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Development of Market Concentration in Mature Markets

Name student: Bob Cloosterman
Student ID: 472717

Supervisor: Professor Thomas Peeters
Second Assessor: Gianluca Antonecchia

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0. Abstract

Literature on Industry Life Cycles has been limited to evidence from a long time ago. Therefore, this paper shines new light on the topic by investigating the mature stage of this Industry Life Cycle in the European Car Market. It does this not only at the market level but even at the segment level. Using the Herfindahl – Hirschman Index to measure the development and the level of competitiveness in the market and segments. I found that the competition in the market as a whole is relatively stable and a bit increasing. This is fueled by the entry of established firms from outside markets and acquisition. Finally, the more luxurious a segment gets the more the amount of competition fluctuates. Overall, the competition is fiercer in more luxurious car markets.

1. Introduction

In the wake of the environmental crisis we face at the moment, there lie big unexploited opportunities. One challenge the world faces is replacing internal combustion engine vehicles with electrical powered vehicles. The recent success of Tesla, an electric vehicle car manufacturer, shows that it is possible to mass-produce electric vehicles in a way that is also economically viable. As a result a lot of start-ups enter the market, in the hope to find the same success. Also incumbent internal combustion car manufacturers rush to produce electric vehicles themselves. This resonates with the influential models of process and product development by Utterback and Abernathy (1975). They find that when demand for a new type of technology or product increases, manufacturers will try to match this. Nevertheless, since performance and process criteria are not clearly defined yet, innovation delivers a very diverse set of products. Over time, a certain design will gain dominance, which in turn will serve as the performance standard. Now innovation will be more centered around improving the products based on the standard design. When the market and product get efficient, manufacturers start to concentrate on process innovation.

Based on this theory, Klepper (1997) distinguishes three stages in which the market evolves, the exploratory, growth and mature stage. The exploratory stage is characterized by high uncertainty and primitive product design. Competition is based on product innovation which is intense due to a high rate of entry. In the growth stage, as the product design stabilizes, innovation declines as well, while the product process becomes more refined, this leads to a substantial growth in output. In this stage entry starts to slow and a shakeout, the mass exit of firms, occurs. This leads to the mature stage, where market shares and output growth stabilize. Where making the production and organizational process more efficient becomes a priority. These stages are often referred to as the industry life cycles or the product life cycle (PLC). Horvath, Schivardi & Woywode (2001) found a similar pattern, when examining the United States beer brewing industry between 1880 and 1987. Their analysis showed that mass entry is indeed followed by a sharp decline in market participants. Another article by Jovanovic and MacDonald (1994) shows a similar pattern for the US automobile tire industry from 1906 through 1971. The number of participants in this specific industry entry peaked around 1922, which was also accompanied by mass exit of firms. More evidence on the existence of these patterns is provided by Utterback and Suarez (1993), where they

summarize the pattern in the number of participants for multiple different industries. They find that a shakeout in the number of participants corresponds to the emergence of a dominant design.

Concurrently, this pattern is observed in many industries, however the timeframe these observations were made are mostly very old. This raises the question if this model is still apparent today, and if this is only observable at industry level or also at a lower level, the segment level. Therefore the research question of this paper is:

How has the market concentration developed through the years in the European car markets for the different segments?

The timeframe used to evaluate the research question is 1970 through 1999. So this research question adds to the existing literature by testing established economic theory on PLC on a more recent timeframe. The Automobile industry (or car industry) is considered to be more in the mature stage of the PLC. Research specifically on the mature stages, if the market shows the same characteristics as described in the literature, has hardly been done.

While most of the existing literature has studied the PLC on industry level, not many zoomed in on the segment level, this as well makes it scientifically relevant. Although the industry as a whole is in the mature stage, that does not mean that all segments are in the mature stage of the PLC. By taking every segment as a separate market, you might observe different stages of the PLC. Then this may serve as additional evidence of the Production Life Cycle.

The social relevance follows from the book of Eeckhout (2021) called the Profit Paradox. The author describes that the past four decades the benefits of great technological change have been accumulated by a relatively small number of firms. This led to them securing huge profits and subsequently acquiring rivals, which led to a 'non competitive market' with just a few very big participants. This itself is not a problem, however, the benefits of their market power and profits were not felt by the people involved, from the workers with low wages to customers who are charged high mark-ups. In order to prevent this from happening the antitrust agencies, whose job is to make sure that the market remains competitive, must play a big role. The results of this research can give an insight into whether the same is or has happened in the European car market. Which might give the antitrust agencies a reason to restore the balance and let society benefit as a whole.

In the following sections, I try to answer the research question by hypothesizing what happens to the market concentration in the car market as a whole, what the possible

explanations are for fluctuations in market concentration and finally what happens to the concentrations in the different segment. Then, I discuss where the data is coming from and the methods used to test the above hypotheses. Next, the methods are implemented to collect the results. Some of the hypotheses are rejected, in that case they are accompanied by an alternative explanation. Finally, an answer to the research question is formulated and suggestions for future research are provided.

2. Hypotheses

a. Hypothesis 1

The car market of our data set corresponds to the mature stage of the PLC as described by Klepper (1997). In this stage the product specifications are more or less fixed, the way a car looks and how engines are built are very similar for all cars produced. Shaked and Sutton (1987) point out that when the product specifications are fixed, companies compete on price. So in order to increase profits a firm must reduce the cost and/or increase output of production. Price is partly determined by the cost, which can be reduced by process innovation and economies of scale.

First, process innovation has to do with making the process more efficient, both the technical and organizational. According to Boone (2000) an increase in efficiency leads to a reduction of a firm's process costs. This Innovation however, is easy to imitate by competitors, therefore if competition is fierce investing in process innovation becomes less attractive and firms will invest more in product innovation. As mentioned before, in this part of the trajectory of the PLC firms are relatively big and there is more exit than entry. Combining this information gives that in the automobile industry process innovation is more important. More evidence is provided by Fritsch and Meschede (2001), who find empirically that the larger a company becomes the more of the budget is spent on process research and development (R&D) relative to product R&D.

Second, economies of scale refers to the cost advantage that enterprises obtain through an increase in output. It implies that the cost per unit decreases as the scale or output increases. This is partly due to the fact that it reduces the fixed cost per unit. Dominant design theory introduced by Utterback and Suarez (1993) show that a dominant design shifts the emphasis to production process and also scale of production. Langlois and Robertson (1989) find that, in the mature stage of the automobile industry, more attention for process innovations leads to an increased benefit of economies of scale. Cars are often mass produced which makes it favourable to be vertically integrated. By streamlining the parts for the different brands with the firms, firms can use this scale to amortize the relatively high fixed cost associated with vertical integration. So the fact that in this stage of the PLC process innovation and economies of scale are important, makes it most suitable for large firms. These

will get bigger over time as they try to increase economics of scale. As a few firms get bigger their respective market shares increase, which implies an increase in market concentration.

Hypothese 1: the European car market as a whole is characterized by an increasing market concentration.

b. Hypothesis 2

In this section I hypothesize that there are two main sources of exit and entry. First, I make a distinction between entry of new firms and entry of established firms from a different geographical market. Second, I look at the role of acquisition in the exit of firms and in the entry of firms into different segments.

Based on earlier statements and literature it is very hard for start-up firms to be successful in the mature stage of the market, as they lack the capital to mass produce products in an efficient way that is economically viable. For established firms this is easier as they already produce the products and have the technology. The only barrier for them is entering the market in a good way. Established firms are mostly car manufacturers who are not yet active in the geographical markets we observe, e.g. manufacturers from the US, China, Japan or Korea who decide they want to expand to the European Market.

The entry barriers car manufacturing firms face entering the European Car are plentiful. They face import fees, the cost of exporting activities, regulations, setting up distribution networks, local knowledge, marketing cost, etc. The fees and regulations are the same for all firms trying to enter the market. But larger established firms are better equipped to bear the cost of setting up distribution networks and the cost of producing. As described by Hilmersson and Jansson (2012) when entering a market you want to gain access to business networks. For mature markets this is harder as business networks are harder to penetrate. In these markets the firms are there for longer and customers are attached to certain brands. The authors state that knowledge of these networks is the most important characteristic for entry to be successful. Penetrating these networks as a new firm can be very difficult. Established firms have a lot of knowledge about the technical aspects of cars. So the main barriers the manufacturing firms face is the lack of cultural knowledge. This can be overcome by time and investigating the market.

Andersen (1998) states that the product expansion matrix serves as an indicator of the direction of the growth. The Direction depends on the capabilities. As production capabilities

are quite good in established firms that operate in mature markets, marketing capabilities are the most important. This capability usually corresponds to the amount of capital available to invest in marketing. So how successful the firms will be depends mostly on the amount spent on marketing. As established firms have a lot of experience and relatively much capital to invest on marketing, they are most suited to enter the market. As they will enter and have experience in different markets can you expect that their entry will be successful in a pretty short time frame. The more successful an entering established firm is, the bigger the impact on market concentration. Successful entry leads to more competition and hence a lower market concentration.

Hypothesis 2A: Entry by established firms into a new geographical market decreases market concentration.

Besides entry of established firms from other markets, there is also an opportunity to grow by the acquisition of competitors. This can increase the scope for economies of scale and increase sales volume while maintaining the level of process innovation or even incorporating more efficient processes. So in the car market the exit will mainly happen through acquisition. However, often after a firm gets acquired, the firm continues to operate under the same brand name. This leads to firms with multiple brands under their wings. Where brands under the same firm often share the same technology. For example Audi and Volkswagen, which are part of the same firm, share the same engine.

Most car brands are specialized in certain segments. The aforementioned acquisition can not only make firms grow by economies of scale but also by diversification into new markets. Yip (1982) found empirically that the choice of entry in a new market by acquisition or through internal development depends on the level of entry barriers and relatedness. The author showed that there was a positive relationship between higher market concentration and acquisition. This can be explained by the fact that scale barriers are in place. The market concentration in every segment is already quite high, therefore firms should favor diversification through acquisition.

As a firm acquires a brand, the market share of that firm will rise, consequently, this will lead to a stronger market concentration. The magnitude of this increase in market concentration will depend on what the incentives for entry are. If it is merely trying to generate growth through diversification of the brands then the market share will only rise proportionally to the market share of the acquired. This is supported by James and Wier

(1987) who found that for the banking industry the change in the acquirer's market share is equal to the acquired market share. They show empirically that acquisition doesn't lead to an additional gain in market share. However, if the firm also decides to invest and expand their actions in that market the market concentration will increase more. The timing of entry is of lesser importance for the differences in market concentration. This is in line with the work by Mitchell (1991), that when products and technologies are immitateable early entry doesn't lead to an advantage when it comes to market share. This is because later entrants could replicate or improve the existing products.

Hypothesis 2B: Acquisition increases market concentration of the acquirer proportionally to the market share of the acquired firm.

Hypothesis 2C: Firms use acquisition to enter different segments, this increases market concentration extra proportionally.

c. Hypothesis 3

Thirdly, I will hypothesize how the market concentration and it's development over the years differs between the segments. As mentioned earlier, the different segments are ranked in ascending order from the cheapest subcompact segment to the most expensive luxury segment. Looking at the summary statistics for 1970 we see that the subcompact cars are sold the most and luxury cars are sold the least. In most developed countries having a car is a basic good. Although there are often other good alternatives to get around, especially in the cities, the car is still the primary mode of transportation. As a basic good the car is meant to drive you from one place to another, how it does so is less important. However, when a car becomes more expensive consumers demand more luxury and performance, so it becomes a luxury good. I categorize the subcompact segment as a basic good, whereafter the segments become more and more of a luxury good.

The basic segments are the most affordable and hence the most demanded. Consumers expect not much performance and luxury at this price point. Moreover, they are looking for the best bargain, which implies that competition will be mostly on price level. As economic theory suggests, the economies of scale are very important when it comes to decreasing cost and therefore lowering the price. Evidence for this is provided by Panzar and Willig (1977) who show that when technology is more homogenous the economies of scale are the main driver behind lowering marginal costs. In these segments cars have quite

homogeneous technologies. As mentioned before this makes for an attractive environment for larger firms. Also, because they are the cheapest to produce and require the least amount of technological advancements, there will be many participants in this segment. However, it is likely to be dominated by large firms, who acquire smaller companies in order to gain market share. This very much resembles the whole car market, which I hypothesized to be very stable with decreasing market share. Finally this also makes it the most easiest segment to enter. So while the highest amount of participants would imply more competition and thus the lowest market concentration, I hypothesize the opposite to be true. Although there might be a lot of competitors, most of the market share will be concentrated around just a few larger firms.

As the cars become more expensive, it becomes more of a luxury good. Now the consumer expects more than just getting from A to B. They expect to get there in the most luxurious way, the fastest way of in the most technologically advanced way. The cars will be more heterogenous, which makes product innovation more important, as the aforementioned literature about product life cycles state. In these segments there is more room for product innovation, for example unique luxurious seats, however the R&D and production cost associated with this innovation are high. This makes it harder for firms new firms to enter. I expect established firms to be able to enter in the more luxurious markets as they are best equipped to bear the cost of these innovations, based on the second hypothesis. Therefore I expect the number of participants to be less in these segments than in the more basic segments. I also these segments to have entries from established firms from other geographical markets. However, economies of scale are less important, which implies that the market share is distributed more equal over the participants this leads to a lower market concentration. Roberts (1999) finds that through product innovation firms in the US pharmaceutical industry can create a sort of temporary monopoly positions. The avoidance of competition can yield temporary abnormal returns. In the context of this paper it means that all the participants can create a monopolistic situation through product innovation. This leads to a higher survival rate and a higher market share. Less competitors means that the market concentration will react more vehemently to changes in market share, by for example entries from other geographical markets. So while less participants would imply less competition, the market share is more evenly distributed over the participants when product

innovation becomes more important. Therefore more luxurious segments will have more competitive markets and hence a lower market concentration.

Hypothesis 3: The more luxurious a car segment is the lower its market concentration

3. Data and Methodology

a. Data

Table 1: Descriptive Statistics

Variable	Observations	Mean	St.dev	minimum	Maximum
Year	30	1,985.431	8.53	1970	1999
Firm	30	14.329	8.6	1	30
Market Share	621	4.83	5.690	0.001	25.069
Class	11,549	2.551	1.290	1	5
Brand	11,549	17.193	10.660	1	47
# of Sales	11,549	19,813.24	37,719.92	51	433,694
Market	11,549	2.915	1.445	1	5
# of Participants	30	20.7	1.725	18	24
HHIndex	30	1,152.145	72.517	1,045.119	1,344.466
Real GDP p/c	10,999	13,167.65	2,734.622	6,725.179	22,528.34

Notes: the descriptive statistics of the most important variables for the analysis. With their respective number of observations, mean standard deviation, minimum and maximum.

The dataset used in this research is coming from Brenkers and Verboven (2006), who used it to investigate competitive effects of the selective and exclusive distribution networks in Europe. It is a panel dataset, which consists of around 11,549 observations from 1970-1999, on car manufacturers in 5 European markets. Next to general brand, model and parent firm information, it also provides information on sales, list price, physical characteristics (e.g. engine attributes), dimensions and performance variables per car. The five markets included are Belgium, France, Germany, Italy and the United Kingdom. They collectively account for over 85% of the total car sales in Europe. These markets differ in size, degree of import penetration, market share concentration and price level (excluding taxes). The period of the sample is characterized by distinct efforts by the European Commission to integrate national markets in Europe. For this research I am mostly interested in brand ownership and sales. The most important variables are summarized in table 1.

b. Herfindahl - Hirschman Index

A very important concept for this research is market concentration. In general a market concentration index is used to assess how market power corresponds to the concentration in a market. Since market concentration indices are very useful in determining the competitiveness in a market according to Donsimoni, Geroski and Jacquemin (1984). In

this research the market concentration will be assessed by the Herfindahl-Hirschman Index (HHI), which is a statistical measure for concentration. The HHI takes the number of firms and concentration in a market into account by looking by incorporating their market share as explained by Rhoades (1993). The HHI is calculated by taking the summation of the squares of the market shares of all firms in the market or segment. Algebraically the formula looks as follows:

$$\text{Herfindahl – Hirschman Index (HHI)} = \sum_{i=1}^n S_i^2$$

The S denotes the market share of every car manufacturing firm i with n participants. The magnitude of the index ranges from almost 0 with unlimited many participants to 10000 for 1 firm who has a 100% market share. So the higher the HHI the less competitive a market generally is. Taking the square of the market share the puts more weight on larger market shares, the bigger the market share the bigger the effect on the market concentration. If one firm has a higher market share than the others, then the HHI will be high and thus a less competitive market. This also explains why we look at the HHI instead of just the number of participants, because a market can still have a lot of participants. If just one or two firms have a high market share then the market is not necessarily competitive. The market shares will be calculated based on the number of sales, as follows:

$$\text{Market share } (S) = \frac{\# \text{ of Sales Firm } i}{\text{Total \# of Sales}}$$

c. Hypothesis 1

To test the first hypothesis I look at how the market concentration has developed over the years. I use the method explained above to calculate the market concentration. For this hypothesis the market share will be calculated per year on the level of the specific model, so that number of sales per firm equals the sum of the market shares of all models sold within a firm in a year. A new variable will be created which stores the value of the market share per firm, which will be used to calculate the HHI. After calculating the HHI for every year in the sample, it will be plotted in order to assess the development of the market concentration. In this plot the year the events of hypothesis 2 take will be indicated. Next, I create a dummy variable that stores the value 1 if a firm is active in a year and 0 if not. I will use this dummy

variable to calculate per year the number of participants in the car market as a whole. Finally, I also plotted the development of the number of participants in the form of a bar chart.

d. Hypothesis 2

To evaluate the second hypothesis first entry or acquisition needs to be identified in the data. To signal entry of a firm in a segment a dummy variable will be generated for every segment. If the variable has the value 1 then it indicates it has a model in that segment, if the value is 0 then this implies that the firm is not active in a segment. The moment a 0 becomes a 1 signals entry of a firm into a particular segment. Subsequently, the source of entry can be investigated by looking if there has been an acquisition. This can be achieved by creating another dummy variable which contains the value 0 if it has not changed firm name and value 1 if a brand has changed to a different firm name. With this information the source of entry can be analyzed. Next, to isolate the effect of these events, I will plot the market share of the acquirers. Beginning to plot two years before the event happens in order to really see the difference with the existing market share and to control for a possible trend. Based on the market share I am able to say something about the market concentration.

In order to investigate whether entrants are established firms, a variable which stores the founding date of all the firms will be generated. Next, will a dummy variable be generated which holds the value 1 if the first observation is later than 1970, which signals entry, and founded earlier than the first observation, which signals an established firm. The information gathered will be used to construct a table with an overview of the entrants and important information. Next, I will plot the development of the market share as well. Finally, the events of both acquisition and entry from a different geographical market are indicated in the graphs of the other hypothesis, by a red and blue line respectively. I will use these lines to explain both the effects of the events and if fluctuations in market concentration have something to do with the events.

e. Hypothesis 3

Just as in hypothesis 1 market concentration plays an important role, so I will also use the Herfindahl – Hirschman index. To indicate if a firm is active in a segment I will create a dummy variable per segment. They contain the value 1 if a firm has a model in that specific segment in a year and 0 otherwise. Next, I will use these dummy's to calculate the market

share and number of participants for every segment independently. The market share is calculated in the same way as for hypothesis 1. Based on the square of the market share I calculate the market concentration per year per segment. Also, the amount of participants are calculated per segment per year. To test the hypothesis I will compare the development of the market concentration of the different segments. In order to this I plot all the segments' trends of the market concentration and number of participants in one graph. Additionally, I will add the events of hypothesis 2 to the graph, indicated by blue and red lines corresponding to the entry and acquisition events respectively.

4. Results

The results of the analysis for hypothesis 1 are represented in graph 1 and 2 and table 2. Those of Hypothesis 2 are displayed in tables 3 and 4 accompanied by graph 3 and 4. First, in order to investigate what the reason could be for fluctuations in market concentration over the years, the acquisitions and entry by established firms are drawn and summarized in the table 2 and 3. Hypothesis 3's results are described in graphs 5 and 6.

a. The car market as a whole

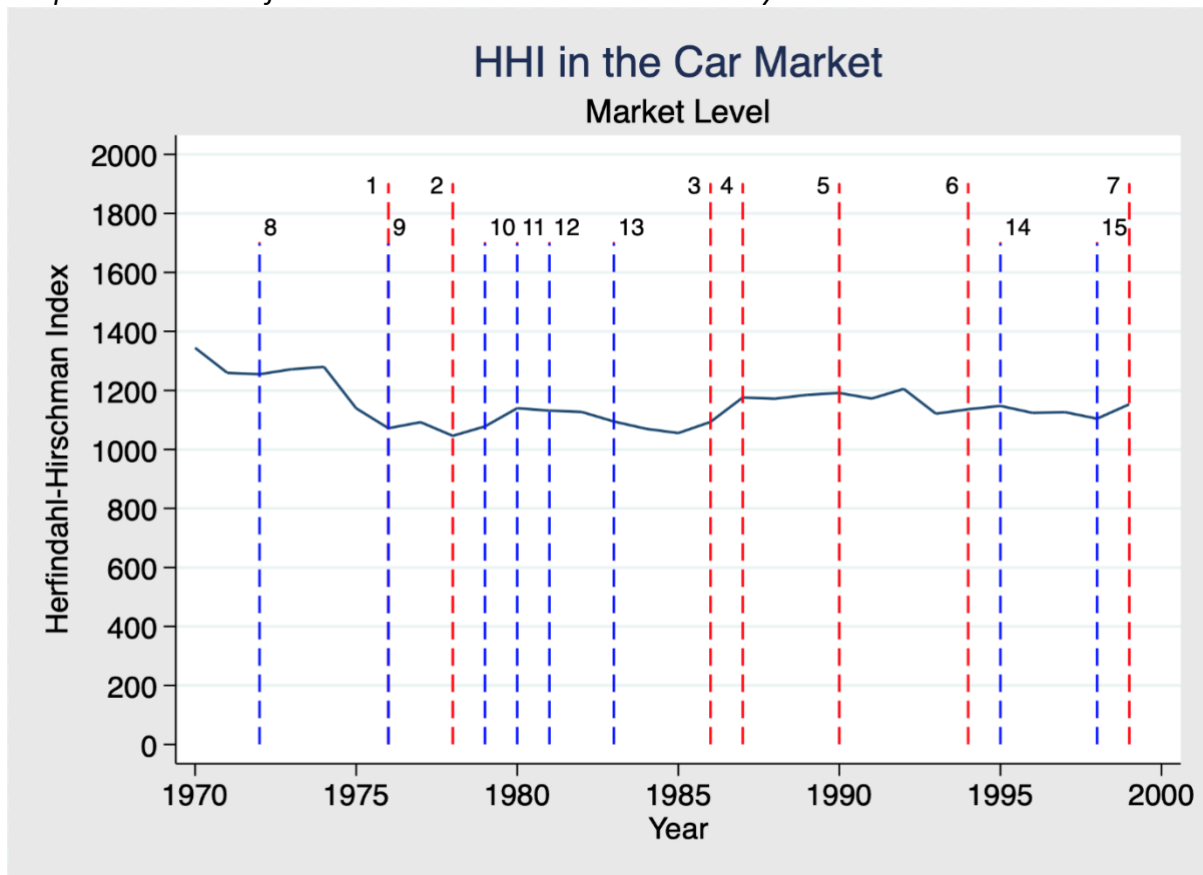
Table 2: List of all firms active in the European Car Market

Firm Name	Years Active	Market Share (Mean) in %	# of Segments	Dominant Segment
<i>Alfa Romeo</i>	1970-1986	2.034	4	Compact
<i>BMW</i>	1970-1999	3.496	5	Standard
<i>Daewoo</i>	1995-1999	0.791	4	Compact
<i>DAF</i>	1970-1975	0.656	1	Subcompact
<i>Daimler</i>	1998-1999	0.342	1	Subcompact
<i>Fiat</i>	1970-1999	16.064	5	Subcompact
<i>Ford</i>	1970-1999	11.542	5	Standard
<i>FujiHI</i>	1979-1999	0.014	2	Subcompact
<i>Honda</i>	1970-1999	0.884	5	Compact
<i>Hyundai</i>	1980-1999	0.303	3	Intermediate
<i>DeTomaso</i>	1970-1989	0.375	1	Subcompact
<i>Kia</i>	1993-1999	0.179	3	Compact
<i>Mazda</i>	1972-1999	1.044	4	Intermediate
<i>Mercedes</i>	1970-1999	3.572	2	Luxury
<i>Mitsubishi</i>	1976-1999	0.600	3	Intermediate
<i>Nissan</i>	1970-1999	2.206	5	Intermediate
<i>General Motors</i>	1970-1999	10.943	5	Standard
<i>Peugeot</i>	1970-1999	12.005	4	Subcompact
<i>Renault</i>	1970-1999	12.223	4	Subcompact
<i>Rover</i>	1970-1993	4.982	4	Subcompact
<i>Saab</i>	1970-1989	0.174	3	Standard
<i>Seat</i>	1983-1985	0.533	2	Intermediate
<i>Suzuki</i>	1981-1999	0.240	2	Subcompact
<i>TalbotSimca</i>	1970-1979	6.149	4	Subcompact
<i>TalbotMatra</i>	1970-1977	0.078	1	Standard
<i>Toyota</i>	1979-1999	1.303	4	Compact
<i>VW</i>	1970-1999	14.618	5	Intermediate
<i>Volvo</i>	1970-1998	1.079	5	Luxury
<i>Yugo</i>	1981-1991	0.086	1	Compact

Notes: all the firms that were at some point active in the period with some information. The years active are the years they were observed in the dataset. The market share is the mean over the years. Also the number of segments it has been active in and what the most used segment is, is displayed.

Table 2 gives an overview of all the participants in the European Car market in the dataset. If all the 30 participants have the same market share then this would generate a market share of around 3% which would yield a market concentration of 270. However, when observing table 1 it stands out that there are 6 firms that have a market share over a 10% and a lot of firms with a very small market share. This means that just a handful of firms compete with each other for the biggest part of demand, while a lot smaller firms compete for a very small share of demand. A less competitive market implies a higher market share. This is confirmed by graph 1, which shows an initial market concentration of around 1300 in 1970.

Graph 1: overview of the HH in the whole market over the years

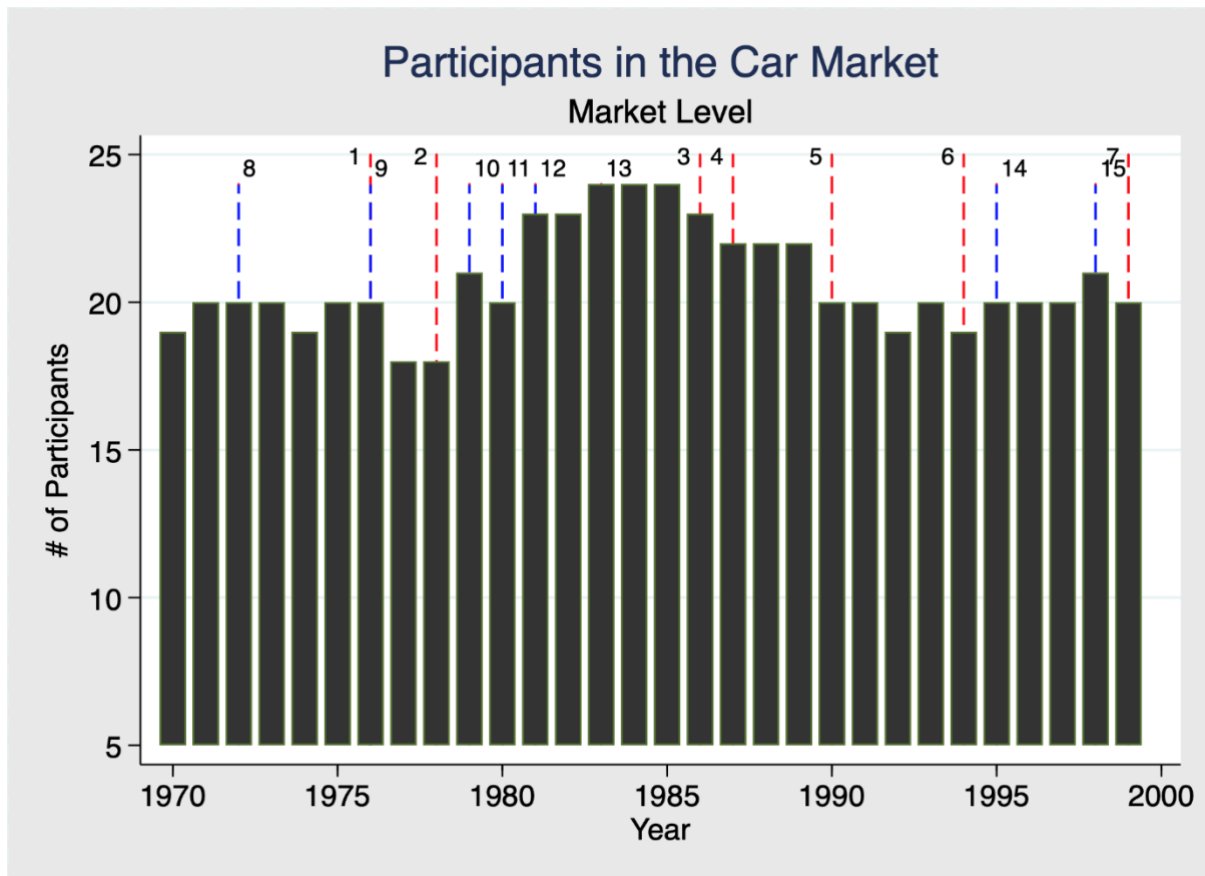


Notes: The line represents the development of the HHI over time. On the X-axis is the year displayed and on the Y-axis the HHI level. The red lines indicate the acquisition events and their respective event number from table 3. The blue lines indicate the entry events and their respective event number from table 4.

Subsequently, it decreases until 1978 after which the concentration recovers a little to decrease again to the minimum of just below 1100 in 1985. After reaching this minimum the concentration increases again until 1993, to eventually decrease again to its final level, a bit below 1200. These fluctuations can have multiple explanations, one of those explanations is fluctuations in the number of participants. If the number of participants decrease, the market

becomes less competitive and the market concentration will fall, and vice versa. Graph 2 shows the development of the number of participants. Indeed, the year with the minimum level of market concentration is also the year with the most participants. Also, the number of participants in 1999 is slightly higher than in 1970 just as the market concentration is slightly lower.

Graph 2: overview of the number of participants in the car market



Notes: the bars are the number of participants in that year in the European Car market. On the X-axis is the year and the Y-axis the number of participants. The red lines indicate the acquisition events and their respective event number from table 3. The blue lines indicate the entry events and their respective event number from table 4.

Based on the results provided above, the first hypothesis that the car market as a whole is characterized by increasing market concentration, can be rejected as the market concentration decreases. This can partly be explained by the results from the second hypothesis. The increases and decreases in the number of participants roughly follows the events of acquisition or entry by established firms. As hypothesized firms use acquisition to grow, which increases market concentration, these events are indicated by the red lines. However, not all acquisitions have a profound effect on market concentration, because most

of the acquired firms had a relatively market share, based on table 2 in the next section. But still, the acquisition increased market concentration. An explanation for a decrease in the market concentration could be the entry of established firms from other geographical markets. The entries of these firms are indicated in the graphs by the blue lines. Table 1 and Table 3, shows that the entrants in the market had a higher market share than the firms that exit. Table 1 shows that most of the 11 firms that exited had a relatively low market share. The biggest exception was the exit of 'Talbot Simca' in 1979 with a market share of above 6%. As you can see in graph 1 this increased the market concentration. Most entrants were able to accumulate mostly market shares of above 0.5% over time. So the entry of established firms from other geographical markets is one of the possible explanations for the decrease in market concentration over time.

b. Forms of entry and exit

Next, I hypothesized that in a mature market entry will be mostly by established firms. Also, I hypothesized that acquisition is a form of exit and a form of entry into different segments. I start with looking at the acquisitions in the market and their effect. Table 3 below shows all the acquisitions that happened between 1970 and 1999. From table 3 follows that over this period 10 firms exited, from which 7 were acquired by other firms. This shows that acquisition is the prominent way of exiting the European car market. I assume in this case, that when an acquirer does not diversify it only acquires a firm to grow proportionately. When an acquirer does diversify then this can be seen as a form of entry into different markets and it will grow extra proportionally.

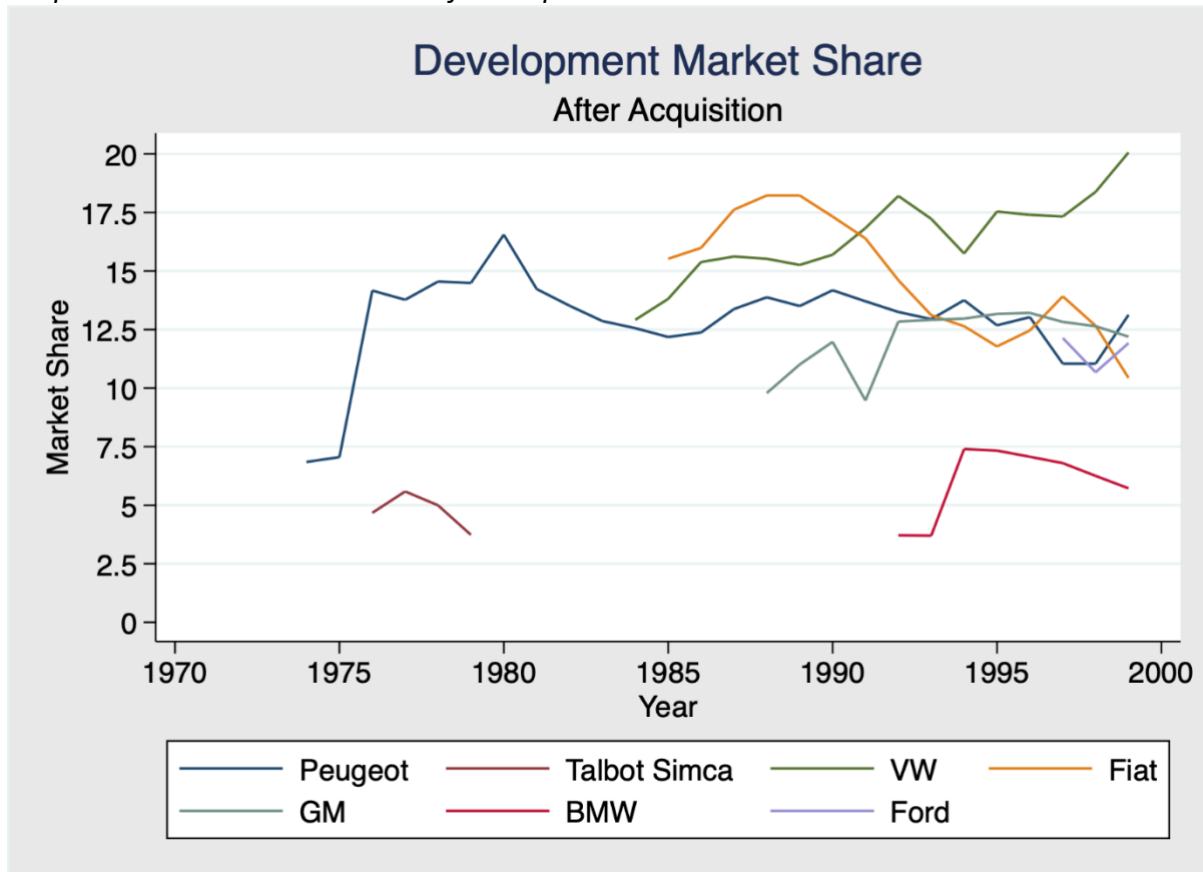
Table 3: list of the acquisition events

Event No.	Name Acquired Brand	Name Acquirer	Year Acquisition	Dominant Segment	Diversify	Segment diversify	Market Share (Mean)
1	Citroën	Peugeot	1976	Subcompact	No	-	1.28%
2	Talbot	TalbotSimca	1978	Standard	Yes	Standard	0.11%
	Matra	HillmanSunbeam					
3	Seat	Volkswagen	1986	Subcompact	Yes	Luxury	0.76%
4	Alfa Romeo	Fiat	1987	Compact	Yes	Standard	1.87%
5	Innocenti	Fiat	1990	Subcompact	Yes	Luxury	0.14%
5	Saab	General Motors	1990	Standard	No	-	0.23%
6	Rover	BMW	1994	Compact	Yes	Compact	3.43%
	Triumph						
7	Volvo	Ford	1999	Luxury	Yes	Luxury	1.27%

Notes: per acquisition the name of the acquirer and acquired is given. The year is the first year was it operated under the acquirer's name. Dominant segment is the segment the acquired brand has the most models in. Diversify is yes if the acquirer diversified into a new segment around the time of the event. The market share is a mean of the last 3 to 5 years depending on the relevant range.

The firms I consider to be acquired just for growth purposes are 'Citroën', 'Seat', 'Innocenti', 'Saab'. Although 'Volkswagen' diversified into the luxury segment around the same time they acquired 'Seat', but because it's dominant segment is subcompact there is no reason to believe 'Volkswagen' acquired it as a tool for entry into the luxury segment. I hypothesized that this kind of acquisition would lead to a proportional increase in market share. Graph 3 shows the development of the market share from one year before the acquisition and onwards. As shown in the graph, when 'Citroën' gets acquired the market share of Peugeot goes up from 7,5% to 14% and stabilizes again, it is likely that this surge is explained by the acquisition. However, I hypothesized that the rise in market share was proportionally to the market share of the acquired firm. Second, when 'Volkswagen' acquired 'Seat' in 1986 graph 3 shows an increase from around 14% to just above 15%. I argue that this change in market share is around the 0.76% market share of 'Seat'. The acquisition of 'Innocenti' did not do much to the market share of Fiat, this is as expected because the market share of 'Innocenti' was just 0.14%. Finally, the acquisition of 'Saab' in 1990 increased the market share as well, this a small increase which is proportionate to its market share of 0.23%. So, graph 3 provides evidence for the fact that acquisition with growth as purpose indeed grows the market share of the acquirer and in most cases it does so in a proportionate matter. However, the acquisition of Citroën led to a higher increase then expected, this can be due to trend effects or other year specific events. Also I hypothesized an immediate effect, the graph does not show signs for this, as the development of the market share is random after the year of the event.

Graph 3: Overview market share after acquisition



Notes: the lines show the market share of the acquirers from two years before the acquisition. X-axis is the years and Y-axis the market share in percentages.

Next, the firms that are acquired for the purpose of diversifying and enter a different segment. As can be seen in table 3, by acquiring or merging with Talbot Matra by 'Talbot Simca', does 'Talbot Simca' enter the standard segment in 1978. Graph 3 shows a decline in market share of Talbot Simca after the acquisition, while a small increase of 0.11% was expected. A possible reason for this could be that there is a year specific event that had a bigger effect than the very small effect of the acquisition. In 1987 'Alfa Romeo' was acquired by 'Fiat' which was followed by entry in the standard segment, although not 'Alfa Romeo's' dominant segment, still a segment it was quite big in. Graph 3 shows an immediate surge of 'Fiat's' market share almost equal to the 1.87% market share of 'Alfa Romeo'. As expected there seems to be a delayed effect of this acquisition, pushing the market share even higher. In the long run Fiat's market share declines, it is unlikely that this has something to do with this specific event. Finally, the acquisition of 'RoverTriumph' by 'BMW' let to entry in the compact segment by 'BMW' in 1994. Again, graph 3 shows an immediate increase in market share for the acquirer of around 3% just as the market share of 'RoverTriumph' which is

3.43%. There seems to be no long term additional increase in market share due to the entry into a new segment, as the market share decreases after the event. All in all the hypothesis must partly be rejected, as acquisition is used to enter different segments and diversify but it does not lead to an additional rise in market share above the increase in market share coming from the acquired firm.

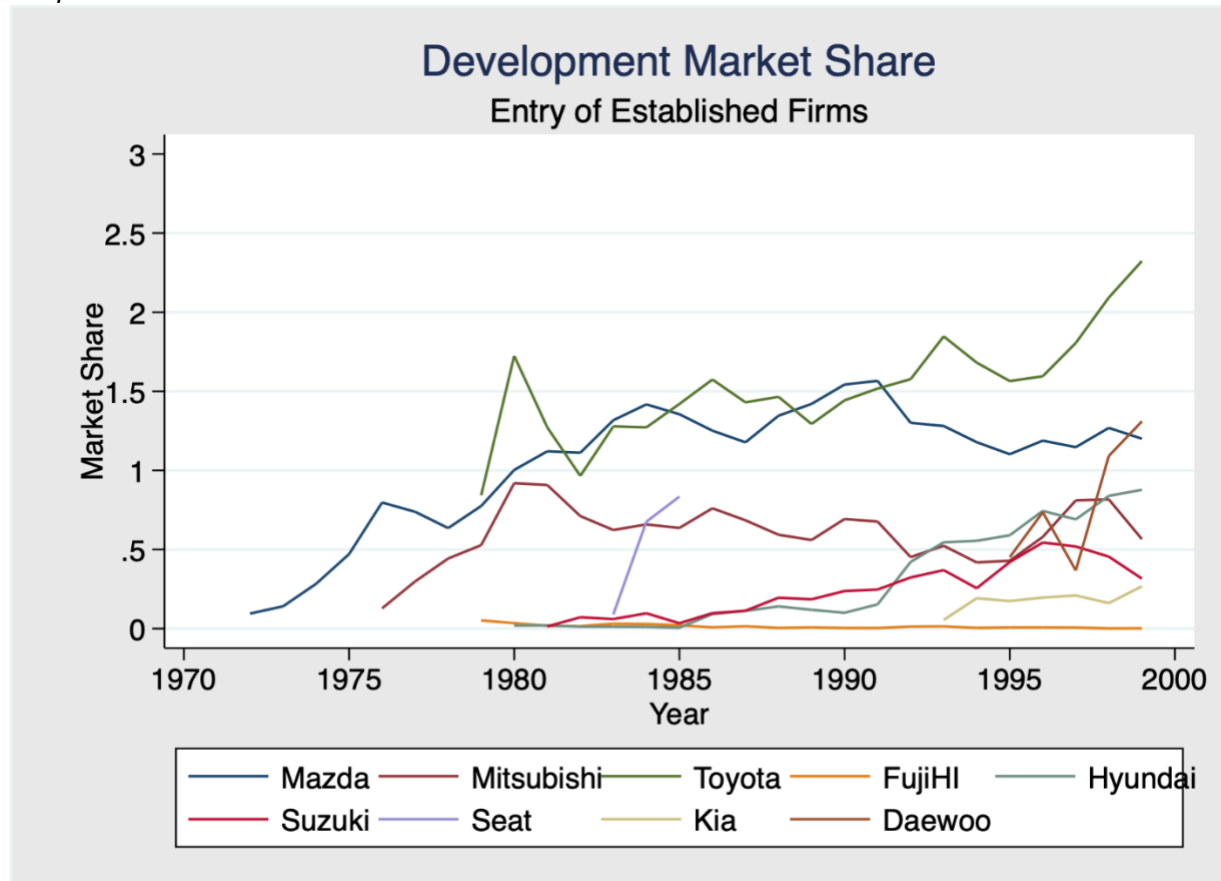
Table 4: list of the entry by established firms events

Event No.	Name Established Firm	Year Entry	Country of Origin	Dominant segment	Market share (mean)
8.	Mazda	1972	Japan/Korea	Intermediate	1.044%
9.	Mitsubishi	1976	Japan/Korea	Intermediate	0.6%
10.	Toyota	1979	Japan/Korea	Compact	1.413%
10.	Fuji HI	1979	Japan/Korea	Subcompact	0.013%
11.	Hyundai	1980	Japan/Korea	Intermediate	0.303%
12.	Suzuki	1981	Japan/Korea	Subcompact	0.24%
13.	Seat	1983	Spain	intermediate	0.533%
14.	Kia	1993	Japan/Korea	compact	0.179%
15.	Daewoo	1995	Japan/Korea	compact	0.791%

Notes: the events of entry by established firms from other geographical markets. The country of origin is the country consumers associate the brand with. The dominant segment is the segment the entrants have the most cars in. The market share is the mean over the years.

Now I will look at what happens to the market concentration if established firms from a different geographical market, enter the European Car market. Table 4 displays all these entries and their characteristics. Table 2 shows that in total 11 firms entered over time, of which 9 were established firms from other geographical markets and just totally new entrants. Table 4 shows that all the entrants but one originate from Japan or Korea and the other is from Spain. Of the new entrants, 'Yugo' was not able to gather a large market share and subsequently exited the market again according to table 2. The other one, 'Daimler', entered very late but was able to gather a significant market share. All of the established firms that entered remained active in the market for the rest of the period, this indicates that the entry was successful regardless of the market share they gathered. This provides evidence for the fact that entry by established firms is the most prominent and successful form of entry in this market.

Graph 4: Overview of the market share of entrants



Notes: the lines show the market share of the established firms that enter the market from a different geographical market. X-axis is the years and Y-axis the market share in percentages.

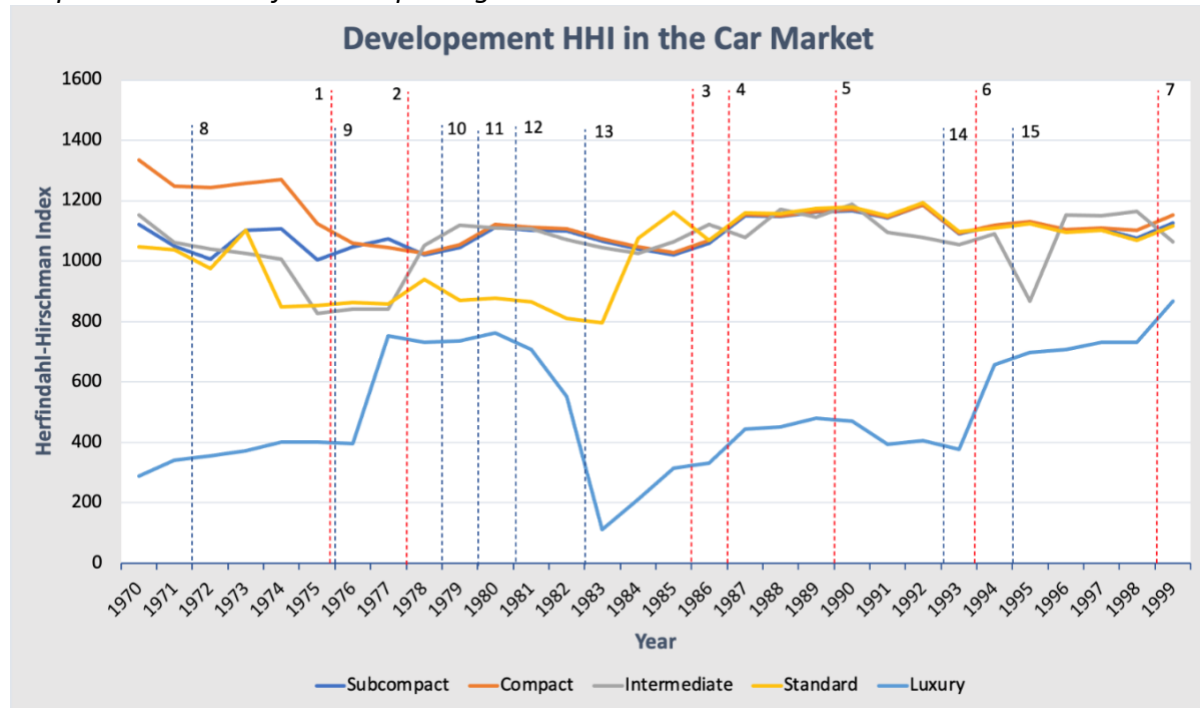
Based on graph 4 Mazda is able to gather 1.5% market share at the maximum, but after just 4 years out of the 28 in the market it has already gained half of it. For Mitsubishi the surge was even quicker, it reached its maximum market share after just 4 years, after that it stabilized around that level. Toyota entered already with a market share of just below 1%, followed by a quick spike and growing steadily afterwards. Both 'Fuji HI' and 'Hyundai' started off with a market share near zero. 'Fuji HI' remained at a market share of 0, but for 'Hyundai' it took 5 years to let its market share grow, eventually it climbed to around 0.8%. The development of the market share of 'Suzuki' is characterized by a stable growth rate, it peaked at 0.5% to lastly fall to around 0.3%. Graph 4 also shows that 'Seat' was able to rapidly increase its market share before it got acquired by 'Volkswagen'. 'Kia's' market share is also characterized by a stable growth rate with 0.3 at its maximum. Finally, after a turbulent first couple years, the market share of 'Daewoo' rose sharply. It started off with an already high market share of 0.5% to eventually soar to 1.3%. After comparing table 4 and graph 4 there seems to be no relationship between dominant segment and the respective All in all, the

hypothesis that entry of established firms from other geographical markets leads to a decrease market concentration holds. This is because entry alone decreases market concentration, but next to that increasing market share of more firms makes this market more competitive which is indicated by a lower market concentration.

c. Per Segment

Finally, I hypothesize that when a segment more luxurious the market concentration becomes lower. Graphs 5 and 6 give the development of the market concentration and the number of participants of all the different segments respectively. Start off with the most basic segment, the subcompact segment. Graph 5 shows that the market concentration is around 1100, which is the third highest and very close to that of the intermediate sector, to end up at around the same level. What stands out is that the development of the market concentration is the most stable over time out of all the segments. The number of participants, shown in graph 6 has rising trend, where it starts as the third highest with 10 participants to end with the most number participants of 18. The fact that the development market concentration resembles that of a mature market the most is in line with what I hypothesized. Then, the luxury segment has by far the lowest market concentration of all the segments, starting at 300 and fluctuating a lot to eventually end at just above 800. Looking at graph 6 shows that the same can be observed for the number of participants, which starts at 5 and ends at 7 which is also the lowest out of all the segments. Lower market concentration implies that the market is more competitive, in this case the market share is distributed more evenly over a smaller amount of participants. This is in line with what I hypothesized.

Graph 5: Overview of the HHI per segment

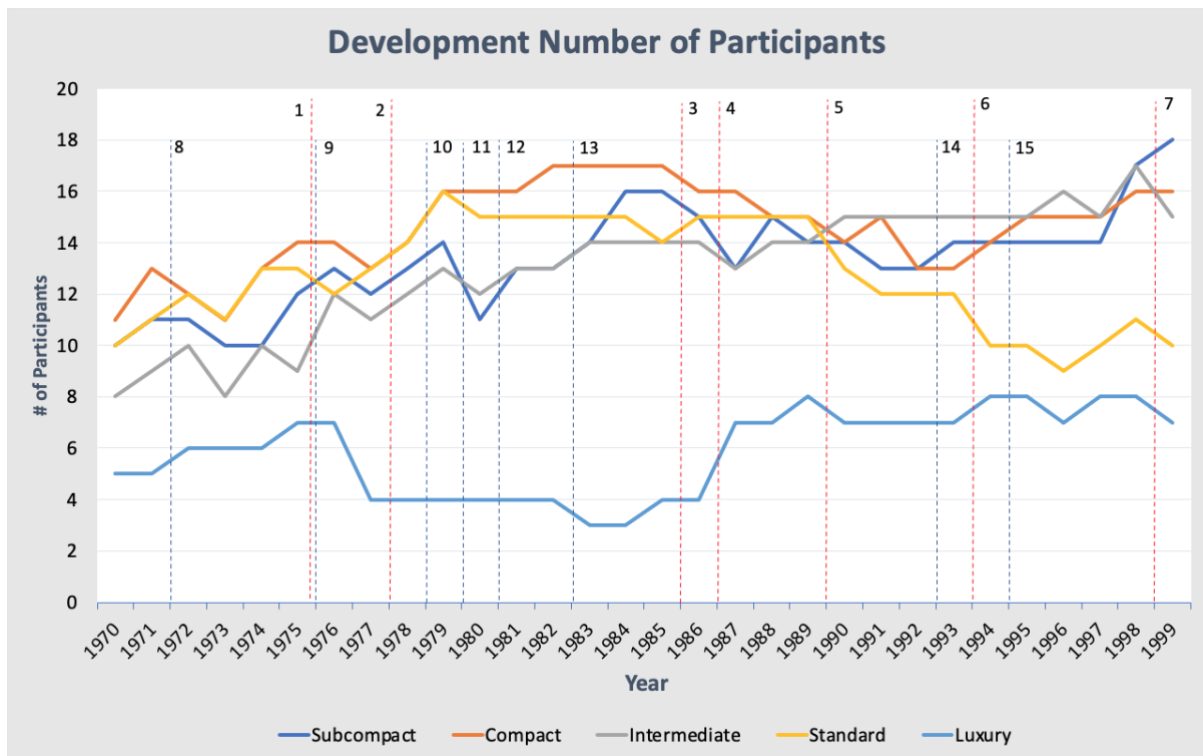


Notes: Each line represents the development of the HHI of a segment. On the X-axis is the year displayed and on the Y-axis the HHI level. The red lines indicate the acquisition events and their respective event number from table 3. The blue lines indicate the entry events and their respective event number from table 4.

From graph 5 also follows that apart from the luxury segment the market concentrations of the segments are pretty close to each other. The compact segment starts with an higher concentration than the subcompact but then decreases to the same level and follows almost the same trend to end up slightly above the subcompact segment. Moving up to the intermediate segment, the market concentration lies mostly below that of the subcompact and compact segments. Also, the trend of the market concentration fluctuates more than the two more basic segments. This can be explained by the fact that multiple established firms entered with this segment as their dominant segment. Therefore, its market concentration reacts a bit more vehemently to certain entries than in other segments. Next to that it also has less participants, which makes that entry and exit will have a more profound effect on the market concentration. Finally, the standard segment also has a market concentration which mostly lies below that of the subcompact and compact segment. At first it fluctuates a lot but after a while it follows the level and trend of the aforementioned segments. A possible explanation for the fluctuations could be explained by the (delayed) effect of entry of 'Mazda' and 'Toyota' in 1973 and 1979 respectively. As these two firms have

the standard segment as its dominant segment and the fact that it had a lower amount of participants in the beginning making it more vulnerable to entry and exit.

Graph 6: Overview of the number of participants per segment



Notes: Each line represents the development of the number of participants in a segment. On the X-axis is the year displayed and on the Y-axis the number of participants. The red lines indicate the acquisition events and their respective event number from table 3. The blue lines indicate the entry events and their respective event number from table 4.

From graph follows that the development of number of participants follows around the same order as the market concentration. Again, the luxury segment has the lowest amount of participants, which starts at 5 participants and ends with 7 participants. As hypothesized, the number of participants is the lowest and also fluctuates the least. The subcompact, compact and subcompact segment follow an increasing trend. Table 4 show that most entrants from established firms enter in these segments. The standard segment's trend has a reversed U-shape, it starts as the second highest level of participants to the second to last number of participants. More participants would imply more competition and hence a lower market share, however here the opposite is the case. As mentioned before and after inspecting table 2, the way the market share is distributed over the participants differs between the segments. This explains why some segments have a higher market share than hypothesized.

All in all, the hypothesis that the more luxurious a segment is the lower the market concentration is, partly holds. The luxury segment has the lowest market concentration but for the other segments there is no unambiguous order for the market concentration. As expected the most basic segments, subcompact and compact, follow almost the same trajectory. This trajectory resembles the one from the market or the mature market. Because profits are low economies of scale become important which suits bigger firms the best. Therefore biggest part of the market share is distributed between just few participants which yields a high market concentration. Also in line with the hypothesis is that the market concentration of the more luxurious segments fluctuates more. As more entry and exit is made possible by a bigger role of product innovation. An explanation for the fact that the bottom 4 segments are closer to each other than expected is that entry by established firms is less equally distributed as expected. The entry by established firms focused mainly on the compact and intermediate segment, lifting the market concentration more than the others. Finally, acquisition led to mostly diversification into the more luxurious segments. Because the acquisition is done by large firms, as table 2 shows, does this lead to more firms with a higher market share, hence a higher market concentration.

5. Discussion

The goal of this paper was to formulate an answer to the question how the market concentration has developed through the years for the different segments in the European Car market. First, I found that the market concentration for the whole car market shares a lot of characteristics with the mature stage as described in the literature. However, the market concentration was stable to decreasing instead of increasing. This is explained by the entry of established firms from outside markets who are better equipped to survive. The effect of these entries is likely to be bigger than the effect of the acquisitions. Then the possible modes of entry in segments were discussed and how they affect the market concentration. The results show that acquisition of incumbent brands takes place. It shows that acquisition is used by firms to grow, but it provides evidence for acquisition as a way to enter different segments as well. Both forms of acquisition increase market share immediately and mostly proportionally. However, there is no evidence that acquisition as form of diversification leads to an extra proportional increase in market concentration or a delayed effect. Entry by established firms from other geographical markets proves to be the dominant form of entry in this sample. The results also provide evidence for the fact that this form of entry leads to a decrease in market concentration, as the market share of the firms quickly increases over time. Finally, the results show that the luxury segment has the lowest market concentration. Also, the more luxurious the segment gets the more the market concentration fluctuates. Next, the more basic segments have a market segment that resembles the trend of the market, relatively stable and slightly decreasing. Finally, the intermediate and standard segments have a higher market concentration than expected. So all in all the development of the market concentration in the European Car market has the characteristics of a mature market. However, the more luxurious a segment gets how less stable the market concentration becomes. The main explanation provided is the characteristics of the product which determines the distribution of the market share. Next to that, the entry of established firms and the acquisition have a segment specific effect on the level of market concentration.

One suggestion for future research is looking at a more recent time frame as the market matures. In the years after this sample, globalization increased even more which lowers the barriers for established firms to enter. It is interesting to see what this does to competition. The market share can be more evenly distributed over more firms or there are

just some winners which might cause the market to consolidate again and lead to exit by acquisition of the Japanese firms for example. Another interesting topic for future research is looking more deeply at the motives for acquisition besides mere growth of market share. Because a lot of the acquired firms had a relatively small market share it raises the question what the motives are as it doesn't increase the firm's market share by a lot.

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