Cartels and Ownership Concentration

Andrea Günster
Zurich University of Applied Science

Gérard Hertig
ETH Zurich

Mathijs A. van Dijk
Erasmus University Rotterdam

Preliminary Draft, January 2023

Abstract
We examine the relationship between corporate ownership and cartels based upon 63 listed firms active in 32 European cartels between 1997 and 2010. We investigate how the distribution of the top 1, 5 and 20 shareholders and their concentration change along competitive and cartel phases. We find that the top 1, 5, 20 shareholders own controlling stakes pre-cartel and then steadily decrease their stakes during the cartel period, with a large drop after cartel breakup — where cartel death does not coincide with detection. For the top 5 shareholders, there is a significant increase of about five percent at the beginning of the cartel. When focusing on different investor types (industrial firms, active/passive investors, individuals, foundations, and governments), corporations are the only investor type significantly increasing stakes at the beginning of the cartel. A tentative explanation for industrial firms' (occasionally partners in crime) behavior is that it facilitates collaboration among cartel members, with suppliers and/or customers. The top 5 shareholders decreasing their stakes during the cartel period is explained by Tobin's Q decreasing during and significantly dropping after the cartel period.

Andrea Günster is at the Institute of Business Technology, Zurich University of Applied Science. Gérard Hertig is at the Center for Law and Economics at ETH Zurich. Mathijs van Dijk is at the Rotterdam School of Management, Erasmus University Rotterdam. E-mails: gues@zhaw.ch, hertig@ethz.ch and madijk@rsm.nl. We thank participants at the economic seminar series of the International Monetary Fund (2013), American Law & Economics Annual Meeting (2014), and ZEW Competition Policy Seminar Series, Martin Carree and Martin Schonger for valuable comments and discussion. We are indebted to Bastiaan Blokland, Carlo De Haas, Iustin Ivanescu and Rogier Wessels for excellent research assistance.

Introduction

Corporate governance is concerned with the resolution of collective action problems among dispersed investors and the reconciliation of conflicts of interest between various corporate claimholders, including managers and shareholders (Becht et al., 2003). Recent years have seen an increased interest in corporate governance. This can be attributed to several trends (Becht et a., 2003). First, scandals such as the Enron and the Ahold cases have been widely publicized and have led to a sense of distrust towards top managers among the general public. Another trend is the growth in defined contribution pension plans, which has created a class of investors that is sufficiently large to influence corporate governance. In addition, the hostile takeover wave in the US and in Europe also created a renewed interest in corporate governance. Finally, deregulation and the integration of capital markets on a global scale have led to corporate governance rules being promoted as a way of encouraging foreign investment in emerging markets. Concentrated ownership by a small number of large owners has been identified as being an important mechanism. The stakes of these owners in corporations are sufficiently high to provide them with monitoring incentives. They might spend considerable effort to gain information about corporations, and use their voting power to influence important decisions of the management.

A second factor acting as a mechanism disciplining managers is competition in product markets. Theoretically, competition improves efficiency. In highly competitive environments, the management has to perform optimally and make decisions only to maximize firm performance (Giroud and Mueller, 2010). Stiff competition would lead to bankruptcy of the less efficient firm and thereby, reputational damage to management. Due to product market competition, the interests of the shareholders and managers are aligned and the agency problem is solved. Since both product market competition and ownership concentration positively affect the agency problem, it is interesting to see whether competition in product markets influence the ownership concentration in corporations.

Competition has been shown to affect firm performance. If competition also affects ownership structure, previous findings regarding the relation between ownership structure and performance could suffer from an omitted variable bias. Competition has mostly been studied in the context of the outputs of corporate governance systems. For example, lower managerial incentives (Hart, 1983), greater managerial waste (Leibenstein, 1996) and lower efficiency (Nickell, 1997; Günster et al., 2011) are associated with less competitive environments (Guadeloupe & Perez-Gonzalez, 2003).

To answer the research question, we use an unique dataset containing information on cartels convicted by the European Commission to identify firms in situations of voluntarily reduced competition. We combine the information on cartel activity with data containing ownership information and additional proxies for corporate governance mechanisms. We examine the relationship between corporate ownership and cartel existence, based upon 63 listed firms active in 32 European cartels between 1997 and 2010. We investigate how the distribution of the largest and the top 1, 5 and 20 shareholders and their concentration changes along the product market competition state, moving from a competitive to a cartel state and then returning to a competitive state.

The results show that the top 1, 5, 20 shareholders own controlling stakes pre-cartel and then steadily decrease their stakes during the cartel period, with a large drop after cartel breakup — which does not necessarily coincide with cartel detection. For the top 5 shareholders, we also find a significant increase of about five percent at the beginning of the cartel. When focusing on different investor types (industrial firms, active/passive investors, individuals, foundations, and governments), we show that corporations are the only investor-type significantly increasing its stake at the beginning of the cartel. One tentative explanation for industrial firms (occasionally partners in crime) increasing their stake at the beginning of the cartel is that it facilitates collaboration among cartel members or with suppliers and customers.

Corporate Governance and Product Market Competition

Shleifer and Vishny (1997) and Becht et al. (2003) survey the corporate governance literature. Shleifer and Vishny (1997) define corporate governance mechanisms as "economic and legal institutions that can be altered through the political process". Corporate governance mechanisms can be designed and influenced by policy makers in an attempt to alleviate the agency problem. Becht et al. (2003) discuss five main corporate governance mechanisms to alleviate the agency problem: 1) legal protection of investors and clearly defined fiduciary duties for CEOs, 2) hostile takeovers and proxy voting contests, 3) delegation and concentration of control in the board of directors, 4) alignment of managerial interests with investors through executive compensation contracts, 5) partial concentration of ownership and control in the hands of one or a few large investor.

For the second reason, Grossman and Hart (1980) present a theoretical model providing a less optimistic perspective on hostile takeovers. They formulate a model of a

tender offer game proposing several solutions which all involve some dilution of the rights of minority shareholders. Several authors have found that the free-riding of investors as described by Grossman and Hart (1980) does not occur in a world with asymmetric information. However, empirical findings that show that on average all the gains from hostile takeovers go to target shareholders do seem to be consistent with Grossman and Hart (1980).

The third corporate governance mechanism is the board of directors. However, directors usually have a limited financial stake in the corporation, which makes it questionable to what extent their incentives are aligned with the shareholders' incentives (Shleifer and Vishny, 1997). Executive compensation also acts as a corporate governance mechanism. Executive compensation contracts can be used to align the interests of managers with those of the owners of a corporation. As Becht et al. (2003) state, most compensation packages in publicly traded firms is comprised of a basic salary component, a bonus related to short run performance (such as accounting profits), and a stock participation plan. Although aligning the interests of managers with those of owners seems like a good solution to corporate governance mechanisms, there are also concerns that unusually large compensation packages are a signal of poor corporate governance (Minow, 2000). The stream of research that looks into compensation contracts has traditionally used the general theory of contracting under moral hazard of Mirrlees (1976, 1999), Holstrom (1979), and Grossman and Hart (1983) to conclude about the structure of executive pay.

A final corporate governance mechanism and the at the heart of this study is concentrated ownership. If ownership is concentrated in the hands of only a few investors, who all have a relatively large cash flow stake, concerted action is much easier than in the case of dispersed ownership (Shleifer and Vishny, 1997). There are several distinct forms that concentration can take, including takeovers, large creditors, and large shareholders. Shleifer and Vishny (1997) argue that the most direct way to align cash flow and control rights of investors in the firm is for a relatively large shareholder to have a substantial minority ownership stake, such as 10 or 20 percent. A substantial minority shareholder has the incentive to collect information and monitor the management, thereby avoiding the traditional free rider problem, as described by Grossman and Hart (1980). Furthermore, a large shareholder can put pressure on management because of his voting power. Shleifer and Vishny (1997) conclude that "large shareholders address the agency problem in that they both have a general interest in profit maximization and enough control over the assets of the firm to have their interests respected".

Demsetz and Lehn (1985) propose that ownership structure adapts to forces in the contracting environment of the firm, in order to maintain optimal governance. First, the value-maximizing size of the firm is related to ownership through a risk-neutral effect and an effect due to risk aversion. Second, corporate ownership is the control potential, which is defined by Demsetz and Lehn (1985) as the wealth gain achievable through more effective monitoring of managerial performance by a firm's owners. The third force driving corporate ownership in Demsetz and Lehn (1985) is regulation. Demsetz and Lehn (1985) empirically test the effect of these forces on ownership, using US data. The measures of instability are significantly positively related to ownership concentration, while the size of the firm is negatively related to ownership concentration. The dummy for systematic regulation shows that the average ownership concentration of the regulated firms is significantly less than for other firms.

Dyck and Zingales (2004) analyze the private benefits of control in 39 countries based on 412 control transactions. They measure the private benefits of control by focusing on privately negotiated transfers of controlling blocks in publicly traded companies. The authors find that the value of control ranges between -4% and +65%. These findings suggest that the minority shareholders could potentially be harmed by the presence of a large shareholder. Dyck and Zingales (2004) conclude that legal protection of minority shareholders is a way to alleviate this problem. There are many different types of shareholders, ranging from hedge funds to pension funds to individual investors. It can be expected that each investor class behaves differently, because of differing interests. Cronqvist and Fahlenbrach (2009) take the research done by Demsetz and Lehn one step further and account for heterogeneity across large shareholders. Consistent with a model in which large shareholders differ from each other along dimensions, such as their beliefs, skills, or preferences, Cronqvist and Fahlenbrach (2009) find evidence of significant heterogeneity across different blockholders. They find that investment, financial, and executive compensation policies are systematically related to the type of large shareholder of a firm. Blockholder categories such as activists, pension funds, corporations, individuals, private equity firms, and mutual funds account for most of the reported effects.

Himmelberg et al. (1999) look at the determinants of managerial ownership. They argue that observable firm characteristics in the contracting environment influence managerial ownership in corporations in the US. They find that the size of the firm negatively effects managerial ownership, while the capital-to-sales ratio, which is a proxy for the scope of discretionary spending, enters positively in the regression, suggesting a positive relation.

Taken as a whole, the firm characteristics clearly affect the extent of managerial ownership. Early research done by Morck et al. (1988) regarding the effects of managerial ownership finds that managerial ownership is related to market valuation, as measured by Tobin's Q. Morck et al. (1988) estimate a piecewise regression and find that Tobin's Q rises as managerial ownership increases from 0 to 5%, while it falls as ownership rises further to 25%. Then Tobin's Q rises again when managerial ownership increases beyond 25%.

Ang et al. (2002) investigate the relation between managerial ownership and agency costs in their sample of small, private, corporations in the US. They use these small firms, due to the increased likelihood of firms with 100 percent of shares owned by managers. Following Jensen and Meckling (1976), they assume that these firms experience zero agency costs. Ang et al. (2002) find that agency costs measured by efficiency are significantly negatively related to managerial ownership.

In the US, institutional ownership has gradually become more important since the 1980s (Gillan & Starks, 2007). After the takeover wave in the 1980s, institutional shareholders also started to use their voting power, and their monitoring effort increased. Interestingly, institutional owners do not just vote during the General Assembly of shareholders, but also seem to prefer to negotiate directly. Active institutional owners have been related to changes in governance structure, such as a restructuring or removal of poison pills. Furthermore, Becht et al. (2008) gained complete access to data from a hedge fund (Hermes, owned by British Telecom Pension Scheme) and use this data to analyze the activism of this hedge fund. Hermes has been very successful, earning annual abnormal returns of 4.9% net of fees, and has been highly involved in activism. They conclude that approximately 90% of the abnormal returns earned by the hedge fund come from the activism program. This suggests that financial institutions can increase in value not just by buying and selling securities strategically but also by creating value inside of firms by providing monitoring services (Gillan & Starks, 2007).

Anderson et al. (2003) analyze whether corporations, controlled by the founding family, experience less agency problems than other corporations. They use a sample consisting of 252 US firms and find evidence that family ownership reduce the agency cost of debt. Anderson et al. (2003) also report that shareholder-bondholder relations are less for firms where the founder family also holds the CEO position, because the cost of debt is higher for these firms relative to family owned firms with outside CEOs. A related study by Anderson & Reeb (2003) looks at the relation between family ownership and firm performance. They report that family ownership occurs in over 35 percent of the S&P 500

and accounts for 18 percent of equity outstanding. Anderson & Reeb (2003) find that founding family owned firms perform better than nonfamily firms and that firms managed by CEOs who are part of the founding family are more profitable. Market performance however appears to be better only in the presence of founder CEOs and outside CEOs because founder descendants serving as CEO have no effect on market performance. Similarly, Villalonga and Amit (2006) investigate if corporations with family ownership outperform corporations with other ownership structures, using a market measure. They find that family ownership only creates value when the founder serves as the CEO or as the Chairman with a hired CEO. However, they report that value is destroyed when one of the descendants of the founder serves as CEO.

Ownership structure differs greatly between countries. For example, corporations in the US are characterized by more dispersed ownership than corporations in Europe. Faccio and Lang (2002) provide a comprehensive overview of the ownership among corporations in Europe. Their sample of 5232 firms in 13 Western European countries is predominated by widely held firms and firms owned by families. International evidence on the link between ownership and control has been provided by Pedersen & Thomsen (1999), who find that ownership concentration does not significantly affect firm performance (Return on Equity) among the 100 largest non-financial firms in each of 12 European countries. Furthermore, Leach and Leehy (1991) find a negative relationship between ownership concentration and firm performance in the UK. The evidence from Germany is mixed, as researchers have found a positive, negative, and a quadratic relationship between ownership concentration and performance (Gedajlovic & Shapiro, 1998; Gorton & Schmidt, 2000). In Japan, a positive and linear relationship is found (Gedajlovic & Shapiro, 2002). Furthermore, large shareholders are associated with higher turnover of directors in Germany and Japan (Franks & Mayer, 1994; Kaplan & Minton, 1994; Kang & Shivdasani, 1995). Firm performance is increased by bank block holders in Germany, according to Gorton and Schmid (1996). Shivdasani (1993) shows that large outside directors increase the likelihood of a firm being taken over, while Denis and Serrano (1996) find that in the case of a takeover defeat, management turnover becomes higher in poorly performing firms with block holders.

In general, product market competition could act as a substitute for corporate governance structures. A higher level of competition in the product market increases the amount available about the firm, which reduces the costs of monitoring. Hence, competition and the corporate governance structures are substitutes, as both can reduce agency costs (Cremers et al., 2008). However, product market competition could also act as a complement

for corporate governance structures. Corporate governance structures occur in response to agency costs. Agency costs are lower in more competitive environments, given that competition disciplines managers by increasing the risk of bankruptcy. Alchian (1950) and Fama and Jensen (1983) argue that strong competition in the product markets is especially costly for firms that are governed and managed inefficiently, as competitive environments are quicker to force inefficient firms out.

Nickell (1996) analyzes the link between competition and efficiency and productivity growth and discusses several theoretical models relating competition to managerial compensation and the agency problem. He states that "competition exerts downward pressure on costs, reduces slack, provides incentives for the efficient organization of production, and even drives innovation forward". Nickell (1996) argues that owners of competitive firms are in a better position to prevent slacking by managers and workers than owners of monopolistic firms. Hart (1983) provides a model of managerial incentives that explicitly shows how competition between firms sharpens incentives.

Kole and Lehn (1999) study the effect of a sudden change in the business environment on corporate governance structure. They examine the governance structures of US airlines during the period 1971 – 1992. They chose this period because it includes the Airline Deregulation Act of 1978, which removed price and entry restrictions in the airline industry. Kole and Lehn (1999) use the deregulation as an experiment, assuming that deregulation is a shock that radically changes the nature of competition. They find that the corporate governance structures of the firms in the airline industry changed in response to the deregulation. Equity ownership became more concentrated, the number of directors decreased, CEO turnover increased, and the pay and stock based compensation of the CEO increased.

Giroud and Mueller (2011) provide empirical insight in the relation between competition in product markets and corporate governance in the US. They employ the G-index proposed by Gompers et al. (2003) to classify firms as either Democracies (strong governance) or Dictatorships (weak governance). Giroud and Mueller (2011) measure product market competition as the sum of squared market shares. They then look at the effect of corporate governance on equity returns by analyzing the return of a portfolio that is long in the Democracy firms and short in the Dictatorship firms and find that good governance has a positive effect on stock market performance.

Schmidt (1997) argues that an increase in competition increases the probability that a firm with high costs becomes unprofitable and must be liquidated. This motivates managers

to work hard to ensure that they keep their jobs and to avoid bankruptcy. Giroud and Mueller (2010) discuss how product market competition reduces managerial slack, in effect substituting effective executive compensation contracts. They use exogenous variation in corporate governance in the form of 30 business combination laws passed between 1985 and 1991. These laws harm the corporate governance structure, because they make hostile takeovers more difficult. Giroud and Mueller test the effect of this variation in corporate governance on firms in competitive and less competitive industries. They report three main results: 1) return on assets (ROA) drops by 0.6 percentage points on average, 2) the drop in ROA is larger for firms in non-competitive industries, and 3) the effect is close to zero and insignificant for firms in highly competitive industries. Hence, managerial slack increases mostly in non-competitive industries, but not in highly competitive industries, where the competition disciplines management.

Product market competition has been associated with the market for corporate control, mostly in the form of takeovers. Allen and Gale (2000) propose a model that shows that competition in product markets can replace the market for corporate control as a corporate governance mechanism. In effect, competition plays an informational role in that it reveals the best management team and disciplines management. This model is empirically tested by Chou et al. (2011), who find that product market competition (measured by the Herfindahl index at the industry level among others) acts as a substitute for corporate governance (measured by the G- and E-index proposed by Gompers et al. (2003) and Bebchuck et al. (2009)) in their 1990-2005 sample of US firms. They conclude that high product market competition is associated with significantly weaker levels of corporate governance, consistent with the view that product market competition substitutes corporate governance structure.

Additional evidence on how competition and the market for corporate control are related is provided by Cremers et al. (2008). They investigate if there is a relation between takeover defenses and competition. They conclude that the product market competition is a substitute for corporate governance structures, as firms in more competitive industries have more takeover defenses. Cremers et al. (2008) discuss that monitoring is less costly in competitive markets where more information is available. Guadelupe and Perez-Gonzalez (2010) show that more intense competition leads to a lower estimate of the private benefits of control, which makes it less beneficial to be a large shareholder of a firm. They use a panel dataset of 586 firms in 16 countries. The private benefits of control enjoyed by controlling shareholders are estimated by measuring the voting premium between shares with differential voting rights. Theoretically, the ability of insiders to redirect corporate resources (Jensen and

Mekling, 1976) and use inside information for personal gains (Dyck and Zingales, 2004) is negatively related with competition. This would mean that the private benefits of control decline as well. Hence, Guadelupe and Perez-Gonzalez test for a negative relation. To measure competition, they use two indices: the Product Market Regulation (PMR) index and the Regulatory Impact (RI) index, both developed by the OECD. The PMR index is a measure of the level of countrywide product market regulation in the final-goods market and is comparable across countries. The RI index is a measure of the importance of government policies for competition. This measure is also internationally comparable. Guadelupe and Perez-Gonzalez report that the private benefits of control are significantly lower in more competitive settings.

However, product market competition could also complement the ownership structure in disciplining management. Januszewski et al. (2002) investigate the impact of product market competition and ownership structure on productivity growth in Germany. They employ a panel of almost 500 firms and report that firms have higher productivity growth if they operate in markets with intense competition. Furthermore, they find that productivity growth is higher for firms that are being controlled by a strong ultimate owner (except if this owner is a financial institution). Most interestingly, Januszewski et al find that the positive effect of product market competition is stronger in the presence of a strong ultimate owner. Hence, their results indicate that product market competition complements concentrated ownership in Germany. Köke and Renneboog (2005) also analyze the relation between product market competition, ownership structure and productivity growth in Germany. They find that the relation between strong blockholder control and productivity growth is limited.

Methodology

Günster et al. (2011) use antitrust infringements in the European Union to investigate whether competition affects the profitability and efficiency of corporations. As cartels lower the competitiveness in an industry, they compare the profitability and efficiency of firms in the five years (three years minimally) before and after the cartel period (supposedly a more competitive setting) with the profitability and efficiency during the cartel period, when competition is less intense. Günster et al. estimate a panel model with firm and year fixed effects as well as dummies identifying the pre-, cartel and post-cartel phase, to measure the effect of product market competition on profitability, innovation and efficiency. They find that firms become less profitable and efficient during the cartel period. The effects of participation in a cartel and thus of less intense competition is estimated by panel models.

To test the hypothesis that product market competition is negatively related to ownership concentration, the following panel regressions will be run:

$$Top\ 1_{it} = \alpha_i + \beta CARTEL_{it} + \gamma u_{it} + \varepsilon_{it} \qquad (1)$$

$$Top\ 1_{it} = \alpha_i + \beta_1 CARTELTREND_{it} + \beta_2 PRECARTEL_{it} + \beta_3 POSTCARTEL_{it} + \gamma u_{it} + \varepsilon_{it} \qquad (2)$$

Top 1 is the level of ownership concentration described before. CARTELTREND is a trend variable, which is used to see if ownership changes during the cartel. Alternative measures will be used for Top 1 (Top 5, Top 20, HERF). Furthermore, γu_{it} accounts for unobserved firm effects. Finally, we test whether profitability is driving the changes in corporate control:

$$ROA_{it} = \alpha_i + \beta_1 CARTEL_{it} + \beta_2 Top1_{it} + \beta_3 CARTEL_{it} \times Top1_{it} + \gamma u_{it} + \varepsilon_{it} \qquad (3)$$

In this estimation, β_1 should enter positively, given that weaker levels of competition should lead to increased profitability. β_2 should also enter positively, as ownership concentration disciplines management, which should lead to better performance. As in testing H1, ROA will be replaced by Tobin's q as alternative measures.

The data from Thompson allows us to delve deeper in the relationship between ownership and competition by looking at the behavior of specific classes of investors. Six classes are created: 1) Active Investors, 2) Corporations, 3) Government, 4) Individual investors or Families, and 5) Passive Investors. We create these classes for any investor that owns at least one percent of the firm and then rerun equations 1 and 2. Logically, if product market competition is a substitute or complement of ownership structure, the effect should be more or less the same for each investor class. Another possibility is that the cartel period does not adequately proxy the competition effect, but instead indicates a reputation effect of the illegal activity that the cartel is. This would imply that any investor that is actively involved with the firm would react to the information that the firm was involved in a cartel. This reputation effect might therefore lead to changes in the ownership structure firms with large investors of the active investor classes (in my classification: active investors, corporations and governments).

The dependent variable is ownership concentration and the independent variable of interest is product market competition, as measured by the infringement cases. Furthermore, several control variables are needed. Ownership concentration is measured by looking at the shares owned by the largest shareholder (Top1), the top 5 shareholders (Top5), the top 20 shareholders (Top20), and the Herfindahl index of ownership concentration. Furthermore, several investor class variables are computed. These variables are transformed into logistic ones, as in Demsetz and Lehn (1985) by employing the following formula:

$$\log\left(\frac{percentage\ concentration}{100 - percentage\ concentration}\right)$$

These variables are transformed into logistic variables to transform an otherwise bounded dependent variable into an unbounded one (Demsetz & Lehn, 1985). The years in which a firm in the sample is in a cartel is used to identify less competitive environments (CARTEL), while we also use the pre- and post-cartel phase in the regressions instead (PRECARTEL and POSTCARTEL). To estimate the joint effect of product market competition and ownership concentration on performance, we use ROA and Tobin's Q as a measure of performance. Due to outliers, ROA is winsorized at 1% and 99%.

Data Description

The data used was created by Günster et al. (2011). They obtain information on identified cartel cases in the European Community from 1957 to 2004 from the decision documents of the European Commission. These documents have been published over the years in the Official Journal and the Annual Reports on Competition. Only horizontal conduct cases infringing Article 101 of the 1957 Treaty of Rome are collected. As Günster et al. discuss, this database has several advantages.

The database contains information on formation and termination dates of each cartel. The European Commission needs to determine most precisely the earliest and latest date that the cartel was in place, because the duration of the cartel is a key determinant of the fine. The European Commission often uses a dawn raid to collect evidence related to the cartel, to identify the earliest collusive agreement. Furthermore, convicted firms can file an appeal to the European Court of Justice, which means that the European Commission needs to be very precise and spend considerable effort in collecting evidence. Of course, it could be possible that the cartel was already active before the formation date identified by the Commission, but

Günster et al. conclude that this is unlikely. The termination dates of cartel cases are also identified in the database. Günster et al. use the Commission's investigation date as the termination of the cartel in 51 percent of cartel cases. In another 38 percent of the cases, the Commission reports that the cartel was already terminated before the investigation and this earlier date is used as the termination date. As is the case with the formation date, there remains some uncertainty related to the termination date, given that the cartel could be continued after the termination date identified by the Commission.

The database consists of 301 antitrust infringement cases from 1964 to 2004. 1519 firms were convicted in these cases. Günster et al. (2011) discard firms that are not publicly listed. For unlisted firms, they check whether there is a parent that controls 100 percent of the firm. If this is the case, the parent is included in the dataset. Furthermore, firms that went public or private during the cartel period and firms that were acquired during the cartel period are excluded. Additionally, Günster et al discard all cartel cases that started before 1983, so that they can obtain financial information of the firms before the cartel period starts (as Worldscope starts in 1980, this was a necessity). The final sample includes 141 publicly listed firms involved in 49 cartel infringements between 1983 and 2004. Within the sample, 44 firms are involved in more than one cartel during the sample period. Furthermore, the sample consists of firms from 22 different countries active in many different industries. Günster et al. combine this data with annual data on the profitability, labor productivity, and innovation of the firms in the sample from the financial statement information in Worldscope.

We collect ownership data from Worldscope (through Thomson One) to form measures of ownership concentration. The data from this database stems from various sources. A large part of the data comes from official filings at the SEC, such as the 20F, 13D, and 13F filings. The 20F form needs to be admitted with the SEC by foreign private issuers of securities in the United States, and not just contains data on ownership but also financial statements and other information. The 13D schedule is commonly referred to as the beneficial ownership report and needs to be filled in by a person or group of persons that acquires beneficial ownership of more than 5% of a voting class of a company's equity securities[1]. This schedule needs to be admitted within 10 days after the acquisition, so it is quite accurate. The 13D schedule ensures that individuals or groups with large ownership stakes are in my sample. Similarly, the 13F schedule requires an institutional investment manager that uses the U.S. mail in the course of its business and manages over 100 million USD to report its

[1] http://www.sec.gov/answers/sched13.htm

holdings.[2] Hence, the 13F schedule covers a broad range of financial institutions. Finally, data on ownership is collected from financial statements and other official firm documents and the aggregate mutual fund holdings of institutions for a minor part of the dataset. Firms are only included if they have data of at least 20 percent of shares outstanding in at least one year during my sample period. An important characteristic of the Worldscope database is that it allows us to collect information regarding different investor types. The data in Worldscope only goes back to 1997, which means that it is only possible to test the effect of product market competition on ownership on a subset of the database of Günster et al. (2011). 31 cartels remain, with an average duration of 3.5 years. These 31 cartels contain 645 firm-years.

Results

Table 1 shows that the widely held corporation that has been described so often in the corporate governance literature is not as prevalent in Europe. This is consistent with earlier findings by Faccio and Lang (2002), who studied the ownership of corporations extensively. Furthermore, the firms in the sample obtain an ROA of 3.56 percent on average. As can be seen from Graph 1, the average ownership concentration across firms in the sample seems to increase during cartel years. This effect is strongest for the Herfindahl measure of ownership concentration and the holdings by governmental organizations. The end of the cartel does not have a strong effect on ownership concentration, as there is at best only a slight decrease of ownership concentration in the post-cartel period. In one instance (the holdings by the 20 largest owners), ownership concentration actually increases slightly.

Active investors and passive investors occur in roughly 90% of the firm-years in the sample (see Graph 2). This means that many firms are owned by financial institutions (with a stake larger than 1%), such as hedge funds and venture capitalists (active), pension funds, banks, and insurance companies (passive). Another large investor class that occurs frequently is corporations. Of course, the differences in ownership and profitability between cartel years and non-cartel years are the most interesting. Table 2 shows the average ownership levels and average ROA in cartel and non-cartel years.

This is an early indication that ownership increases because of the cartel. While it is by no means possible to draw statistical inferences from this table. Ownership and product market competition are negatively related. Interestingly, ownership does not change much after the cartel. Looking at the profitability measures, this table provides ambiguous insights.

[2] http://www.sec.gov/answers/form13f.htm

ROA increases because of the cartel, and remains higher after the cartel period. However, ROE is slightly higher before the cartel and decreases strongly after the cartel. Tobin's q shows a decrease of almost 10% after the cartel period, while Tobin's q is also higher before the cartel period.

Focusing on Table 3, it becomes clear that there is substantial evidence of a relation between ownership concentration and the firm being in a cartel or not. Using the ownership concentration of the five largest shareholders, the panel regression yields a negative cartel trend coefficient of -2.09% (significant at the 0.01 level), a negative pre-cartel coefficient of -4.43, and a negative post-cartel coefficient of -10.34. Top1 and Top20 shareholders also significantly decrease their stakes during the cartel period with a significant drop at the end of the collusive phase. The Herfindahl index of ownership concentration as the dependent variable leads no significant changes apart from a slight drop at the end of the cartel. All these results are significant in terms of economic magnitude as well.

From a corporate governance perspective, these results do not unambiguously support the hypothesis that product market competition acts as a substitute or complement of ownership concentration as a corporate governance mechanism. The coefficients of post-cartel dummy variables indicate that ownership concentration is negatively related to competition. When the firm's environment becomes more competitive due to the termination of the cartel, the ownership concentration decreases, regardless of the ownership variable used. This negative relationship is consistent with product market competition and ownership concentration being substitutes, as other authors like Cremers et al. (2008) and Guadelupe and Perez-Gonzalez (2010) have found. The negative cartel trend suggests that product market competition and concentrated ownership are complements, consistent with Kole and Lehn (1999).

However, there are several issues concerned with the corporate governance perspectives. First, the fact that the pre-cartel dummy coefficient is only significant in one instance weakens this interpretation, because it would be expected that ownership would increase at the start of the cartel to account for the less competitive situation. Alternatively, this could be caused by the fact that European Commission had to investigate the start date of the cartel ex-post and it could be difficult to determine the exact start date, which might lead to noise in the pre-cartel variable. (Günster et al. 2010). Second, the finding that ownership concentration gradually decreases during the cartel, as becomes apparent from the significant cartel trend coefficients, is inconsistent with the substitute hypothesis. Hence, this finding cannot be explained by the substitutes hypothesis.

Perhaps more interesting is the significant negative coefficient for the cartel trend variables. This seems to indicate that large shareholders could be aware of the firm being in a cartel or not and hence reduce their ownership stake during the cartel to prevent being harmed by the negative effects of a possible cartel conviction. Naturally, this is a bold statement considering that it implies that some investors have more knowledge than others. The assumption that large shareholders are concerned about their reputation because of their stake in the cartel firm is more plausible for active investors, such as hedge funds, venture capitalists, corporations and governments, than for well-diversified passive investors, like banks or insurance companies. Hence, this interpretation would be supported by findings that indicate that more active investors react more strongly to the cartel situation of the firm. The next section will discuss the results of panel regressions run with the holdings of different ownership classes as independent variables.

Looking at Table 4, the following results can be found. For simplicity, we only report the significant results which are available for corporations and active investors only. We do not find significant results for passive investors, individuals, foundations, and governments. First, it appears that the results discussed in the previous section are mostly driven by the actions of corporations as shareholders. Corporations appear to react significantly to the start of the cartel, as the pre-cartel coefficient is negatively significant. Then, they reduce their holdings during the cartel, given the significantly negative coefficients of about 2.21%. When the cartel is terminated, corporations react further by decreasing their holdings in the firm. Similarly, active investors decrease their stakes during the cartel period.

When looking at the results of the panel regressions with the general ownership concentration variables and interaction effects, it becomes clear that profitability is related to the firm being in a cartel or not in the size of the controlling shareholder. There appears to be a positive interaction effect of the cartel dummy variables and general ownership variables in the regressions where ROA is the dependent variable. These coefficients are significant at the 0.05 level. This means that firms gain more from the cartel situation when ownership is more concentrated. From a corporate governance perspective, this could indicate that large shareholders exert more control on the firm's management. Hence, management is not able to reap private benefits of the cartel situation and more benefits in terms of profitability goes to the firm itself. This finding is similar to the findings of Giroud and Mueller (2011). When focusing on Tobin's Q, it is evident that the firms experience a significant overvaluation. Since controlling shareholders might be better informed about the cartel existence and

therefore the overvaluation of the firm, it might be the explanation why they decrease their stakes during the collusive phase when stock prices are still high.

Conclusion

From a theoretical perspective, product market competition and ownership concentration are related. First, product market competition might act as a substitute for corporate governance structures, because a higher level of competition increases the information available about the firm, thus reducing the costs of monitoring (Cremers et al., 2008). This view predicts a negative relation between product market competition and ownership structure. On the contrary, product market competition could also act as a complement for corporate governance structures, because governance structures occur in response to agency costs and these costs are lower in more competitive settings. Empirical evidence has been found that support both views (Kole & Lehn, 1999; Cremers et al., 2008; Giroud & Mueller, 2010).

We examine the relationship between corporate ownership and cartel existence to answer the question on product market competition and corporate control using a data set based upon 63 listed firms active in 32 European cartels between 1997 and 2010. We investigate how the distribution of the largest and the top 1, 5 and 20 shareholders and their concentration changes along the product market competition state, moving from a competitive to a cartel state and then returning to a competitive state. The results show that the top 1, 5, 20 shareholders own controlling stakes pre-cartel and then steadily decrease their stakes during the cartel period, with a large drop after cartel breakup—which does not necessarily coincide with cartel detection.

For the top 5 shareholders, we also find a significant increase of about five percent at the beginning of the cartel. When focusing on different investor types (industrial firms, active/passive investors, individuals, foundations, and governments), we show that corporations are the only investor-type significantly increasing its stake at the beginning of the cartel. One tentative explanation for industrial firms (occasionally partners in crime) increasing their stake at the beginning of the cartel is that it facilitates collaboration among cartel members or with suppliers and customers. As for the top 5 shareholders decreasing their stakes during the cartel period, one tentative explanation is that cartel firms' loose value over cartel duration, a claim that is supported by Tobin's Q decreasing during and significantly dropping after the cartel period.

While our results do not support the hypothesis that ownership concentration and product market competition are substitutes, the results are interesting because they indicate that there

is a highly significant effect of the firm being in a cartel or not. This could be caused by a reputation effect. Large shareholders might not want to be associated with firms that participated in a cartel. This explains the drop in concentrated ownership in the year after the cartel is terminated. This shift towards more dispersed ownership is primarily driven by corporations, who substantially reduce their ownership stake after the cartel termination. Other active investors do not react to the firm being in a cartel or not. Contrary to corporations, governments actually increase their holding in the firm after the cartel is terminated, perhaps to exercise control to prevent the firm from entering in another cartel in the future. Finally, it seems that at least some large investors are aware of the firm participating in a cartel, because these investors gradually decrease their holdings prior to the cartel termination.

There are several limitations to this study. First, while the European commission spends considerable effort in identifying the termination and formation date of the cartel, it might not be possible to adequately establish these dates. This is more an issue with the formation date than with the termination date, which also might explain the largely insignificant results for the pre-cartel dummy. Another limitation is the ownership database used. Ownership data is generally less reliable for European firms (Faccio & Lang, 2002), and the source of the data might lead to a bias towards US based firms, given the identification of shareholders by looking at forms filed with the SEC. Hence, it might be possible that the ownership data omits several large investors who do not have an office in the US and are not identified in other countries.

In addition, Demsetz and Villalonga (2001) discuss the drawbacks of Tobin's Q as a measure of firm performance in relation to ownership concentration. They argue that this measure is forward looking, while ownership concentration is (partly) a result from past performance. Furthermore, they state that Tobin's Q is a measure of performance measured by shareholders of the firm. Hence, this measure is inadequate, because shareholders can be manipulated by managers of firms with weak governance mechanisms. They conclude that Tobin's Q is an imperfect performance measure in the context of corporate governance. In addition, Demsetz and Villalonga (2001) argue that there will be a problem with the measure of ownership concentration. They argue that the fraction of shares owned by a corporation's largest shareholders is not a reliable measure of the degree to which investors are protected from abuse by management if professional management holds enough shares to put them in this category of shareholders.

Furthermore, ownership is an endogenous variable if it is used to explain firm performance. Due to concepts such as insider information and performance-based compensation, firm performance is at least as likely to affect ownership structure as ownership structure is to affect performance. In light of these concepts, management has an incentive to vary its holdings of stock in line with its expectation regarding future performance. Demsetz and Villalonga (2001) suggest a two-stage least squares regression to alleviate this endogeneity problem.

Additional shortcomings of the analyses are that not all corporate governance mechanisms are accounted for in the regressions. For example, European data is lacking on takeover defenses, proxy voting or executive compensation contracts. Hence, the analyses are subject to an omitted variable bias.

The cartel might also lead to reputational damage for sufficiently large shareholders. The public might be aware of the presence of the large shareholder and is aware of his monitoring power. Hence, the public could assume that the shareholder was aware of the cartel and did not act to stop or prevent it. This reputational damage is an alternative explanation of any variability in ownership data. Therefore, it might be difficult to draw inferences regarding the relation between product market competition and ownership concentration.

References

Alchian, A.A., 1950. Uncertainty, Evolution, and Economic Theory. *Journal of Political Economy*, 58(3), pp. 211-221.

Allen, F., Douglas, G., 2000. Corporate governance and competition. *Corporate Governance Theoretical and Empirical Perspectives*. Cambridge University Press, Cambridge.

Anderson, R.C., & Reeb, D.M., 2003. Founding-Family Ownership and Firm Performance: Evidence from the S&P 500. *Journal of Finance*, 58(3), pp. 1301-1327.

Anderson, R.C., Mansi, S.A., & Reeb, D.M., 2003. Founding family ownership and the agency cost of debt. *Journal of Financial Economics*, 68(2), pp. 263-285.

Ang, J.S., Cole, R.A., & Wuh Lin, J., 2000. Agency Costs and Ownership Structure. *The Journal of Finance*, 55(1), pp. 81-106

Bebchuk, L., Cohen, A., & Ferrell, A., 2009. What matters in corporate governance? *Review of Financial Studies*, 22, pp. 783–827.

Becht, M., Bolton, P., & Roell, A., 2002. Corporate Governance and Control. In: Constantinides, Harris and Stulz, eds. *Handbook of Economics and Finance*. North Holland.

Becht, M., Franks, J., Mayer, C., Rossi, S., 2010. Returns to Shareholder Activism: Evidence from a Clinical Study of the Hermes UK Focus Fund. *Review of Financial Studies*, 23(3), pp. 3093-3129.

Boycko, M., Shleifer, A., & Vishny, R., 1996. A Theory of Privatization. *Economic Journal*, 106(435), pp. 309-19.

Chou, J., Ng, L., Sibilkov, V., & Wang, Q., 2011. Product Market Competition and Corporate Governance. *Review of Development Finance*, 1, pp. 114-130.

Cremers, K.J.M., Nair, V.B., & Peyer, U., 2008. Takeover Defenses and Competition: The Role of Stakeholders. *Journal of Empirical Legal Studies*, 5(4), pp. 791-818.

Cronqvist, H., & Fahlenbrach, R., 2009. Large Shareholders and Corporate Policies. *Review of Financial Studies*, 22(10), pp. 3941-3976

Demsetz, H., & Lehn, K., 1985. The Structure of Corporate Ownership: Causes and Consequences. *Journal of Political Economy*, 93, pp. 1155−1177.

Demsetz, H., & Villalonga, B., 2001. Ownership Structure and Corporate Performance. *Journal of Corporate Finance*, 7, pp. 209−233.

Denis, D., & Serrano, J., 1996. Active Investors and Management Turnover Following Unsuccessful Control Contests. *Journal of Financial Economics*, 40, pp. 239-266.

Dewenter, K.L., & Malatesta, P.H., 2001. State-Owned and Privately Owned Firms: An Empirical Analysis of Profitability, Leverage, and Labor Intensity. *American Economic Review*, 91(1), pp. 320-334.

Dyck, A., & Zingales, L., 2004. Private Benefits of Control: An International Comparison. *Journal of Finance*, 59, pp. 537 - 600.

Faccio, M., & Lang, H.P., 2002. The ultimate ownership of western European corporations. *Journal of Financial Economics*, 65(3), pp. 365−395.

Fama, E.F., & Jensen, M.C., 1983. Separation of Ownership and Control. *Journal of Law and Economics*, 26.

Franks, J., & Mayer, C., 1994. The ownership and control of German corporations.

Gedajlovic, E., & Shapiro, D., 1998. Management and ownership effects: evidence from five countries. *Strategic Management Journal*, 19(6), pp. 533-553.

Gedajlovic, E., & Shapiro, D., 2002. Ownership structure and firm profitability in Japan. *Academy of Management Journal*, 45, pp. 565-575.

Gibbons, R., & Murphy, K.J., 1992. Optimal incentive contracts in the presence of career concerns: theory and evidence. *Journal of Political Economy*, 100, pp. 468−505.

Gillan, S.L., & Starks, L.T., 2007. The Evolution of Shareholder Activism in the United States. Working paper.

Giroud, X., & Mueller, H., 2011. Corporate Governance, Product Market Competition, and Equity Prices. *Journal of Finance*, 66(2), pp. 563-600.

Giroud, X., & Mueller, H.M., 2010. Does corporate governance matter in competitive industries? *Journal of Financial Economics*, 95(3), pp. 312-331.

Gompers, A.P., Ishii, L.J., & Metrick, A., 2003. Corporate governance and equity prices. *Quarterly Journal of Economics*, 118, pp. 107–155.

Gorton, G., & Schmid, F., 1996. Universal banking and the performance of German firms. Working Paper 5453. National Bureau of Economic Research, Cambridge, MA.

Gorton, G., & Schmidt, A., 2000. Universal banking and the performance of German firms. *Journal of Financial Economics*, 58, pp. 29-80.

Grossman, S.J., & Hart, O., 1980. Takeover bids, the free-rider problem, and the theory of the corporation. *Bell Journal of Economics*, 11, pp. 42-64.

Grossman, S.J., & Hart, O., 1983. An analysis of the principal-agent problem. *Econometrica*, 51, pp. 7−45.

Guadelupe, M., & Perez-Gonzalez, F., 2010. Competition and Private Benefits of Control. NBER.

Günster, A., Carree, & M., Van Dijk, M.A., 2011. Do cartels undermine economic efficiency and innovation? Working paper.

Hart, O.D., 1983. The Market Mechanism as an Incentive Scheme. *Bell Journal of Economics*, 14, pp. 366-382.

Hart, O.D., 1995. *Firms, Contracts, and Financial Structure*. London: Oxford University Press.

Himmelberg, C.P., Hubbard, R.G., & Palia, D., 1999. Understanding the determinants of managerial ownership and the link between ownership and performance. *Journal of Financial Economics*, 53, pp. 353−384.

Holmstrom, B., 1979, Moral hazard and Observability. *Bell Journal of Economics*, 10, pp. 74−91.

Januszewski, S.J., Köke, J., & Winter, J.K., 2002. Product Market Competition, Corporate Governance and Firm Performance: An Empirical Analysis for Germany. *Research in Economics*, 56, pp. 299-332.

Jensen, M., & Meckling, W., 1976. Theory of the firm: Managerial behavior, agency costs, and ownership structure. *Journal of Financial Economics*, 3, pp. 305-360.

Kang, J.K., & Shivdasani, A., 1995. Firm Performance, Corporate Governance, and Top Executive Turnover in Japan. *Journal of Financial Economics*, 38, pp. 29-58.

Kaplan, S., & Minton, B., 1994. Appointments of Outsiders to Japanese Boards: Determinants and Implications for Managers. *Journal of Financial Economics*, 36, pp. 225-257.

Köke, J., & Renneboog, L., 2005. Do Corporate Control and Product Market Competition Lead to Stronger Productivity Growth? Evidence from Market Oriented and Blockholder-Based Governance Regimes. *Journal of Law and Economics*, 48(2), pp. 475-516.

Kole, S.R., & Lehn, K.M., 1999. Deregulation and the Adaptation of Governance Structure: The Case of the U.S. Airline Industry. *Journal of Financial Economics*, 52(1), pp. 79-117.

Krueger, A. 1990., Government Failures in Development. *Journal of Economic Perspectives*, 4(3), pp. 9-23.

Leech, D., & Leahy, J., 1991. Ownership structure, Control Type Classifications and the Performance of Large British Companies. *Economic Journal*, 101, pp. 1418−1437.

Minow, N., 2000. *CEO Contracts 1999*.

Mirrlees, J.A., 1976. The Optimal Structure of Incentives and Authority Within an Organization, *Bell Journal of Economics*, 7, pp. 105−131.

Mirrlees, J.A., 1999. The Theory of Moral Hazard and Unobservable Behaviour: Part I. *Review of Economic Studies*, 66, pp. 3−21.

Morck, R., Shleifer, A., & Vishny, R., 1988. Management Ownership and Market Valuation: An Empirical Analysis. *Journal of Financial Economics*, 20, pp. 293-315.

Nickell, S.J., 1996. Competition and Corporate Performance. *Journal of Political Economy*, 104(4), pp. 724-746.

Pedersen, T., & Thomsen, S., 1999. Economic and systemic explanations of ownership concentration among Europe's largest companies. *International Journal of the Economics of Business*, 6(3), pp. 367-381.

Schmidt, K.M., 1997. Managerial Incentives and Product Market Competition. *Review of Economic Studies*, 64(2), pp. 191-213.

Shivdasani, A., 1993. Board Composition, Ownership Structure, and Hostile Takeovers. *Journal of Accounting and Economics*, 16, pp. 167-198.

Shleifer, A., & Vishny, R., 1997. A Survey of Corporate Governance. *Journal of Finance*, 52, pp. 737-783.

Stigler, G., 1958. The Economies of Scale. *Journal of Law and Economics*, 1, pp. 54-71.

Villalonga, B., & Amit, R., 2006. How do family ownership, control and management affect firm value? *Journal of Financial Economics*, 80(2), pp. 385-417.

Table 1: Descriptive Statistics

	Mean	Median	St. Dev.	Min	Max
Top 1	15.945	8.100	17.069	0.040	80.200
Top 5	29.649	23.010	19.723	0.100	94.140
Top 20	39.683	36.370	21.146	0.130	99.740
HERF	0.065	0.016	0.108	0.000	0.644
Active	6.536	2.020	10.335	0.000	51.010
Corp.	14.753	5.100	20.686	0.000	89.140
Govt.	11.044	0.250	19.751	0.000	80.200
Indiv.	6.624	1.175	14.729	0.000	71.330
Passive	13.407	10.590	12.589	0.000	67.350
ROA	0.040	0.026	0.094	-0.093	1.920
TQ	0.970	0.853	0.452	0.297	2.899

Figure 1: Ownership During Cartel and Non-Cartel Years

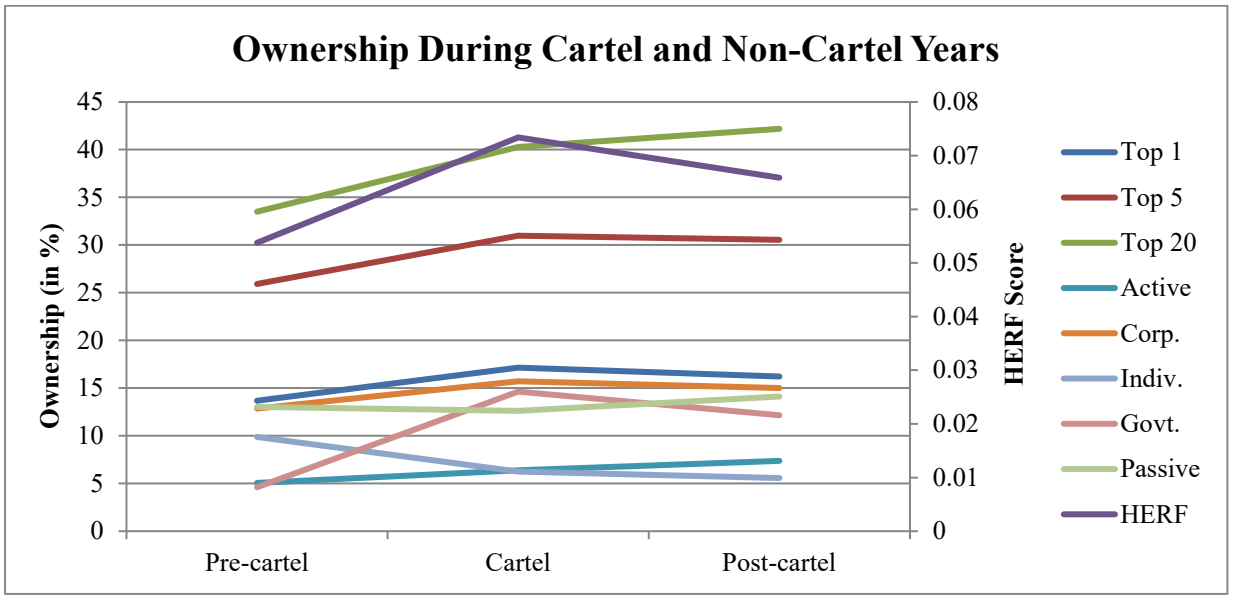

Figure 2: Frequency by Investor Class

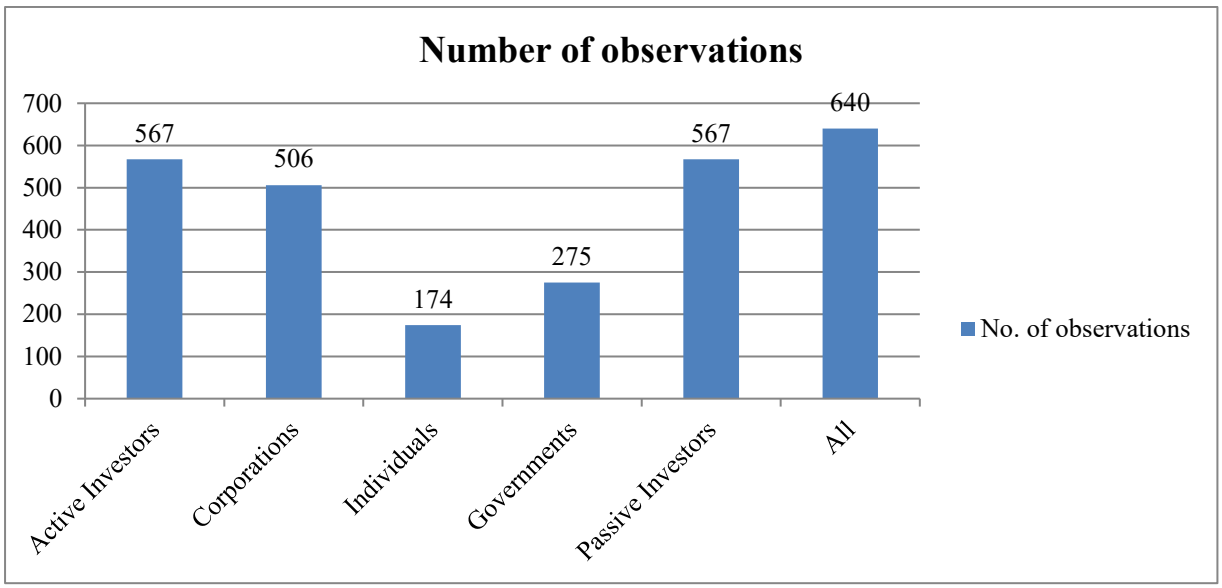

Table 2: Cartel vs. Non-Cartel Years

	Cartel	Pre-Cartel	Post-Cartel
Top 1	17.15%	13.68%	16.22%
Top 5	30.98%	25.92%	30.54%
Top 20	40.30%	33.50%	42.19%
HERF	7.34%	5.38%	6.59%
Active	6.38%	5.06%	7.37%
Corp.	15.72%	12.86%	15.02%
Indiv.	6.24%	9.88%	5.57%
Gov.	14.64%	4.61%	12.15%
Passive	12.62%	13.03%	14.12%
ROA	4.27%	2.81%	4.34%
Total Assets (in million USD)	29052.41	24820.89	37145.56
TQ	0.998	1.114	0.907

Table 3: Cartels and Controlling Shareholder

Variable	Top1	Top5	Top20	Herfindahl
PreCartel	-3.064	-4.432*	-3.589	-0.015
	(2.044)	(2.591)	(2.827)	(0.014)
Carteltrend	-1.078**	-2.098***	-2.341***	-0.004
	(0.555)	(0.705)	(0.769)	(0.004)
Cartel*Firms	-0.134	-0.244	-0.185	-0.001
	(0.137)	(0.175)	(0.191)	(0.001)
PostCartel	-5.676**	-10.342***	-10.327***	-0.030*
	(2.560)	(3.244)	(3.540)	(0.018)
Year Fixed Effects	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes
Number of Observations	640	640	640	640
R^2	0.780	0.735	0.725	0.725
Adj. R^2	0.748	0.698	0.687	0.686

Note that we always include cross section and year fixed effects. Note: *, ** and *** indicate significance at 10, 5 and 1% significance levels, respectively. Standard errors in parenthesis.

Table 4: Cartels and Controlling Shareholder Type

Variable	Corporation	Active
PreCartel	-4.606*	0.981
	(2.827)	(0.840)
CartelTrend	-2.215***	-0.436**
	(0.773)	(0.232)
Cartel*Firms	-0.179	0.029
	(0.192)	(0.056)
PostCartel	-9.448***	-1.542
	(3.664)	(1.048)
Year Fixed Effects	Yes	Yes
Firm Fixed Effects	Yes	Yes
Number of Observations	502	563
R^2	0.793	0.909
Adj. R^2	0.762	0.896

Note that we always include cross section and year fixed effects. Note: *, ** and *** indicate significance at 10, 5 and 1% significance levels, respectively. Standard errors in parenthesis.

Table 5: Cartels, Controlling Shareholder and Profitability

Variable	Tobin's Q	ROA	ROA (Top 1)	ROA (Top 5)	ROA (Top 20)	ROA (Herfindahl)
PreCartel	-5.04	-1.37	-1.40	-0.20	0.29	-1.79
	(6.01)	(1.89)	(2.49)	(2.63)	(2.74)	(2.44)
Carteltrend	-3.75**	-0.15	-0.45	-0.52	-0.54	-0.44
	(1.62)	(0.49)	(0.65)	(0.65)	(0.65)	(0.65)
Cartel*Firms	0.09	0.02	-0.03	-0.02	-0.04	0.00
	(0.40)	(0.14)	(0.18)	(0.18)	(0.18)	(0.18)
PostCartel	-15.42**	-1.26	-1.07	-0.05	0.37	-1.24
	(7.48)	(2.26)	(2.91)	(3.02)	(3.10)	(2.88)
Top 1, 5, 20 or H			-0.08	-0.07	-0.06	-11.31
			(0.05)	(0.04)	(0.04)	(7.51)
Cartel*Top 1, 5, 20 or H			0.10**	0.10**	0.09**	16.07**
			(0.05)	(0.04)	(0.04)	(7.72)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	640	640	640	640	640	640
R^2	0.747	0.314	0.307	0.309	0.309	0.308
Adj. R^2	0.712	0.221	0.202	0.204	0.204	0.203

Note that we always include cross section and year fixed effects. Note: *, ** and *** indicate significance at 10, 5 and 1% significance levels, respectively. Standard errors in parenthesis.