Economics of Organisations and Development

A dissertation presented by

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to

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Especially dedicated to Elsa, Gerardo, Augusto, Rossana, and Alejandro

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Abstract

This thesis contains three essays on the Economics of Organisations and Development. Each essay focuses on a different topic that has received special attention by the Development literature over the last two decades. The first chapter is motivated by the fact that malfunctioning institutions constitute a severe obstacle for economic progress. It centers the analysis on the role of the media to constrain bureaucratic corruption. The second chapter is inspired by the large and influential literature on the determinants of the technical progress. The chapter focuses on the role of market competition and entry liberalization to affect the direction of the technical change. The third chapter analyzes the role of conflicting organisational technologies to affect the economic performance of merging firms. I now turn to describe each chapter in detail.

Chapter 1

This chapter explores, both from a theoretical and empirical point of view, the relationship between corruption in the public sector and concentration of the ownership structure of media firms. In doing so, we bring into the analysis corporate governance theory. In other words, we open "black-box" firms, and we analyze how the interactions among media shareholders, and their incentives to compete for corporate control, affect the ability of the government to capture the media, and to control political and economic outcomes. In this set-up, we show that ownership concentration affects governmental corruption through two different channels. One that is called "the owner effect," that has a negative impact on corruption; and the

other that is called "the contest-for-control effect," that has a positive impact on corruption. Depending on the ownership structure of a firm, one of these two effects dominates the other. Thus, making corruption a possible non-monotonic function of ownership concentration. Increasing for low values of concentration and decreasing for high ones. In this respect, cases of intermediate concentration are the worst to curb corruption, while extreme situations are the best to promote accountability in the public and private sector. The findings provide new guidelines for media regulation.

Chapter 2

This chapter explores, both from a theoretical and empirical point of view, the effect of competition, imitation, and barriers to entry in a market, to direct the technical change towards one direction: quality or variety. It also re-examines previous results in the IO literature, which argue that the supply of high-quality products substitutes the provision of new but low-quality goods, providing new and contrary evidence. The chapter shows that more competition and lower barriers to entry in a market, direct the technical change towards the introduction of vertically superior goods. However, imitation affects the technical change in an opposite direction. The paper also provides new theoretical foundations for the well-known inverted U-shaped relationship between the level of vertical $R\&D$ expenditures and the degree of product market competition.

Chapter 3

This chapter presents a dynamic model to analyze the determinants of mergers' success when there are benefits from technological compatibilities between the firms that merge, and a common technology can not be implemented unless one firm changes its production technology and incurs a cost. The parameters in the model capture the degree of organisational polarization: size asymmetries and differences in other characteristics like sector or industry. The chapter shows that greater disparities between the firms that merge lead to longer periods of inefficient interactions and low

performance. Furthermore, it also shows how changes in the relative size of the firms, from a less polarized situation to a more polarized case, stretch out the integration delay and the period of under-performance. The maximum delay to integrate both firms occurs when firms are symmetric in size. Thus, the chapter rationalizes why mergers materialize more frequently between size-asymmetric and industry-symmetric firms.

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Chapter 1

Corporate Control in The Market for News, Tunneling Problems and Corruption

1.1 Introduction

In the last decade, the media industry of many countries around the world has experienced remarkable changes, and even though these changes have been affected by each country's idiosyncratic factors, most of the transformations in the industry have been characterized by two worldwide trends: ownership and market concentration. In the U.S the dominant trend has been the conglomeration of media ownership. To some extent, this trend has been fueled by a desire to create lucrative vertical and horizontal integrations. As a result, the press industry has experienced a spectacular consolidation, which has left half a dozen major chains and a handful of shareholders to rule the market.[1]

Similar trends have also been observed in Europe, where there has been a constant

[1] ..."At the end of the World War II, 80 percent of the daily newspapers in U.S were independently owned by chains. In 1981, twenty corporations controlled most of the business of the country's 11.000 magazines, but only seven years later, that number had shrunk to three corporations." Bagdikian, *The Media Monopoly*, p.4.

push towards the consolidation of the sector. Concentration has taken place not only in the market, but also in the ownership of publishing firms. This process leaves few outlets and shareholders controlling the industry. Some Western European media firms have been acquired by large American media groups, while other Western European media groups have bought old Eastern European media companies.[2] The same process has also been evidenced in Latin America, even though at a smaller scale. During the 90s, the media industry of many countries has become rather less dispersed. Concentration takes place at the hands of domestic pre-existing media groups, which expand their holdings in the industry. Thus, what has been clear during these years, is that what every the country around the world, the option of being a small or middle-sized media firm is hardly viable at present. Furthermore, despite the fact that there are-literally speaking-thousands of titles across the world, in each country these titles are controlled by a small number of shareholders.

Inspired by this evidence, a new and growing literature has emerged, with the purpose of studying the consequences of these changes on political accountability and economic performance. While most of the previous works in this literature focus their analysis on the impact of market concentration, little has been said about the impact of ownership concentration. The only paper that addresses this question (see Besley and Prat[14]) emphasizes, relying on transaction cost arguments, that ownership concentration is harmful, because it makes the capture of the industry less expensive, and thereby enhances corrupt governments' incentives to steal public funds.

[2]..." There is a clear issue of concern about the high levels of local, regional and national ownership concentration of newspapers in CEE countries. For example, the German media giant *WAZ* has an European empire, with more than 130 newspapers." European Federation of Journalists, *Eastern Empires, p.8.*

Although conventional wisdom and several scholars in the literature agree with this view, the framework has two important drawbacks. The first one, is that it disregards from the analysis corporate governance theory. In other words, it considers firms as if they were "black-boxes". Therefore, it does not analyze how the interaction among shareholders, and their incentives to seize corporate control, affect the ability of the government to capture the media, and to control political and economic outcomes. The second drawback relies on the fact that the framework is not able to explain many observed cases where the ownership structure of media firms become more (less) concentrated and corruption decreases (increases). Therefore, the purpose of this paper is to fill these gaps, as well as to provide new theoretical and empirical insights on the channels through which ownership concentration in the industry affects corruption. The findings bring new insights to promote accountability in the media and in the public sector.

The theoretical analysis rests on a two-period moral hazard voting model, which adds to the standard framework a media sector, that provides endogenously information about the incumbent to the electorate. As an innovation, the model opens media firms, and introduces a contest for corporate control among media shareholders, which figures out the channel through which ownership concentration affects corruption. In the model, the control of each media firm is determined in a shareholders' meeting, where large media shareholders submit competing proposals in order to capture the votes of minority owners. The proposals are binding commitments about a monetary payment that each large shareholder promises to distribute, as dividend of the firm, in case he wins the control of the outlet and there is no written story exposing the corrupt politician. This payment serves to compensate minority owners for the

profits they lose when the controlling shareholder accepts a bribe in exchange for the suppression of the news.

A key determinant of corruption in equilibrium is how much the politician must pay to silence the media. Higher bribes decrease the return to corruption and consequently the amount of public funds stolen. The bribe has to compensate the amount of money that the controlling shareholder loses when he accepts to make the firm uninformative. This amount depends on both, the money he loses as a shareholder of the firm, and the compensation he has to pay to minority owners. Thus, the effect of ownership concentration on corruption can be decomposed into two different effects: a negative *owner effect*, that discourages corruption, and a non-negative *contest-for-control effect*, that enhances it.

Specifically, when the ownership structure of media outlets is concentrated, there is a majority block-holder, shareholders inside a firm do not compete for corporate control. Instead, the main shareholder runs the company and he pays nothing to minority owners under misreporting. Hence, the *contest-for-control effect* vanishes, and since the bribe that the incumbent has to pay to silence the media firm increases with the size of the controlling shareholder's stock, corruption decreases as ownership concentrates.

By contrast, when the ownership structure is widely held, large shareholders of each media company compete for corporate control. In equilibrium, the largest owner wins the contest, promising to the smaller ones a compensation for misreporting that decreases with the size of his stock. This introduces a new tunneling problem, where the benefits implicitly expropriated to minority owners are transferred indirectly to the bad politician, which reduces the burden he has to pay to win the re-election.

Under this situation, the *owner* and the *contest-for-control effects* co-exist. However, since the latter effect dominates, corruption increases as ownership concentrates.

Thus, the paper shows that the relationship between ownership concentration and corruption is non-monotonic i.e. increasing for low levels concentration and decreasing for high ones. In this respect, cases of intermediate concentration are the worst to curb corruption and to promote accountability in the media, while extreme situations in which ownership is exceptionally concentrated, or widely held, are the most appropriate for these purposes. This of course, contradicts previous findings in the literature and constitutes, above all, one of the main contributions of this work.

To test the model, the paper focuses the analysis on the press industry, and explores if there is evidence about the existence of a negative *owner effect* and a positive *contest-for-control effect*. The empirical analysis is conducted over a panel of 37 countries. For each country, the paper uses information regarding the ownership structure of the top-three newspapers in the years 1999 and 2003. The paper provides robust evidence in support of the model.

The chapter is organized as follows: section 2 presents the literature review, section 3 presents the theoretical analysis, section 4 provides the empirical analysis. The final section concludes.

1.2 Literature Review

This paper is related to different strands of the literature. First, it is part of the literature on media and economic and political performance. A common theme of some of these works is how media affect governments' accountability and responsiveness to citizens' needs. The present paper relates to the work of Besley and Prat[14].

The authors develop a model of democratic politics in which the actual freedom of the media is endogenous and depends on the degree of competition among media firms. They find that pluralism provides an effective protection against media capture. Since the existence of a large number of independent media organizations make less likely that the government controls news provision. Even though the main focus of the analysis is on the impact of market concentration on corruption, the authors study some aspects related to the effect of ownership concentration. They find that less transaction costs i.e. more concentrated media firms, increases the probability that the industry be captured. The authors provide some empirical but not causal support for this fact.

From an empirical point of view, the most important paper this work relates to is the one provided by Djankov et al.[29]. The authors present an extensive and very rich cross-country empirical analysis of the impact of different types of media ownership structures on social, political and economic outcomes. They find that state ownership has a negative impact on these issues.

In a different approach, Stromberg[72], [71] analyzes how media affect the allocation of public resources. The main idea of his work is that if better informed voters receive favorable policies, then the existence of mass media or the invention of a new medium will affect government policies because mass media not only provide most of the information people use in voting, but also determine who is informed and who is not. The author conducts an empirical investigation of a major New Deal relief program, that was implemented in the middle of the expansion period of radio, and he finds that in U.S. counties with many radio listeners received more relief funds.

In the same vein, Besley and Burguess[13] study the importance of media in

determining how responsive governments are to citizens' needs. They show that having a more informed and politically active electorate strengthens incentives for governments to be responsive. This idea is tested on panel data from India. The authors find that governments are more responsive to falls in food production and crop flood damage where newspaper circulation is higher and electoral accountability greater.

Second, the paper relates to the line of research that study the determinants of corruption at country level. In this regard, Ades and Di Tella[2] present the first empirical study of the causes of corruption across countries. The authors find that corruption is higher in countries where domestic firms are sheltered from foreign competition, by natural or policy induced barriers to trade, and where the antitrust regulations are not effective in preventing anticompetitive practices. In addition, La Porta et al.[51] show that countries with Protestant traditions and more developed economies, have higher quality governments and lower levels of perceived corruption. Lastly, Triesman[75] finds that federal states are more corrupt than unitary ones, and that long periods of exposure to democracy delivers lower corruption.

Finally, the paper relates to the literature on the balance of power in corporations with multiple (single) large shareholders and its effect on firms' performance and minority expropriation. Thus, this paper relates to the works of Berle and Means[11], Jensen and Meckling[46], Grossman and Hart[38], Shleifer and Vishny[68], Agrawal and Mandelke[5], Chen[23], and Gutierrez and Tribo[39] and Bloch and Ulrich[16]. It takes some of the results in this literature, and see how they affect the ability of the government to capture the media industry.

1.3 Theoretical Analysis

The model considers some ingredients of the retrospective voting model of Besley and Prat[14], but it departures from that model into two directions. First, because the focus of this paper is on the relationship between ownership concentration and corruption, the model considers the opposite case to Besley and Prat [14], the one in which there is only one firm in the market. As I explain later, this assumption is not crucial for the main result of the paper, but its inclusion in the model is twice useful. On the one hand, it states clearly the differences between this work and previous ones. On the other, it helps to focus the analysis on the main topic of the paper. Second, the model opens media firms and incorporates corporate governance considerations into the analysis, through a contest for corporate control among large shareholders, which figures out the theoretical channel through which ownership concentration affects corruption.

1.3.1 The Model

The set-up consists of two periods. In the first period, an incumbent is exogenously in power. There are two possible types $\theta \in \{b, g\}$, with $\Pr(\theta = g) = \gamma$, where g stands for good and b for bad. A good incumbent delivers a benefit of 1 to voters. A bad incumbent extracts $y \in [0, 1]$ from the public funds, obtains benefits $v(y)$, with $v'(y) > 0$ and $v''(y) < 0$, and delivers the remainder, $1 - y$, to voters. Implicit in the assumption that $v''(y) < 0$, is the fact that it is increasingly difficult for the incumbent to convert public funds into private resources as he steals more money.

Voters choose whether to re-elect the incumbent or a randomly selected challenger, i.e. one that is good with probability γ. Voters do not known the incumbent's type,

and they can not observe y before the election. However, they can get information about the incumbent through the media in order to update their believes. Voters buy news when media is informative. Before buying news, voters know whether or not media report about the incumbent, but they ignore the content of the news.

There is one media outlet. When the incumbent is bad, with probability $\varphi(y)$, the manager receives a signal. Then, if the signal is reported, the outlet makes profits $\pi_r = mks_r\Pi$, where mks_r stands for the maximum share of the industry's benefits that the firm can obtain when reporting the bad signal. Parameter Π refers to the size of the industry i.e. readers or audience.[3] I assume that $0 < mks_r \leq 1$, and that $\varphi(y)^{'} > 0$, $\varphi(y)^{''} \geq 0$, $\varphi(0) = 0$, $\varphi(1) = 1$.[4]

The incumbent can manipulate news. This is modeled as a bargaining game between the manager and the politician. The incumbent can make a non-negative offer of money t to the manager in exchange for the suppression of the bad news. Then, if the manager accepts this offer, he makes no report, and the incumbent gets benefits $r - t$ if he is re-elected, and $-t$ if he is not.

The media company has an ownership structure, composed by two large blockholders, $i = 1, 2$, and a continuum of small shareholders. I denote by α_1 and α_2 the fractions of shares owned by the two large shareholders. I assume that $\alpha_1 > \alpha_2$. The remainder of the shares, 1- α_1 -α_2, are distributed uniformly among the small shareholders.[5]

[3]Notice that in a model with only one firm mks_r depends on the elasticity of the demand for news with respect to the publishing of the corruption story. In a context with more than one firm mks_r depends in addition on the market share of rival firms, that is, those that cover the same market.

[4]I assume that $0 < mks_r \leq 1$ instead of $mks_r = 1$ because it helps to make the match between the theory and the empirical evidence. It is possible to rationalize this assumption by assuming that there is one large company in the market and many tiny firms that play no role in the problem. The crucial assumption is that mks_r>0.

[5]I assume this particular ownership structure because it is related to what the data describe. In

A shareholders' meeting is annually convened in order to allocate control power. At the meeting, each of the two large shareholders proposes a plan to run the company. Specifically, the plan of shareholder-i describes what fraction, $x_i \in [0, mks_r]$, of benefits Π, shareholder-i will distribute as dividends of the firm, if he seizes control and there is no written story exposing the corrupt politician.[6] This payment is intended to limit the payoffs that the manager can get exploiting the informational advantage he has, because he is the only one that can receive the signal, and bargain with the incumbent for the suppression of the news. The plans are binding commitments that will be enshrined in the company charter and cannot be revoked by the controlling shareholder.

Control is allocated to one of the two large shareholders, according to the results from the voting process. Each share carries one vote, and the controlling shareholder is elected by simple majority of the votes effectively cast.[7] While the attendance of large shareholders to the meeting is guarantee, this is not the case for small shareholders, who face a cost, $\kappa\Pi$, for participating in the meeting.[8] Different small shareholders face different costs and κ is distributed uniformly on $[0, 1]$. Finally, being in office allows the controlling shareholder to get other rents V. These rents guarantee that large shareholders always want to participate in the contest.[9]

1999, a 78.11 % of the media firms in the sample has at most 2 shareholders controlling more than 50 percent of the total shares of each media company. In 2003, this feature appears in 79.48 % of the cases.

[6]Notice that in the most favorable scenario, compensation for misreporting will be equal to the benefits the outlet would yield if the manager would reject to hid the bad signal, $mks_r\Pi$.

[7]In order to break ties, I assume that when two plans receive the same number of votes, the largest shareholder wins the contest. Frequently, the largest stake-holder of a media firm is the founder. Thus, this rule might reflect the power of the entrepreneur as the founder of the organization. The same assumption can be found in Bennedsen and Wolfenzon[9].

[8]I assume this functional form for the cost to the sake of simplicity. However this is not a crucial assumption of the model. See proof of Proposition 1.

[9]This assumption is introduced to simplify the exposition. Removing this assumption may eliminate the contest for control among shareholders. As shareholder 2 may want to deliver control to

The timing of the game is as follows:

1. Large shareholders compete to become the manager of the media. Each shareholder proposes $x_i \in [0, mks_r]$, for $i = 1, 2$, and all shareholders vote. The manager is elected.

2. The incumbent's type θ is realized. If $\theta = g$ the manager observes no signal. If $\theta = b$, with probability $\varphi(y)$ the manager receives a signal. The incumbent observes the media signal and selects a transfer $t \geq 0$.

3. The manager observes the transfer t and decides whether to accept or to reject t. If he accepts, he suppresses the bad news. If he rejects, he reports about the corrupt incumbent.

4. Voters observe whether media report something about the politician and decide whether to buy news. Finally, they vote for the incumbent or the challenger.

1.3.2 Equilibrium

I focus attention on pure strategy perfect Bayesian equilibrium, and I restrict the solution of the corporate game to strong equilibrium, i.e equilibria such that no group of agents with positive measure has an incentive to deviate.[10] The following proposition characterizes the equilibrium.[11]

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the largest block-holder when V is not large enough to over offset the risk of getting control and not receiving a signal about the incumbent.

[10] I adopt a non-cooperative approach, in the sense that the concept of strong equilibrium refers to the fact that large shareholders anticipate the least favorable outcome or the most favorable one, when they propose a plan.

[11] All proofs are in Appendix A.

Proposition 1 *In the pareto-efficient equilibrium of the game the following occurs:*

1. *Voters vote for the challenger if they observe a report about the incumbent and re-elect the incumbent when this is not the case*

2. *Shareholder 1 becomes the manager of the outlet. He proposes* $x_1^* = 0$ *if* $\alpha_1 \geq 0.5$ *and* $x_1^* = mks_r - \frac{(\alpha_1 - \alpha_2)}{(1-\alpha_1-\alpha_2)}$ *if* $\alpha_1 < 0.5$

3. *The manager accepts* t *and hides the bad signal if and only if* $t \geq [\alpha_1 \pi_r + (1 - \alpha_1) x_1^* \Pi]$

4. *A bad incumbent offers* $t = [\alpha_1 \pi_r + (1 - \alpha_1) x_1^*]$ *if:(a) shareholder 1 observes the bad signal; and (b)* $r + v(1) \geq t$

5. *In the second period the equilibrium value of* $y = 1$*. In the first one,* y *satisfies the following condition:*

$$v'(y) - \varphi'(y) \left(r + v(1) - \max \left(0, r + v(1) - [\alpha_1 \pi_r + (1 - \alpha_1) x_1^* \Pi] \right) \right) = 0$$

The proposition shows that media capture depends on the ownership structure of the media firm. When the ownership structure has a majority shareholder, the equilibrium bribe is equal to $\alpha_1 \pi_r$ i.e. the benefits that the controlling shareholder looses under misreporting. When no shareholder has more than 50% of the company, the bribe also depends on the compensation for misreporting that the largest owner promises to pay to minority shareholders, $(1 - \alpha_1)(\pi_r - \frac{\Pi(\alpha_1 - \alpha_2)}{(1-\alpha_1-\alpha_2)})$. This payment is a decreasing function of α_1, as well as of the difference between α_1 and α_2, which captures the contestability of the main shareholder's voting power.

To analyze how ownership concentration affects corruption in equilibrium, I apply the implicit function theorem to the F.O.C of the incumbent's problem. I find that $\frac{\partial y}{\partial \alpha_1}$ is equal to the following expression:

$$\frac{\partial y}{\partial \alpha_1} = \frac{-\pi_r + d[(\pi_r - \Pi\frac{(\alpha_1-\alpha_2)}{(1-\alpha_1-\alpha_2)})] + \Pi(1-\alpha_1)\left(1+\frac{\alpha_2(1-2\alpha_2)}{(1-\alpha_1-\alpha_2)^2}\right)}{\varphi'(y)\left[-v''(y)+\varphi''(y)t\right]} \tag{1.3.1}$$

where d is a dummy variable that takes value 1 if $\alpha_1 < 0.5$. According to equation (1.3.1), concentration affects corruption through two different channels. The first channel is related with what I call the *owner effect (OE)*. The second one is associated with the *contest-for-control effect (CCE).*

The OE, $\Phi_{OE} \equiv -\pi_r$, is determined by the profits the outlet losses when the manager suppresses the bad signal about the incumbent. The sign of this effect is negative underlining the fact that when there is no competition for corporate control, ownership concentration reduces the amount of stolen public funds, because more concentration increases the equilibrium bribe and thereby reduces the returns from corruption. This feature of the equilibrium appears as a consequence of the policy that the outlet implements to distribute dividends among shareholders. In the model, each shareholder receives benefits proportional to the size of his stock. This makes the losses for misreporting larger for a bigger stake-holder.

Even though the *owner effect* is in line with many findings in the literature of corporate governance, which document that ownership concentration improves the performance of the firms, aligning the interests of managers and owners (see Berle and Means[11], Jensen and Meckling[46], Grossman and Hart[38], Shleifer and Vishny[68], Agrawal and Mandelke[5], Chen[23], and Gutierrez and Tribo[39]), it is interesting

that in the case of the media, the positive stylized relationship between ownership concentration and performance does not always apply. I provide empirical evidence about this fact in the following section, and I explain theoretically how this can occur using what I call the *contest- for-control effect*.

The CCE, $\Phi_{CCE} \equiv \left[\left(\pi_r - \frac{(\alpha_1-\alpha_2)\Pi}{(1-\alpha_1-\alpha_2)}\right) + (1-\alpha_1)\left(1 + \frac{\alpha_2(1-2\alpha_2)}{(1-\alpha_1-\alpha_2)^2}\right)\Pi\right]$ reflects the impact of increasing α_1 on the additional burden that the incumbent has to pay when media ownership is dispersed and he pretends to silence the outlet. The effect relates three remarkable ingredients of the problem: contestability of the main shareholder's voting power, expropriation of media minority shareholders' profits, and the cost for the politician in power to silence the industry. To realize how these factors link themselves, notice that the plans that large shareholders propose at the time to compete for corporate control are a function of the absolute and relative size of their stocks. In equilibrium, the main shareholder's plan is either zero or a decreasing function of α_1. Then, since the bribe that the incumbent has to pay to silence the market depends on the controlling shareholder's promise, more concentration of the property in the hands of the main block-holder reduces the value of that bribe and thereby increases the returns from corruption. Therefore, it is possible to talk about the presence of a *second order tunneling problem*, to refer to the transfer of resources out of the company, from small shareholders to the dishonest politician. Contrary to the *standard tunneling problem*, where the manager appropriates the benefits expropriated to minority owners, in this case, the tunnel favors the corrupt incumbent, because it reduces the burden he has to afford in order to win the re-election.

Re-writing equation (1.3.1) in the following manner it is possible to realize which

of the two effects dominates:

$$\frac{\partial y}{\partial \alpha_1} = \left[\frac{-d\pi_r + (1-d)\left[\left(1 + \frac{\alpha_{2(1-2\alpha_2)}}{(1-\alpha_1-\alpha_2)^2}\right)\right]\Pi}{(\varphi'(y))^{-1}\left[-v''(y) + \varphi''(y)t\right]} \right] \tag{1.3.2}$$

Thus, equation (1.3.2) shows, that when there is a majority shareholder the *owner effect* dominates and corruption decreases as ownership concentrates. However, when no shareholder has more than 50% of the company, the *contest-for-control effect* dominates and corruption increases as ownership concentrates. The following proposition characterizes the corruption function in equilibrium. It is convenient for this purpose to make the following definitions: $\hat{\alpha_1} \equiv max\{0.5, \alpha_1 : \alpha_1 = \frac{r+v(1)}{\pi_r}\}$, $\bar{\alpha_1} \equiv min\{0.5, \alpha_1 : mks_r - \frac{(1-\alpha_1)(\alpha_1-\alpha_2)}{(1-\alpha_1-\alpha_2)} = \frac{r+v(1)}{\Pi}\}$, and $\underline{\alpha_1} > 0$ is the minimum possible size for the largest owner's stake.

Proposition 2 *Corruption is a non-monotonic function of ownership concentration:*[12]

- *Increasing and convex in the interval* $[max\{\underline{\alpha_1}, \bar{\alpha_1}\}, 0.5)$
- *Decreasing and concave in the interval* $[0.5, min\{\hat{\alpha_1}, 1\}]$
- *Constant in the interval* $[\underline{\alpha_1}, max\{\underline{\alpha_1}, \bar{\alpha_1}\}] \bigcup [min\{\hat{\alpha_1}, 1\}, 1]$

[12]The function exhibits the following properties according to the cases: (i) $\bar{\alpha_1} < 0.5 \leq \hat{\alpha_1}$; (ii) $0.5 \leq \bar{\alpha_1}, \hat{\alpha_1}$; (iii) $\bar{\alpha_1}, \hat{\alpha_1} \leq 0.5$.

- (i) The function achieves its maximum at $\alpha_1 = 0.5$ and it is discontinuous at this value.
- (ii) The function achieves its maximum at $\lim_{n \longrightarrow \infty} \{\alpha_n \mid n \in N\}$, with $\alpha_n = \frac{2\alpha_1^{\frac{1}{n}} - 1}{2}$, if $r + v(1) > (\pi_r - 0.5\Pi)$, or at any point in the interval [0.5, 1], otherwise. The function is continuous if and only if $r + v(1) = (\pi_r - 0.5\Pi)$.
- (iii) The function achieves its maximum at 0.5 if $r + v(1) > 0.5\pi_r$, or at any point in $[\underline{\alpha_1}, 0.5)$, otherwise. The function is continuous if and only if $r + v(1) = 0.5\pi_r$.

The results presented in Proposition 2 have important implications for the debate on media regulation, as they show that conventional prescriptions on ownership concentration may not be appropriate when it comes to an industry such as the media. This is because policies designed to promote competition must take into account not only economic welfare considerations, but also accountability effects. In this respect, the results show that ownership concentration may harm neither the media freedom nor a transparent administration of the public funds. Moreover, they show that cases of intermediate concentration are the worst to curb corruption, while extreme situations in which the ownership is completely concentrated, or widely held are the most appropriate ones for such purpose.

An illustrative example in concordance with the situation in which ownership concentration plays a crucial role to fight corruption, has been documented by *Media Ownership and its Impact on Media Independence and Pluralism*, and corresponds to the case of Bosnian media. The *Dnevni Avaz* is the main newspaper in Bosnia and Herzegovina. For a long time, the paper has been the only one in the market. There is a lot of discussion about its finance and political affiliation, but it has been widely claimed that *Avaz*, initially, was supported by the ruling Bosnian nationalist party *SDA*. Nevertheless, in 2000, its only owner, Fahrudin Radonic, distanced himself from the party in an attempt to establish an independent daily. This move was severely punished by*SDA* officials, who used, without success, various forms of pressure to put an end to his rebelion. The fact that all the property of the paper was concentrated in one shareholder prohibited the government from silencing the outlet.

A contrary case to the one previously described, regards that of Estonian media, at the beginning of their privatization processes. According to the same sources, the

media have played an outstanding role in the transformation and liberalization of the Estonian civil and political society. During the privatization, it was mainly the editorial teams who became the owners of the newspapers. Press freedom brought about joint ventures and agreements that divide the market among competing media companies and shareholders. The process delivers independence, pluralism, and transparency.

1.3.3 Extensions

A potential source of concern related to these findings is how they could change when some assumptions of the model are replaced by others. In the following paragraphs, I discuss what would happen if: (1) large shareholders have more available actions, apart from competition, at the time to define who controls the media, (2) there are more than one outlet in the market, (3) media is ideological, and (4) the bargaining power is not concentrated any more on the incumbent's side.

Actions to Seize Corporate Control

It might be argued, that large shareholders could buy shares, rather than propose a dividend plan, at the time to compete for seizing control. If this possibility were available, one of the two large block-holders would win the contest, and he would pay in equilibrium a price p^* for the votes he bought. When this shareholder receives the bad signal, he decides whether to accept or reject the transfer t, the incumbent proposes, comparing the profits he would obtain if he exposes the corrupt politician, with the ones he would yield if he suppresses the bad news. These benefits are equal to $0.5\pi_r - (0.5 - \alpha_i)p^*$ if he rejects the transfer t, and $t - (0.5 - \alpha_i)p^*$ if he accepts

it. In both situations, the largest stake-holder has to pay the cost of winning control. Hence, the equilibrium bribe is equal to $t = 0.5mks_r$, and corruption is independent of ownership concentration. I show in the following section that this finding is not consistent with the empirical evidence.

It could also be possible that large shareholders choose between competition or collusion. In the last situation, large shareholders would pay nothing to minority owners if they accept to hid the news, and they would bargain over the division of V. At first glance, it thus appears, that if the largest block-holder makes a take it or leave it offer to the second owner, both shareholders collude. But this assumes that a collusive agreement can be sustained under all contingencies. This of course, is an extreme assumption that contradicts some empirical evidence about the idea that collusion may break under stress (see Volpin[77]). Disregarding this last point, and assuming that collusion can be held in equilibrium, if both shareholders form a coalition, the *contest-for-control effect* vanishes, as well as the non-monotonicity property of the corruption function. The case resembles the situation in which there is only one majority block-holder. I test empirically this hypothesis, and I do not find evidence validating it.

More Outlets in The Market

It is straightforward to see that the properties of the corruption function in equilibrium remain when there is more than one outlet in the market. To rationalize this result, suppose that there are n media firms, each one with a particular ownership structure similar to the one previously described. All the companies receive the same

signal about the incumbent, and they divide readers equally among informative outlets. In equilibrium, it is a dominated strategy for the incumbent to silence partially the market. As he will not be re-elected, but he will have to pay some bribes. Therefore, if the politician wants to win the political contest, he will have to pay to the controlling shareholder of each outlet an amount of money equivalent to the one the manager would yield if his firm were the only informative company of the industry. Hence, the equilibrium structure of the bribe will be the same as in the case in which there is only one outlet, and function y will exhibit in equilibrium the same properties as before when α_{1j} changes, for $j = 1, 2, ..., n$.

Even though there are no qualitative differences between this case and the baseline one, quantitative discrepancies appear in the magnitudes of the cutoff points $\hat{\alpha_{1j}}$ and $\bar{\alpha_{1j}}$, which now are defined as follows: $\hat{\alpha_{1j}} \equiv max\{0.5, \alpha_{1j} : \alpha_{1j} = \frac{r}{\pi_r} - \sum_{i=1, i\neq j}^{n} \frac{t_i}{\pi_r}\}$ and $\bar{\alpha_{1j}} \equiv min\{0.5, \alpha_{1j} : mks_r - \frac{(1-\alpha_{1j})(\alpha_{1j}-\alpha_2)}{(1-\alpha_{1j}-\alpha_2)} = \frac{r}{\Pi} - \sum_{i=1, i\neq j}^{n} \frac{t_i}{\Pi}\}$, as well as in the equilibrium value of y, which in the case of n firms satisfies the following first order condition:

$$v'(y) - r\varphi'(y) + \varphi'(y) \max\left\{0, r - \sum_{i=1}^{n} t_i\right\} = 0 \tag{1.3.3}$$

It is straightforward to show, that $\bar{\alpha_{1j}}$ is larger than in the previous case, while $\hat{\alpha_{1j}}$ and y are lower.

Ideological Media

To consider the possibility that the media and citizens are ideologically motivated, I follow the framework proposed by Besley and Prat[14]. There are two positions, left and right, with the right wingers being a fraction $\pi > \frac{1}{2}$ of the population. Thus,

the right wingers determine the election outcome if they vote on purely ideological grounds. There is one media outlet, with an ownership structure equal to the one of the baseline model. All shareholders have the same ideological preferences and each one attaches a benefit proportional to $B > 0$, with the factor of proportionality given by the size of his stock, from having a politician of their preferred type in office. Implicit in this assumption is the fact that the outlet can yield extra profits when the government is of the same ideology as media owners.

A proportion ρ of voters value ideology over information, i.e. they prefer to read an uninformative newspaper with their ideology rather than an informative one on opposite position. The other $1-\rho$ voters value information, and they buy news only if media make reports exposing corrupt politicians. If no signal is observed, each voter votes for his ideologically preferred candidate. If a signal is observed, the voter votes for the politician with the highest likelihood of being honest.

It is straightforward to show that in equilibrium the incumbent gives the following payoff to the media, in exchange for the suppression of the news:

$$max \left\{ \begin{array}{c} 0, \alpha_1 \left(\pi_r^{id} + \left(-d_2 B + (1-d_2)\, B\right)\right) + \\ +d_1 \left(1-\alpha_1\right) \left[\left(\pi_r^{id} - \frac{(\alpha_1-\alpha_2)\Pi}{(1-\alpha_1-\alpha_2)}\right)\Pi + \left(-d_2 B + (1-d_2)\, B\right)\right] \end{array} \right\}$$

where d_1 and d_2 are dummy variables that take value 1 if $\alpha_1 < 0.5$ and media's ideology is right, respectively. Compared with the baseline case, the bribe that the politician has to pay to silence the market is different in two respects. First, the profits that the outlet losses for becoming uninformative depend now on the proportion of readers that value information over ideological content, $1-\rho$. Second, *ceteris paribus*, re-election cost is lower when media share the same ideological preferences that the

incumbent, while it is larger if both dissent in their political views.

If the following condition is satisfied: $\{\alpha_1(\pi_r^{id}-B)+d_1\,(1-\alpha_1)\,[\left(\pi_r^{id}-\frac{\Pi(\alpha_1-\alpha_2)}{(1-\alpha_1-\alpha_2)}\right)-B]\}<0$, corruption is equal to 1. Since the incumbent has to pay nothing to media shareholders in order to suppress the report. When this is not the case, the corruption function exhibits the same properties as in Proposition 2, with $\hat{\alpha_1}\equiv min\{0.5,\alpha_1 : r+v(1)=\left[\left(\pi_r^{id}-\frac{\Pi(\alpha_1-\alpha_2)}{(1-\alpha_1-\alpha_2)}\right)+(-d_2B+(1-d_2)\,B)\right]\}$ and $\hat{\alpha_1}\equiv max\{0.5,\alpha_1 : r+v(1)=\alpha_1(\pi_r^{id}+[-d_2B+(1-d_2)B])\}$.

Bargaining Power

To analyze what would happen if the bargaining power were not any more all on the incumbent's side, I study the case in which the incumbent proposes a transfer t to the manager, but the latter has bargaining power to demand in addition a fraction ϕ of the stolen public funds. It is easy to see that the results of Proposition 2 would still remain under this situation, even though, the conditions that define $\bar{\alpha_1}$ and $\hat{\alpha_1}$ are not simple as in the baseline model. Under this situation, the optimal y when the incumbent decides to silence the media is determined by the following equation:

$$-\varphi'(y)(v(y)+r)+(1-\varphi(y))v'(y)+\varphi'(y)[r-t+v((1-\phi)y)]+ \tag{1.3.4}$$

$$+\varphi(y)[(1-\phi)v'((1-\phi)y)]=0 \tag{1.3.5}$$

and the impact of changes in α_1 on y is characterized by the following equation:

$$\frac{\partial y}{\partial \alpha_1}=\frac{-d\pi_r+(1-d)\left[\left(1+\frac{\alpha_{2(1-2\alpha_2)}}{(1-\alpha_1-\alpha_2)^2}\right)\right]\Pi}{-S.E.C(\varphi'(y))^{-1}} \tag{1.3.6}$$

where $S.E.C$ stands for the second order condition of the incumbent's problem. As in the baseline model, the *owner effect* dominates when $\alpha_1 \geq 0.5$, while the *contest effect* does it when $\alpha_1 < 0.5$.

1.4 Empirical Analysis

The theoretical analysis of the previous section shows that ownership concentration affect corruption through two different channels: the negative *owner effect* that discourages corruption, and the non-negative *contest-for-control* effect that enhances it. In this section, I confront this prediction with data.

1.4.1 Data

I describe in the following paragraphs the proxies I construct to measure the main media variables, as well as the corruption index I use to test the implications the model delivers. The description of the control variables is relegated to the Appendix B.

I focus the analysis on the press market, instead of the T.V or radio ones, because it is in the first one where the ownership structure of media firms experienced more changes. Data corresponding to the press industry come from several sources. I use the data from Djankov et al.[29] for the year 1999. In attempting to control for unobserved country characteristics, I extend this data-set for a sample of 37 countries with private ownership of the media in the year 2003. The countries have been selected for the sample according to the availability of free data at the time to conduct the

extension. [13]For each country the data gather information on the ownership structure and market share of the top four publishing companies, according to readership figures.

Equation (1.3.1) shows that four media variables determine the equilibrium value of the bribe that a corrupt politician has to pay to silence a media outlet: π_r, α_1, α_2, and Π.

Proxy for π_r: according to the model, this variable reflects the profits a media outlet yields if it deviates and publishes the story that exposes the corrupt politician when rival firms are silenced. Hence, π_r is determined by the following parameters or variables: (i) the demand elasticity with respect to the publishing of the corruption story ε, (ii) rival firms' market shares, and (iii) market size. In what follows I discuss how I measure each one.

(i) Unfortunately, there is no available data that allow me, in an experimental way, to estimate how sensitive readers are to the report of corruption stories in each country. Therefore, I assume that ε is the same for each paper and country, and I estimate it exploiting cross-country data on the demand for news and the freedom of the press. The last variable has been built according to political pressures and governmental controls on press content.[14] To estimate ε, I work with the following log-log newspaper demand-supply two-equation system:

$$q_i^d = \beta_0 + \beta_1 fpress_i + \beta_2 gdp_i + \beta_3 liter_i + \beta_4 pop_i + \mu_i^d \tag{1.4.1}$$

$$q_i^s = \beta_5 + \beta_6 fpress_i + \beta_7 gdp_i + \beta_8 liter_i + \beta_9 pop_i + \beta_{10} fcosts_i + \mu_i^s \tag{1.4.2}$$

[13]See Appendix E for a detailed description of all the involved sources.
[14]See Appendix B for details about this variable.

where subindex-i stands for country-i, q for newspaper circulation per thousands of inhabitants, $fpress$ for press-freedom, gdp for GDP per capita, $liter$ for the literacy rate in the segment of population with more than 15 years old, which is the one expected to read newspapers, pop for population, and $fcosts$ for firing costs. [15] In line with the theory, it is expected that coefficient β_1 be significant and negative. Since countries that enjoy a more independent press are located lower in the ranking than other nations in which the governments distort, reduce, or suppress news. It is also expected that more developed countries, those that display higher figures of the GDP per capita and literacy rates, have a larger demand for newspapers i.e. $\beta_2 > 0$ $\beta_3 > 0$. It is also expected that β_4 be positive, as far as pop is related to the square surface of a country, since citizens of a bigger nation have larger incentives to buy news in order to be informed of other counties.[16]

I use variable $fcosts$ for an identification purpose, since it is an exogenous and exclusive supply shifter. To test the rank condition I run the following regression [17]:

$$q_i = \pi_1 + \pi_2 gdp_i + \pi_3 liter_i + \pi_4 pop_i + \pi_5 f\cos ts_i + v_i \tag{1.4.3}$$

where $\pi_1 = \left(\frac{\beta_5 - \beta_0}{\beta_1}\right)\delta$, $\pi_2 = \left(-\frac{\beta_6\beta_2}{\beta_1} + \beta_7\right)\delta$, $\pi_3 = \left(-\frac{\beta_6\beta_3}{\beta_1} + \beta_8\right)\delta$, $\pi_4 = \left(-\frac{\beta_6\beta_4}{\beta_1} + \beta_9\right)\delta$,

[15] In other specifications, I include as control variables a corruption and a democratic index, to be sure that β_1 is capturing only ε, instead of reflecting in addition the effect of some omitted variables correlated with the press-freedom index as well as with newspaper circulation. However, since the empirical evidence shows that these two indices are not statistically significant, and because the explained variance of the demand estimation that incorporates both measures is lower than the one that exclude them, I do not include this variables in the final specification.

[16] The data for the estimation come from several sources and generally correspond to the year 2002. The sample of countries used for the empirical exercise includes all the nations with no missing values in any of the variables that appear in system (3)-(4). See Appendix B for a detailed description of the variables and the source.

[17] The rank condition requires that the exogenous variable excluded from the demand equation has a non-zero population coefficient in the supply equation.

$\pi_5 = \beta_{10}\delta$, $v_i = \left(\mu_i^s - \frac{\beta_6 \mu_i^d}{\beta_1}\right)\delta$ and $\delta \equiv \left(1 - \frac{\beta_6}{\beta_1}\right)^{-1}$. The following table presents the results.

Table 1.1: Rank Condition

q	$coeff.$	$std.error$
$fcost$	-0.310	$[0.112] * **$
pop	0.100	$[0.57]*$
$liter$	0.895	$[0.39] * *$
gdp	1.023	$[0.095] * **$
$cons$	-9.021	$[1.262] * **$
$No.obs$	67	$R^2 = 0.816$

Robust standard errors in brackets. *: sig. at 10%; **: sig. at 5%; ***:sig. at 1%.

Table 1.1 shows, that the rank condition is satisfied, since variable $fcosts$ is statistically significant at 1%. To estimate β_1, I use variable $fcosts$ to instrument $fpress$.[18] Table 1.2 reports the results from the IV estimation.

Table 1.2: Demand Elasticity

q	$coeff.$	$std.error$
$fpress$	-1.030	$[0.510] * *$
pop	0.281	$[0.122] * *$
$liter$	1.497	$[0.540] * **$
gdp	0.408	$[0.310]$
$cons$	-6.672	$[2.611] * *$
$No.obs$	67	$R^2 = 0.725$

Robust standard errors in brackets. *: sig. at 10%; **: sig. at 5%; ***:sig. at 1%.

[18]The correlation between these two variables is significant at 1% level and equal to 0.365.

The table shows that government controls of press content are significant at 5% level to explain newspaper demand. The estimated value for ε is equal to 1.03.

(ii) A potential source of concern related to the task of measuring mks_r is the fact that this variable must reflect the market share that an outlet gain when other firms that cover the same region misreport about the corrupt incumbent. If all the newspapers were local, the analysis would have been impossible, as there is no information regarding the city in which each paper reports. Fortunately, the data document that in almost all the countries the top three newspapers are national, while the others are regional. Therefore, I focus the analysis on these papers, and I define mks_r as the total market share of the main three leading firms. (iii) Finally, I measure the size of the market, Π, with data on daily newspaper circulation. Then, variable $\pi_r = \varepsilon mks_r \Pi$.

Proxy for α_1: I work with the variable called the *ultimate controlling shareholder* in Djankov et al.[29] to measure the size of the largest owner's stock. To construct this variable the authors follow the methodology proposed by La Porta et al.[50], which involves the following steps. The first step consists in the identification of the shareholders that own a significant voting stake within each media company. This provides the first level of ownership. In the second step, the ownership structure of each legal entity is identified, to bring the second level of property. The process continues until it reaches an entity for which it is not possible to break down the ownership structure any further. The company that ultimately controls the highest number of voting rights, but no less than 20% at every link of the chain, is defined as the ultimate owner, and its stake is calculated as the minimum holding along the chain of control. When the ownership structure of a newspaper is direct, there is no chain of intermediate firms controlling the outlet, the variable reflects the size of the

largest shareholder. When the property is indirect, the variable captures the power of the shareholder that at the end of the chain of control commands the newspaper.

Proxy for α_2: when extending the data-set from Djankov et al.[29], I gather information about the second largest owner, using the same criterium as before. Unfortunately their data-set does not collect information on this issue, but this does not constitute per-se an important source of concern, since many outlets in 1999 have only one shareholder. For those cases in which the main owner has less than 100%, I proceed in the following manner. First, I look for data on the second largest owner in 1999. For those cases in which I do not find information, I apply the following criterium. If the size of the largest stake-holder does not change between 1999 and 2003, I assume that neither does the size of the second one. This is a quite standard pattern that I observe in those cases for which I have information for both years. The majority of the few cases for which the criterium described above does not apply have the main shareholder with less than 30% of the stake. For this cases, I assume that the company is "widely held" and that the second largest owner has 5% of the stake.

Proxy for y: I use corruption perception indexes to analyze the impact of ownership on y. As other scholars pointed out, the use of subjective measures of governmental corruption has both advantages and disadvantages. Two of the main sources of concern related to the work with not objective data stem on the possibility that the persons answering the survey do not share the same cardinal rankings, or that the latter ones are not uniform, in the sense for example, that a change in corruption from 4 to 5 is different from a change in corruption from 6 to 7. On the other hand, objective data, may be affected by different legal criteria that countries use to categorize a situation as a corruption event. There is also another argument in favor of

using these type of measures which is related to the fact that even though the rankings are constructed with different methodologies, which use complementary inputs, they turn out to be highly correlated among themselves. Thus, the consistency of such ratings across time period, source, and method of construction, reduces the risk of being analyzing the quirks or guesses of individuals.

From the available indicators of governmental corruption at country level, I use as the main measure of corruption the one provided by *International Country Risk Guide* (ICRG), because I think that the concept of corruption modeled in this paper may be more correlated with the concept of corruption measured by this index compared with the ones provided by other indices such as *Transparency International* (CPI). Specifically, the measure reflects to what extent high government officials are likely to demand special payments. In this respect, one can interpret these payments as y, as long as these payments are appropriated by the incumbent in an dishonest manner. The index takes values from 1 to 6 with a value of 1 indicating the highest level of corruption. To facilitate the interpretation of the econometric results, I re-scale monotonically the measure such that higher values indicates now less transparent governments. Since the variable is monthly available, I use the annual average as the indicator of corruption in a particular year. Appendix B shows means, standard deviations, maxima, and minima of the variables described before.

1.4.2 Empirical Estimates

The purpose of this section is to explore empirically the channels through which ownership affects corruption. In this regard, the main focus of the analysis is to provide suggestive evidence of the theoretical model, as well as of the implications

that it delivers: (i) existence of a negative *owner effect*, (ii) existence of a positive *contest-for-control effect*, (iii) existence of a second order tunneling problem.

According to the model, increments in the ownership stake of the largest shareholder of any media firm decrease corruption through the *owner effect* in a magnitude proportional to π_r. Therefore, taking into account that in order to silence the national market a corrupt incumbent has to silence the three national papers, as partial silencing is a dominated strategy, I introduce the following term $\sum_{j=1}^{3} \alpha_{1ji}\pi_{ri}$ as an explanatory variable in the estimation of the determinants of corruption at country level. Thus, I test the existence of the *owner effect* through coefficient δ_{OE} in the estimation of equation (1.4.4). Evidence in support of the theoretical model requires that δ_{OE} be statistically significant and negative.

To test the existence of the *contest-for-control effect*, I analyze how the contestability of the main shareholder's voting power affect corruption in equilibrium. According to the model, when large shareholders compete for corporate control, the main owner wins the contest, and he promises a compensation for misreporting equal to $x_{1ji}\Pi = (mks_r - \frac{(\alpha_{1ji}-\alpha_{2ji})}{(1-\alpha_{1ji}-\alpha_{2ji})})\Pi$, where $\frac{(\alpha_{1ji}-\alpha_{2ji})}{(1-\alpha_{1ji}-\alpha_{2ji})}$ captures the contestability of shareholder 1's voting rights normalized by the free float. Due to the presence of a second order tunneling problem, a lower contestability decreases the amount that the largest block-holder has to pay to minority owners and thereby increases corruption in equilibrium. Therefore, to test the existence of this effect I introduces the term $\sum_{j=1}^{3}(\alpha_{1ji} - \alpha_{2ji})\Pi_i$ as an explanatory variable in the estimation of the determinants of corruption at country level. Evidence in favor of this effect requires that coefficient δ_{CCE} in the estimation of equation (1.4.4) be statistically significant and positive. Thus, to test the theoretical model, I estimate the following econometric model:

$$Corr_{it} = \delta_i + \delta_{OE} \sum_{j=1}^{3} \alpha_{1jit} \pi_{rit} + \delta_{CCE} \sum_{j=1}^{3} (\alpha_{1jit} - \alpha_{2jit}) \Pi_{it} + \tag{1.4.4}$$

$$+\delta_3 (\sum_{j=1}^{3} \alpha_{1jit}) + \delta_4 (\sum_{j=1}^{3} \alpha_{2jit}) + \delta_5 \pi_{rit} + \delta_6 \Pi_{it} + \delta_7 Z_{it} + \delta_t + \varepsilon_{it}$$

where subscript-i stands for country-i and Z for a vector of control variables that includes log value of the GDP per capita, openness to trade, democracy, voice & accountability, regulatory quality, rule of law, political stability & absence of violence indices, as well as a dummy variable that takes value 1 if the top four newspapers of a country have more than 50% of the market. I control for British rule, British colonies, federal state, and protestant traditions through fixed-effects.

The set of controls takes into considerations previous findings in the corruption literature, such as the ones provided by Ades and Di Tella[2], La Porta et al.[51], Triesman[75], and Besley and Prat[14]. More specifically, Ades and Di Tella[2] present the first empirical study of the causes of corruption across countries. The authors find that corruption is higher in countries where domestic firms are sheltered from foreign competition, by natural or policy induced barriers to trade, and where the antitrust regulations are not effective in preventing anticompetitive practices. In addition, La Porta et al.[51] find that countries with Protestant traditions and more developed economies, have higher quality governments and lower levels of perceived corruption. Lastly, Triesman[75] shows that federal states are more corrupt than unitary ones, and that long periods of exposure to democracy delivers lower corruption. I include other controls such as voice & accountability, rule of law, and political stability, which may be correlated with corruption as well as with ownership concentration. Finally, variables $(\sum_{j=1}^{3} \alpha_{1jit})$, $(\sum_{j=1}^{3} \alpha_{2jit})$, π_{rit}, and Π_{it}, are introduced in the model to be

sure that the coefficients of interest are capturing the effect I want to test, instead of reflecting the impact of one of these variables if they are omitted. The regression results are reported in the following table

Table 1.3: Testing the Model I

$CORR$	$ICRG$	CPI
OE	-0.710	-0.423
	$[0.340] * *$	$[0.193] * *$
CCE	0.159	0.077
	$[0.069] * *$	$[0.038] * *$
FE	Yes	Yes
TE	Yes	Yes
obs	74	74
R^2	0.0508	0.059

Note: included control variables: GDP, openness, democracy, reg. quality, voice and accountability, pol. stab, industry profits. *: sig. at 10%;**: sig. at 5%;***:sig. at 1%.

The results of column (1) and (2) in Table 1.3 confirm the predictions of the model. There is a negative owner effect, that discourages corruption, and a positive contest-for-corporate control effect, that enhances it. Both effects are statistically significant at 5% level, and the evidence is robust to the use of more than one measure of corruption.

According to column (1), a 10% increases in α_{1ji} reduces, through the owner effect, the corruption index of country-i in $0.071\pi_r$ units. The same increment raises, through the contest effect, the index in 0.016Π points. The evidence that δ_{CCE} is positive indicates also the presence of a second order tunneling problem, where the resources expropriated to minority owners by a less contestable largest stake-holder reduce the cost to silence the media, and thereby increases corruption in equilibrium. Even

though δ_{OE} is larger than δ_{CCE}, this does not mean that the owner-effect dominates the contest-for-control effect. It could be possible that coefficient δ_3 be capturing part of the last effect, reflecting the fact that increments in the size of the main shareholder's stake reduce the fraction of shares held by minority shareholders, and therefore the compensation the largest owner has to pay when the corruption story is not published. In the following section I make robustness checks of these results.

It could be argued that δ_{OE} and δ_{CCE} are capturing the effect of changes in market size instead of reflecting the impact of variations in the ownership structure of the firms. To address this issue, I re-estimate equation (1.4.4) assuming that π and Π are constant when included in the terms that capture the impact of the owner and contest effects. Thus, the estimated model is as follows:

$$Corr_{it} = \delta_i + \delta_{OE}\sum_{j=1}^{3}\alpha_{1jit}\pi_{ri} + \delta_{CCE}\sum_{j=1}^{3}(\alpha_{1jit} - \alpha_{2jit})\Pi_i + \tag{1.4.5}$$

$$+\delta_3(\sum_{j=1}^{3}\alpha_{1jit}) + \delta_4(\sum_{j=1}^{3}\alpha_{2jit}) + \delta_5\pi_{rit} + \delta_6\Pi_{it} + \delta_7 Z_{it} + \delta_t + \varepsilon_{it}$$

Table 1.4 shows that the empirical findings do not change when controlling for variations in the size of the market. The only difference between the results of Table 1.3 and 1.4 relies on the absolute values of the coefficients, which in the last case are lower than in the previous one.

Reverse causality

A potential source of concern regarding the estimation of the previous econometric models is the reverse causality problem i.e. rather than identifying the effect of ownership concentration on corruption, one may be identifying the effect of corruption

Table 1.4: Testing the Model II

$CORR$	$ICRG$	CPI
OE	-0.634	-0.407
	$[0.305] * *$	$[0.173] * *$
CCE	0.127	0.066
	$[0.056] * *$	$[0.030] * *$
FE	Yes	Yes
TE	Yes	Yes
obs	74	74
R^2	0.0413	0.005

Note: included control variables: GDP, openness, democracy, reg. quality, voice and accountability, pol. stab, industry profits. *: sig. at 10%; **: sig. at 5%;***:sig. at 1%.

on ownership structure. This problem can be solved using instrumental variables i.e. variables that have no direct effect on corruption and they are highly correlated with the degree of ownership concentration of media firms. To analyze if the ownership structure of a media firm is an endogenous variable, I perform the Hausman[42] test for endogeneity.

To conduct the Hausman[42] test, it is necessary to find an instrument for the endogenous variable, in this case, the size of the main shareholder's stock. According to Staiger and Stock's [70] work, the estimated coefficients of the second stage have acceptable properties if the F statistic of the first stage is larger than 10. I apply this criterium and I find that the index of rule of law index (RLI) is a good instrument of variable ($\sum_{j=1}^{3} \alpha_{1ji}$). Therefore, I instrument the owner effect with variable RLIπ_{ir}. The F statistic of the first stage is 16 when the endogenous variable is ($\sum_{j=1}^{3} \alpha_{1ji}$) and 129 when the endogenous variable is the *owner effect*. Finally, I perform the Hausman test and I do not find evidence supporting the endogeneity assumption. The p-value

associated to the null hypothesis of exogeneity is equal to 0.463. Thereby, reverse causality is not a problem in this sample.

Competition or Collusion among Large Shareholders?

The last empirical evidence I provide in support of the model is related to the hypothesis that large shareholders compete for corporate control, instead of colluding, at the time to determine who controls the media. To test the hypothesis that a coalition is formed, against the alternative on competition, I estimate a new model under the assumption that a controlling group is constituted to run the firm. When large shareholders collude, the contest-for-control effect disappears, and corruption decreases as the coalition's size raises. Therefore I estimate the following model:

$$Corr_{it} = \delta_i + \delta_{OE} \sum_{j=1}^{3} \alpha_{jit}^{Coal} \pi_{rit} + \delta_1 (\sum_{j=1}^{3} \alpha_{jit}^{Coal}) + \delta_2 \pi_{rit} + \delta_3 Z_{it} + \delta_t + \varepsilon_{it} \qquad (1.4.6)$$

where α_{ji}^{Coal} stands for the size of the coalition formed in outlet-j from country-i. Thus, if the ownership structure of a media company is composed by a majority shareholder, this variable reflects the size of his stake. Otherwise, it captures the proportion of shares that the two largest owners have, as long as they own together more than 50% of the firm, or the smallest proportion of cash flow needed to get control (50%), if the stake of the top two owners is not enough to reach a majority. For the last case, I follow Bennedsen and Wolfenzon[9], who analyze theoretically the balance of power in closely held corporations. The authors show that the coalition with the smallest cash flow needed to seize control is the one that in equilibrium command a firm, since this coalition has the largest group of shareholders from whom to expropriate. The following table presents the results.

Table 1.5: Collusion Hypothesis

$CORR$	$ICRG$	CPI
OE	-0.033	-0.006
FE	Yes	Yes
TE	Yes	Yes
obs	74	74
R^2	0.021	0.027

*: sig. at 10%;**: sig. at 5%;***:sig. at 1%.

Table 1.5 shows that there is no empirical evidence of the existence of the owner-effect under the assumption that large shareholders collude at the time to determine who controls a media firm. The coefficient δ_{OE} is negative, but it is not statistically significant to explain corruption. This result is observed in both regressions, the one that use the index provided by $ICRG$, as well as the one that considers the CPI measure.

1.5 Conclusions

This paper explores, both from the theoretical and empirical point of view the relationship between corruption in the public sector and the degree of ownership concentration of media firms. In doing so, it introduces in the analysis corporate governance aspects of media firms, identifying thereby the channels through which concentration affect corruption. The theoretical and empirical results have important implications for the debate on media regulation, as well as for the design of institutions to promote accountability and to curb corruption in the public sector. In effect, they show that conventional prescriptions on ownership concentration may not be appropriate when

it comes to an industry such as media. This is because policies designed to promote the independence of the sector must take into account not only economic welfare considerations, but also accountability effects. Regarding this issue, the paper shows that ownership concentration may not damage neither press freedom, nor a transparent administration of the public funds. This of course stands in sharp contrast with the conventional wisdom, and constitutes one of the main contributions of the present work. The paper also shows that ownership structures as the ones that are commonly observed, with two large shareholders and one of them with a majority of the firm, have a more negative impact on corruption than ownership structures with only one or many small owners. Finally, an important extension that this paper does not cover and that I have left for future work is related to the impact of media cross-ownership on corruption.

Chapter 2

Competition and Directed Technical Change: Quality vs. Variety

2.1 Introduction

The direction of the technical change towards vertical innovations or horizontal inventions is of central importance for several problems in Development, International Trade and IO.[1] As it determines the worldwide supply of high quality goods and new products, and thereby affects the bilateral patterns of trade, the rewards to factors, and country growth rates.[2]

Recent empirical studies have focused on the role of factor endowments to shape the supply of quality and that of varieties (see Schott [66], Hummels and Klenow [45], Choi et al. [25], Hallack and Schott[41], Khandelwal[48]). In this strand of the literature Schott[66] finds no evidence of endowment-driven specialization *across* products, but consistent evidence with specialization *within* goods. This means that

[1] Vertical innovations refer to quality improvement inventions, while horizontal innovations refer to the creation of new goods.

[2] Linder[52] pointed out that rich countries tend to import relatively more from economies that produce high-quality products.

firms from developed and developing economies have been producing similar set of products, but those from rich countries have been supplying high-quality goods.

It has been conjectured that this change in the pattern of specialization from *across* to *within* product differentiation may have been driven by globalization. It is the intention of this paper to explore, both from a theoretical and empirical point of view, how product market competition, entry liberalization, and the threat of imitation bias the technical change towards one direction: quality or variety.

To analyze theoretically these issues, the paper presents a model that combines the "love for variety" approach of Spence [69], and Dixit and Stiglitz [28], and the Howitt[43] model of endogenous growth, with vertical and horizontal innovations. There are knowledge spillovers in the vertical activity, increasing complexity to create new and better products, and threat of being imitated by other firms.

The model shows the existence of different trade-offs between doing one type of innovation or the other. On the one hand, more product market competition shifts firm's incentives, away from the proliferation of new products, and towards the improvement of the quality of the existing goods. This occurs for many reasons. First, competition increases the marginal value of adding one extra unit of quality to an existing variety. Second, competition reduces the demand expected by horizontal inventor. Third, competition raises the incentives to make vertical innovations because these types of inventions allow the successful firm to jump to the top of the distribution of quality in the economy, and to leave its rivals further behind it.

In the same vein, entry liberalization encourages firms to introduce vertically superior goods. This happens because entrance is profitable when the incumbent firm does not supply a leading variety. Thus, when countries reduce legal barriers to entry,

quality up-grading constitutes an effective strategy for incumbent firms to scape from competition. On the other hand, the complexity of the innovation process, makes horizontal inventions easier to be created, and therefore more attractive. Finally, because quality-innovators are exposed to the threat of being imitated, less intellectual property rights protection encourages firms to create new but low quality goods.

The chapter also shows that the complexity to innovate in both dimensions introduces certain kind of complementarities between the supply of high-quality products and the provision of new but low-quality goods. These complementarities help to rationalize the well known inverted U-shaped relationship between the level of vertical $R\&D$ expenditures and the degree of product market competition.

To test the predictions the model delivers, the paper exploits firm level data. Specifically, we use a survey conducted by the Central Bank of Italy, which gathers information about the innovative activity of Italian manufacturing firms during the period 1998-2000 and 2001-2003. The survey covers a representative sample of 4,660 and 3,452 firms, respectively. A sample of 1,634 firms has been followed during both periods. A very nice feature of this data-set is that it collects information about the type of innovations that firms decide to carry out i.e quality innovations, variety innovations or cost reducing innovations. Thus, it allows to study the composition of the $R\&D$ activity.

To test the prediction that more product market competition directs the technical change towards quality innovations, I construct different measures of the quality technical bias at sectoral level. I measure the degree of product market competition with the Rauch[63] and Broda and Weinstein[18] sectorial classifications. I find evidence supporting the prediction.

To see if there is evidence that entry liberalization biases the technical change towards vertical innovations, I analyze how exporter firms react when the countries in which they sell their products lower the barriers to start-up firms. I find that a 10% reduction in the delay to entry in a market increases the probability of doing quality up-grading by 3%, while it has no significant effect on the likelihood of introducing new products.

Regarding the effect of imitation, the paper shows that small, productive and exporter firms that innovate in quality, are the ones that receive a negative and significant impact from imitation. According to the empirical results, a 10% increment in the probability of being imitated reduces the bias towards quality by 40%.

Finally, to test the existence of complementarities between both types of innovations, I apply the productivity approach of Cassiman and Veugelers[19]. The methodology consists in testing the Milgrom and Robert's[56] definition of complementarity between two activities. According to the authors, two activities complement each other, when adding one activity while the other is already performed, has a higher incremental effect on firms' performance than adding both activities in isolation. To test that definition, I regress a measure of innovation performance on exclusive combinations of the two types of innovations. I use the percentage of sales attributable to the innovative activity as the measure of firm's performance. I find evidence that supports the complementarity hypothesis.

The theoretical and empirical results this paper presents deliver several policy implications. First, they show that entry liberalization is an effective way to promote innovations that increase the quality of the goods. Second, the results suggest that liberalization must be followed by policies that strength intellectual property

rights protection, to avoid that the threat of imitation encourages incumbent firms to create low-quality products. Third, the results suggest that sectors with low elasticity of substitution between products may be the ones to need more assistance when countries reduce barriers. Since it is in these sectors where firms have low incentives to create vertically superior goods. Finally, taking into account that both activities complement themselves, they should be promoted together.

The chapter is organized as follows. Section 2 presents the model and the theoretical results. Section 3 presents the empirical analysis. The final section concludes.

2.2 Theoretical Analysis

2.2.1 The Model

I present in this section a model built on a combination of the love for variety approach of Spence[69] and Dixit and Stiglitz[28], and the Howitt[43] model of endogenous growth with vertical and horizontal innovations. The economy consists of two sectors, one in which firms produces the final good, and the other in which firms creates new and improved intermediate products. The following sections describe the behavior of final producers and innovating firms.

2.2.2 Final Good Sector

Firms in this sector produce consumption goods and $R\&D$ services, under perfect competition, using the same technology. The economy output is produced with a constant returns to scale production function. The inputs in the production process are labor and a continuum of intermediate products. Specifically, the total output of

the economy at any time-t is as follows:

$$Y_t = C_t + H_t + V_t \tag{2.2.1}$$

$$Y_t = L_{yt}^{(1-\alpha)} \left[\int_0^{N_t} (q_{it} x_{it})^{\frac{(\sigma-1)}{\sigma}} \, di \right]^{\alpha \frac{\sigma}{(\sigma-1)}} \tag{2.2.2}$$

where C_t is consumption, H_t is horizontal $R\&D$ expenditure, V_t is vertical $R\&D$ expenditure, N_t is the number of intermediate products available in the economy, q_{it} is the quality of variety-i, x_{it} is the quantity of variety-i, $\sigma > 1$ is the elasticity of substitution between any two varieties of the intermediate good, and L_{yt} is the labor input used in the production process. A typical firm-j that produces the final good maximizes its profits π_{jt}, choosing L_{yjt} and x_{ijt}, where π_{jt} is given by the following expression:

$$\pi_{jt} = L_{yjt}^{(1-\alpha)} \left[\int_0^{N_t} (q_{ijt} x_{ijt})^{\frac{(\sigma-1)}{\sigma}} \right]^{\alpha \frac{\sigma}{(\sigma-1)}} - w_t L_{yjt} - \int_0^{N_t} p_{it} x_{ijt} di \tag{2.2.3}$$

where p_{it} is the price of the intermediate input-i and w_t is the wage rate for labor. Solving for profit maximizing behavior yields the demand for intermediate-i and labor which can be written as follows:

$$x_{it} = \frac{\alpha Y_t p_{it}^{-\sigma} q_{it}^{(\sigma-1)}}{\left[\int_0^{N_t} p_{it}^{(1-\sigma)} q_{it}^{(\sigma-1)} di \right]} = \frac{\alpha Y_t p_{it}^{-\sigma} q_{it}^{(\sigma-1)}}{P_t^{1-\sigma}} \tag{2.2.4}$$

$$w_t = (1-\alpha) L_{yt}^{-\alpha} \left[\int_0^{N_t} (q_{it} x_{it})^{\frac{(\sigma-1)}{\sigma}} \, dj \right]^{\alpha \frac{\sigma}{(\sigma-1)}} \tag{2.2.5}$$

2.2.3 Intermediate Good Sector

Firms engage into two different types of $R\&D$ activities: vertical and horizontal ones. Specifically, when firms involve in the vertical $R\&D$ activity, they do so with the goal of developing higher quality intermediate products. Thus, at any point in time, a successful vertical innovator supplies a variety that previously exists in the market but which embodies the leading-edge quality of that moment, Q_t.[3] This innovator enters in Bertrand competition with the previous supplier of that good and drives him out from the market.[4]

Each firm-j that intends to innovate vertically in variety-i faces a poisson probability equal to $\phi^v_{ijt} = \frac{v_{ijt}}{Q_t}$ of being successful, where v_{ijt} is the amount of $R\&D$ expenditures that the firm devotes to the $R\&D$ activity. Division by Q_t captures the fact that as time goes by and better products are introduced, researchers' productivity falls because the problems they face become more complex and harder to be solved. Thus, there is a negative externality of past vertical innovations that makes the creation of vertically superior goods progressively more difficult.[5]

As in Caballero and Jaffe [19], and Howitt[43], the leading-edge quality grows over time as a result of knowledge spillovers produced from the vertical $R\&D$ activity. The size of the spillovers is proportional to the aggregate flow of vertical innovations,

[3] $Q_t \equiv \max\{q_{it} : i \in [0, N_t]\}$.

[4] As in Grossman and Helpman[37], Aghion and Howitt[3], I assume that since the current leaders have less to gain from vertically innovating than other firms, they do not participate in vertical R&D races.

[5] I introduce this assumption due to the following two reasons. The first reason is related with the existence of a balanced growth path in equilibrium. The second reason is related with what the empirical studies on innovation document about increasing innovation complexity. In particular, Jaffe and Hall[47] analyze 2,923,922 US patents citations for the period 1963-1999. They show that as time goes by, the set of fields cited by a patentee becomes prominently wider for almost all the sectors in the US economy. Thus suggesting, that innovations have become progressively more complex, and therefore, more difficult of being created.

$\phi_t^v N_t$, and the factor of proportionality is given by $\frac{1}{N_t}$. Division by N_t reflects the idea that as a sector develops an increasing number of intermediate products, each vertical innovation has a smaller impact on the stock of public knowledge used by researchers. This means that $g_t^v = \frac{\dot{Q}_t}{Q_t} = \sum_j \phi_{ijt}^v$.

Vertical innovators faces a probability equal to p of being imitated by some outsider firm.[6] When an inventor is imitated he retains a proportion λ of the benefits of his invention while the rest, 1-λ, is appropriated by the imitating firm.[7]

Firms also engage in the horizontal $R\&D$ activity with the purpose of expanding the set of intermediate products. Thus, horizontal innovations are associated with increases in N_t. At any time-t, each horizontal innovation results in the creation of a new good whose level of quality is drawn randomly from the existing distribution of quality at that moment. Each firm-j that wants to innovate horizontally faces a poisson probability equal to $\phi_{jt}^h = \frac{h_{ijt}}{N_t}$ of being successful, where h_{jt} are the $R\&D$ expenditures that firms devote to the horizontal activity. Division by N_t captures the idea that as a sector develops an increasing number of intermediate goods the creation of new products becomes more difficult.

Finally, to be able to sell their products in the market, firms must apply for a licence. These legal requirements affect innovations in two directions. First, it reduces the expected profits from an invention as firms must wait a period before selling the new goods. Second, it affects the entrance of outsider foreign firms. Specifically, I focus on technologically advanced entry. Thus, when entry happens, it takes place

[6] I will provide empirical evidence that leading varieties are the ones targeted to be imitated. ..."Copying in China goes far beyond fake DVDs, watches and handbags....mobile phones that look like the latest offerings from Nokia can all be easily found. Copying DaimlerChrysler's small two seater Smart car seems to have become especially popular....". *The Economist-April 7th 2007.*

[7] In fact, no two firms have an incentive to copy the same product because price competition would lead them to negative profits

at the frontier, with goods that contains the leading-edge quality of that moment.[8] This of course, does not affect the survival of leading varieties, but it increases the probability for an horizontal innovator of being replaced by a better supplier of his good. I denote this probability with $s(d)$ and I assume $s'(d) < 0$, where d stands for the time it takes to a firm to sell legally its product in the market.

2.2.4 Innovation in Equilibrium

R&D firms face a two-stage decision process. In the first stage, they decide whether or not to devote resources to the innovative activity. In the second stage, they set the optimal price at which to sale the invented product. Thus, in the second stage, the incumbent monopolist of the intermediate product-i faces production costs equal to $w_t x_{it}$ and solves the following maximization problem:

$$\max_{\{p_{it}\}} \pi_{it} = (p_{it} - w_t)x_{it} \tag{2.2.6}$$

s.t

$$x_{it} = \frac{\alpha Y_t p_{it}^{-\sigma} q_{it}^{(\sigma-1)}}{P_t^{1-\sigma}} \tag{2.2.7}$$

which yields the standard monopoly mark-up $\frac{(p_{it}-w_t)}{p_{it}} = \frac{1}{\sigma}$ and current profits $\pi_{it} = \frac{\alpha Y_t}{\sigma} \frac{q_{it}^{(\sigma-1)}}{\int_0^{N_t} q_{it}^{(\sigma-1)} di}$.

[8] It is possible to provide foundations for this assumption using a sequential game between incumbent firms and potential entrants. Suppose that the entrant must pay a small entry fee to enter and can decide whether to pay this fee after observing the post-innovation technology of the incumbent firm in each variety. Assuming that the incumbent and the entrant compete a la Bertrand after entry takes place, the entrant will find it profitable to pay the entry fee and appropriate the local market when the incumbent supplies a product with lower quality than him. If the incumbent is, instead, expected to compete on an equal footing with the entrant, then the entrant will find it optimal not to pay the entry fee.

In the first stage, a researcher has to decide about the innovative activity. In particular, any firm-i finds $R\&D$ investments attractive if the present value of the profits the innovation delivers is at least equal to the cost of creating a new good. The total reward for a vertical innovator at time-t is the expected discounted value of the profits flows he earns before being replaced by the next inventor. This reward is as follows:

$$R_{it}^{v}(d) = \int_{t+d}^{\infty} e^{-\int_{t}^{\tau}(r_s+\phi_s^v)ds}\pi_{it\tau}d\tau \tag{2.2.8}$$

where $\pi_{it\tau}$ is the monopoly profit flow at time τ for a firm that produces a variety of vintage-t. Since each horizontal innovation results in a new variety of the intermediate product whose quality is randomly drawn from the existing distribution of quality, it follows that the expected value of an horizontal invention is as follows:

$$E[R_{it}^{h}(d)] = E\left[\left(\frac{q_{it}}{Q_t}\right)^{(\sigma-1)}\right] R_{it}^{v}(d) \tag{2.2.9}$$

The following lemma characterizes the distribution of $\frac{q_{it}}{Q_t}$ in the steady-state.

Lemma 1 *The distribution of relative quality,* $a_{it} \equiv \frac{q_{it}}{Q_t}$*, converges monotonically to the invariant distribution* $\Pr = (a_{it} \leq a) = F(a) \equiv a$*, with* $0 < a \leq 1$.[9]

Proof of lemma 1 is relegated to Appendix C. It follows then, that $\int_0^1 a_{it}^{(\sigma-1)}F'(a)da = \frac{1}{\sigma}$, and that in the steady state the following applies:

[9]The fact that the invariant distribution is uniform depends on the assumption about the knowledge spillovers in the vertical $R\&D$ activity. Changes in the factor of proportionality change the shape of the distribution of relative quality, but do not alter the negative impact of σ on $E[R_{ijt}^{h}]$. If the factor of proportionality belongs to the interval (0,1), the distribution of relative quality is bias to the right, while the opposite is true if the factor of proportionality is higher than 1.

$$E[R^h_{it}(d)] = \frac{1}{\sigma} R^v_{it}(d)$$

Because entrance in the vertical and horizontal activities is free, entry occurs until the marginal firm just breaks even. Thus, the free entry condition for each $R\&D$ activity is as follows:

$$\frac{v_{ijt}}{Q_t} R^v_{it}(d)[1 - p(1-\lambda)] = v_{ijt} \tag{2.2.10}$$

$$\frac{h_{jt}}{N_t}(1 - s(d))E[R^h_{it}(d)] = h_{jt} \tag{2.2.11}$$

The first-order conditions for each research firm are: $[1 - p(1-\lambda)]\frac{1}{Q_t} R^v_{it}(d) = 1$ and $\frac{1}{N_t}(1 - s(d))E[R^h_{it}(d)] = 1$. Hence, the marginal and average product of research are equal in the steady state.[10] Then, from the non-arbitrage condition it follows that the bias of the technological change is equal to:

$$\frac{Q_t}{N_t} = \frac{\sigma[1 - p(1-\lambda)]}{(1 - s(d))} \tag{2.2.12}$$

Furthermore, since the leading-edge quality must grow over time at the same rate that N_t it follows that:

$$\frac{V_t}{H_t} = \frac{\sigma[1 - p(1-\lambda)]}{(1 - s(d))} \tag{2.2.13}$$

[10]This means: $\phi'^v_{ijt} = \frac{\phi^v_{ijt}}{vijt} = (R^v_{it}(d))^{-1}$ and $\phi'^h_{jt} = \frac{\phi^h_{jt}}{hjt} = (E[R^h_{it}(d)])^{-1}$.

Thus, equations (2.2.12) and (2.2.13) show that a higher substitutability between goods at horizontal level shifts firms' incentives away from the proliferation of new products and towards the introduction of vertically superior goods. This result occurs because more competition increases the marginal benefit of adding one extra unit of quality to an existing variety, and thereby rises the return to the vertical activity. In the same direction, entry liberalization biases the technical change towards quality, while less intellectual property rights protection increases the firms' incentives to invent new but low-quality goods.

Equations (2.2.12) and (2.2.13) also show that it is possible to decompose the effect of changes in σ on Q_t and V_t into two different effects: a positive *substitution effect*, and a negative *complementarity effect*. The first effect is related with the shifts of incentives that changes in σ generate towards the introduction of vertically superior goods. This effect has been previously pointed out Sutton[**?**].[11] The second effect is related to the fact that in equilibrium varieties and quality must grow over time at the same rate. This kind of complementarity between both innovations emerges in the model as a result of the complexity to create new and high-quality products.[12]

To understand how the complementarity between both innovations arises, suppose that the economy is out of the equilibrium situation, and that the non-arbitrage condition is not satisfied, with the return to horizontal investments exceeding that of vertical research. In this situation firms have strong incentives to devote their $R\&D$

[11]The author examines the relationship between the $R\&D$ intensity of an industry and its level of concentration, from the perspective of the Bounds approach to market structure. He presents a non-convergence theorem which provides a lower bound to the (one-firm) concentration ratio, $\frac{1}{N}$, of an industry. He finds that the bound is a positive function of σ.

[12]Evidence of this fact at country level is documented by Broda and Weinstein[18]. In 1988, the average number of varieties exported by a country was 12822. This value increases to 14572 in 1990, and continue growing up to 16390 in 2001. The average value per variety was 2.67 in 1988, 2.72 in 1990, and 4.30 in 2001.

efforts to the creation of new goods. However, as time goes by, and new products are introduced, researchers productivity falls, because the problems they face become more complex and harder to be solved. Thus, firms allocate resources to the horizontal activity until a point in which vertical innovations start to become also profitable. In equilibrium, both innovations must deliver the same benefits and this makes N_t to grow together with Q_t.

An interesting implication that can be drawn from the existence of the substitution and complementarity effect, is that they provide new theoretical foundations for the well known inverted U-shaped relationship between the level of vertical $R\&D$ expenditures and the degree of product market competition.

Since 1970 until nowadays, there is a vast number of empirical works that try to figure out the shape of that relationship. However, there seems to be no conclusive result on this issue. The most reconciling work in the literature corresponds to Aghion et al.[4]. The authors find a non-monotonic relationship between the level of vertical $R\&D$ expenditures and the degree of product market competition. According to their findings, innovation is an inverted U-shaped function of competition. The authors reconcile the Darwinian view supported by Nickell et al.[**?**][13] with the Schumpeterian paradigm,[14] using a "step by step" approach of technological progress. Under this approach, incumbents innovators are not automatically leap-frogged by their rivals firms. Then, competition may increase the incremental profit from innovating, but it may also reduce innovation incentives for laggard firms.

This chapter presents new foundations for such relationship. Under the set-up of this chapter two conditions must be satisfied to find the non-monotonicity property.

[13]This view states that competition forces firms to innovate in order to survive in a market.
[14]This paradigm states that competition reduces innovation incentives.

First, that the substitution effect dominates the complementarity effect when σ is low, and viceversa, when σ is high. Second, that $[\epsilon\frac{(1-\epsilon)}{\sigma} - \gamma\frac{\partial\epsilon}{\partial\sigma}] < 0$, where ϵ is the elasticity of H_t with respect to σ. The following section provides empirical evidence in support of the model.

2.3 Empirical Analysis

To test the model, I use data on the innovative activity of Italian manufacturing firms during the periods 1998-2000 and 2001-2003. The data come from a survey conducted by the Central Bank of Italy, and they cover a representative sample of 4,660 and 3,452 firms, respectively. A sample of 1,634 firms has been followed during both periods. The survey gathers detailed innovation about the type of innovations that firms decide to carry out (quality innovations, variety innovations or cost reducing innovations). Thus, it allows to study the composition of the $R\&D$ activity. The next section describes the proxies constructed to test the main implications that the model delivers: More competition i.e higher σ biases the technical change towards quality; Less intellectual property right protection biases the technical change towards the creation of low quality goods; Entry liberalization biases the technical change towards the introduction of vertically superior goods; Quality- and variety-innovations complement each other.

2.3.1 Data

Technological bias

Since the model has predictions about the technological bias at sectorial level, I

construct a measure of the bias for each 3-digit ATECO91 sector and I focus on sectors with more than 4 firms. I use this definition of sector because it corresponds to the highest level of disaggregation for which it is possible to calculate the measure of the bias without applying a Cox's transformation.[15]

In the survey firms also report about the size of their innovative activity (high, medium, or low). I carry out the empirical analysis with the information regarding to high innovations. I adopt this criterium for the following two reasons. The first reason has been pointed out by the empirical $R\&D$ literature (see Geroski[37] for a detailed discussion), and it is related with the fact that one should find a way to weight the innovative activity because as far as it varies significantly across firms and industries direct values may not be comparable. [16] The second reason relies on the fact that the innovation measure must be related with the amount of expenditures that each firm devotes to the $R\&D$ activity, as this is a reliable index of the innovative intensity of a firm. Since there is a large number of firms in the survey that report that they have made medium or low innovations while they have spent no resource in $R\&D$, while this is not the case for firms that have made high innovations, I focus on the last category to carry out the empirical analysis.

According to the model, the technical bias in sector-i at time-t is given by the following expression: $QB_{it} = \frac{Q_{it}}{N_{it}}$. Thereby, I define the empirical measure of the bias as the ratio between the number of firms that make quality improvements to the number of firms that create new goods, $QB_{it} = \frac{N^q_{it}}{N^v_{it}}$. Because the model is isomorphic

[15]This transformation is used when analyzing grouped data and there is a group with no observations. For many sectors with less than 4 firms the Cox transformed measure of the bias delivers outlier values.

[16]Usually, empirical studies on innovation use patent citations to weight the innovative activity (see Jaffe and Hall[47] for a detailed discussion about different ways to weight the activity.)

to the case in which vertical innovations are cost reducing inventions, I construct another measure of the bias, $CB_{it} = \frac{N_{it}^c}{N_{it}^v}$, where N_{it}^c stands for the number of firms that carry out cost reducing inventions.

Elasticity of substitution

To measure the elasticity of substitution between two varieties of the intermediate product, I use two different sectoral classifications. First, I employ the classification built by Broda and Weinstein[18]. The authors widely extend the seminal work of Feenstra[32]. Using a model built on Dixit and Stiglitz's [28], and data on U.S imports during the period 1990-2001, they estimate the σ for 3-digit SITC(revision 3) sectors. Then, they classify sectors in three categories: sectors with low, medium, or high product elasticity of substitution, depending on whether the σ of the sector is lower than the σ corresponding to the percentile 33, between the σ of the percentile 33 and the corresponding to the percentile 66, or higher than the σ corresponding to the percentile 66. The percentiles are calculated over the distribution of estimated σ's for 257 sectors.

A final important remark regarding the use of Broda and Weinstein[18]'s classification is the following. To estimate the σ's, the authors exploit the panel structure of the data, and they estimate the following equations:

$$\Delta \ln s_{it} = (\sigma - 1) \ln \left(\frac{P_t}{P_{t-1}} \right) - (\sigma - 1) \ln \Delta p_{it} + \varepsilon_{it} \tag{2.3.1}$$

$$\Delta \ln p_{it} = \psi_t + \frac{\omega}{1+\omega} \Delta \ln s_{it} + \delta_{it} \tag{2.3.2}$$

where $\varepsilon_{it} = \left[\sigma \Delta \ln q_{it} + \Delta \ln \frac{\lambda_{it-1}}{\lambda_{it}} \right]$, $s_{it} = q_{it}^{\sigma} p_{it}^{-(\sigma-1)} P^{(\sigma-1)}$, $\frac{\lambda_{it-1}}{\lambda_{it}}$ is the well known

Feenstra[32]'s price index adjustment due to changes in the number of varieties supplied, $\Delta \ln q_{it}$ represents changes in the quality of variety i, and ω stands for the supply elasticity. Thus, the authors collect in the error term of the demand equation, changes over time in the quality of the goods, and changes over time in the number of varieties. Furthermore, they assume that the demand and supply equations have an independent error structure, and they use this assumption for identification purposes. This assumption is adequate in models where changes in the quality of the goods or changes in the number of varieties are completely exogenous, but it is not appropriate when these changes come from optimal firms' responses, as it is the case of the model of this paper. A simple example that helps to figure out how supply and demand shocks can be correlated when there are endogenous decisions about vertical and horizontal innovations, is the case of an economy that lowers barriers to trade, and in which firms start to make outsourcing. It is quite natural to think that in this case, the supply shock may affect Broda and Weinstein[18]'s demand shock, as long as firms re-allocate the efficiency gains from outsourcing, to supply either more quality or more varieties.

Even though there exists this limitation, that makes the application of Broda and Weinstein[18]' s classification to my model not straightforward, it is still one instance that make the use of this classification possible. This requires the introduction of two additional assumptions in the model. First, that any supply shock is common to all firms. Second, that the fraction of sectoral output devoted to the $R\&D$ activity is constant over time. This is a feature that happens when the economy reaches its steady state. If this is the case, the equilibrium prices and quantities of my model do not change with supply shocks, and the estimated σ of Broda and Weinstein

corresponds to the σ of my model.

The second classification corresponds to Rauch[63]. This classification divides goods into three categories: commodities, reference priced goods, and differentiated products. Depending on whether they are traded on organized exchanges, listed as having a reference price, or are not included in any of the previous categories.

Imitation

To measure p (probability of being imitated), I use information regarding the impact of imitation on firms' profits. According to the survey, the impact can be strongly significant, significant, or irrelevant. I define p as the ratio between the number of firms in a sector which receive a strongly negative impact from copy, to the total number of firms that exist in that sector i.e. $p = \frac{N_{it}^{ss}}{N_{it}}$. Variations of p across sectors may appear either because the technological features of some goods expose them to more imitation than other products, or because intellectual property rights protection varies across sectors.

Barriers to entry

To measure d (delay between the moment a product is created and the moment it can be sold legally in the market), I use the *World Bank* data on *Doing Business*. Specifically, I consider the variable "time to start a business". According to Djankov et al[**?**], time is recorded in calendar days. The measure captures the median duration that lawyers indicate is necessary to complete a procedure with minimum follow-up with government agencies and no extra payments. It is assumed that the minimum time required for each procedure is 1 day, and that although procedures may take place simultaneously, they cannot start on the same day. A procedure is considered completed once the company has received the final document, such as the company

registration certificate or tax number. It is also assumed that the entrepreneur does not waste time and commits to completing each remaining procedure without delay. The variable is available at country level. I explain later how I proceed to test implication 3.

Capital and Skill intensity

To control for other sectoral characteristics that may be correlated with σ, p, and the technological bias, such as capital intensity and skill intensity, I use data from Bartelsman and Gray[8]. The data set contains information about the U.S manufacturing industries along the period 1958-1996. I use the average value of capital and skill intensity at each 3-digit sector in 1996 as control variables. The following table presents summary statistics of the main variables at sectorial level for the period 2001-2003.

Table 2.1: Summary Statistics

Var	Obs	Mean	Std.dev	Min	Max
N_i^q	79	20.139	17.330	1	79
N_i^v	79	7.835	7.941	1	38
N_i^c	79	3.481	3.540	0	22
p	79	0.170	0.104	0	0.545
$Size$	79	177.602	273.692	24.818	2087
Exp	79	$2.05e^7$	$5.38e^7$	222560.1	$4.55e^8$
$Sk.int$	79	80.701	79.110	14.461	517.836
$K.int$	79	0.282	0.12	0.68	1.46

2.3.2 Empirical Estimates

To explore the first two theoretical implications, I estimate the following model:

$$TB_i = \beta_0 + \beta_1 D_i^{Medium} + \beta_2 D_i^{High} + \beta_3 p_i + \beta_4 X_i + \varepsilon_i \tag{2.3.3}$$

where TB_i measures the technical bias towards vertical innovations in sector-i, and D_i^{Medium} and D_i^{High} are dummy variables that take value 1 if i is a medium-σ or high-σ sector, respectively. Variable X_i represents a vector of control variables that includes capital intensity, skill intensity, volume of exports, and average number of workers per sector. I incorporate these controls in the regression to be sure that the coefficients of interests are capturing the effect I want to test and not the impact of some omitted variable which may be correlated with σ and/or p as well as with TB.

It is quite natural to think that capital and skill intensive sectors may have an advantage in the production of vertically superior goods, or that sectors with large volume of exports produce better products, as firms devote more resources to supply high-quality goods in order to appeal to the standards of international markets. There are also reasons to expect that firms' size may be correlated with the technological bias, even though the direction of this correlation is not obvious, as large firms can spend more $R\&D$ expenditures in both the vertical and horizontal activity.

Table 2.2 displays the results from the estimation of equation (2.3.3). The sectoral classification employed for this estimation corresponds to Broda and Weinstein. I estimate equation (2.3.3) in levels and logs. I use the log specification to separate the effect of σ on TB from that of p on TB. Because d varies at country but not at sectoral level, I exclude this variable from the estimation. In the following sections I explain how I use firm level data to measure the impact of d on the technical bias.

Table 2.2: Technical Bias

VAR	$\frac{N_i^q}{N_i^v}$	$ln(\frac{N_i^q}{N_i^v})$	$\frac{N_i^c}{N_i^v}$	$ln(\frac{N_i^c}{N_i^v})$
$D^{M,\sigma}$	1.122	0.364	0.487	0.319
	$(0.417)**$	$(0.119)***$	$(0.193)**$	(0.238)
$D^{H,\sigma}$	1.199	0.366	0.379	0.358
	$(0.609)**$	$(0.136)***$	$(0.176)**$	$(0.213)*$
p	-4.066	-1.217	-0.842	-0.044
	$(1.772)***$	$(0.468)***$	$(0.497)*$	(0.173)
$K.int$	0.007	0.001	-0.001	0.0021
	$(0.003)**$	$(0.0006)**$	$(0.0006)**$	(0.0015)
$Sk.int$	-0.910	-0.388	-0.379	-0.758
	(1.481)	(0.374)	(0.496)	(0.813)
$Exp.$	-0.268	-0.116	-0.106	-0.259
	(0.226)	$(0.054)**$	(0.089)	(0.128)
$Size$	-0.211	-0.057	0.053	0.294
	(0.331)	(0.088)	(0.12)	(0.228)
N	79	79	78	62
R^2	0.345	0.432	0.197	0.178

Note: sectoral classification corresponds to Broda and Weinstein classification. Robust standard errors in brackets. ***:sig at 1% level; **: sig at 5%level; *: sig at 10 % level.

Product Market Competition and the Technical Bias

Table 2.2 shows that market competition is an important determinant of the technical bias. Variables $D^{M,\sigma}$ and $D^{H,\sigma}$ are statistically significant at 1% and 5% level, respectively. According to column 2, the bias is 1.12 and 1.19 discretely higher when one compares low-σ sectors with medium or high-σ sectors, respectively. In other words, suppose that there are two sectors: cheese (with σ=11.37) and pharmaceutical products (with σ=1.30). Assume for the sake of simplicity that in both sectors the number of firms that innovate horizontally is the same as well as the total number of firms in that sector. Then, Table 2.2 tells, that in the pharmaceutical sector there is a 36% less of firms that make quality improvements compared with the number of firms that introduce better cheese.

Product competition is also relevant to explain the technical bias towards cost-reducing inventions. However, variations of σ across sectors have a lower impact on $\frac{N_i^c}{N_i^v}$ than on $\frac{N_i^q}{N_i^v}$. According to Table 2 column 4, changes in σ from the category of low-σ sectors to the category of medium-σ sectors increase the bias in 0.487 points, while they increase the ratio $\frac{N_i^c}{N_i^v}$ in 0.379 when moving from low-σ sectors to high-σ ones. Finally, similar patterns to those observed in Table 2.2 are also displayed by Table 2.3, which contains the results of the estimation of equation (2.3.3.) when the Rauch's classification is employed. Thus, all the evidence provides robust support for the theoretical finding that more competition creates a bias towards the introduction of vertically superior goods.

Table 2.3: Technical Bias

VAR	$\frac{N_i^q}{N_i^v}$	$ln(\frac{N_i^q}{N_i^v})$	$\frac{N_i^c}{N_i^v}$	$ln(\frac{N_i^c}{N_i^v})$
D^{RPG}	1.322	0.323	0.545	0.319
	(0.736)*	(0.163) **	(0.271) **	(0.238)
D^{TOE}	0.786	0.352	−0.510	0.339
	(0.322) **	(0.082) ***	(0.112) ***	(0.256)
p	−4.414	−0.251	−1.013	−0.044
	(1.697) ***	(0.82) ***	(0.481) **	(0.173)
$K.int$	0.006	0.001	−0.002	0.0002
	(0.004)	(0.0009)*	(0.0009) **	(0.002)
$Sk.int$	−0.020	−0.200	0.059	−0.186
	(1.531)	(0.398)	(0.359)	(0.755)
$Exp.$	−0.255	−0.125	−0.074	−0.215
	(0.217)	(0.055) **	(0.089)	(0.131)*
$Size$	−0.083	−0.005	0.082	0.247
	(0.294)	(0.086)	(0.12)	(0.234)
N	79	79	78	62
R^2	0.343	0.432	0.128	0.178

Note: sectoral classification corresponds to Broda and Weinstein classification. Robust standard errors in brackets. ***:sig at 1% level; **: sig at 5% level; *: sig at 10 % level.

Imitation and the Technical Bias

In this subsection I explore the impact of imitation on the technical bias. First, I test the theoretical assumption that quality innovators are targeted by imitating firms. Second, I investigate how imitation affects the technical bias. To test the theoretical assumption that quality innovators are targeted by imitating firms, I estimate the following probit model:

$$IMIT_{ji} = [\gamma_0 + \gamma_1 Sales_j + \gamma_2 Prod_j + \gamma_3 IX_j + \gamma_4 IF_j + \gamma_5 IQ_j + \gamma_6 IV_j + \gamma_7 IE_j + \gamma_8 R\&D_j + \mu_{ji} > 0]$$

where $IMIT_j$ is an indicator variable that takes value 1 if firm-j receives a negative impact from copy. Variable $Prod_j$ stands for firm-j's productivity, and it is measured as the ratio between firm-j's sales and firm-j's production workers. Variables IX_j, IF_j, IQ_j, IV_j and IC_j are dummy variables that take value 1 if firm-j is an exporter, has foreign owners, is a quality innovator, variety innovator or cost-reducing inventor, respectively. Finally, $R\&D_j$ stands for firm-j's total research investments.

Table 2.4 shows that small and productive firms that export their products and innovate in quality are the ones that receive a negative and strongly significant impact from imitation. A possible explanation to the fact that quality innovators are targeted by imitating firms relies on the cost of copying an invention. Thus, as long as quality improvements are less expensive to be copied than the creation of new products, quality innovations become more attractive to imitating firms.[17] Furthermore, from

[17] According to the survey, the average value of an innovation in quality is 642,721.7 euros for the period 2001-2003, while it is equal to 1,086,309 euros for the creation of a new good. This evidence may suggest that imitation of a vertical innovation may be less expensive than imitation of a new good.

Table 2.4: Which firms are imitated?

IMIT	Coeff.	Std.Error.
$Sales$	-0.18	$(0.024) * **$
$Prod$	$2.11e^{-7}$	$(5.14e^{-7}) * **$
IX	0.231	$(0.075) * **$
IF	-0.055	(0.115)
IQ	0.258	$(0.057) * **$
IV	0.114	$(0.068)*$
IC	0.104	(0.095)
$R\&D$	$-1.26e^{-9}$	$(3.02)e^{-9}$
$N = 3130$		$R^2 = 0.0835$

Note:Robust standard errors in brackets.
***:sig at 1% ; **: sig at 5%; *: sig at 10%
Other controls: sector and regional effects.
Dep. variable and Exp in logarithm.

all the determinants of the probability of being imitated the condition of being a quality innovator is the one with highest impact. For the average firm this probability is 6% larger when firms make quality up-grading. Thus, evidence shows, that the threat of being imitated reduces the expected benefit from a vertical innovation, while it does not affect the return to the creation of new products. In the following paragraphs I discuss how this fact affects the technical bias.

Tables 2.2 and 2.3 show that imitation has a significant negative impact on vertical innovations. According to the tables, a 10% increment in the probability of being copied reduces the quality bias 40%. To figure out what the estimated value of coefficient β_3 implies, think for example in the footwear sector, which is one of the sectors with more imitation i.e. $p = 0.35$. The sector has 80 firms, 36 of them make quality up-grading, while 13 create new goods. Assume that the intensity of imitation increases in 10% and that the number of firms in the sector remains constant. Then, according to Table 2.2, 18% of the firms that were innovating vertically decide to

stop producing better shoes. In the same direction, more imitation reduces firms' incentives to search for efficient production techniques, even though, the impact of increments in p on $\frac{N_i^c}{N_i^v}$ is minor compared with that on $\frac{N_i^q}{N_i^v}$.

Delay to Entry and the Technical Bias

To analyze the impact of d on the technical bias, I proceed in the following manner. Since data on d is only available at country level, I explore directly the effect of d on firms' innovation decisions, instead of looking to the impact of d on the technical bias at sectoral level, and I use export destinations as the source of variation in the sample. In the survey, countries can export to each of the following 8 destinations: European Community (before 2001) (EUR), Russia and other European countries (ROE), Africa (AFR), Middle East and Asia except China (MEA), China (CH), U.S, Canada, and Mexico (UCM), Center and South America (CSA), and Australia and Oceania (AUO). Table 2.5 describes the values of d for each destination during the years 1999 and 2003.

Table 2.5: Delay to Entry

Dest.	1999	2003
EUR	30.00	36.38
ROE	50.50	41.63
AFR	56.29	53.94
MEA	48.07	47.53
CHI	64.50	48.00
UCM	24.33	22.00
CSA	56.30	72.58
AUO	22.50	7.00
ITA	62.00	23.00

To test the impact of d on the supply of quality and varieties, I proceed in the

following manner. First, I show that the delay to sell legally a product in a country affects the decision to export to that country. Second, I show that when countries lower d, incumbent firms increase the quality of the products they offer, but they do not expand the set of goods they supply. This provides evidence that a reduction in barriers to entry biases the technical change towards quality improvements.

To study how the delay to enter in a country affects the decision to export to that country, I estimate the following linear probability model in differences, which has the advantage to control for unobserved firms' characteristics, such as product attributes and managerial ability, which may affect the decision to export:[18]

$$\Delta IX_{jic} = \beta_1 \Delta \ln d_c + \beta_2 \ln Sales_{jic-1} + \beta_3 \ln \Delta lnRGDP_c + \beta_4 D_c + \nu_{jic} \qquad (2.3.4)$$

Variable IX_{jic} is a dummy that takes value 1 if firm-j in sector-i exports to destination-c and d_c is the delay to enter in destination-c, which is an average of the delay to enter in each of the countries that belongs to region-c. Variable $RGDP_c$ stands for the average value of real GDP in destination-c. I include this variable to be sure that coefficient β_1 is capturing the effect of the delay, instead of reflecting the impact of other country's characteristics that may be correlated with GDP as well as with the decision to export. Variable D_c is a dummy that takes value 1 if the destination is ROE. I include this variable to control for the fact that the decision to export may be affected by the integration of some countries in region ROE to the European Community. Finally, I control for firm's size. Since Bernard and Jensen[12] show that plants switching export status from non-exporter to exporter and vice-versa undergo dramatic contemporaneous changes, I instrument the change in sales with $Sales_{jic-1}$

[18]Variable d_c is included in logarithm because this specification fits better the data.

to avoid simultaneity problems. Table 2.6 presents the results from the estimation of equation (2.3.4).

Table 2.6 shows that the average delay to sell legally a product in a region affects the decision to export that region. According to the results, a 10% increment in the logarithm of d, which is equivalent to a 1-day increase in the time it takes to obtain a licence to sell a product in a country, reduces the probability of exporting to that country by 1%. This result is in line with Hummels[44]'s findings The author finds that an additional day spent in the transportation of a good from some country to U.S reduces the probability that U.S will source from that country by 1-1.5%.

Table 2.6: The Export Decision

VAR	COEFF.	STD.ERROR.
d	-0.011	$(0.004) **$
$Sales$	0.004	(0.004)
RGD	0.379	$(0.043) ***$
D	0.207	$(0.005) ***$
$N = 11431$		$R^2 = 0.0014$

Note: results clustered by country. Robust standard errors in brackets. ***: sig at 1% ; **: sig at 5% *: sig at 10 %.

To examine the impact of barriers to entry on the technical bias, I estimate the following seemingly unrelated linear probability model in differences. I use this specification because it allows to control for unobserved firms' characteristics as well as for contemporaneous correlation between the error term of the quality and variety equations. In order to have more variability, I restrict the sample to exporter firms. The estimated system is the following:

$$\Delta IQ_{ji} = \alpha_1 \Delta wd_j + \alpha_2 \Delta wRGDP_j + \alpha_3 \Delta lnSales_j + \alpha_4 \Delta prod_j + \alpha_5 \Delta KSQ_i + \vartheta_{ji}$$

$$\Delta IV_{ji} = \delta_1 \Delta wd_j + \delta_2 \Delta wRGDP_j + \delta_3 \Delta lnSales_j + \delta_4 \Delta prod_j + \delta_5 \Delta KSQ_i + \varepsilon_{ji}$$

where IQ_{ji} and IV_{ji} are dummy variables that takes value 1 if firm-j in sector-i innovates in quality or variety, respectively. Variable wd_j is a weighted average of the delay to start a business in each of the regions to which firm-j exports during the period 1998-2000, where the weights are the fractions of sales that firm-j exports to each foreign destination. To disentangle the impact of changes in d from that of changes in the weights, I assume that each firm-j exports the same fraction to each destination during both periods. I use the share of sales to weight the effect of changes in d to capture the idea that entry liberalization have a larger impact in those destinations in which firm-j export a large proportion of its production. Variable $wRGDP$ is a weighted average of real GDP in each region, *prod* is firm's productivity, which is measured as the ratio between sales and production workers, and KSQ stands for knowledge spillovers in the vertical activity, which is determined by the proportion of firms in a sector that make quality improvements. In other estimations I also control for knowledge spillovers in the horizontal activity, but since the variable is not statistically significant, I omit it from the analysis. Table 2.7 presents the results from the estimation.

Table 2.7 shows that the only significant variable to explain the changes in innovation decisions is the delay to start a business. According to the estimation, a negative variation of 10% in the delay to start a business varies the probability of doing quality up-grading by 3%. However, delay has no significant impact on horizontal innovation decisions. Thus, the empirical evidence suggests that lower barriers to entry bias the technical change towards vertical innovations. This fact happens either because the expected benefits from vertical innovations increase when firms can sell their products

Table 2.7: Delay to Entry and the Technical Bias

VAR	IQ	IV
wd	-0.033	-0.0001
	$(0.016)**$	(0.013)
$wRGDP$	0.0002	$2.49e^{-5}$
	$(0.0001)*$	$(1e^{-4})$
$Sales$	-0.006	0.005
	$(0.008)*$	(0.033)
$prod$	$-1.09e^{-07}$	$-5.99e-08$
	$(1.11e^{-07})$	$(8.65e^{-08})$
KSQ	$1.26e^{-09}$	0.0089
	$(5.36e^{-10})$	(0.0064)
$N = 959$	$R_Q = 0.011$	$R_V = 0.006$

Note: Robust standard errors in brackets.
***:sig at 1% ; **: sig at 5%; *: sig at 10 %.

quickly in the market, or because the introduction of vertically superior goods allows incumbent firms to scape from competition.

The last argument has been pointed out by Schott[66], but at country instead of firm level. The author exploits product-level U.S. import data and he tests trade theory. He finds evidence that rejects factor-proportions specialization *across* products, and provides evidence consistent with such specialization *within* products. He conjectures that globalization increases competition, and that in an attempt to scape from competition, rich countries use their capital endowment comparative advantage to supply better goods.

Complementarity between Quality and Variety

To test whether the supply of quality complements or substitutes the supply of variety, I work at sectoral and firm level. At sectoral level I look at the sign and statistical significance of the correlation between the number of firms that innovate in quality

and those that create new goods. I find that this correlation is not only significant at 1% level, but also equal to 0.85 for both periods, 1998-2000 and 2001-2003.

To test the existence of complementarities at firm level, I apply the productivity approach proposed and implemented by Cassiman and Veugelers[19]. The methodology consists in testing the Milgrom and Robert's[56] definition on complementarity between two activities. According to the authors, two activities complement each other when adding one activity while the other is already performed has a higher incremental effect on performance than adding the activity in isolation. To test that definition, I regress a measure of innovation performance on exclusive combinations of the innovative activity, which is assumed to be of two types: innovation in quality ($IQ = 1$) or innovation in variety ($IV = 1$). I use the percentage of sales attributable to innovation as the measure of innovation performance. Restricting the performance measure to innovation performance only, rather than overall firm performance, allows to reduce the problem of having to correct for other sources of firm heterogeneity that influence overall performance. I estimate the following equation:

$$\pi_{jt} = \theta_j + \theta_{00}(1 - IQ_{jt})(1 - IV_{jt}) + \theta_{10}IQ_{jt}(1 - IV_{jt}) + \theta_{01}IV_{jt}(1 - IQ_{jt}) + \quad (2.3.5)$$
$$+\theta_{11}IQ_{jt}IV_{jt} + \theta_2 X_{jt} + \theta_t + \varepsilon_{jt}$$

where X_{jt} is a vector of control variables that includes $R\&D$ intensity, export status, and sales. According to the definition of complementarity, one should expect to observe that θ_{11}- $\theta_{10} \geq \theta_{01}$- θ_{00} if both activities complement themselves. Table 2.8 presents the results.

Consistent with complementarity, the coefficient θ_{11} is large and statistically significant at 1% level. The direct test for complementarity (θ_{11}- $\theta_{10} \geq \theta_{01}$- θ_{00}) is accepted

Table 2.8: Q and V: Substitutes?

Var	Coeff.	Std.Error.
IQIV	20.742	(1.634) ∗ ∗∗
IQ(1-IV)	16.097	(2.629) ∗ ∗∗
IV(1-IQ)	−1.029	(1.040)
X	3.111	(1.799)∗
Sales	0.052	(0.225)
R&D.int	−3.439	(8.745)
$N = 1588$		$TE = YES$
$R^2 = 0.146$		$FE = YES$

Note: Robust standard errors in brackets.
***:sig at 1% ; **: sig at 5%; *: sig at 10 %.

at 5% level (p-value = 0.029), indicating that both activities complement themselves. This result is important for the design of policies intended to promote innovation and enhance firms' performance, as it shows that promoting both activities simultaneously have a larger impact on firms' performance than encouraging each activity in isolation.

2.4 Conclusions

This paper explores, both from a theoretical and empirical point of view, the effect of competition, imitation, and lower barriers to entry in a market, to direct the technical change towards one direction: quality or variety. It also re-examines previous results in the IO literature, which argue that the supply of high-quality products substitutes the provision of new but low-quality goods, providing new and contradictory evidence. The paper shows that more competition and lower barriers to entry in a market direct the technical change towards the introduction of vertically superior goods, while imitation affects that change in an opposite direction.

The theoretical and empirical results this paper presents deliver several policy implications. First, they show that entry liberalization is an effective way to promote innovations that increase the quality of the goods. Second, the results suggest that liberalization must be followed by policies that strength intellectual property rights protection, to avoid that the threat of imitation encourages incumbent firms to create low-quality products. Third, the results suggest that sectors with low elasticity of substitution between products may be the ones to need more assistance when countries reduce barriers. Since it is in these sectors where firms have low incentives to create vertically superior goods. Finally, taking into account that both types of innovative activities complement themselves, they should be promoted together.

Chapter 3

How long does it take to merge two firms?

3.1 Introduction

The empirical literature on mergers and acquisitions has shown that the probability that mergers experience negative results in terms of profitability, sales, market shares, and $R\&D$ expenditures, is not the same for any blending process. Even more important than these findings is the detection of certain peculiarities in the merging corporations that make the process more likely to fail.[1]

In that literature, Gregory[36] and Conn et al.[26] show that mergers of equals under perform those that take place between a big bidder and a small target. This fact also relates to the stylized fact that mergers materialize more frequently between asymmetric-size firms (see Tichy[74] for a survey on this stylized fact). In a parallel strand of research, Ravenscraft and Scherer[62] find that acquisitions of firms belonging to the same industry are more rentable than horizontal ones, which are more

[1]Contrasting pre- and post-merger performance studies conducted between 1970-2001, Tichy[74] finds that in 58% of the cases, profits come out weaker than in the respective non-merging control group, and stronger in only 11%.

profitable than vertical mergers, which give more earnings than conglomerates. Furthermore, Healy et al.[42] document positive abnormal, normal, and negative returns for mergers of related, semi-related and unrelated business, respectively.

The last findings are also consistent with the results of other comparative studies on the performance of the first two waves in the postwar period. The one in the 1960's, and the other in the 1980's. The 60's wave was characterized by diversification and conglomeration, while the 80's was a move back to greater specialization. Although the profitability of a large portion of firms decreased in both periods, there is strong evidence that the first wave produced lower profits than its follower (see Berger and Ofek[10]).

Besides that the classic literature on organizations recognizes that the paramount function of a firm is the coordination of its human assets in order to produce a good or service, historically, research on mergers' failures has been focused on IO considerations, such as market structure and cost functions, as opposed to technological or corporate cultural questions.[2] [3]

Recently, a new game-theoretical and experimental approach has started to analyze the effect of conflicting organizational cultures on the performance of different organizations (see Fershtman and Gneezy[34], Camerer and Fehr[20], Camerer and Weber[21], Chuah et al.[25], and Botelho et al.[17], among others). In this strand of the literature, Weber and Camerer[21] conduct an experiment to explore the role of

[2]In the IO literature, Salant et al.[64] and Perry and Porter[59] show, that two firms never merge if there is quantity competition and firms have linear cost functions. In this set-up, costs must be sufficiently convex to incentive firms to blend. However, Huck et al.[57] show that mergers can appear-even when firms have linear cost functions-if a "strong" leader firm incorporates a "weak" follower one. In this case, the newly merged firm produces the same quantity as the strong firm did alone, prior to the merger, while the weak firm essentially disappears. The price increases sufficiently to make the blending process profitable.

[3]We use the concepts "technology" and "culture" as thesauruses.

cultural conflicts as a determinant of the performance of a merger. In their experiment, the authors define a technology (culture) of a firm as a specialized homemade language a pair of workers develops to solve a task. In the task, two subjects with the same set of pictures have to learn to jointly identify a subset of the entire set of pictures. To do this, they must create a shared way to describe the pictures, as quickly as possible, so that one worker can guide the other to pick the pre-specified subset. Two pairs of subjects, or "firms", develop technologies separately. Then, the two pairs are merged. As expected, the conflict in homemade procedures makes a quickly coordination difficult, and it also slows down the speed at which each subject works, compared with the one prior to the merger.

This paper provides a dynamic model to explain, from a game-theoretical approach, why some firms integrate or coordinate sooner than others, after they merge. Specifically, the paper argues that when the integration of two organizations has significant costs-because firms do not share the same culture-each firm may attempt to shift the cost of integration (or coordination) onto the other. The process leading to integration is thus well represented by what is called as a "war of attrition". This is a game in which each unit (firm) attempts to wait until the other one is out (accepts to adopt the technology of the other), wasting resources on the way, and in this case, coordination occurs after one firm concedes, and supports the necessary cost to work efficiently.

The Bayesian Nash equilibrium of the model delivers an expected time for coordination that is a function of the attributes of the firms that merge. The parameters in the model capture the degree of organizational polarization: size asymmetries and differences in other characteristics like sector or culture. The paper shows that greater

cultural conflicts lead to longer periods of inefficient interactions and low performance. Furthermore, it also shows that changes in the relative size of the firms, from a less polarized situation to a more polarized case stretch out the integration delay and the period of under-performance. The maximum delay occurs when firms are symmetric in size. Thus, the paper rationalizes why mergers materialize more frequently between size-asymmetric and cultural-symmetric firms.

This paper is organized as follows. Section 2 presents the model. Section 3 presents the equilibrium. Section 4 shows the comparative-statistic analysis. The final section concludes.

3.2 The Model

Suppose that two firms i of size n_i, with $i = 1, 2$, that initially have different production technologies merge at time-0. In the new firm, each worker is randomly matched to work with another worker. When merging firms share the same production technology each worker produces 1 unit of a good. However, output is equal to 0 if firms employ different production techniques.

Managers agree on the need to use the same production technology. However, they disagree on which firm will change its production technique. At each point in time, each manager decides whether he concedes or not. Concession in this model means that the manager accepts to train his workers to adopt the production technology of the other firm.

The cost of concession for manager-i is $C_i = n_i h(\theta_i, \phi, r_i)$, with $h'_1 > 0$, $h'_2 > 0$ and $h'_3 > 0$. Parameter θ_i is inversely related to the average ability of workers in firm-i. This parameter is private information of firm-i. It is distributed over the interval

$[\theta_{L,}\theta_H]$ according to a common and known distribution function $F(\theta)$. Parameter $\phi \in [0,1]$ captures differences in firms' activities, or loosely speaking culture. Finally, r_i captures the reluctancy of firm-i's workers to adopt the production technique of the other firm. We assume that r_i is determined by the amount of effort (resources) that each worker of firm-i allocates to a lobbying activity. The goal of lobbying is to convince managers to change the production mode of the other firm. We assume that the probability of convincing managers is $p_i = \frac{n_i r_i}{n_i r_i + n_j r_j}$. The utility of holding the own technology is 1, and the total cost of lobbing per worker is r_i.[4] There are no free-riding problems among workers of the same firm and that workers ignore that if p_i is lower than 1, then managers will fight to decide which firm changes its technology.

When managers fight, manager-i gets the following expected utility if he concedes at time T_i:

$$EU\left(T_i\right) = \left[1 - G_j\left(T_i\right)\right] U_i^l\left(T_i\right) + \int_0^{T_i} U_i^w\left(T_j\right) g_j\left(T_j\right) dT_j \tag{3.2.1}$$

where $G_j\left(T\right)$ is the distribution of firm-j's optimal concession time, and $g_j\left(T\right)$ is the corresponding density function. These functions are endogenous and will be derived in equilibrium. Function $U_i^z\left(T\right)$, with $z = l, w$ for looser or winner respectively, is the lifetime utility of manager-i when concession occurs at time T. This function can be written as follows:

$$U_i^z\left(T\right) = \int_0^T u_i^{bc} e^{-\rho x} dx + e^{-\rho T} V_i^z \tag{3.2.2}$$

where V_i^z is the lifetime utility from the day of concession onward, and u_i^{bc} stands for the flow utility before concession.

[4]We assume that 1 is the utility a worker gain if he does not change his technology.

3.3 Equilibrium

In this section we characterize the equilibrium. The following lemma shows that workers' reluctancy to change their production technology depends on firms' asymmetries in terms of size.

Lemma 1 *The reluctancy of worker-i to change his production technology is* $r_i = \pi(1-\pi)$*, where* $\pi = \frac{n_i}{n_i+n_j}$ *and* $i = 1, 2$*.*

Proof of Lemma 1 is relegated to Appendix D. Now, to derive the equilibrium conditions, notice that since the distribution $G_i(T)$ is not known, equation (1) can not be used directly for this purpose. However, the equilibrium can be obtained re-writing equation (1) in terms of $T_i(\theta)$. This allows to use the known function $F_i(T)$, instead of $G_i(T)$, to find the equilibrium. To re-write equation (1) one must show first, that there is a monotonic relationship between $T_i(\theta)$ and θ_i. The following lemma characterizes this relationship.

Lemma 2 *$T_i(\theta)$ is a strictly increasing function of θ*

Proof of Lemma 2 is relegated to Appendix D. According to this lemma the manager of the more efficient firm concedes early. The following proposition characterizes the concession function $T(\theta)$.

Proposition 1 *There exists a symmetric Bayesian Nash equilibrium at which each firm's optimal concession behavior is characterized by function $T(\theta)$. This function satisfies the following conditions:*

$$\left[\frac{f(\theta)}{[1-F(\theta)]T'(\theta)}\right] h(\theta, \phi, \pi(1-\pi)) = \frac{[1-h(\theta, \phi, \pi(1-\pi))]}{\rho} \tag{3.3.1}$$

$$T(\theta_L) = 0 \tag{3.3.2}$$

Proof of Proposition 1 is relegated to Appendix D. The right hand side of equation (3) is the cost of waiting another instant to concede. The left-hand side is the expected gain from waiting another instant to concede, which is the product of the conditional probability that a firm's opponent concedes (the hazard rate in brackets) multiplied by the gain if the other firm concedes. Concession occurs when the cost of waiting just equals the expected benefit of waiting.

Equation (3) is also useful in understanding the evolution of the war of attrition from the viewpoint of a firm. Consider a firm with $\theta > \theta_L$. At time 0, there is some probability that the opponent firm has $\theta = \theta_L$ and concedes immediately. If no firm concedes at time 0, both sides know that their opponent is not type θ_L. At the next moment, the next-lowest type concedes and so on, so as time elapses, each side learns that its opponent does not have a cost lower than a certain level. When the conditional probability of an opponent's concession in the next instant just holds, it is time to throw in the towel.

There may be asymmetric equilibria. For example, there are equilibria in which one firm concedes immediately. We do not investigate such equilibria, since our interest is in demonstrating that this type of models can deliver integration delay.

As long as each firm believes that the other may have a lower θ, integration does not occur immediately. The cumulative distribution of concession times T is therefore 1 minus the probability that every firm has a θ higher than the value consistent with integration at T. This is, $I(T) = 1 - [1 - F(\theta(T))]^2$.

3.4 Why do some firms merge sooner than others?

We can now ask how different parameter values affect the expected time of concession. Our goal is to analyze whether observable characteristics of merging firms can explain why some mergers fail and others not. The results are presented in the following propositions.

Proposition 2 *The expected minimum concession time is a non monotonic function of π. Changes in the relative sizes of the firms from a less (more) polarized situation to a more (less) polarized case stretch out (shorten) the technological standardization delay and the period of low performance. The maximum delay occurs when firms are symmetric.*

Proof of Proposition 2 is relegated to Appendix D. This proposition rationalizes the fact that mergers of equal-size firms under-perform those that take place between a big bidder and a small target. It also proposes an explanation as to why mergers materialize more frequently between asymmetric firms. Evidence of this fact has been surveyed by Tichy[74]. The author finds that in almost all the 36 available outcome studies about mergers and acquisitions during the period 1977-2000 the targets were larger than the acquiring firms.

Conflicts between groups are ubiquitous in organizational life, and there seems to be a widespread belief in the literature of the theory of the firm that divisionalization causes conflict in organizations (see Scharfstein and Stein[65], Pfeffer[60], Meyer[55], Rajan et al.[61]). However, little research has explored how asymmetries between groups influence the magnitude of the conflicts. One of the most important papers in this strand of the literature is Rajan et al.[61]. The authors model the distortions that internal power struggles can generate in the allocation of resources between divisions

of a diversified firm. Their model predicts that if divisions are similar in the level of their resources and opportunities (symmetric case), funds will be transferred from divisions with poor opportunities to divisions with good opportunities. When diversity in resources and opportunities increases (asymmetric case), however, resources can flow toward the most inefficient division, leading to more inefficient investments and less valuable firms. Contrary to their findings, in this model asymmetries favors integration, and thereby increase the value of the new firm.

An example that illustrates the theoretical finding that integration delay is larger when firms are symmetric in size is the Daimler-Chrysler merger, which is considered as a merger of "equals". In the period leading up to the merger, both firms were performing quite well, and there was a lot of expectation that the merger would be successful. However, performance after the merger was entirely different. Discrepancies in the production technologies and workers' reluctancy to adapt the modus operandi of the other firm were largely responsible for this failure (see Camerer and Weber[21]).

Proposition 3 *The expected minimum concession time is an increasing function of ϕ. Larger disparities between firms in terms of their activities delay integration and stretch out the period of under-performance.*

Proof of Proposition 3 is relegated to the Appendix. Proposition 3 proposes an explanation as why mergers of firms belonging to the same industry are more profitable than conglomerates of unrelated firms (see Ravencraft and Scherer[**?**]). Evidence of this fact has been also provided by Healy et al.[42], who find positive abnormal, normal, and negative returns for mergers of related, semi-related, and unrelated business, respectively.

Similar conclusions have been drawn from the comparison of the performance of the first two merger waves in the postwar period. The one in the 1960's and the other in the 1980's. Even though both merger tendencies had a profound impact on the structure of corporate America, they were very different. The discrepancies were observed not only in the strategy that firms pursued during each process, but also in their performance afterwards. The 60's wave was characterized by diversification and conglomeration (high ϕ) while the 80's was a move back to greater specialization (low ϕ). Although the profitability of a large portion of firms decreased in both periods, the first wave produced lower profits than its follower.

3.5 Conclusions

This paper provides a theoretical framework to analyze the role of conflicting organizational cultures on the time that it takes to integrate two firms. The paper brings a game-theoretical approach that explains why mergers materialized more frequently between a big bidder and a small target. It also shows how mergers between similar-size firms under-perform those that take place between asymmetric-size firms. Finally, the paper gives theoretical arguments for the fact that mergers within an industry are more profitable than conglomerates of unrelated business.

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Appendix A

A.1 Proof. of Proposition 1

The structure of the proof follows Besley and Prat [14]. For the equilibrium of the corporate game I follow Bloch and Hege [16].

The pure-strategy pareto-efficient equilibrium is characterized as follows:

1. Voters vote for the challenger if they know the incumbent's type is b, and re-elect the incumbent otherwise.

2. Manager-i accepts t if and only if $t \geq [\alpha_i mks_r + (1-\alpha_i)x_i^*]\Pi$, with $i = 1, 2$.

3. The incumbent offers $t = [\alpha_i mks_r + (1-\alpha_i)x_i^*]\Pi$ if: (a) manager-i observes the bad signal; (b) $r + v(1) \geq t$.

4. In the first period, $y = 1$. In the second period, the equilibrium value of y satisfies the following condition:

$$v'(y) - \varphi'(y)\left(r + v(1) - \max\left(0, r + v(1) - [\alpha_i mks_r + (1-\alpha_i)x_i^*]\Pi\right)\right) = 0$$

5. If $\alpha_1 \geq 0.5$, shareholder 1 proposes $x_1^* = 0$ and becomes the manager of the outlet. If $\alpha_1 < 0.5$, shareholder 1 proposes $x_1^* = mks_r - \frac{(\alpha_1 - \alpha_2)}{(1-\alpha_1-\alpha_2)}$, shareholder 2 proposes $x_2^* = mks_r$, and the largest owners seizes control.

To see that voters do not play weakly dominated strategies, think in their behavior. The only information voters receive is through the media. Kicking out the incumbent when media report that the incumbent's type is b is a strictly dominant strategy. Then, what remains to be proved is that they do not kicked out the incumbent when

there is no report. If there is no information about the incumbent, voters do not buy news, but they up-date their believes. The posterior about the fact that the incumbent is a bad politician is as follows:

$$P(\theta = b \mid a = nr) = \frac{P(\theta = b)P(a = nr \mid \theta = b)}{P(\theta = g)P(a = nr \mid \theta = g) + P(\theta = b)P(a = nr \mid \theta = b)}$$

$$P(\theta = b \mid a = nr) = \frac{\gamma\left[1 - \varphi(y)k\right]}{(1-\gamma) + \gamma[1 - \varphi(y)k]}$$

where $k = P(a = r \mid \theta = b)$ stands for the strategy of the manager, $a \in \{r, nr\}$ for an action available to him, r for reporting, and nr for not reporting. Since $P(\theta = b \mid a = nr) < \gamma$ for every value of $k \in [0, 1]$ and $\varphi(y)$, the expected utility of re-electing the incumbent is higher than the one of voting the challenger. Thus voters re-elect the incumbent if they do not observe a report about him.

Now, consider the interaction between the incumbent and the manager. If manager-i accepts to suppress the bad news, he receives a payoff $t - (1 - \alpha_i)x_i^*\Pi$. If manager-$i$ makes the report, he yields $\alpha_i mks_r\Pi$. Thus, manager-i accepts t if and only if $t \geq [\alpha_i mks_r + (1-\alpha_i)x_i^*]\Pi$. Then, a bad incumbent finds profitable to silence the manager if and only if the benefits he obtains from re-election are at least equal to the cost he has to pay to win the political competition i.e. $r + v(1) \geq [\alpha_i mks_r + (1 - \alpha_i)x_i^*]\Pi$.

Since any elected politician will not be removed from office in the second period, it is clear that if the incumbent is re-elected y in the second period is equal to 1. Then, in the first period, the incumbent chooses y in order to maximize the following expected utility:

$$v(y) + (1 - \varphi(y))(r + v(1)) + \varphi(y)\left(\max\left(0, r + v(1) - t\right)\right)$$

subject to $t = [\alpha_i mks_r + (1 - \alpha_i)x_i^*]\Pi$; which delivers the following F.O.C:

$$v'(y) - \varphi'(y)(r + v(1)) + \varphi'(y)\max(0, r + v(1) - t) = 0$$

Now, consider the contest for corporate control. Since voting is costly, it is a dominant strategy for small shareholders not to participate in the meeting when their preferences agree with those of the largest shareholder. Thus, the only situation where the votes of small shareholders matter is when they favor the dividend plan of the second largest owner. Shareholder 2 wins the contest if and only if he attracts the votes of a fraction at least equal to $\frac{\alpha_1-\alpha_2}{1-\alpha_1-\alpha_2}$ of small shareholders, which means that a proportion equal to that of minority owners has to find $x_2\Pi - \kappa\Pi \geq x_1\Pi$. Since κ is uniformly distributed on [0,1], the condition for shareholder 2 to seize control is the following $x_1 \leq x_2 - \frac{\alpha_1-\alpha_2}{(1-\alpha_1-\alpha_2)}$.

Then, to see that the equilibrium involves a pair of dividend-plans $(x_1^*, x_2^*) = (mks_r - \frac{(\alpha_1-\alpha_2)}{(mks_r-\alpha_1-\alpha_2)}, mks_r)$, use the condition $x_1 \leq x_2 - \frac{\alpha_1-\alpha_2}{(1-\alpha_1-\alpha_2)}$, to divide the plane $[0, mks_r]^2$ in two regions. Region A, below the line $x_2 = x_1 + \frac{\alpha_1-\alpha_2}{(1-\alpha_1-\alpha_2)}$,where shareholder 1 becomes the manager of the outlet, and region B, above the line $x_2 = x_1 + \frac{\alpha_1-\alpha_2}{(1-\alpha_1-\alpha_2)}$, where shareholder 2 does. I first claim that there cannot be an equilibrium that belongs to region B. To see this notice that, whenever $x_1 = mks_r$, shareholder 1 becomes the manager. Hence, for any point in region B, shareholder 1 has a profitable deviation. Now consider a point in region A, with $x_1 \leq x_1^*$. As $x_1 \leq x_1^*$ and the point belongs to region A, it must be that $x_2 > 0$. By choosing $x_2 = mks_r$, shareholder 2 wins the contest. Hence, for any point in that region, shareholder 2 has a profitable deviation. Finally, consider a point in region A, with $x_2 > 0$ and $x_1 > x_1^*$. Since shareholder 1's utility is decreasing in x_1, his promise in

equilibrium must be the minimal that guarantees him to win the control. Therefore, the only possible equilibrium is the following: $(x_1^*, x_2^*) = (mks_r - \frac{(\alpha_1-\alpha_2)}{((1-\alpha_1-\alpha_2))}, mks_r)$. The case $\alpha_1 \geq 0.5$ is trivial and for this reason I omit the proof.

A.2 Proof. of Proposition 2

The proof is structured as follows: First, I analyze the function in the interval [0.5, 1]. Second, I characterize the function in the interval $[\underline{\alpha 1}, 0.5)$, which requires two intermediate proofs: (i) the contest for control effect dominates the owner effect; (ii) under the constraints about the ownership structure there is only one value for the threshold $\bar{\alpha_1}$. Third, I study at which value of α_1 the function achieves its maximum. Fourth, I analyze the continuity of the function.

Consider the case in which α_1 belongs to the interval [0.5, 1]. It is clear that at $\hat{\alpha_1}$ the incumbent is indifferent between silencing or not the media. However, he chooses to suppress the bad news if $\alpha_1 \leq \hat{\alpha_1}$, and not to do that otherwise. Thus, if $\hat{\alpha_1} \geq 1$, the incumbent silences the media, whatever the value of α_1 in the interval [0.5, 1]. The function is decreasing and concave according to the following derivatives:

$$\frac{\partial y}{\partial \alpha_1} = \frac{-\varphi'(y) mks_r \Pi}{[-(v''(y) - \varphi''(y)t)]} < 0$$

$$\frac{\partial \left(\frac{\partial y}{\partial \alpha_1}\right)}{\partial \alpha_1} = \frac{\varphi'(y)\varphi''(y) \left(mks_r \Pi\right)^2}{\left[-(v''(y) - \varphi''(y)t)\right]^2} > 0$$

If $0.5 \leq \hat{\alpha_1} < 1$, the incumbent silences media as long as $\alpha_1 \in [0.5, \hat{\alpha_1}]$, because the benefits of winning the re-election exceeds its costs. The function exhibits the same properties as before. However, if $\alpha_1 \in [\hat{\alpha_1}, 1]$, media is not silenced, and corruption

is independent of the ownership structure of media firms. Finally, if $\hat{\alpha_1} < 0.5$ the incumbent does not silence the media and y is constant along the interval [0.5, 1].

Consider the case in which α_1 belongs to the interval $[\underline{\alpha_1}, 0.5)$. (i) In equilibrium, the cost for the incumbent to silence the media is:

$$-\left[\alpha_1 mks_r + (1-\alpha_1)\left(mks_r - \frac{(\alpha_1-\alpha_2)}{(1-\alpha_1-\alpha_2)}\right)\right]\Pi$$

which is the sum of the owner and contest effects. The direction of the impact of changes in α_1 on y is given by the sign of the derivative of this expression with respect to the α_1. If the contest effects dominates, the derivative is positive. Specifically, it can be written as:

$$\frac{\partial(-t)}{\partial\alpha_1} = \left\{\frac{(1-2\alpha_1-\alpha_2)(1-\alpha_1-\alpha_2)+(1-\alpha_1)(\alpha_1-\alpha_2)}{(1-\alpha_1-\alpha_2)^2}\right\}$$

adding and subtracting α_2 in the first parenthesis of the numerator allows to rewrite the expression as follows:

$$= \left\{\frac{((1-\alpha_1-\alpha_2)-\alpha_1+2\alpha_2)(1-\alpha_1-\alpha_2)+(1-\alpha_1)(\alpha_1-\alpha_2)}{(1-\alpha_1-\alpha_2)^2}\right\}$$

applying the distributive rule in the first term and rearranging the expression it follows that:

$$= \left\{\frac{(1-\alpha_1-\alpha_2)^2+\alpha_2(1-\alpha_1-\alpha_2)+(\alpha_1-\alpha_2)\alpha_2}{(1-\alpha_1-\alpha_2)^2}\right\}$$

$$= \left\{1+\frac{\alpha_2(1-2\alpha_2)}{(1-\alpha_1-\alpha_2)^2}\right\} > 0$$

Hence, the contest effects dominates and more concentration delivers more corruption.

(ii) Consider the condition that defines the threshold $\bar{\alpha_1}$:

$$mks_r - \frac{(1-\alpha_1)(\alpha_1-\alpha_2)}{(1-\alpha_1-\alpha_2)} \equiv \frac{r+v(1)}{\Pi}$$

Since this condition is a quadratic form, there are two possible values for the threshold $\bar{\alpha_1}$. In what follows, I prove that only one value fulfills this condition when α_1 and α_2 are restricted as follows: (i) $\alpha_1 + \alpha_2 < 1$; (ii) $\alpha_1 > \alpha_2$.

Suppose there are two roots that fulfill all the requirements. Taking the derivative of the LHS of expression (25) w.r.t α_1, and using restrictions (i) and (ii), it is straightforward to show that the LHS decreases as α_1 raises. This implies that to the right of each root the function takes lower values. But since the LHS is a continuous function, this can happen only if there is another value of α_1 at which the $LHS = \frac{r+v(1)}{\Pi}$. Of course, this can not be possible and involves a contradiction.

Having proved (i) and (ii), I will characterized the corruption function in the interval $[\underline{\alpha_1}, 0.5)$. It is clear that at $\bar{\alpha_1}$ the incumbent is indifferent between silencing or not the media. However, according to the result of equation (24), he chooses to suppress the bad news if $\alpha_1 \geq \bar{\alpha_1}$, and not to do that otherwise. Thus, if $\bar{\alpha_1} < \underline{\alpha 1}$, the incumbent silences the media for any value of α_1 in the interval $[\underline{\alpha_1}, 0.5)$. The function is increasing and convex according to the following derivatives:

$$\frac{\partial y}{\partial \alpha_1} = \frac{-\varphi'(y)\frac{\partial t}{\partial \alpha_1}}{[-(v''(y) - \varphi''(y)t)]} > 0$$

$$\frac{\partial\left(\frac{\partial y}{\partial \alpha_1}\right)}{\partial \alpha_1} = \frac{\varphi'(y)\frac{[(1-2\alpha_2)\alpha_2]}{(1-\alpha_1-\alpha_2)}[-(v''(y) - \varphi''(y)t)] + \varphi'(y)\left(\frac{\partial t}{\partial \alpha_1}\right)^2 \varphi''}{[-(v''(y) - \varphi''(y)t)]^2} > 0$$

Suppose now, that $\underline{\alpha_1} \leq \bar{\alpha_1} < 0.5$. It is straightforward to show that the incumbent silences media if $\alpha_1 \in [\bar{\alpha_1}, 0.5)$, and decides not to do that for other values. Finally, if $0.5 < \bar{\alpha_1}$, corruption is independent of the ownership structure and constant in the interval $[\underline{\alpha_1}, 0.5)$.

To analyze the point at which the function achieves its maximum, and to determine whether the function is or not continuous, which clearly is in doubt at $\alpha_1 = 0.5$, I combine the analysis carried out in the previous paragraphs, and I consider the following three cases: (i) $\bar{\alpha_1} < 0.5 \leq \hat{\alpha_1}$; (ii) $0.5 \leq \bar{\alpha_1}, \hat{\alpha_1}$; (iii) $\bar{\alpha_1}, \hat{\alpha_1} \leq 0.5$.

In case (i) the function increases from $\bar{\alpha_1}$ until before reaching 0.5. In the limit to this point, the cost for the incumbent to silence the media is higher than in the situation in which there is a majority shareholder with 50% of the capital of the firm. This happens because in the first situation, the incumbent has to compensate also minority shareholders. This extra-cost increases the equilibrium value of the bribe and makes corruption lower than in the other case. Since corruption is decreasing from 0.5 until $\hat{\alpha_1}$, the function achieves its maximum at 0.5. Because the limit of the function does not exist at this point, the function is not continuous.

Case (ii) is similar to the previous one, with the difference that the incumbent does not silence the media when there is a majority shareholder running the company. Then, taking into account that y increases from $\bar{\alpha_1}$ until before reaching 0.5, that it is constant from $\alpha_1 = 0.5$, that $v'' < 0$, and that $\varphi'' > 0$, it is straightforward to show from the F.O.C of the incumbent's problem that the maximum of the function is achieved at the limit of 0.5 (from the left) if $r + v(1) > (mks_r - 0.5)\Pi$ or at any point in [0.5, 1] if the benefits from re-election exceeds the cost of silencing the media when there is a larger shareholder.

In case (iii), the function is constant for all the values of α_1 lower than 0.5, and decreasing since 0.5 to $\hat{\alpha_1}$. Thus, the highest value is achieved either at $\alpha_1 = 0.5$, or at any point below that. The first case occurs when $r + v(1) > 0.5mks_r\Pi$, since $\frac{v'(y^s)}{\varphi'(y^s)}$ must be in equilibrium lower than $\frac{v'(y^{ns})}{\varphi'(y^{ns})}$, where y^s stands for corruption when the incumbent silences the media, and y^{ns} when he does not. Then, if $r+v(1) \leq 0.5mks_r\Pi$ the maximum of the function is achieved at any point in the interval $[\underline{\alpha_1}, 0.5)$. Clearly, the function is continuous if at 0.5 the cost of silencing a shareholder with 50% of the stake is equal to the benefits from re-election.

Appendix B

B.1

Table 3.1: Summary Statistics: ownership structure

		1999				2003			
Var	Obs	$Mean$	$Std.D$	Min	Max	$Mean$	$Std.D$	Min	Max
α_{11}	37	0.651	0.285	0.26	1	0.687	0.314	0.11	1
α_{12}	37	0.611	0.290	0.01	1	0.592	0.298	0.09	1
α_{13}	37	0.600	0.287	0.01	1	0.681	0.348	0.07	1
α_{21}	37	0.070	0.118	0.00	0.5	0.099	0.143	0.00	0.50
α_{32}	37	0.088	0.116	0.00	0.5	0.129	0.147	0.00	0.50
α_{23}	37	0.058	0.094	0.00	0.5	0.075	0.115	0.00	0.50

Source: *World Bank, Amadeus, European Media* Institute, Media Ownership and its Impact on Media Independence and Pluralism, media companies' web pages, ICRG, TI

Table 3.2: Summary Statistics: market structure and corruption

		1999				2003			
Var	Obs	$Mean$	$Std.D$	Min	Max	$Mean$	$Std.D$	Min	Max
mks_1	37	0.198	0.106	0.03	0.5	0.244	0.143	0.03	0.64
mks_2	37	0.378	0.206	0.06	1	0.357	0.190	0.06	1
mks_3	37	0.461	0.209	0.08	0.91	0.444	0.195	0.08	0.85
Π	37	4713	10073	60	56000	4828	10148	30	57123
$ICRG$	37	2.9	1.3	1	6	3.6	1.2	1	6
CPI	37	5.0	2.5	1	9	5.1	2.4	1.3	8.6

Source: *World Bank, Amadeus, European Media* Institute, Media Ownership and its Impact on Media Independence and Pluralism, media companies' web pages, ICRG, TI

B.2 List of Control Variables

ICRG: Corruption in government index. Measures to what extent high government officials are likely to demand special payments" and "illegal payments are generally expected through lower levels of government" in the form of "bribes connected with import and export licenses, exchange controls, tax assessment, policy protection, or loans." Scale from 1 to 6. Lower values indicate less corruption. Annual average for the years 1999 and 2003. Source:International Country Risk Guide (ICRG). http://www.prsgroup.com/

CPI: Corruption perceptions index. It is a composite index that measures the frequency and size of bribes paid in a country. Scale from 1 to 10. Low values indicate less corruption. Annually available. Source: Transparency International. http://www.transparency.org

Openness: Total trade (exports plus imports) as a percentage of GDP. Source: Alan Heston, Robert Summers and Bettina Aten, Penn World Table Version 6.2, Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania.http://pwt.econ.upenn.edu/

RGDP: is obtained by adding up consumption, investment, government and exports, and subtracting imports in any given year. The given year components are obtained by extrapolating the 1996 values in international dollars from the Geary aggregation using national growth rates. It is a fixed base index where the reference year is 1996. Source: Alan Heston, Robert Summers and Bettina Aten, Penn World Table Version 6.2, Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania.http://pwt.econ.upenn.edu/

Literacy: Percentage of population with more than 15 years old who are literate in 2002. Source: http://www.worldmapper.org. Data from United Nations Development Programme (UNDP) Human Development Report 2004 Table 11. Source: UNESCO Institute for Statistics (United Nations Educational, Scientific and Cultural Organization) 2004.

Reg. Quality: Index that identifies "the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development." Biannually available. Years used: 1998 and 2002. Source: Kaufmann et al. (2005). World Bank.

Voice & **Account.**: Index that identifies "the extent to which a countrys citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and freedom of association, and a free media". Biannually available. Years used: 1998 and 2002. Source : Kaufmann et al. (2005). World Bank.

Rule of Law: Measures the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, the police, and the courts, as well as the likelihood of crime and violence. The index ranges from -2.5 to 2.5. High values indicate better rule of law. Source: World Bank.

Political Stab.: Measures perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including domestic violence and terrorism.The index ranges from -2.5 to 2.5. High values indicate more political stability. Source: World Bank.

Democracy: Measures general openness of political institutions. The index takes values from 0-10. Higher values indicate more democracy.Source Polity IV.

Freedom of the Press: The measure is constructed taking into account the political pressures and controls on media content (including harassment or violence against journalists or facilities, censorship, self-censorship etc). The index ranges from 0-100. Higher values indicate more freedom of the press. Source: Freedom House.

Daily circulation: Daily circulation per thousands of inhabitants. Source: Data for 1999 from Djankov et al.[29]. Data for the year 2002 from http://www.worldmapper.org. Data for the year 2003 from several sources. See details for each country in the following table.

Appendix C

C.1 Proof. of Lemma 1

Suppose that the leading-edge quality grows over time as a result of knowledge spillovers in the vertical activity; with the size of the spillovers proportional to the aggregate flow of vertical innovations, $\phi_{it}^{v} N_t$, and the factor of proportionality given by $\frac{1}{N_t}$. Division by N_t reflects the idea that as a sector develops an increasing number of intermediate products, each vertical innovation has a smaller impact on the stock of public knowledge used by researchers. Thus, the growth rate of the leading edge quality can be written as: $g_Q = \phi_t^v$.

To show that under these assumptions the distribution of relative quality is uniform in the steady state, I follow the proof presented in Sergerstrom[67]. Let G(., t) denote the cumulative distribution of absolute quality q_{it} at time-t. Pick any $q > 0$ that was the leading-edge quality at some time $t_0 \geq 0$, and define $\Phi(t) \equiv G(Q, t)$. Then $\Phi(t_0) = 1$ since no variety can have a quality larger than the leading-edge at time t_0, which by construction is Q. It follows that $\dot{\Phi}(t) + \phi_t^v \Phi(t) = 0$ holds for all $t \geq t_0$. To understand this differential equation, note that since horizontal innovations represent random draws from the distribution of quality, they do not change the distribution of quality, and thus they can be ignored when characterizing the time path of Φ. Next note that after time t_0, the rate at which vertical innovations cause the mass of varieties behind Q to fall is the overall flow of vertical innovations occurring in varieties currently behind q. There are $\Phi(t)$ of such varieties and the Poisson arrival rate of vertical innovations in each of these varieties is ϕ_t^v. Taking into account the initial value condition $\Phi(t_0) = 1$, the unique solution to the first order linear differential equation is $\Phi(t) = e^{-\int_{t_0}^{t} \phi_s ds}$ for all $t \geq t_0$.

The expression for the growth rate ($g_Q = \phi_t^v$) also represents another differential equation, which given the initial condition $Q_{t_0} = Q$, has a unique solution $Q_t = Qe^{\int_{t_0}^{t} \phi_s ds}$. Now, define $a \equiv \frac{Q}{Q_t}$. Then, using the solutions to the two differential equations it follows that $\Phi(t) \equiv P(q_{it} < Q) = P(\frac{q_{it}}{Q_t} < \frac{Q}{Q_t}) = \frac{Q}{Q_t}$ for all $Q \geq Q_0$, which can be alternatively expressed as $P(a_{it} \leq a) = F(a) \equiv a$ for all $a \geq \frac{Q_0}{Q_t}$. As t converges to $+\infty$, $\frac{Q_0}{Q_t}$ converges to zero. Thus, the distribution of relative quality converges monotonically over time to the invariant distribution $F(.)$.

Appendix D

D.1 Proof. of Lemma 1

Proof of Lemma 1 derives straightforwardly from the maximization of function $[\frac{n_i r_i}{n_i r_i + n_j r_j} - r_i]$ w.r.t r_i.

D.2 Proof. of Lemma 2

To prove that $T_i(\theta)$ is a strictly increasing function of θ_i, first we prove that $T_i(\theta)$ is a weakly increasing function of θ. Second we prove the $T_i(\theta)$ is strictly increasing. To see that $T_i(\theta)$ is weakly increasing in θ, notice that in equilibrium type θ_i' must prefer $T_i' = T_i(\theta_i')$ to $T_i'' = T_i(\theta_i'')$, while type θ_i'' must prefer $T_i(\theta_i'')$ to $T_i(\theta_i')$. This is equivalent to the following conditions:

$$EU(T_i', \theta_i') \geq EU(T_i'', \theta_i') \tag{3.5.1}$$

$$EU(T_i'', \theta_i'') \geq EU(T_i', \theta_i'') \tag{3.5.2}$$

which means that $[h(\theta_i') - h(\theta_i'')][Prob(T_j > T_i'')e^{-\rho T_i''} - Prob(T_j > T_i')e^{-\rho T_i'}] \geq 0$. Suppose now that $h(\theta_i'') < h(\theta_i')$ (which is equivalent to say that $\theta_i'' < \theta_i'$) while $T_i' < T_i''$. Then, $[h(\theta_i') - h(\theta_i'')][Prob(T_j > T_i'')e^{-\rho T_i''} - Prob(T_j > T_i')e^{-\rho T_i'}] < 0$. And we reach a contradiction. Therefore, T_i is a weakly increasing function of θ_i.

To show that T_i is strictly increasing in θ_i, suppose by contradiction that it is not, which means that there must be an atom at some $T > 0$. This means that $Prob(T_i = T)$ is higher than 0. Under this situation, the best strategy for manager-j is to assign probability 0 to the interval $[T - \epsilon, T)$. As he does better playing just

above T. But then, manager-i will be better off playing $T - \epsilon$. Since he will increase firms' benefits. Therefore, there can not be an atom at T, and T_i is strictly increasing in θ_i.

D.3 Proof. of Proposition 1

To prove Proposition 1, notice that choosing a concession time T_i for firm-i is equivalent to choosing a type $\hat{\theta}_i$, and conceding at time $T_i = T(\hat{\theta}_i)$. Therefore, equation (1) can be re-written in the following manner:

$$EU = n_i[[1 - F\left(\hat{\theta}_i\right)]e^{-\rho T\left(\hat{\theta}_i\right)}[\frac{1}{\rho} - h(\theta_i, \phi, \pi(1-\pi))] + \int_{\theta_L}^{\hat{\theta}_i} \frac{1}{\rho} e^{-\rho z} f\left(z\right) dz] \quad (3.5.3)$$

Equating the derivative of equation (7) w.r.t $\hat{\theta}_i$ to 0, and using the property that $\hat{\theta}_i$ must be equal to θ_i, when $\hat{\theta}_i$ is chosen optimally, one can obtain the equilibrium condition presented in equation (3).[5] To obtain the boundary condition, notice that for any $\theta > \theta_L$ the gain of having the rival firm conceding is positive. Thus, as long as $f(\theta_L)$ is non zero, a firm with $\theta > \theta_L$ does not concede immediately. This in turn implies that a firm with $\theta = \theta_L$ concedes at time 0.

D.4 Proof. of Proposition 2

To prove Proposition 2, assume that $\pi = \frac{1}{2}$ and that $\hat{\pi} < \pi$. Using the equilibrium condition (3) we have:

$$\frac{T'}{\hat{T}'} = \frac{\frac{h(\theta,\phi,\pi(1-\pi))}{[1-h(\theta,\phi,\pi(1-\pi))]}}{\frac{h(\theta,\phi,\hat{\pi}(1-\hat{\pi}))}{[1-h(\theta,\phi,\hat{\pi}(1-\hat{\pi}))]}} > 1 \quad (3.5.4)$$

Equation (8) together with the boundary conditions imply that $\hat{T} < T$. The same is true for values of $\hat{\pi} > \frac{1}{2}$.

[5] A sufficient condition for a maximum requires that $T'' < 0$ and $f' < 0$.

D.5 Proof. of Proposition 3

To prove Proposition 3, assume that that $\hat{\phi} < \phi$. Using the equilibrium condition (3) we have:

$$\frac{T'}{\hat{T}'} = \frac{\frac{h(\theta,\phi,\pi(1-\pi))}{[1-h(\theta,\phi,\pi(1-\pi))]}}{\frac{h(\theta,\hat{\phi},\pi(1-\pi))}{[1-h(\theta,\hat{\phi},\pi(1-\pi))]}} > 1 \tag{3.5.5}$$

Equation (9) together with the boundary conditions imply that $\hat{T} < T$.

Appendix E. Source Media Variables

Country	Source Media Variables
ALBANIA	South East European Network for Professionalisation of the Media (SEENPM).
ARGENTINA	http://www.mirovni-institut.si/media_ownership Djankov et al.[29] www.grupoclarin.com http://www.comunica.org/chasqui/alonsa75.htm http://www.ivc.com.ar
AUSTRALIA	Djankov et al.[29] http://oldwww.roymorgan.com/pressreleases www.fxj.com.au www.newscorp.com
AUSTRIA	Djankov et al.[29] http://www.oeak.at The European Institute for Media www.styria.com
BRAZIL	Amadeus Data Set Djankov et al.[29] http://www.anj.org.br
CANADA	http://www.infoamerica.org/grupos/folha02.htm Djankov et al.[29] www.bellglobemedia.ca www.torstar.com
COLOMBIA	http://www.cna-acj.ca/client Djankov et al.[29]
CROACIA	http://www.infoamerica.org/grupos Djankov et al.[29] http://www.project-syndicate.org, http://www.mirovni-institut.si/media_ownership South East European Network for Professionalisation of the Media (SEENPM).

Country	Source Media Variables
CZ. REPUBLIC	Djankov et al.[29]
	http://www.mirovni-institut.si/media_ownership
	South East European Network for Professionalisation of the Media (SEENPM)
DENMARK	Djankov et al.[29]
	Amadeus Data Set
	The European Institute for Media
	http://news.bbc.co.uk/1/hi/world/europe/
	http://www.novinar.com/upload/EIM-EP-REPORT-2004.pdf
ESTONIA	Djankov et al.[29]
	South East European Network for Professionalisation of the Media (SEENPM).
	http://www.mirovni-institut.si/media_ownership
	http://www.novinar.com/upload/EIM-EP-REPORT-2004.pdf
FINLAND	Djankov et al.[29]
	The European Institute for Media
	http://www.novinar.com/upload/EIM-EP-REPORT-2004.pdf
	http://www.sanomawsoy.fi/investors
	Amadeus Data Set
FRANCE	Djankov et al.[29]
	The European Institute for Media
	http://www.novinar.com/upload/EIM-EP-REPORT-2004.pdf
	http://www.esj.lille.fr
GERMANY	Djankov et al.[29]
	The European Institute for Media
	http://www.novinar.com/upload/EIM-EP-REPORT-2004.pdf
	Amadeus Data Set
	www.kek-online.de
GREECE	Djankov et al.[29]
	The European Institute for Media, Amadeus Data Set http://www.novinar.com/upload/EIM-EP-REPORT-2004.pdf

Country	Source Media Variables
HUNGARY	Djankov et al.[29]
	http://www.mirovni-institut.si/media_ownership
	http//:www.matesz.hu
	http://www.novinar.com/upload/EIM-EP-REPORT-2004.pdf
INDIA	Djankov et al.[29]
	Who Owns the Media? Global Trends and Local Resistances Edited by Pradip and Nain
ITALY	Djankov et al.[29]
	http://www.novinar.com/upload/EIM-EP-REPORT-2004.pdf
	The European Institute for Media
	www.mediamonitor.nl
LATVIA	Djankov et al.[29]
	http://www.mirovni-institut.si/media_ownership
	http://www.novinar.com/upload/EIM-EP-REPORT-2004.pdf
	Amadeus Data Set
	www.bonnier
	http://www.baltkurs.com/english/archive/01/port.htm
LITHUANIA	Djankov et al.[29]
	http://www.mirovni-institut.si/media_ownership
	http://www.novinar.com/upload/EIM-EP-REPORT-2004.pdf
	The European Institute for Media
MALAWI	Djankov et al.[29]
	Media institute for South Africa.http://www.misa.org/annual
MEXICO	Djankov et al.[29]
	Instituto verificador de circulares
NETHERLAND	Djankov et al.[29]
	The European Institute for Media
	www.mediamonitor.nl
	cvdM 2003

Country	Source Media Variables
NEW ZELAND	Djankov et al.[29]
	http://npa.co.nz/statistics.php
	hilary@npa.co.nz
NIGERIA	Djankov et al.[29]
	http://www.wacc.org.uk/index.php/wacc/regional_associations/africa/african_articles
NORWAY	Djankov et al.[29]
	http://www.project-syndicate.org/member_papers/n
PERU	Djankov et al.[29]
	http://www.infoamerica.org/grupos
PORTUGAL	Djankov et al.[29]
	The European Institute for Media
	Amadeus Data Set
ROMANIA	Djankov et al.[29]
	http://www.mirovni-institut.si/media_ownership
SINGAPORE	Djankov et al.[29]
	http://news.bbc.co.uk/2/hi/asia-pacific/country_profiles/1143240.stm
SLOVAK	Djankov et al.[29]
	http://www.mirovni-institut.si/media_ownership
SLOVENIA	Djankov et al.[29]
	http://www.mirovni-institut.si/media_ownership
SPAIN	Djankov et al.[29]
	The European Institute for Media
	http://www.novinar.com/upload/EIM-EP-REPORT-2004.pdf
SWEEDEN	Djankov et al.[29]
	The European Institute for Media
	http://www.novinar.com/upload/EIM-EP-REPORT-2004.pdf
SWITZERLAND	Djankov et al.[29]
	The European Institute for Media http://www.novinar.com/upload/EIM-EP-REPORT-2004.pdf

Country	Source Media Variables
UNITED KINGDOM	Djankov et al.[29]
	The European Institute for Media
	http://www.novinar.com/upload/EIM-EP-REPORT-2004.pdf
	Amadeus Data Set
UNITED STATES	Djankov et al.[29]
	http://www.dowjones.com
	http://www.gannett.com
	companies' websites