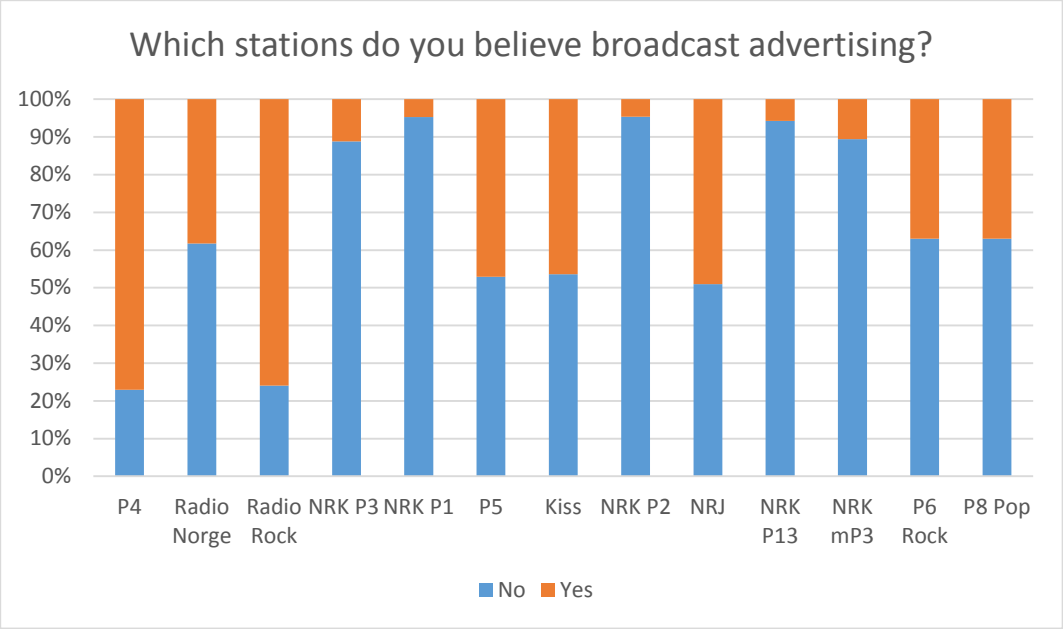

Figure 22: Share of the respondents that believe a certain station have advertising.

Q010

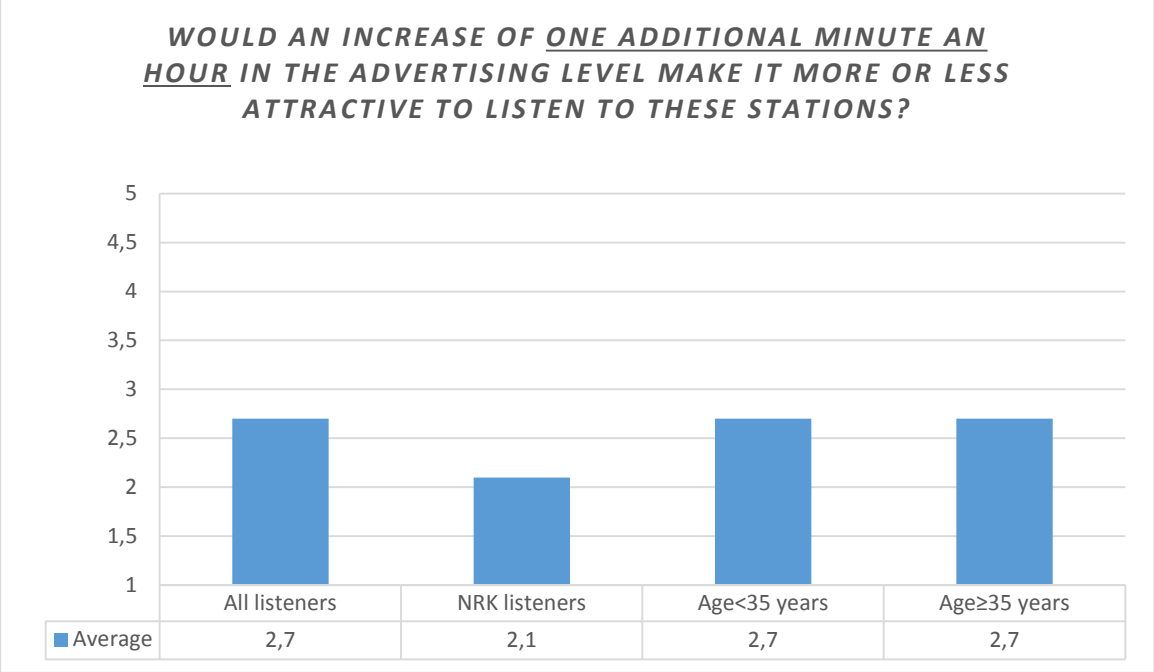

Figure 23: Effect of increased amount of advertising.

**1 - Much less attractive. 9 - Much more attractive*