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Reorientation of the US Radio Market

-An empirical analysis of ownership and concentration changes after the 1996 radio market deregulation

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Abstract

In this paper I theoretically and empirically study the effects of radio ownership structure on revenue and station distribution across radio markets after the 1996 deregulation of the radio market in the US. I find that market expansion by radio owners has been more significant in large markets compared to small markets with respect to revenue between 1997 and 2000, and in rich markets compared to poor markets between the two time periods, also with respect to revenue. Moreover I find significant concentration in the market nationally both with respect to revenue and stations. However, I find no statistically significant change in local concentration between the two time periods. When regressing relative C1-C3 market shares on the number of stations in local markets, I find that the largest firms decrease their market shares relative to the rest of the owners in the markets. Finally, I find that incumbents have been more successful at product differentiation than entrants. This may be due to the nature of the radio market, which is characterized primarily by large fixed costs, close to zero marginal costs, and great economies of scale and its product, which is characterized by repeated sales. These market features enable incumbents to pre-empt entry and expand into new markets more effectively compared to in a normal goods industry.

Content

1. Introduction[1]

In this paper I theoretically and empirically study the effects of radio ownership structure on revenue and station distribution across radio markets after deregulation of the US radio market.

The cost structure of radio market is somewhat unusual compared to many other industries, as the industry is characterized by large fixed costs, close to zero marginal costs, and great economies of scale (primarily after the deregulation). Moreover, the radio product also differs from normal goods since it is free to consume, and is characterized by the possibility of "repeated sales", i.e. that radio owners can broadcast the same show over many different stations in many markets at little extra cost.

When studying the US radio market during my thesis research, I somewhat naturally got to focus on concentration changes as I found this to be a particularly interesting topic in aspect to a newly deregulated market. Given the nature of the radio market and its product, I expected to find differences between general concentration theory on normal goods and industries compared to the radio market, which it has been my intention to explore theoretically as well as empirical.

The US commercial radio broadcasting market was deregulated in 1996, allowing for radio owners to expand their number of stations without limits nationally, and with some limits locally. Since the previous US radio regulation had created a fragmented market, I expected to see significant shifts in concentration, stations, markets, and revenue given data on a rather limited time period (1997 and 2000), which I also did. As I do not have data on 1996, I treat my 1997 data as a benchmark for the time of deregulation.

The findings of this paper are, I believe, primarily of interest for policy makers and competition authorities monitoring deregulated radio markets in, or sharing features similar to, the US radio market, since I believe that deregulating the radio market has different implications on e.g. concentration compared to a normal goods market.

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[1] First and foremost I would like to extent my sincere gratitude to Associate Professor Måns Söderbom at Gothenburg School of Business, Economics and Law Department of Economics for supervising my master thesis, and doing so much more than that. Mr. Söderbom is a former Fellow at the University of Oxford, which is directly attributable for making my cross-university thesis research and writing between Oxford and Gothenburg University work successfully.

Moreover, I would like to thank Professor Steve Bond at Nuffield College in Oxford for supervision during my studies at Oxford University Department of Economics. I would also like to extent my gratitude to Dr. Howard Smith at Keble College in Oxford for providing me with the data set on the US radio market, as well as taking time to discuss the radio industry with me. Finally, I would like to thank second year MPhil-student at Oxford University Department of Economics Fred Beelitz for creative discussions during my thesis work.

I begin by testing my hypothesis that after the deregulation of the commercial radio market, radio owners have expanded revenue the fastest in relatively large markets. I define a large commercial radio market as a market with more than 900,000 individuals (and a small market as less than 900,000), which gives me a similar sized distribution between markets. My hypothesis is that once increased expansion and market concentration was allowed in 1996, radio owners strategically chose a first move to occupy the most important and profitable national areas, primarily focusing on expansion in large markets as they carry greater potential for economies of scale (which are significant) regarding broadcasting, programming and administration, compared to small markets. I find statistical evidence that radio owners has expanded more aggressively in large markets over small markets with respect to aggregated revenue across markets.

My second hypothesis is that radio owners (and advertisers indirectly) expand more aggressively in rich markets than in poor markets, since rich markets display a higher level of purchasing power which advertisers should want to access to a larger degree than for poor markets. Although, I also argue that poorer on average spend more time listening to the radio. I arbitrarily define rich markets as markets with a median income of, or above, $50,500 per individual on an annual basis, and poor markets as a market with a median income below $50,500 in order to get a similar sized group distribution. I find statistical evidence that radio owners have expanded more aggressively in rich markets than in poor markets with respect to revenue, since the potential customer base for both radio owners and advertisers on the margin have more purchasing power, even though a poor market is probably more susceptible to advertisers.

My third hypothesis is that both local and national market concentration has increased after the deregulation, both with respect to revenue and the number of stations. I find no statistical evidence for any shift in local market share between 1997 and 2000 for the largest owners on revenue. However, I find a modest relative local market share decrease on stations for the largest owners, indicating that these particular owners in the average market decreased their market share with respect to the number of stations. Moreover, I find that concentration with respect to both revenue and stations increase significantly between 1997 and 2000 on a national level.

My fourth and final hypothesis is that entry in the market has increased after the deregulation, combined with increased and more successful product differentiation by incumbents compared to entrants. I estimate entry by dividing the radio owners into segments depending on their size relative to their number of stations. I find that medium-sized radio owners' market share fall to the largest owners in the market, but also to the smallest owners, which I argue can be interpreted as entrants in the market. This enables me to further analyze whether incumbents have been more successful at product differentiation compared to

entrants, given a set of assumptions. I argue that the economies of scale in the radio market combined with the nature of the product (multiple sales) provides a particular well-suited environment for large established firms to product differentiate more successfully than entrants, as well as small established firms, consequently increasing concentration both regarding revenue and the number of stations.

In the whole, the evidence in this essay suggests that the nature of the radio market to some extent magnifies the general characteristics of concentration changes in deregulated markets. Since the theoretical costs of opening up new stations and new markets for incumbents are low, concentration, product differentiation and pre-emption, I argue, are more easily obtained in the radio market compared to normal goods markets.

The plan of the paper is as follows. Chapter 2 reviews the conceptual framework. Chapter 3 describes the data used in the study and presents some relationships in the data. Chapter 4 adapts the theory to radio broadcasting, presents the econometric specification and the estimation results, and chapter 5 concludes.

2. Conceptual Framework

In order to analyze market share and concentration changes, as well as entry and product differentiation after the deregulation in the US radio market, I find it important to set the theoretical framework for the subsequent empirical analysis. In the succeeding chapters I contrast theoretical predictions with empirical data, as I expect to find some discrepancies between general theories on e.g. concentration changes with the US radio market given the different nature of the radio product compared to normal goods.

2.1 The Product

The radio product is a "special" product in several ways. First, commercial radio stations "sell" radio listeners to various advertisers in order to generate revenue. Of course listeners are not the purchased input of commercial radio firms, but choose by their own free will whether or not to listen to the radio. All revenue a radio station generates is from advertising. Second, the price of advertisement sold by a station is proportional to the number of listeners, i.e. buying advertising time for a station in a large city is more expensive than buying time in a small rural community (more on this in the next chapter). Third, I assume that when a station experience an increase in the number of listeners, its revenue increases proportionally. Consequently, total revenue for a commercial radio station is then defined as the market advertisement price per listener times the number of listeners for that particular station (Berry and Waldfogel, 1996).

Now consider the effects of regulations on consumer welfare. Consumers are by definition who the government (in our case the US Department of Justice Antitrust

Department [DOJ]) wants to protect. The radio market is in this regard somewhat different from most other markets since radio broadcasting is both free and a public good since it is non-rivalrous and non-excludable, meaning that me listening to the radio will not affect your decision to do the same, and we can listen to it at the same time for free. We can argue that the more advertising we have over the air, the lower consumer welfare we will have since the quality of the shows will decrease with more commercial breaks. But since the product is free to start with, you are never worse of than if you had not turned on the radio in the first place. However, there is no doubt that the radio increases welfare compared to not having it.

Moreover, since consumers do not pay to listen to radio, they are not subjected to any monopoly inefficiency pricing that we would normally be discussing when studying potentially concentrated markets. I therefore find it of more interest to look at the situation of radio advertisers, since they are purchasing something, i.e. commercial airtime from radio owners, which is by no means free of charge. Arguably, the focus of the Department of Justice is instead directed at the advertisers since they are potentially subjected to unfair pricing. In sum, the possible negative effects of high concentration (high market power) in the US radio market are almost exclusively channelled to advertisers rather than to listeners, yet another feature distinguishing the radio market from most other markets.

2.2. Technology, Costs and Revenue

The cost structure of radio market is somewhat unusual compared to many other industries, as the industry is characterized by large fixed costs and close to zero marginal costs. Fixed cost is a cost that a firm must sustain in order to produce, which is independent of the number of units of output. Fixed costs are always sunk to some extent since market imperfections prevent firms from recapturing the full value through e.g. instantaneous rental of capital or hiring of labor. Fixed costs (which are independent of the scale of production) are, however, only sunk in the short run, and sunk costs are those investments that produce a stream of benefits over a long period of time, yet they can never be recouped (Tirole, 1988: 307-308). In regard to the radio market, fixed costs are the costs that radio owners face each period independent of their production output, i.e. broadcasting.

Berry and Waldfogel (1996) argue that large fixed costs and close to zero marginal cost create a market in which free entry is most likely to be socially (economically) inefficient. The number of firms in the market quickly tends to become excessive beyond the optimal point with free entry in the market when new products are substitutes current products. If so, the business-stealing from incumbents the is tendency for social inefficiency. It is, however, not my intention to study social efficiency, but rather to get an idea of the theoretical extent of anticipated entry in a market similar to the commercial radio market. According to Berry and Waldfogel the deregulation should result in increased entry, as entry is set free in the sense

that owners do longer suffer from station and market restrictions after the deregulation.

Mankiw and Whinston (1986) argue that we get excessive entry (socially inefficient) in a market of homogenous goods (which many authors assume the radio market is in their models) when firms must incur fixed costs upon entry (like the radio market). In the presence of business-stealing, free entry will according to the authors lead to social inefficiency since the marginal entrant increases variety, but does not capture the resulting gain in social surplus as profits (Makinw and Whinston, 1986:57). Consequently, both Berry & Waldfogel and Mankiw & Whinston argue that there is a theoretical possibility that the radio market should experience significant entry (whether or not socially efficient) after a deregulation.

If we in fact expect significant entry in the commercial radio market, this could potentially increase the effect of business-stealing. Business-stealing occurs when entrants or incumbents align their products so close to each other that the consumers perceive them as substitutes (I will discuss this more later in this chapter). Consequently, the consumers (in our case the listeners) do not care from which producer (owner) they consume their product, as they are perceived as identical, which means that one of the firms steal listeners from the other, instead of trying to create a new audience for their station. Business stealing is competition, however, it is characterized by rivals trying to create substitutes for current products, rather than shifting consumers by introducing new products.

Business-stealing effect is present if the equilibrium output per firm declines as more firms enter the market. Under imperfect competition (above marginal cost pricing), business-stealing is vital determining the number of firms entering into a specific market. Mankiw and Whinston (1986) conclude that business stealing and product differentiation (which I will discuss in detail later in this chapter) work in opposite directions in a homogenous product market affecting the level of entry.

Another important feature of the radio market structure is economies of scale. Prior to the 1996 deregulation, the radio market suffered from inefficiency, as the US government intervened to prevent commercial companies from cutting costs by expanding their production locally as well as nationally. Economies of scale within the radio market can for instance be captured through e.g. mergers and acquisitions, sharing one general manager and other management personnel, production, programming, reduced staff, bulk discounts on services and shared facilities (Ekelund, Ford and Koutsky, 2000).

Another issue is the pure size of the market. Prior to the deregulation, the market was capped; you could not have stations in the entire US market at once. With the deregulation, the market suddenly increases to its natural size, with a much greater customer base for firms to profit from through advertisement.

In conclusion, given the nature of the radio product and radio market, we should in theory expect significant entry in the market (combined with a growth of the largest firms

through mergers and acquisitions in order to capture increased economies of scale) in the period after the deregulation, although the level of product differentiation should reduce this effect to some extent if we assume that the radio market is homogenous.

The financial situation of radio owners (revenue) is primarily determined through station ratings. Radio station ratings are most easily understood if we identify it as the currency in the radio market by which radio time is bought and sold. Radio owners generate revenue by selling airtime to advertisers that pay the owners to broadcast their advertisements. Ratings (the radio currency), which are conducted on a regular basis, are the measure that advertisers use to determine the price they are willing to pay the radio owners, i.e. the higher the rating, the higher the price advertisers are willing to pay. Revenue is rather self-explanatory when determining owners' financial situation. Recall that commercial radio stations generate their entire revenue from advertisement.

There are two important measures for rating listening which in turn help determine the rating: Cume and Time Spent Listening. Cume is the number of people that tune in to listen on the radio in a week. Time Spent Listening is simply the average number of hours people listen to radio (Arbitron, 2005).

Since station ratings are what advertisers use to determine the price they are willing to pay, and that radio owners generate their revenue from these advertisements entirely, ratings are a likely indicator of an owner's revenue (as they generate their entire revenue from advertisements).

If a radio station captures more listeners, advertisers will want to pay more to gain access to their large customer base, translating into greater revenue for the station, and consequently its owner. Radio advertisers on their hand can for instance limit their purchase to e.g. the top three stations in a particular market. Hence, the rating of stations is very important both for stations and advertisers (Arbitron, 2005). Radio owners, on the other hand, also have ways to influence the price advertisers have to pay in addition to ratings and top-X stations. It is not uncommon for radio owners to also have businesses in other media segments, e.g. also owning TV stations (Myerson, 1998). This enables them to bundle offers together and sell packages to advertisers that span across both the radio and TV markets, increasing the demand for their radio and e.g. TV broadcasting services among advertisers.

The US commercial radio market is in many ways very different from analyzing other markets of "normal" goods since the "radio product" distributed to consumers are per se free to listeners, as we have discussed. A few percent of the market is, however, made up of public radio stations that have subscribers, but these are not within the scope of this paper.

2.3. Regulation

Before we turn to the data and subsequent empirical analysis, a brief introduction to the background and framework of the US radio market is in order.

Before the deregulation, the Federal Communications Commission (FCC) restricted the number of radio stations that owners were allowed, both within local markets as well as nationally, reaching back to 1938 (almost from the beginning of radio broadcasting). The purpose of the FCC restrictions was to promote economic competition and diversity in the radio market. The view of the FCC has historically been that diversification of ownership serves public interests best and prevent concentration of economic power. This provided the foundation of the strict ownership policy that was in place up until the mid 1990s. There were some modifications of policy, e.g. in 1970 allowing joint ownerships of radio stations in the same market, but still under strict quantitative ownerships rules (Ekelund, Ford and Koutsky, 2000).

In 1992, the FCC relaxed its ownership policy slightly, doubling the number of radio stations owners were allowed nationally from 20 to 40. In addition the FCC and also slightly increased the number of stations owners that were allowed in local markets from two to three or four depending on market size.

The radio industry argued that increased local concentration would permit them to enjoy economies of scale from consolidation of facilities to managerial aspects. Quite interestingly, the FCC agreed with its critics, i.e. that increased local concentration would probably be in the best interest of the public. Even though, the FCC kept its ownership policy in place until the US Senate and President Clinton in 1996 directed the FCC to change its rules through the Telecommunications Act, which relaxed (deregulated) the ownership rules in the radio market. Smith and O'Gorman (2008) most clearly illustrate how the pre-1992 policy, the first 1992 relaxation, and later the 1996 deregulation restricted commercial radio companies from expanding (table 1).

Table 1: Government regulation on station ownership*

	Maximum # stations		
	Pre-1992	1992-1996	Post-1996
Nationally	20	40	No limit
Locally:			
Markets with 1-14 stations	2	3	5
Markets with 15-29 stations	2	3	6
Markets with 30-44 stations	2	3	7
Markets with +45 stations	2	4	8

*In 2009 there are 302 local markets across the US. A radio market is a market in which the population receive the same radio station offerings. Large metropolitan areas can be divided in to several sub-markets, as well as rural regions with few significant population centres can make up an area. Market regions can overlap, meaning that people living on the edge of one market may be able to receive radio content from a nearby market.

The radio market regulations set in place by the FCC prior to 1996 created a fragmented market structure both locally and nationally, where market concentration was kept low. Although the FCC recognized that allowing increased concentration locally would most likely be to the benefit of consumers, the regulations were kept in place.

After the deregulation, previous ownership limits was relaxed significantly, or removed all together. Local market limits was increase up to eight stations per owner and market, but primarily the previous limits on the number of stations allowed per owner nationally was removed. The fragmented pre-1996 radio market now became open for owners to increase concentration levels as they sought to e.g. enjoy economies of scale and become more profitable.

2.4. Conduct

When deregulating a market, i.e. opening it up for increased competition and concentration changes primarily, strategic aspects become increasingly important as firms try to increase their own market share, but keep rivals market share at a minimum. Simultaneously they like to price above marginal cost (in our case advertising prices), something I would like to return to later in this chapter. I begin the theoretical discussion by discussing how concentration and revenue should change in theory with a deregulation in the radio market.

Before 1996, the US radio was a fragmented market, as local as well as national ownership was constrained by ownership limits as earlier mentioned. It is therefore reasonable to predict that concentration should increase both with respect to revenue and the number of stations within owners. When a market is fragmented (low market power), radio owners in the regulated radio market should arguably be price-takers towards advertisers. If firms expand in size either by revenue or the number of stations, concentration (market power) increases, which should increase the likelihood of a shift from radio owners being price-takers to price-setters, increasing the average price for advertising in the market. With the deregulation, it is therefore reasonable to argue that both total revenue as well as the total number of stations in the market should increase. Revenue should theoretically increase due to increased market power i.e. bargaining power of radio owners. Moreover, the number of stations should theoretically increase for each firm with market size, as they can now expand nationally without limit.

It is not unlikely that a concentration increase after the 1996 deregulation will come primarily through a series of mergers and acquisitions, something that characterizes newly deregulated markets as firms want to increase their economies of scale primarily. Although this effect increases concentration, we will probably also experience increased and

simultaneous entry in the market as we discussed in section 2.1. I therefore discuss entry, barriers to entry, as well as the strategic implications this might have for incumbents.

Our theoretical assumptions have so far rested on the notion that barriers to entry are primarily made up of large fixed costs, which are static in the sense that we have not yet assumed that incumbents will try to change them as concentration changes. If concentration increases after the deregulation due to increased size and market share by the largest owners in the market, there is reason to believe that barriers to entry will not only persist, but increase with concentration as established firms seek to pre-empt other firms from entering the market in order to protect their market shares and revenues. Incumbents have many reasons for trying to raise barriers to entry in the commercial radio market in order to e.g. reduce the effect of business-stealing by entrants that align their stations and program variety along theirs. If incumbents are unsuccessful at both blocking new entrants, but also at filling niche areas between their current stations, entrants are in a position to create near substitutes to the stations of the incumbents, consequently stealing listeners, which in turn lower advertising revenues for the incumbents. Arguably, it is in the interest of the established commercial radio owners to close the "gaps" in their product range in order to pre-empt both entry and business-stealing. Given that incumbents are indeed successful at pre-empting entrants from competing in the market, they pave the way for increased imperfect competition in which they can act increasingly like price-setters, in position to set advertising prices above marginal cost. Since we in theory might suspect incumbents to try to block potential entrants, let us consider some of the means, which by incumbents can increase barriers to entry in order to deter entry and keep/increase competition at an imperfect level.

2.4.1. Pre-emption and Barriers to Entry

Bain (1956) identified four elements of market structure that affect established firms' ability to prevent entrants capturing their above marginal cost pricing, as well as entering the market (Tirole, 1988:306):

Economies of scale: This is probably one of the most effective ways to raise barriers to entry by incumbents. By enjoying economies of scale, large owners are able to reduce marginal costs, which allows them to do several things. First, their profit margin potentially increases, as it is less expensive for them to operate. Second, they are able to lower prices if competition becomes intense, but break-even or even remain profitable as rivals struggle with deficits. Third, accumulate capital for investments further excelling their growth.

Absolute cost advantages: This is perhaps of less interest for us, but an absolute cost advantage could be learning-by-doing, and incumbents having acquired know-how in the industry that entrants do not have upon entry.

Product-differentiation advantages: Incumbents may have cornered the right niches in the product space or have high degree of consumer loyalty through branding. This is an important aspect in the commercial radio market. If we assume that an incumbent in the commercial radio market is a first mover in a game with entrants, there is a significant advantage to possible preemption by the incumbent. The conclusion is that a firm that delays its investments a bit, e.g. incumbents investing in new/existing radio markets, loses its first-mover advantage to some extent. A commercial radio firm that fails to e.g. occupy the right radio market niche on time may not be able to prevent an entrant from occupying the niche.

Capital requirements: This element of entry barriers is made up of the notion that entrants may have a harder time than incumbents raising capital for investments for entering a market. In our case this may be raising money for acquiring a broadcasting license, buying sound equipment, or buying or renting real estate to broadcast from. Creditors may have a more favorable view of the established firms in the market since they have worked with them before, and then would choose to finance an incumbent over a potential entrant. This is more of a general aspect of entry barriers, in which incumbents can raise entry barriers for entrants simply by accumulating more capital, either to invest, or in order to survive a price war in advertising revenues.

The issue of capital may therefore also be an aspect of predation by established firms, i.e. established commercial radio firms lowering advertising prices significantly, damaging the entrants' finances if they do the same in order not to lose advertisers. Predation can also prevent entry all together. On the other hand, incumbents may be locked in long-term price agreements e.g. with their advertisers. There is then room for entrants to undercut the incumbent's prices and consequently capture some market share and revenue in the short run before the incumbent can respond effectively. (Tirole, 1988:310)

Finally, Bain (1956) argues that although product-market competition determines the market price in the short run, firms compete through the accumulation of capital in the long run. It is therefore a great advantage to enter the market as early as possible in order to accumulate enough capital to withstand strategic responses by other players.

Based on the theoretical arguments presented, I argue that we should see large incumbents invest heavily in market expansion after the deregulation in 1996 in order to become more cost-efficient, to increase revenue, and to raise barriers to entry for potential entrants. This market expansion is arguably in the form of increasing revenue, the total

number of stations (e.g. to fill product niches), and the number of markets that large incumbents operate in (e.g. enjoy economics of scale and fill product niches across markets), something I will study more in chapter 3.

Consequently, I find that there are several theoretical arguments in favor of the radio market experiencing a significant increase in concentration, something I will study empirically by for instance calculating concentration indices. If owners increase their market shares, and with that market power, I argue that there is also reason to suspect that competition will become increasingly imperfect as large radio owners have more power to bargain with advertisers. Determining whether or not radio owners become true price-setters in a market of imperfect competition is, however, not within the scope of this paper.

2.4.2. Product Differentiation

Now that we have studied the theoretical implications of e.g. entry, barriers to entry, economies of scale, and pre-emption, I argue that this introduces a new aspect to product differentiation in a radio market.

Based on our earlier theoretical discussion, I argue that the deregulation in 1996 made it possible for radio owners to differentiate their products more effectively, i.e. by increasing their supply of stations. Before the deregulation an owner could only have 20 (later 40) nationally, and no more than two (later three) stations in each local market. This would imply that a radio owner prior to the deregulation had to choose in which format his e.g. three stations should focus on, for instance classical music on one, country and pop music on the other two (given that he would concentrate his stations to fewer markets and not spread them out nationally). You could of course argue that one station could hold various formats, e.g. in mix of several formats during different times of the day, however, I find this somewhat unlikely since the product is then more undifferentiated. I will assume that owners choose formats based on finding and locking in certain niches, and not risking losing listeners by combining classical music and pop on the same station. Given this assumption, it is not until the deregulation in 1996 that owners can product differentiate effectively. However, we still have local limits on the number of stations allowed for one owner, but the upper limit moves to eight, which allows owners to cover the most traditional formats if they want to. After the deregulation, radio owners could expand into many new formats in as many markets as they like nationally. Consequently, I find it interesting to analyze (theoretically and later empirically) which owners are most "successful" at product differentiating after the deregulation, i.e. expanding their number of stations in new and current markets.

The radio market is different compared to many other markets as I have previously argued, since you for instance can "sell" the same product repeatedly. If you broadcast a show in Los Angeles, you can record it and broadcast it in New York simultaneously, or later if you

wish, at little extra cost. This is an interesting feature when discussing e.g. economies of scale compared to traditional industry products that are sold only once.

Relating this back to our discussion on barriers of entry and economies of scale, I argue that the difference in cost structures between entrants and incumbents when entering a new market are very different, creating a significant barrier to entry for the entrant. Incumbents know that they on average face less costs for setting up and competing in new markets (in theory only acquiring a license and copy one of their existing stations into that market), which enables them to strategically enter into markets or formats in order to pre-empt entry or to make it harder for entrants to capture market shares. From an economic point of view, the incumbent faces increased returns to scale, i.e. the more markets or formats that its enters into with already at least one established station, its costs per station is decreasing.
If this is the case, then product differentiation turns primarily into a matter of costs for the firms, subject to economies of scale and barriers to entry. This may be particularly valid for a market like the radio industry where the producer can sell its product repeatedly. The production cost of a radio show will decrease as the producer distributes it to more and more markets and listeners. If you are a large incumbent across markets, a good investment (both regarding product quality and financially) would arguably be to hire the best DJs and program hosts you can find, and then simply copy the station concept you have created for one market in new markets.

2.4.3. Anticompetitive Behaviour

One of the greatest challenges when deregulating a market is somewhat obvious, but never the less important: the risk of high concentration, and with that a greater risk of firms engaging in anticompetitive behaviour. Anticompetitive behaviour can be in the form of:

Changes in concentration: After the deregulation, radio owners now have the option to expand beyond the previously set ceiling on the number of stations through e.g. mergers and acquisitions. Competition authorities now have to monitor and evaluate proposed mergers and acquisitions if they suspect it will affect competition to negatively, spending both time and money trying to determine the effects of e.g. a particular merger between two radio companies on market power and prices to advertisers (mainly done through merger simulations). If the negative effects are too grave, the merger will not be approved. The resources (time and money) devoted to determining whether or not to approve a merger are obviously sunk, making it rather costly for government to uphold competition.

Abuse of dominant position: Assuming that increasing concentration leads to fewer, but larger radio owners in the market (something I will analyze in the next chapters), there is the

risk of them abusing their dominant position against both advertisers and other radio owners. In sum, large firms are generally not allowed to do things that small firms may choose to do. There are mainly the potential problems of: first, predation and deterrence. Large owners can in various ways try to make other radio owner exit a market, or easy targets to acquire. Predation is hard for owners and authorities to prove, as it is difficult to determine whether a large owner prices below marginal cost. In the commercial radio market this would for instance be expressed as owners offering advertising time very cheap to advertisers, which could affect rivalling firms negatively.

Second, Overpricing. After predation comes the possibility of re-raising the price to a level higher than prior to the predatory attack. Given that the large company made smaller owners exit the market, there is now room for a potential price increase above the previous level. This is particularly a problem since entry costs in the market are high.

Anticompetitive agreements (also possible within a regulated market, but on a smaller scale): Commercial radio owners can agree to coordinate their advertisement prices to a common level (collude) in order to increase prices and profit margins among the participating colluders. Although radio companies can engage in anticompetitive agreements in both a regulated and a deregulated market, there is arguably a greater risk of a successful collusion in a deregulated radio market, since concentration will probably increase, leaving fewer agents in the market making it easier to coordinate their actions and act as one monopoly firm. In addition, the negative effects of anticompetitive agreements increase with market and firm size.

2.4.4. Efficiency and Externalities

There are of course also many positive economic effects that radio owners can take advantage of in a deregulated US radio market, such as:

Strategy: Deregulation opens up for a much greater emphasis on strategy by firms. Which markets should a firm expand into? In what formats should their stations be? Should they diversify or go for a niche market in a niche location? Companies can complement their local strategies with an overall national strategy as the market becomes deregulated.

Product quality: With greater profit margins comes the possibility of investing more in the quality of the product for the consumers. Arguably, a company operating across many markets with large revenue due to advertisements has the money to hire more qualified staff to broadcast in the different markets, e.g. attract celebrities to radio broadcasting. Again, there is an issue of economies of scale in the sense that a company that is allowed to expand

beyond e.g. its 20 or 40 radio stations nationally, arguably experiences a decreasing marginal cost per show they broadcast, since more listeners can be included without having to hire more staff for a specific radio program. Of course, some stations focus specifically in a local market, bringing local news from that region etc, but some shows are more mainstream and do not include local information to the same extent. Although a mix, it is arguably beneficial for a company to operate in a larger market regarding marginal cost of producing mainstream radio shows. As discussed, the quality of the product to the consumers is probably increased moving from a smaller to a larger market.

Coordination: This effect is arguably less beneficial to listeners, but definitely so for both radio owners and advertisers. When more stations are under fewer owners, it is easier to coordinate actions. One issue might be to try to coordinate the timing of advertisements. Andrew Sweeting (2006) provides empirical evidence that support the hypothesis that commercial radio stations (ceteris paribus), prefer to coordinate the times for commercial breaks (the average in-car listener switches stations 29 times per hour primarily to avoid commercial) in order to promote less stations switching.

Business-stealing effect: With more stations under same ownership, stations that were previously competing for listeners (business-stealing) can now be aligned in a wider product line and thus internalize business-stealing effects. In another study by Sweeting (2004), he finds support that a common owner tends to increase product diversification if stations are in the same music format.

We have now described the conceptual framework of the US radio market: the product, the market structure, the regulations, and finally the possible behaviour of firms in the market. Given the nature of the product and market in the context of the deregulation, I found four hypotheses that I would like to analyze in greater detail.

My first hypothesis is that radio owners expand the fastest in large markets compared to small markets with respect to revenue after the deregulation. My second hypothesis is that that owners expand the fastest in rich markets compared to poor market with respect to revenue after the deregulation. My third hypothesis is that relative local market shares for the C1-C3 firms in the radio market have increased more relative to the rest of the owners within the markets with respect to both revenue and stations. Finally, my fourth hypothesis is that entry in the commercial radio market has increased since the deregulation in 1996.

I would therefore like to continue the analysis by introducing the data later used to empirically test how revenue and concentration has changed in the radio market between 1997 and 2000, and also provide evidence on some of the issues discussed in this chapter.

3. Data

The dataset consists of just under 4000 observations for two time periods in the US commercial radio market: 1997 and 2000. Although the deregulation of the radio market occurred in 1996, I will use the 1997 observations as a benchmark for the 1996 market in order to spot patterns and correlations, since I do not have commercial radio data from 1996.

3.1. Sample

The sample used in this paper is just under 4000 observations distributed over two time periods: 1997 and 2000. In each time period the observations are divided among 128 markets distributed across the US, i.e. markets are only used if they are in both time periods.

The reason for our sample size is also that these markets specifically were the only markets for which reliable revenue data was available, one of the main focuses of this paper.

Dr. Howard Smith, from whom I later received the data sample, originally obtained the data set from Duncan's American Radio.

3.2. Market Structure

I begin by studying the market structure from the data (table 2).

Table 2: Market structure in the sample

	1997	2000	%-change
Total # markets	128	128	
Total # owners	171	191	11,7%
Total # stations	1574	2139	35,9%
Total market revenue	6 236 million USD	9 411 million USD	50,9%

The data covers 128 markets, representing a sample of the US radio market. Recall that the US radio market is made up of roughly 300 markets nationally (in 2009).

From a macro point of view, table 2 indicates that the total number of owners across the 128 markets has increased slightly between 1997 and 2000 by just over ten percent, from 171 owners to 191. Aggregate number of commercial radio stations has increased more significantly by about 35 percent, from 1574 to 2139 radio stations. Finally, Aggregate market revenue across markets and owners increased by just over 50 percent between 1997 and 2000, from 6,2 billion USD to 9,4 billion USD. Recall that market revenue is generated entirely from advertisement. Consequently, there is either more advertising being broadcasted and/or the advertising prices have gone up. These trends are consistent with the theoretical arguments and predictions in chapter 2.

Tables 3 and 4 show some summary statistics on average revenue and markets per owner in the US radio market.

Table 3: Average revenue per owner (in million USD)

	Revenue per owner			Owner	
	1997	2000	% change	1997	2000
Maximum-value	1 012	2 727	169,4%	Westinghouse	Clear Channel
Median	8.1	4.6	-43,2%		
Mean	36.9	49.3	33,6%		
Stdev.	101.0	255.0	152,5%		

Table 4: Average # markets per owner

	Total # markets per owner			Owner	
	1997	2000	% change	1997	2000
Maximum-value	22	96	336,4%	Clear Channel	Clear Channel
Median	2	1	-50,0%		
Mean	3,13	3,09	-1,3%		
Stdev.	3,72	8,05	116,4%		

Table 3 shows that the largest owner in the market changes between 1997 (Westinghouse) and 2000 (Clear Channel), and that the yearly revenue for an average radio owner increased from 37 million USD in 1997 to 49 million USD in 2000. Moreover Clear Channel had about 55 times the revenue of an average owner in 2000 (in 1997 Westinghouse had about 25 times the revenue of an average owner). Consequently, on average revenue per owner has increased in the years after the deregulation, which is also consistent with previous theoretical predictions. Moreover, notice how the median decreases as the average increases, a sign of revenue redistribution to the largest owners, i.e. the largest owners become larger.

Table 4 provides some information on market expansion, indicating that Clear Channel had radio stations in the most markets both in 1997 and in 2000. In 1997 Clear Channel had radio stations in 22 markets nationally, and in 2000 they had expanded into 74 new markets totaling 96 markets, a significant increase. This is also to compare with the rather static station owner average of about three markets. Recall from chapter 2 that we expected incumbents to invest heavily in market expansion, which the C1 seems to have done accordingly to the theoretical predictions.

Another interesting feature is comparing tables 3 and 4, indicating that although Clear Channel was the second largest owner with respect to revenue, it had stations in more markets than any other owner in *both* 1997 and 2000. The heavy market expansion might help explain how Clear Channel managed to become the number one owner regarding both revenue and markets in 2000, which also align well with Bain's (1956) theoretical argument that is important to enter the market as early as possible in order to be successful later (an advantage to incumbents over entrants). Regarding the number of stations across markets (which we will

explore in the tables below), Clear Channel also managed to move from second to first place between 1997 and 2000, leaving them the largest firm in all my measured aspects.

3.3. Concentration Indexes

Tables 5 through 7 show two of the most common concentration ratios in a market, the calculated C4 and Herfindahl indexes, which we in chapter 2 argued should increase significantly after the deregulation. Turning to tables 5 and 6 first, notice first of all that there are two different C1-C4 calculations; table 5 is calculated on market share being equivalent to the number of stations owned, compared to table 6 which is calculated on market share being equivalent to the total revenue generated by owners.

Table 5: C1-C4 Concentration ratio (# stations/owner) at a national level

	1997		2000		
	# Stations/owner	ratio	# Stations/owner	Ratio	% Change
C1	90	0,06	528	0,25	486,7%
C2	174	0,11	708	0,33	306,9%
C3	251	0,16	851	0,40	239,0%
C4	320	0,20	930	0,43	190,6%

Table 6: C1-C4 Concentration ratio (revenue/owner, million USD) at a national level

	1997		2000		
	Revenue/owner	Ratio	Revenue/owner	Ratio	% Change
C1	1 012	0,16	2 727	0,29	169,4%
C2	1 413	0,23	4 867	0,52	244,5%
C3	1 794	0,29	5 254	0,56	192,8%
C4	2 154	0,35	5 612	0,60	160,5%

Table 7: Herfindahl index (on market revenue and # stations)

	1997	2000	% change
HHI on revenue (0-10,000)	500	1448	189,5%
HHI on # stations (0-10,000)	194	790	307,2%

From table 6 we see that the owner with the greatest amount of stations in 1997 increased the most in the period up to 2000, an increase by almost 500 percent in three years. It is also worth noting that the four largest firms in three years increased their total ownership of US radio stations from 20 percent to 40 percent.

If we now instead consider market share as defined by revenue generated by firms, we see the same trends as in table 5, but not as a dramatic C4 concentration ratio increase. The most revenue-generating firm in the market "only" increased its market share by about 170

percent (compared to almost 500 percent when studying the number of stations). Consequently, the C1 firm expanded its station supply significantly more than its revenue.

Another interesting observation in table 6 is the concentration ratio increase when including the third and fourth largest firm in the market in 2000, concluding that very little happens, i.e. the market shares only increase by 4 percent for the third and fourth largest firm respectively. In 2000, the two largest firms (with respect to revenue) have more than 50 percent of aggregate revenue generated in the US radio market sample (almost 5 billion USD). Comparing the C2 concentration ratio on revenue with number of stations, we see that the same two firms "only" have 29 percent of the market. Moreover, the distribution between the four largest firms on stations is more even, i.e. that both the second, third and fourth largest firm each have about 7 percent of the market, compared to case of revenue distribution being more concentrated to the top two firms. The percentage increases both on stations and revenue show the same pattern, i.e. that the two largest firms have increased their market shares the most compared to both the third and fourth largest firms, as well as all other firms in the market. Remember that when discussing market shares, whether it is defined as the number of stations or revenue, the market growth in the respective area was 35 and 50 percent. Increasing ones market share from e.g. 10 to 20 percent in a market of zero growth compared to 50 percent are two very different things, the latter showing signs of more expansive behavior.

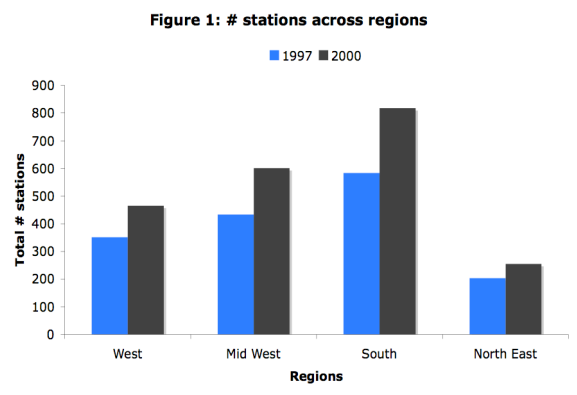
In table 7 I construct two Herfindahl indexes calculated on market revenue and number of stations when determining market share. For revenue as market share, the index increase from 500 to just below 1,500, which is also a good indicator that the radio market between 1997 and 2000 shifts from a somewhat un-concentrated market towards a high-concentrated market.

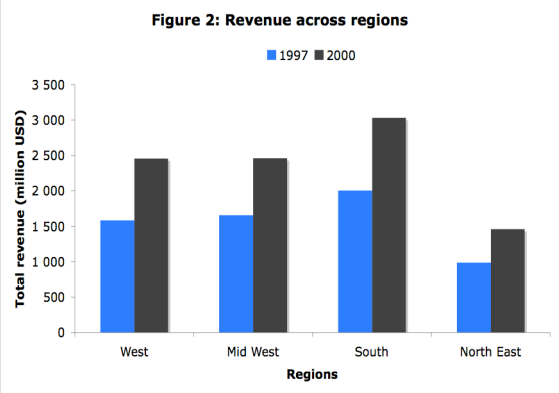
For number of stations as market share, the Herfindahl index increase 194 to 790. Consequently, although the market is still to regard as rather un-concentrated, the percentage increase in concentration on stations between 1997 and 2000 has been significantly greater than the concentration increase on revenue.

3.4. Geographical Distribution and Average Markets

Let us now turn to the markets that the owners operate in. In Figures 1 and 2 we see distributions of between stations and revenue for the US divided into four regions: the West (W), the Mid West (MW), the South (S), and the North East (NE). Trends are that the South has the largest share of both stations and revenue in the sample, and that the four regions have increased quite equally both regarding stations and revenue between 1997 and 2000. It is hard do draw any further conclusions based on these numbers since we for example might have a situation of sample bias with regard to the South being the largest of the four, but we seem to

have an equal distribution and trend in the sample when comparing revenue and stations geographically, which is good. Finally, it is always interesting to study the geographical distribution of stations and revenue to get an overview of the national market within the sample.





Tables 8, 9 and 10 provide a more detailed overview of the average market.

Table 8: Average revenue across markets

	Total revenue across markets			Locality	
	1997	2000	% change	1997	2000
Maximum-value	516 600 000	771 400 000	49,3%	Los Angeles	Los Angeles
(2nd largest)	469 300 000	685 100 000	46,0%	New York	New York
Median	19 460 000	28 981 500	48,9%		
Mean	48 720 688	73 525 313	50,9%		
Stdev.	77 945 684	119 303 278	53,1%		

Table 9: Average # stations across markets

	Total # stations across markets			Locality	
	1997	2000	% change	1997	2000
Maximum-value	36	45	25,0%	Los Angeles	Los Angeles
(2nd largest)	27	37	37,0%	Houston	Chicago
Median	12	16	33,3%		
Mean	12,30	16,71	35,9%		
Stdev.	5,64	6,41	13,7%		

Table 10: Average # owners across markets

	Total # owners across markets			Locality	
	1997	2000	% change	1997	2000
Maximum-value	16	14	-12,5%	Los Angeles	Los Angeles
(2nd largest)	13	11	-15,4%	New York	Chicago
Median	4	4	0,0%		
Mean	4,19	4,62	10,3%		
Stdev.	2,35	1,98	-15,7%		

Table 8 tells us that Los Angeles hosts the most total owner revenue of all markets, both in 1997 and 2000, with New York in second place. The Los Angeles market is estimated at

just over 510 million USD in 1997, increasing to around 770 million USD in 2000. However, this growth seems parallel to the average market growth, as the Los Angeles market remains 26 times larger than the average market in both 1997 and 2000.

In table 9 I examine how many stations the largest and the average market holds. Again, Los Angeles holds the largest number of stations both in 1997 and 2000, but only around three times as many stations as the average US market both in 1997 and 2000.

In table 10 I examine how many owners the largest and the average market holds. Yet again, Los Angeles is the largest market, having no less around 15 owners in the market from 1997 to 2000. Consequently, Los Angeles is the largest market in all of my measured aspects.

Based on these trends and calculations, combined with previous theoretical predictions, it is my intention to further analyze my hypotheses regarding how market aggregated revenue across owners has expanded in what I define as large and small markets, as well as in rich and poor markets. Furthermore, I intend to analyze how the C1-C3 have expanded market shares relative to the rest of the market with respect to both revenue and total number stations. Finally, I study entry in the radio market, and discuss whether entrants or incumbents are most successful at product differentiation.

4. Empirical Analysis

In this chapter, I test my hypotheses regarding the revenue and concentration changes in the US commercial radio market between 1997 (one year after the deregulation) and 2000.

4.1. Aggregate Market Revenue Changes in Large and Small Markets

My first hypothesis regards the effects of the deregulation in the commercial radio market on aggregated market revenue across owners. I will analyse how it has changed between 1997 and 2000 in what I define as small and large markets. I define large markets by setting an arbitrary population limit at 900,000 people and above (small markets are defined as being equal or smaller than 900,000). The reason that I choose this particular number is simply based on the sample distribution, dividing my sub sample into two groups of approximately the same size. It is my hypothesis that large markets should have experienced a greater revenue increase compared to small markets, as I expect commercial radio owners to expand more aggressively in large markets as they potentially hold greater economies of scale as the markets hold more people, which advertisers prominently would want to reach out to through radio stations.

My empirical specification that attempts to measure the effect of increased owner revenue on a market level is

$$LREV = \beta_0 + \beta_1 \text{LPOP} + \beta_2 \text{LY} + \beta_3 \text{LYSQ} + \beta_4 \text{YEAR2000} + \varepsilon \quad (1)$$

My selection of explanatory variables for explaining aggregate owner revenue within local markets is limited to the size of the population, median income, median income squared, and a dummy variable year 2000 in order to capture the effects from the shift from 1997 to 2000, since population and income are part of my hypotheses (table 10). My reason for not including additional variables is also due to limits in my data set.

Table 10: Variable definitions

Variable	Definition
LREV	Logged annual revenue (on USD per owner per market)
LPOP	Logged market population
LY	Logged annual median income
LYSQ	LY squared
YEAR2000	Dummy variable for year 2000
C1REV	Local market C1 revenue
C2REV	Local market C2 revenue
C3REV	Local market C3 revenue
C1STN	Local market C1 # stations
C2STN	Local market C2 # stations
C3STN	Local market C3 # stations

I expect LPOP to be positive, since increased population size should be correlated positively with owner revenue. Regarding LY it is harder to predict the sign of the coefficient, since individuals with a low median income (low purchasing power relative to advertisers) probably listen more to radio than individuals with a higher income (high purchasing power relative to advertisers). However, I anticipate that increased income is correlated with higher owner revenue, although time spent listening to radio is probably inversely correlated to income. Since I believe that median income in general will be positive, I expect median income squared to be negative as I assume there is a non-linear relation between logged income and logged owner revenue. Our dummy variable I expect to be positive, as the shift from 1997 to 2000 should if any, have a positive effect on owner revenue as the market as the market was deregulated.

Below are the first four regressions.

Table 11: Regression results

	(1)	(2)	(3)	(4)
	LREV (large markets)	**LREV (small markets)**	**LREV (rich markets)**	**LREV (poor markets)**
LPOP	0.570	0.591	0.623	0.651
	(7.45)***	(6.69)***	(14.04)***	(11.07)***
LY	39.791	17.395	41.885	0.782
	(3.20)***	(1.85)*	(2.28)**	(1.97)**
LYSQ	-1.808	-0.776	-1.896	
	(3.22)***	(1.79)*	(2.31)**	
YEAR2000	0.136	0.000	0.149	-0.022
	(1.40)	(0.01)	(1.62)	(0.23)
Constant	-210.928	-89.865	-224.125	-1.698
	(3.08)***	(1.76)	(2.18)**	(0.40)
Observations	496	470	506	460
R-squared	0.15	0.11	0.30	0.23

Absolute value of t statistics in parentheses * significant at 10%; ** significant at 5% *** significant at 1%

Each data point (observation) is a total revenue for any given radio owner in any given market divided over the two time periods.

Studying regressions 1 and 2 in table 11, the dummy variable intended to catch the shift between time periods (YEAR2000), is not significantly different from zero in either of the two regressions. Although small markets show no significant change in revenue what so ever, large markets are significant at 16 percent, which indicates that there might be some truth to the hypothesis regarding large markets over small. Consequently, there might be a slight shift for large markets, but no shift for small markets. Interpreting the dummy variable, assuming that we accept that it is not significant at any higher degree, it reads that in 2000 compared to 1997 aggregated market revenue in large markets increased by 13.6 percent on average, whereas it did not increase significantly in small markets, results favouring my first hypothesis.

Studying how logged median income (LY), and logged medium income squared (LYSQ) explains aggregate market revenue in regressions 1 and 2, we see a non-linear trend in both regressions. Derivation of the income variables gives

$$\frac{\delta LREV}{\delta LY} = \beta_2 + 2\beta_3 LY \qquad (2)$$

which we set equal to zero to obtain the point of the curve where the slope is zero. For large markets I calculate a medium income of just over $59,000. For small markets I calculate a medium income of just over $63,000. I interpret this as market aggregate owner revenue is maximized in large markets when medium income is around $59,000, and in small markets around $63,000, i.e. markets with a median income up this point are positively correlated with market aggregate revenue, where as a median income above is negatively correlated, meaning that increased median income results in reduced revenue.

4.2. Aggregate Market Revenue Changes in Rich and Poor Markets

My second hypothesis regards the effects of the deregulation in the commercial radio market on how aggregated market revenue across owners has changed in markets between 1997 and 2000 in what I define as rich and poor markets. I define rich markets by setting an arbitrary limit for annual median income at $50,500 and above per person (poor markets defined as equal or below $50,500). The reason that I choose a median income of $50,500 is, as before, based on the sample distribution, dividing my sub sample into two almost equally large segments.

It is my hypothesis that rich markets should experience a greater revenue increase compared to poor markets, as they hold more purchasing power compared to poor markets. On the other hand I find it reasonable to argue that there are significant forces working in the opposite direction, as I also believe that the average person in poor markets generally listens more to radio than the average person in rich markets, consequently leaving them more exposed to the messages of advertisers.

In the regressions (3 and 4 in table 11) I include explanatory variables for market revenue, as before, as logged population (LPOP), logged median income (LY), logged median income squared (LYSQ), and finally a dummy variable (YEAR2000) to capture the effects of a shift from 1997 to 2000.

Studying regression 3 and 4 in table 11, I find several interesting results. First of all, neither of the dummy variables are significant at 5 percent, which indicate that there is little reason to believe that there has been a significant shift in revenue between the two periods. However, as we also saw in the previous regressions, one of the dummy variables is more significant on a relative basis compared to the other. Again, this does not allow me to draw any certain conclusions, but makes it reasonable to argue that there most likely been an increase in aggregate market revenue in rich markets compared to poor markets. If so, reading the regression says that moving form 1997 to 2000 increases the average market revenue in rich markets by 14.9 percent compared to poor markets, which do not display any increase.

The logged median income (LY) in rich and poor markets is also interesting to study closer. I receive a non-linear trend for rich market, but find LYSQ to be insignificant for poor markets, which is why it is dropped from regression 4. For rich markets I calculate an aggregate market revenue maximum annual medium income of just over $61,000. One plausible interpretation is that less wealthy individuals (up to this point) spend more time listening to radio than individuals with an income above $61,000, and are consequently responding positively to radio advertising. However, beyond this income level revenue will fall as income increases, suggesting that wealthy people respond less to radio advertising, probably because they do not have as much time to listen to the radio as less wealthy people. This is interesting for radio owners and advertisers, since income levels should optimally (with respect to revenue maximization) neither be to low or too high.

4.3. Concentration Changes Across Markets

So far I have tested how aggregate market revenue across owners has changed between 1997 and 2000. My third hypothesis regards concentration. I begin by analysing how the market share (i.e. market power) for the largest owners in each market (C1-C3) has changed between 1997 and 2000. In doing so I construct two C1-C3 indexes (CXREV and CXSTN), the first calculating the C1-C3 index in each market based on revenue (i.e. market share as a percentage of entire market regarding revenue), the second calculating the C1-C3 index in each market based on the number of stations. The reason that I do not include for instance a C4 index (as I do in chapter 3) is because too many of markets at this level show a market share of 100 percent in the sample, leaving little reason to try regress any changes between the two time periods.

I begin by studying how these constructed C1-C3 indexes help explain aggregate market revenue in order to get an idea of how concentration changes affect aggregate market revenue. In chapter 3 we saw that total aggregate revenue and stations for the largest owners has increased significantly between 1997 and 2000, showing that the US commercial radio market has become significantly more concentrated on a national level, primarily due to the C1 and C2 expansion. Even though national market concentration has gone up, I intend to study how the isolated local market C1-C3's have changed relative to the rest of the market within their local markets, i.e. studying local concentration compared to national concentration previously.

I run six separate regressions for each of the two C1-C3 indexes (se previous section for definition) concentration variables using the previously defined variables. I do this in order to analyze if concentration with respect to revenue and the number of stations indicate any sign of a significant shift from 1997 to 2000 for the largest owners in the markets within local markets.

My empirical specification is the same as (1), except that the dependent variable is now C1-C3 on revenue and stations.

Table 12: regression results

	(5)	(6)	(7)	(8)	(9)	(10)
	C1REV	**C2REV**	**C3REV**	**C1STN**	**C2STN**	**C3STN**
LPOP	-0.073	-0.103	-0.084	-0.069	-0.111	-0.109
	(8.58)***	(11.78)***	(12.49)***	(8.35)***	(11.33)***	(12.94)***
LY	1.723	3.605	1.187	2.515	3.641	2.223
	(1.13)	(2.31)**	(0.99)	(1.69)*	(2.07)**	(1.48)
LYSQ	-0.080	-0.165	-0.054	-0.115	-0.166	-0.101
	(1.15)	(2.32)**	(0.98)	(1.69)*	(2.06)**	(1.47)
YEAR2000	-0.012	0.011	0.011	-0.045	-0.049	-0.033
	(0.77)	(0.69)	(0.86)	(2.98)***	(2.71)***	(2.14)**
Constant	-7.819	-17.556	-4.540	-12.418	-17.806	-9.879
	(0.94)	(2.06)**	(0.69)	(1.53)	(1.86)	(1.20)
Observations	221	221	221	221	221	221
R-squared	0.30	0.43	0.45	0.29	0.41	0.47

Absolute value of t statistics in parentheses * significant at 10%; ** significant at 5% *** significant at 1%

Studying regressions 5-7 in table 12 (C1-C3 on revenue), I find no statistical significant change in concentration (relative revenue change) between 1997 and 2000 for C1-C3. However, we know from previous data that the total revenue across all markets in the sample has increased with just over 50 percent between 1997 and 2000. What the regressions are telling us is that the largest owners in local markets on average have not experienced increased concentration, i.e. a more rapid increase in market shares for C1-C3 compared to other owners in the market. The reason that we do not see any statistical link in local C1-C3 revenue expansion might be due to the fact that although C1-C3 hold the largest market share nationally, they have not experienced any significant expansion rate in revenue compared to the other owners in the markets perhaps primarily due to their expansion in new markets, only increasing national market share, leaving local concentration unchanged.

Studying regressions 4-6 (C1-C3 on stations), we see that the largest owner's market share (regression 8) in each market on average falls *relative* to the rest of the owners in the markets by 4.5 percent between 1997 and 2000, significant at 1 percent. Studying regressions 9 and 10, we see the same relative market share loss of 4.9 percent (C2) and 3.3 percent (C3),

significant at 1 percent and 5 percent respectively. Consequently, local markets with respect to stations become less concentrated between the two time periods.

From chapter 3 we know that C1-C3 (and C4 for that matter) has experienced a substantial increase in the total number of stations across all markets and increased concentration. So although these owners hold the largest market share on a national level, they have experienced a slower relative expansion rate in stations compared to the other owners in the markets, i.e. fallen market shares to competitors leaving the local markets less concentrated. One reason might again be that largest firms expanded rapidly primarily into new markets (as we also saw in chapter 3), meaning that their market share went up from zero in those markets, resulting in relative slow concentration increases in those markets.

In conclusion, when regressing relative market share expansion between C1-C3 and the rest of the local owners within local markets, I find no statistical significant shift between 1997 and 2000 on revenue, i.e. local concentration is unchanged between the time periods. However, when regressing relative market share expansion between C1-C3 and the rest of the local owners within local markets, I find that C1-C3 market shares has fallen on all three levels with a statistical significance, i.e. local concentration decreases between the time periods. Simultaneously, I find that national concentration levels increase significantly on both revenue and stations.

It is hard to tell whether this shift (unchanged and reduced local concentration combined with increased national concentration) is desirable for the agents in the market, i.e. owners, advertisers, the government, and the consumers. Assuming that for instance Clear Channel (the C1 on revenue and stations in 2000) and Walmart (the world's largest company) are negotiating advertising contracts, I would argue that negotiations of contracts are more likely on a national level (or at least some frameworks for local stores to bargain within), rather than leaving each Walmart store/market to negotiate their radio advertisement contracts with e.g. Clear Channel on a local level. However, when turning to small local advertisers, they probably negotiate contracts on just local levels. Giving these, what I would argue, opposing forces with respect to bargaining and coordination nationally/locally, I find it hard to draw any conclusions whether the concentration changes between 1997 and 2000 are for better or worse.

4.4. Market Entry and Product Differentiation

In the previous regressions we have studied how local concentration has changed in the US commercial radio market, compared to national concentration in the previous chapter.

Going back to the discussion on product differentiation, I would like to analyse my fourth and final hypothesis: that large radio owners are better at product differentiating than

entrants, a potential mechanism explaining concentration changes in the US commercial radio market better.

I argue that there may well be a more significant link between product differentiation and cost structure in the radio market compared to other industries. Since you can sell your product repeatedly within a radio market at little extra cost combined with economies of scale within the market, product differentiation takes form as the number of stations you have in a market, and consequently in how many markets you can copy this concept to. Assuming that each station carries its own format (e.g. R&B), an owner with three stations in formats in one market is more differentiated than a rival with only two stations in two formats in that market. Based on this assumption, increased station supply per owner per market increases the level of product differentiation.

I will first examine if there has been any significant entry in the radio market between 1997 and 2000. Tables 13, 14, and 15 show how stations and revenue are distributed within different sized segments in the market. I have arbitrarily chosen to divide the owners and stations into five segments based on their aggregate station supply across markets. More specifically the segments are divided from 1-5, 6-10, 11-20, 21-50, and finally +51 stations.

Table 13: Segment concentration ratio (owners with X stations have Y of total market revenue, in million USD)

	1997		2000		
Owners with x stations	Total revenue	Ratio	Total revenue	Ratio	% change
1-5	630	0,10	630	0,07	0,1%
6-10	873	0,14	538	0,06	-38,3%
11-20	1 070	0,17	1 209	0,13	13,0%
21-50	1 360	0,22	1 078	0,11	-20,8%
+51	2 290	0,37	5 956	0,63	160,1%

Table 14: Segment concentration ratio (owners with X stations have Y stations in total across markets)

	Total # stations		
Owners with x stations	1997	2000	% change
1-5	302	354	17,2%
6-10	280	243	-13,2%
11-20	271	253	-6,6%
21-50	335	217	-35,2%
+51	386	1072	177,7%

Table 15: Segment concentration ratio (owners with X stations are in total Y owners across markets)

	Total # owners		
Owners with x stations	1997	2000	% change
1-5	98	126	28,6%
6-10	38	34	-10,5%
11-20	19	18	-5,3%
21-50	11	7	-36,4%
+51	5	6	20,0%

For illustration, the first line in table 15 reads: in 1997 there were in total 98 owners in the US radio market that each owned between one and five stations across markets. In 2000 that number went up to 126 owners, an increase by 28,6 percent.

A problem that I encountered examining the data was that a lot of radio firms merged, acquired each other, or simply changed names after the deregulation. Consequently, I found it rather difficult to estimate any trend of entry in the market by simply trying to compare firm names in 1997 to the ones in 2000. In short, I did not find this method of estimating entry in the market very convincing.

Instead, I have tried to estimate the magnitude of entry in the market by separating total stations by owners and not just stations per owner per market, in order to capture the trend of entry in the market. I argue that radio firms in the smallest segment (1-5 stations across all markets) should either experience acquisitions, mergers or simply expand the number of stations on their own between 1997 and 2000. If so, the number of owners in the smallest segment should decrease between the two time periods if new entry does not occur. Clear Channel (C1), for instance, had stations in 22 markets in 1997, which increased to 96 in 2000. Moreover, aggregate number of radio stations in the sample increases by about 35 percent between 1997 and 2000. Assuming that this trend applies for all owners, I argue that it is more probable that owners expand their number of stations compared to reducing it. These factors taken together I believe that the low-station segment (1-5) provides a way of capturing a possible increased entry trend between the time periods, which I can use when analysing product differentiation.

Let us briefly discuss some of the most important features in tables 13 through 15. Table 13 shows owner revenue across markets. The most notable features are, first, how the +51 station owners (the large owners) expand exceptionally compared to the other segments (in line with the previous C1 regression on revenue), and second, how we might see a declining trend in the three middle segments. Notice that the percentage calculations are calculated on the absolute revenue values and not on the market shares; if we look at the segment 11-20 stations we see an absolute *increase* of about 140 million USD between 1997 and 2000, but a total market share *decrease* from 17 percent to 13 percent.

Table 14 illustrates owner segments with respect to their total number of stations instead of total revenue. We see perhaps an even more interesting change in segment concentration among owners here. The smallest and the largest owners increase their total number of stations across all markets, as the middle segments (owners with 6-50 stations) lose stations. There are several possible explanations for this trend: The largest owners are expanding rapidly (according to previous theory), and are most likely doing this through acquisition of smaller owners. An explanation for the increase in the smallest owner segment may be that

although the largest owners acquire their rivals from all underlying segments, there is a continuous inflow of new entrants in the market.

Table 15 illustrates owner segments with respect to the total count of owners within a particular segment. The pattern is almost identical to the one in tables 13 and 14. There are, however, some differences. First, there is a greater percentage increase in the number of small owners, probably due to high entry. Second, as expected the middle three segments decrease as the largest owners grow in size, which also explains that there is only one new owner that manages to accumulate more than 50 stations and enter the top +51 station segment.

The tables presented in this chapter gives a good indication that the level of concentration in the US radio market has increased significantly between 1997 and 2000 as we expected it to. Whether I look at a C4 index, a Herfindahl index, or various combinations of segments, markets, stations, owners and revenue, the trend across all non-statistical output is that large firms become increasingly dominant nationally. However, when regressing C1-C3 on revenue relative to the rest of the owners within local markets, I find that there is no significant relative shift between 1997 and 2000, i.e. local concentration is unchanged between the two time periods. Consequently, there is a general trend of small owners (and possible entrants) being able to capture market shares (on stations) compared to their larger rivals. In addition, the increase in the number of small firms (most likely due to entry) aligns well with our theoretical predictions that we should see increased entry in a market of high fixed-costs and close to marginal costs.

Finally, there is more revenue in absolute terms the market in 2000 than in 1997 (which has increased significantly more than both the number of stations and owners). Moreover, the average radio station within the sample generates more revenue in 2000 than in 1997 (shifting from an annual revenue stream of 4,0 million USD per station to 4,3 million USD), combined with the C1-C4 significantly increasing their market shares nationally. This might indicate that firms are advertising more in 2000 than in 1997, and/or that the prices for purchasing airtime for advertisers have gone up as concentration and market power have increased for radio owners, enabling them to bargain more with advertisers.

Both from chapter 3 we know that the largest owners on average become increasingly larger in all aspects, regarding revenue, markets, and stations. In previous section we saw that local C1-C3s experience falling market shares relative to the rest of the owners regarding stations, with no statistical shift with respect to revenue. I therefore find it of interest to further discuss to what extent entrants and small owners have been successful at product differentiation after the deregulation, given the assumption that one station holds only one format, and that firms will choose to add a new format when increasing their number of stations. In reality, however, it is not uncommon that firms add stations in the same format as their other stations in a market in order to pre-empt entrants or rivals from competing in that

particular format even though this is a form of cannibalizing their own product. However, I will assume this is not a common action of firms, and assume all station expansion in a market is into new formats compared to the format of the first station. Consequently, a firm with one station in each two markets will probably choose the same format in both markets (not an assumption), but when increasing station supply form one to two in each market, these two new stations are in a different format than the original station. Given these assumptions, expanding in stations and markets I argue equal product differentiation in the radio market. Consequently, increased product differentiation is linked to the cost structure of firms as an increasing cost for each additional station.

When increasing station supply either in a current or new market, you first of all need to acquire a FCC license in order to broadcast in a market, determining in which frequency you can air. You acquire a license through electronic auction (sealed bids) through the FCC, and there are a limited number of them available in each market (since there are only so many frequencies available to broadcast from). Large markets are generally "fully licensed", meaning that a firm wishing to enter the market needs to purchase a license from a rival in the market that agrees to sell it as they are probably all taken, which is expensive. Moreover, it can be cheaper to expand in markets with fewer stations so you don't have to acquire a license from a rival, or in markets that are perceived as less lucrative.

With respect to product differentiation incumbents has an advantage compared to entrants in these markets, as they already hold licenses that they could in theory bargain with (e.g. I'll give you one of my licenses in New York if you give me two of your licenses in Dallas). Moreover, this provides large firms an advantage as they can more easily finance purchasing a new license in current or new markets. This means that incumbents, and particularly large firms, should be more successful at product differentiation, as they have the money (and theoretically bargaining power) to buy (negotiate) licenses in markets that are per definition already "full", i.e. perceived as more attractive by radio owners and advertisers.

If we turn to markets that are not yet full, there are still significant start-up costs for entrants and incumbents entering a new market (assuming high-quality market covering broadcasting, and not just an antenna in a basement). Turning to entrants first, they need to acquire a place to broadcast from with room for sound equipment, hosts, and guest appearances. In addition to buying the actual sound equipment you need to hire DJs and program hosts. Moreover, there are administrative costs of hiring staff responsible for contacting potential advertisers and negotiate advertisement contracts.

Incumbents wishing to expand into a new market, on the other hand, most likely already covered many of these costs when they entered the market for the first time. In theory, they only need to acquire a license for a market, and then broadcast (copy) one of their other stations into that market. Although radio is normally subjected to a lot of local information,

successful hit channels in New York with popular radio hosts, will probably also perform well in Los Angeles and receive public as well as advertising attention. Incumbents can of course combine taped material with local content, which add more value for local listeners but higher costs for the owner, however, still allowing the incumbent to save money due to the increased economies of scale.

I therefore argue that since the deregulation in 1996, which allowed for increased product differentiation both locally and nationally given the previous assumptions, the data and regressions show signs of large and already established owners being more successful at entering and expanding regarding revenue and stations compared to all other firms. Moreover, I argue that there is significant entry in the radio market between 1997 and 2000, with a clear trend that medium-sized firms (table 13-15: middle segments) both generally become fewer as the smallest and largest firms increase in numbers, but also lose total market shares. Consequently, given my empirical analysis covering various aspects of concentration, I find it reasonable to argue that the economies of scale in the radio market combined with the nature of the product (multiple sales) provides a particular well-suited environment for large established firms to product differentiate more successfully than primarily entrants, but also small established firms, consequently increasing concentration both regarding revenue and the number of stations.

Since large owners can enter new markets more easily than entrants primarily due to the effect of economies of scale, the discussion on product differentiation also links to pre-emption in the market as we discussed in chapter 2. If large owners can enter markets at a relatively lower cost than entrants, they can also pre-empt entry somewhat effectively given the cost structure of the radio market. It is therefore not surprising that the largest owners in the radio markets has increased market shares nationally both with regard to stations (and markets), and revenue in the relative short time period between 1997 and 2000.

5. Conclusion

The US commercial radio broadcasting market was deregulated in 1996, allowing for radio owners to expand their number of stations virtually without any limits. In this theoretical and empirical analysis of concentration changes and product differentiation within the radio market, it has been my intention to contrast theoretical predictions with my empirical findings, explaining the structure, conduct and characteristics of a market that is very different from a normal goods market primarily due to possibility of repeated sale of the radio product, and low marginal costs etc. An overall goal has been to find significant characteristics in the radio market that differs from general theory on the implications of a deregulation.

In my analysis I find indicators that market expansion by radio owners with respect to revenue has been more aggressive in what I define as large markets compared to small markets. Moreover, I find that revenue expansion by radio owners has been more aggressive in what I define as rich markets compared to poor markets between the two time periods

I find that concentration in the US radio market has increased significantly between 1997 and 2000, as I expected it to. Whether I look at a C4 index, a Herfindahl index, or various combinations of segments, markets, stations, owners and revenue, the trend across all non-statistical output is that large firms become increasingly dominant nationally. However, when regressing C1-C3 on revenue relative to the rest of the owners within local markets, I find that there is no significant relative shift between 1997 and 2000, i.e. local concentration is unchanged between the two time periods.

Regressing C1-C3 on stations relative to the rest of the owners within local markets, I find that their market shares relative to the rest of the owners within the markets fall by 4.5, 4.8 and 3.3 percent respectively, i.e. local concentration is reduced between the two time periods.

At the outset of this paper, I suspected to find a relative C1-C3 increase on both revenue and stations since I suspected that total revenue and station increases for the largest owner would apply locally as well as nationally. However, my conclusion is that national concentration levels increase significantly, driven by the C4 firms (predominantly contributable to the C2s), simultaneously with unchanged (revenue) and reduced (stations) concentration levels locally.

One explanation for these results might be that for instance Clear Channel (C1) expanded from 22 to 96 markets between 1997 and 2000, meaning that their market share in those new markets increased from zero. Consequently, I argue that the largest firms in the US radio market have been more successful at increasing national market shares (and with that concentration levels) opposed to local market shares. This is well in line with earlier theoretical arguments (chapter 2) that large incumbents should invest heavily in market expansion after the deregulation in order to become more cost-efficient by capturing increased economies of scale, to increase revenue, and to raise barriers to entry for potential entrants.

Finally I argue that since the deregulation in 1996, which allowed for increased product differentiation both locally and nationally given the previous assumptions, the data and regressions show signs of large and already established owners being more successful at entering and expanding regarding revenue and stations compared to all other firms. Moreover, I argue that there is significant entry in the radio market between 1997 and 2000, with a clear trend that medium-sized firms both generally become fewer as the smallest and largest firms increase in numbers, but also lose total market shares. Consequently, given my empirical

analysis covering various aspects of concentration, I find it reasonable to argue that the economies of scale in the radio market combined with the nature of the product (multiple sales) provides a particular well-suited environment for large established firms to product differentiate more successfully than primarily entrants, but also small established firms, consequently increasing concentration both regarding revenue and the number of stations.

I argue that the nature of the radio market and its product magnifies the general characteristics of concentration changes in deregulated markets. Since the cost of opening up new stations and new markets is low due to nature of the radio product, concentration, product differentiation and pre-emption, I argue, are more easily obtained in the radio market compared to normal goods markets. If so, the result of this paper has implications for both policy makers as well as competition authorities monitoring deregulated radio markets in, or sharing features similar to, the US radio market, implying that regulatory authorities should expect a more rapid concentration increase at least on a national level compared to normal goods markets combined with increased pre-emption from incumbents.

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