Dominant Investors and Strategic Transparency*

Enrico C. Perotti† Ernst-Ludwig von Thadden‡

March 2002

Abstract

This paper proposes a theory of corporate transparency and its determinants. We show that under imperfect product market competition, the corporate transparency decision affects the value of equity and debt claims differently. We then embed this insight in a model of endogenous investor influence in which either equityholders or banks may emerge as dominant investors. In line with evidence from Continental Europe and Japan, we find that dominant creditors seek to decrease transparency below the level preferred by equityholders. The theory predicts a clustering of firm characteristics associated with bank dominance: opaqueness, uncertainty about assets in place, low variability of profits, and reduced average profits.

*We thank Sudipto Bhattacharya, Bruno Biais, Ulrich Hege, Martin Hellwig, Bengt Holmström, Colin Mayer, Fausto Panunzi, Jean Tirole, and Xavier Vives for a number of very useful comments, and Elliot Romano for excellent research assistance.

†University of Amsterdam and CEPR

‡Université de Lausanne and CEPR

1 Introduction

In recent years, transparency has become one of the most important concepts in the public debate on corporate governance. It is generally regarded as a critical feature of well-functioning arm's length governance: transparency allows public investors to monitor firms, and thus supports capital market development. Consequently, the issue of transparency has figured prominently in the debate on reform of the Japanese and Continental European governance systems (Becht and Mayer, 2000), and has been a major part of the OECD corporate governance recommendations (OECD, 1999). Poor transparency has been widely advanced as a cause of financial vulnerability in emerging economies, following the Asian crisis.[1] A large study by PricewaterhouseCoopers (2000) in 35 countries concludes that firms in countries with poor disclosure face a higher cost of capital. In the aftermath of the crisis, many Asian and Latin American countries have tightened disclosure procedures, including mandatory adoption of IAS accounting standards.

Given the obvious benefits of transparency, it is surprising that corporate opaqueness is such a widespread phenomenon. In this paper, we provide an explanation based on agency costs of finance. Our empirical starting point is the wide-spread perception that bank-dominated firms are more opaque.[2] We argue that monitoring by banks can grant them a governance role in the firms they finance; we then study the effect of bank influence on strategic corporate decisions, focussing on the transparency choice. As in Bhattacharya and Ritter (1982), Gertner, Gibbons and Scharfstein (1988) and Bhattacharya and Chiesa (1995), our theory recognizes that when information is disclosed to more than one audience, this will have strategic effects in a context of imperfect competition. In such a context, we show that dominant lenders will discourage transparency, as this would endogenously undermine the value of their claims.

The economic mechanism is that opaque firms reveal less to competitors about their competitive strength. This hurts firms which are strong, as it

[1] The quest for transparency has become so central to rebuilding business confidence in Asia that Singapore's Business Times has launched in 2000 its own corporate transparency index, ranking the degree of transparency in financial reporting for all listed companies on the Singapore Exchange.

[2] For the case of Germany, for example, The Economist (2000) notes that "in the past, Germany's banks were classic stakeholders, shielding the companies they owned from the capital markets, often with the help of proxy shares parked with them by retail investors."

leads competitors to be more aggressive, forcing the firm to restrain its output; but it protects weak firms, which then face less aggressive competition and can retain more market share and profitability. As a result, under opaque competition expected profits are lower, but less variable. Consequently, there is a natural preference by lenders for less information dissemination, as they do not gain from higher profits but suffer from higher risk.

Hence, our first main observation is that under strategic competition, transparency affects equity and debt claims differently. We can therefore treat the corporate transparency decision as an instance of the general Jensen-Meckling (1976) risk-shifting conflict.[3] Our second main result is that, although equity is ex post adversely affected by opaqueness, firms may accept debt financing and bank dominance in order to resolve a double agency problem. In our model, the governance structure of the firm emerges endogenously as the outcome of an optimal financing and monitoring choice, when investors face both information asymmetry (which lead some firms to choose debt financing) and managerial moral hazard (which leads to concentrated claimholdings).[4]

We distinguish transparency from disclosure: we view transparency as a strategic ex-ante decision, while disclosure is an ex-post decision of uncertain reliability, since ex post the firm may be reluctant to reveal unfavorable information. We argue that ex-post information dissemination is reliable only if the firm has adopted a long-term disclosure policy which allows investors to ascertain objectively its true quality.[5]

Furthermore, we assume that controlling investors influence the transparency decision. We view corporate control as granting extensive ex post discretion (Hart, 1995), thus making it difficult to separate reliably the control over specific decisions. In particular, while there may be ways to partially commit to greater transparency in a way that cannot be undone by controlling investors, there is much evidence that disclosure has a large discretionary

[3] This distinguishes our model, in particular, from the work of Admati and Pfleiderer (1998) and Bhattacharya and Chiesa (1995) who explain corporate opaqueness by externalities in information production, regardless of capital structure.

[4] The presence of both moral hazard and adverse selection is crucial, as they jointly endogenize both the presence of leverage in the capital structure and the identity of dominant investors.

[5] Most of the literature has focused on the short-term incentives for disclosure once a firm has acquired some private information (e.g., Gertner, Gibbons and Scharfstein (1988), Yosha (1995)). Instead, we concentrate on the long-term transparency decision.

component even for listed firms.

There are other explanations why firms over which banks have significant influence may be more opaque. For example, a main bank may be able to fund directly the entire investment requirement by a firm, thus limiting information dissemination to the market. Yet, as already observed by Bhattacharya and Chiesa (1995), this explanation fails to make clear why information dissemination is per se undesirable. In a similar vein, bank monitoring may simply substitute for public transparency; this may lead to a low level of trading liquidity, which in turn discourages information-gathering by investors. This, however, begs the question of why banks are active in the first place, as it is not in the interest of shareholders to be informationally captured by lenders (Rajan, 1992, von Thadden, 1998).[6]

A classic view is that banks specialize in lending to firms with inherently less transparent *activities*. Banks are in general not better than markets at screening uncertain *prospects*, but they are often perceived to be good at monitoring the *use* of existing assets by managers (Diamond, 1984). We build on this view, ask why such delegated monitors use debt contracts, and show how the nature of the debt contract influences the monitors' behavior. We find that firms with high uncertainty concerning assets in place will choose debt, and firms with operations which are hard to monitor at arm length choose concentrated debt, thus bank governance. Thus our conclusion is that firms with operations which are less easily observable will require bank financing and governance, which in equilibrium maintains and even reinforces their opaqueness, because of the banks' desire to reduce risk.

Our model offers several empirical implications. We predict lender-dominated firms (and firms in bank-dominated financial systems) to be less transparent than equity-run firms (and firms in shareholder-oriented systems). Moreover, corporate profitability should be less volatile in bank-dominated firms, and higher on average in equity-dominated firms. In fact, our theory predicts a clustering of attributes: we expect to observe jointly bank dominance, opaqueness, lower variability of profits, lower average profits, uncertainty about assets in place, and limited growth opportunities. Bank dominance should be less prevalent when product market competition is strong and more prevalent when the agency problem between the firm and its in-

[6] This explanation presumably applies best to smaller firms with limited access to finance. In contrast, our approach is also suited to larger firms with broader access to finance.

vestors is important.

There seems to be no empirical study covering all attributes predicted by our theory. On the comparative international front, Ang and Ciccone (2000) find for a sample of firms from 42 countries that transparency (measured as the average analyst earning forecast error) depends on firm governance structure even more than on country characteristics. They also find that the shares of opaque firms tend to underperform transparent firms (see also Fan and Wong (2001) on firm performance during the Asian crisis). Relatedly, there is abundant evidence that conglomerate firms or business groups are more prone to moral hazard and exhibit lower transparency than independent, focused firms. And indeed, consistent with our theory, banks typically contribute significant financing and play an important governance role in business groups, as they do in Japan, Germany, and many emerging economies (see, e.g., Khanna and Rivkin (1999)).[7]

There is little empirical work available for the U.S. on our questions (not surprisingly, given the limited influence of banks on firms in the U.S.).[8] On the other hand, there is ample evidence that Japanese companies with influential main banks have been less profitable than more independent companies (e.g., Weinstein and Yafeh, 1998) and that transparency is greater for independent companies (Weinstein and Yafeh (1998), Dewenter, Novaes, Pettway (2001)). Overall, these firms appear to show less variability in profitability and grow comparatively less than independent companies (Nakatani (1984), Hoshi, Kashyap, and Scharfstein (1991)). Dewenter and Warther (1998) find that dividend payments by Japanese keiretsu firms with a main bank affiliation are less informative than those by independent firms. All these facts are consistent with our result that bank-dominated firms ought to be less transparent and have lower average profits and less volatility of economic results than more transparent, market-financed rivals.

In Germany, traditionally banks have played a major role in the governance of many firms, and there has been a wide-spread concern about this domination. In the cautious words of D. Wolf, the President of the German

[7] Concentrated equity may be better than concentrated debt under extreme moral hazard, since a shareholder can exercise more significant control ahead of default. While beyond the confines of our model, the observation could easily be integrated to complete the cross-section of governance structures.

[8] Yet, it is interesting to note that there is evidence that U.S. firms with more opaque assets and higher ownership by financial institutions have less liquid securities (Hegde and McDermott (2000)).

Federal Cartel Office, "because the banks are predominantly interested in safeness and stability, it is possible that banks use their influence to prevent innovative, but risky investments ... There is the danger that delegated voting rights are exercised not in the interest of the clients but of the banks."[9] This is exactly the scenario of the dominant-lender equilibrium that we identify in this paper.[10]

Until 1998, disclosure requirements for listed firms in Germany were significantly weaker than those demanded by U.S. GAAP. In particular, neither cash flow statements nor detailed segment reports were mandatory. Yet, there was significant variation in voluntary reporting practices. While we do not know of empirical studies explicitly addressing our question of the link between investor dominance, transparency, and earnings volatility, there is a consensus that those firms that voluntarily provided more accounting information were 'capital market-oriented' as opposed to those dominated by banks or private owners (see, e.g., Goebel and Fuchs, 1995, Leuz, 1998).[11]

The remainder of this paper is organized as follows. Section 2 sets out the model. In sections 3 we analyze product market competition. Section 4 studies the transparency decision, and Section 5 analyses firm financing and governance. Section 6 concludes. In the Appendix we collect formulae and proofs needed to derive our results formally.

2 The Model

The model is a dynamic game between two firms and their investors, in which financing and control decisions are taken first, and then the firms compete on the product market. We first describe the product market stage, and later the earlier part of the game.

[9] Frankfurter Allgemeine Zeitung, March 5, 1997.

[10] Böhmer (2000), Chirinko and Elston (1997), and Perlitz and Seger (1994) all provide econometric evidence about the strong influence of banks on firms in Germany. While Chirinko and Elston (1997) find no significant impact on mean profitability, Perlitz and Seger (1994) find a "negative influence of the banks that is surprisingly clear." Böhmer (2000) finds that higher bank influence on bidder firms in corporate takeovers is correlated with substantially lower cumulative abnormal bidder returns.

[11] An interesting example has been the listing of Daimler-Benz on the NYSE, which shed light on a traditionally opaque company. While Deutsche Bank was the dominant investor in Daimler-Benz, it held at the time more than a quarter of the firm's equity, and thus acted probably more as a shareholder than as a lender.

2.1 Product market interaction

Once the firms have raised finance and invested, they learn about their competitive strength on the product market, and then compete with differentiated products as Cournot competitors.

Firms have either a high quality or a lower quality product, which has an effect on its relative attractiveness vis-a-vis their competitor's. Quality is described by a parameter θ_i which can take two values. When the product is of high quality, $\theta_i = \theta_H$, while $\theta_i = \theta_L$ otherwise, with $\theta_H > \theta_L$. Product quality is uncertain; ex ante either firm has a prior probability q of having a high quality product. The probability of high quality is common to both firms and commonly known.[12] A firm's θ becomes publicly known either before or after the production decision, depending on the ex ante transparency decision. In either case, once output is realized, customers base their purchase on actual quality.

The inverse demand function faced by firm i is given by

$$P_i = \begin{cases} \theta_i - Q_i - \gamma Q_j & \text{if } Q_i + \gamma Q_j \leq \theta_i \\ 0 & \text{if } Q_i + \gamma Q_j \geq \theta_i \end{cases}, \tag{1}$$

where $i = 1, 2$, $j \neq i$,and $-1 \leq \gamma \leq 1$. γ can be interpreted as the degree of substitutability between the firms' products, and describes the intensity of competition in the market. If $\gamma > 0$ the two goods are strategic substitutes under Cournot competition; if $\gamma < 0$, the goods are strategic complements.[13]

We assume that marginal costs for each firm are constant and normalized to zero. Finally, we assume that the production decision of the firm is taken by managers as to maximize profits, $P_i Q_i$. In particular, at the product market stage we assume away the issue of opportunism by managers or inside equity holders (see, e.g., Hart, 1995).[14] We introduce opportunism in the

[12] Given our linear demand specification, the difference in product quality can as well be interpreted as a difference in marginal costs. The two formulatons are equivalent.

[13] By inverting (1), one sees that the specification covers also the case of price competition. It can be derived explicitly from a model with quadratic preferences (see, e.g., Singh and Vives (1984)).

[14] Brander and Lewis (1986) show that leveraged firms may overproduce to take advantage of limited liability. We have investigated such incentives in an earlier version: the analysis is much more complex and does not add to our results. As the Brander-Lewis result is empirically not well supported (Chevalier, 1995) and theoretically ambiguous (Bolton and Scharfstein (1990), Showalter (1995), we choose to work with the simple assumption of profit maximization.

longer-term decisions about investment discussed in the next subsection.

To simplify the presentation we impose three types of parameter restrictions. First, we will concentrate on the case $\gamma \geq 0$. Second, we assume that firms produce a strictly positive level of output whatever the constellation of (θ_1, θ_2), i.e. that there is no exit. This requires assuming that demand even for a low quality product is sufficiently strong. The following assumption, which will be maintained throughout the paper, is sufficient to guarantee this in the different settings we consider later on:

$$\theta_L > \theta_H - \theta_L. \tag{2}$$

Finally, we assume that equilibrium prices, and hence profits, are strictly positive in all contingencies.[15] It is worth emphasizing that all our qualitative results continue to hold if $\gamma < 0$ or if (2) does not hold or if parameters are such that equilibrium prices can be zero, only some formulas will change.

2.2 Finance and control

In order to enter the market described above, firms need external financing of $I > 0$. Firms are subject to moral hazard concerning their investment activity and are differentiated by the value of their existing operations. These characteristics influence their interaction with investors, and determine the form of financing and the control rights of external investors.

The moral hazard problem modelled here is a simple version of the problem of managerial discretion about internal funds as analyzed, e.g., by Burkart, Gromb and Panunzi (1998) and Holmström and Tirole (1997). For simplicity, we assume that, unless controlled, the owner or manager of a firm can divert all new funds I, but there is no diversion at all when she is controlled. To simplify the exposition further, we assume that the direct costs of controlling are positive but sufficiently small to make control profitable whenever the firm would divert.

In the spirit of Myers and Majluf (1984), the value of existing operations is private information. Overall firm value, therefore, has two components: the value from existing operations, $V \in \{V_L, V_H\}, V_L < V_H$, and the return π from the new venture, if undertaken. Investors know the ex-ante distribution

[15] This restriction is binding for competition under incomplete information when γ is close to 1 and q close to 0, i.e. when competition is head-on and quality is likely to be low. The precise condition needed for the formulas in the paper to hold is $\gamma+\gamma(1+\gamma)(1-q) < 2$.

of V, with prob $(V = V_H) = h$ and prob $(V = V_L) = 1 - h$. Firms cannot signal their type by any action besides the type of financing they seek.

We normalize the firm's initial debt to zero. The financing options for the investment cost consist of diffused equity (DE), concentrated equity (CE), diffused debt (DD), or concentrated debt (CD). Concentration implies that a large investor able to oversee management decisions invests a significant amount in the company and is granted some control rights. Following the literature on large investors (e.g., Holmström and Tirole (1997), Bolton and von Thadden (1998)), we assume that a sufficiently large stake is necessary to exert control. We interpret concentrated debt as main-bank financing and dispersed debt as bond financing. When the firm issues concentrated debt it becomes bank-dominated, otherwise equity-dominated. Hence, we assume that in the absence of dominant lenders, the owners are in control.[16] Without loss of generality, we do not consider the possibility of a mix of debt and equity financing.

While productive decisions such as the level of output Q are taken to maximize firm value, we assume that dominant investors, apart from their control function, can potentially influence some longer-term strategic choices. Although the owners may have an interest in specifying different decision rights separately, this is typically difficult if the environment is complex and the right to control management involves discretion. We therefore assume that at the operational level such separation is infeasible.[17] As an important example of investor influence we focus on the choice of transparency, which we view as long-term, taking place before firms receive private information about their product market prospects (given by θ_i). A firm's transparency policy can imply facilitating access to management and company resources for analysts and researchers, using meaningful accounting and disclosure practices, creating a transparent asset structure, encouraging secondary trading in the firm's stock, listing on stock exchanges with stringent disclosure requirements, etc.[18]

[16] Including managerial self-interest would be a natural and important extension of the model for the case of diffused finance (DD and DE). Whether more or less opaqueness would prevail in those cases would depend on the form of the managerial incentive-scheme.

[17] See, for example, Burkart and Panunzi (2000) on the problem of conflicts of interest, discretion, and self-interest for corporate control by large investors.

[18] For the latter, the decision by European firms to list on the NYSE is an example. Another example is the decision to switch from the British Unlisted Securities Market to the Official List of the LSE.

For simplicity, we assume that a firm can be either transparent (T) or opaque (O) with no differential cost. For a transparent firm, its quality parameter θ_i becomes publicly known once it is realized. If a firm is opaque, its θ_i is private knowledge to the firm at the production stage. We do not model here how information is disseminated, see Bhattacharya and Chiesa (1995), in a banking context, and Perotti and von Thadden (1998), in a market-microstructure context, for explicit models of this issue.[19] The revelation mechanism cannot be changed after private information is obtained.[20]

2.3 Timing

The game is among two firms, drawn from a large population of ex-ante identical and independent firms, and a large number of risk-neutral investors.

1. Firms' types V are realized as private information to the firm.

2. Firms choose their form of financing, in order to raise I. If a firm chooses debt, it offers a standard debt contract $D > 0$; if it chooses equity, it offers a fraction of its equity $s \in (0, 1)$.

3. Investors accept the offer or not; in cases of several acceptances or oversubscription, the firm chooses its investors randomly.

4. If the firm issues concentrated finance, the controlling investor monitors management and chooses the firm's transparency policy, $C \in \{T, O\}$. If there is no controlling investor, the firm chooses C.

5. In the absence of monitoring, firms choose whether to divert the funds raised, I. Firms who have received external funding and not diverted it, invest I.

6. Product quality for each investing firm θ is realized. For transparent firms, this information becomes public immediately, for opaque firms θ it remains private information..

[19] We also abstract from differences in types of information as analyzed by Boot and Thakor (2000).

[20] Depending on how the market interprets signals, there will typically be an ex-post incentive to reveal more if the information is good, or less if the information is bad. We assume that there is no credible way to selectively communicate this information ex post, unless a reliable mechanism has been established in advance to allow information to be verified by outsiders.

7. Firms compete by choosing quantities Q (if there is only one firm to have invested, it acts as a monopolist).

8. Firm quality is publicly revealed, demand and returns π are realized, and investors are repaid. Under an equity contract, investors receive $s(V+\pi)$ or sV, depending on whether the firm has invested or not; under a debt contract, investors receive either min $(V+\pi, D)$ or min (V, D).

3 Product Market Competition

We analyze the game using the concept of perfect Bayesian Nash equilibrium, by first solving for equilibria of the subgame starting at stage 6 of the overall game tree. This is possible because the asymmetric information about V has no impact on subsequent product market interaction and because managers maximize firm value. Hence, product market competition can be analyzed without regard to capital structure.[21]

If a firm acts as a monopolist (either because the other firm has received no funding or because it has diverted its funds), its choice is trivial, and in particular, does not depend on its transparency. We focus therefore on the subgame with two competing firms. As firm quality θ is either public information or it remains private, we have two possible informational states for each firm, resulting from the choices in stage 4: T (θ revealed) or O (θ private information). In total, this yields four subgames, which we shall discuss now in turn.

3.1 Competition under complete information

We first consider competition under complete information, defined as a situation in which the information on each firm's θ is public.

Both firms simultaneously choose their quantities Q_i to maximize profits, taking the other's choice as given. Hence, firm i chooses Q as to $\max_Q(\theta_i - Q - \gamma Q_j)Q$.

[21] As mentioned earlier, this is different from the Brander and Lewis (1986) literature. If we included the Brander and Lewis (1986) limited-liability effect, our results would become more complicated, but be strengthened, because equity control would create additional profit volatility.

Firm i's behavior will depend on its own θ and that of its competitor. We therefore have four different possible states, $ij = HH, HL, LH, LL$, for the interaction. It is straightforward to calculate the unique, symmetric Nash equilibrium $(Q_{HL}^{TT}, Q_{HH}^{TT}, Q_{LL}^{TT}, Q_{LH}^{TT})$ (see the appendix), where the superscript TT denotes the fact that both firms' θ have been revealed, and Q_{ij}^{TT} denotes a firm's equilibrium action if it has quality θ_i and its competitor quality θ_j.

The ordering of the corresponding four profit levels is intuitive. In fact, we have

$$\pi_{HL}^{TT} > \pi_{HH}^{TT} > \pi_{LL}^{TT} > \pi_{LH}^{TT},$$

where LH is the worst possible state for firm i and the firm makes lower profits than in state LL, the second worst state, etc.[22]

The analysis of this standard form of market interaction is simple. The effect of complete information is to produce some implicit coordination on output decisions, as each firm conditions its production on the actual strength of its competitor's demand and thus on the competitor's ability to expand beyond its own market.

3.2 Competition under symmetrically incomplete information

We now consider the case of competition when there is no public information about any firm's quality available. We shall index all variables by OO, as all the θ's are private information.

Now each firm makes its output decision at a time when there is imperfect information about the level of its competitor's product-specific demand θ_j. In this case each firm will choose output as a function only of its own θ_i, and therefore chooses Q_i to maximize

$$E_{Q_j} P_i Q_i = \begin{cases} (\theta_i - Q_i - \gamma q Q_H^{OO} - \gamma(1-q) Q_L^{OO}) Q_i & \text{if } Q_i \leq \theta_i - \gamma Q_H^{OO} \\ (1-q)(\theta_i - Q_i - \gamma Q_L^{OO}) Q_i & \text{if } \theta_i - \gamma Q_H^{OO} \leq Q_i \leq \theta_i - \gamma Q_L^{OO} \\ 0 & \text{if } Q_i \geq \theta_i - \gamma Q_L^{OO}, \end{cases} \tag{3}$$

where Q_i^{OO} denotes a firm's equilibrium action when it has quality θ_i.

[22] If $\gamma < 0$, i.e. if the goods are strategic complements, we have $\pi_{HH}^{TT} > \pi_{HL}^{TT} > \pi_{LH}^{TT} > \pi_{LL}^{TT}$: in LL, the worst possible state for firm i, it produces less than in state LH, the second worst state, etc.

It is readily verified that the game again has a unique symmetric (Bayesian) Nash equilibrium, (Q_L^{OO}, Q_H^{OO}), given in the appendix. As in the case of symmetric complete information, it is easy to show that the profit levels in the four different states are ordered as intuition suggests:

$$\pi_{HL}^{OO} > \pi_{HH}^{OO} > \pi_{LL}^{OO} > \pi_{LH}^{OO}.$$

3.3 Competition under asymmetric information

The last case to consider is the asymmetric case, in which the type of one firm, say firm 1, is unknown to the market, whereas the other's type is known. Now firm 1, when making its output decision, knows the state of firm 2, but firm 2 does not know θ_1. In this case, firm 1 will choose output as a function of θ_1 and θ_2 and therefore produce as to $\max_Q(\theta_1 - Q - \gamma Q_2(\theta_2))Q$, where Q depends on θ_1 and θ_2. Firm 2, on the other hand, seeks to maximize

$$E_{\theta_1} P_2 Q_2 = \begin{cases} (\theta_2 - Q_2 - \gamma q Q_1(\theta_H, \theta_2) - \gamma(1-q)Q_1(\theta_L, \theta_2))Q_2 \\ \qquad \text{if } Q_2 \leq \theta_2 - \gamma Q_1(\theta_H, \theta_2) \\ (1-q)(\theta_2 - Q_2 - \gamma Q_1(\theta_L, \theta_2))Q_2 \\ \qquad \text{if } \theta_2 - \gamma Q_1(\theta_H, \theta_2) \leq Q_2 \leq \theta_2 - \gamma Q_1(\theta_L, \theta_2) \\ 0 \text{ if } Q_2 \geq \theta_2 - \gamma Q_1(\theta_L, \theta_2), \end{cases} \tag{4}$$

where Q_2 depends on θ_2 only.

It is straightforward (if lengthy) to show that the game again has a unique (Bayesian) Nash equilibrium $(Q_H^{TO}, Q_L^{TO}, Q_{HL}^{OT}, Q_{HH}^{OT}, Q_{LL}^{OT}, Q_{LH}^{OT})$, which we spell out in the appendix. Here, Q_i^{TO} is the equilibrium quantity produced by the firm whose θ is known (and who cannot condition on the other firm's strength), and Q_{ij}^{OT} the quantity produced by the firm with private information about its type (who faces a transparent competitor) when its own quality is i and that of its competitor j. The corresponding eight profit levels (for each state and each firm) are given in the appendix.

Again, it can easily be verified that equilibrium quantities and profits are ordered as in the two equilibria under symmetric information. For example, the profits of a transparent firm facing an opaque firm are highest when the firm has high quality and the competitor low quality, second highest when both have high quality, third highest when both have low quality, and lowest when the firm has low and its competitor high quality.

In order to understand the costs and benefits of transparency in this context, it is useful to compare the profit levels of firm i in the case where

both firms are transparent (π^{TT}) with those where firm j is transparent but firm i not (π^{OT}). Direct inspection shows that profits are ordered state by state. Profits under full transparency, π^{TT}, are, in fact, a "median-preserving spread" of profits under unilateral opaqueness, π^{OT}, in the sense that π^{TT} is statewise lower than π^{OT} in the two unfavorable states (LL, LH) and statewise higher in the two favorable states (HH, HL). Hence, expected profitability is always higher for the T - firm than for the O - firm in the strong quality state, and vice versa in the weak quality state. The same comparison holds between π^{OO} and π^{TO}, i.e. if one firm is always opaque. Figure 1 depicts this comparison graphically.

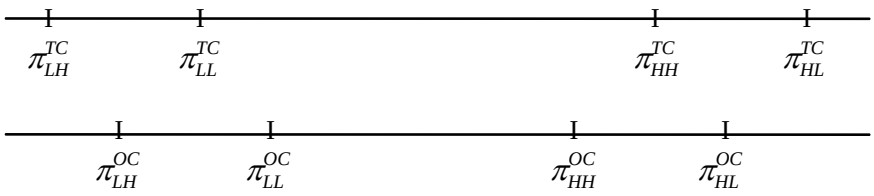

Figure 1: Comparison of π^{TC} and π^{OC} for $C \in \{O, T\}$

This fact reflects a general result from the industrial organization literature (see, e.g., Kühn and Vives (1994) for an excellent survey) and is at the heart of our argument in this paper. It is, therefore, useful to discuss its underlying rationale.

The main difference in strategic interaction between the case where a firm is transparent and the case where it is not transparent is that by disclosing more, the firm allows its competitor to react more precisely to the situation on the product market, which makes the intercept of its residual demand more volatile (Fried (1984), Li (1985)). Hence, when in the state of high demand, a firm whose quality is public information (T) can produce more aggressively than if it were opaque, because the firm knows that its competitor knows its strength, and will thus restrain its output. In addition, if the competitor is opaque the T - firm does not restrain its output when its competitor is strong, since it does not know it. The analogue argument applies for the low quality state. Hence, being transparent confers an important strategic advantage (the advantage of forcing the other to restrain himself when one

is strong, i.e. when the gains from aggressiveness are highest), even if the competitor remains opaque.

Opaqueness can therefore be seen as a device to prevent coordination by competitors. This lack of coordination due to lack of information makes profits higher on average for weaker firms and lower for stronger firms. From an ex ante perspective, the reduced profitability in high quality states, when marginal profitability is highest, is greater than the profit gain in low quality states. Hence, lack of information reduces both expected profits and their variance.[23]

We summarize our findings in the following proposition, whose proof is completed in the appendix. We note in passing that what is important for the analysis is the result about the variance of profits, not their mean.

Proposition 1 *For any transparency choice of the other firm, the mean and the variance of a firm's profits are higher under transparency than under opacity.*

4 Moral Hazard and Transparency Choice

In stages 4 and 5 of the game, dominant investors decide whether to monitor, and firms who are not monitored decide whether to invest their funds or whether to divert them. We now analyze these decisions working backwards, beginning with the firms' decision in stage 5.

4.1 Diversion

Consider a firm that is not monitored, either because it has no dominant investor or because its dominant investor decided not to monitor. In either case, its payoff from diverting its funds depends on the type of outside finance it has raised in stages 2 and 3 of the game and on the transparency choice in stage 4.

Suppose first that the firm has been financed through debt with face value D. Then the firm will divert its funds instead of investing, if and only if

[23] Formally, this is due to the convexity of profits in θ (see the formulas in the appendix): outward shifts of high profit realizations are more important than downward shifts of low realizations.

$$E_\pi \max(V + \pi - D, 0) < I + \max(V - D, 0), \tag{5}$$

where $V \in \{V_L, V_H\}$ is the firm's value without investment and π the return from investing (here π is any of the random variables derived in the last section - which one is decided in stage 4 - or the monopoly return). Similarly, the firm diverts under equity finance if and only if

$$(1 - s)E_\pi \pi < I. \tag{6}$$

Both conditions, (5) and (6), simply state that the return from investing I is smaller than the gain from diverting I.

4.2 Monitoring

In stage 4 of the game, dominant investors, if they exist, decide whether to monitor. Given our assumption of positive but sufficiently small monitoring costs, a dominant investor will monitor if and only if (5) or (6) hold, i.e. if and only if the firm would divert otherwise.[24]

4.3 Transparency

The other decision taken in stage 4 of the overall game is the choice of transparency, either by the firm itself (if there is no dominant investor) or by the dominant investor. If (off the equilibrium path) the contracts in stage 2 and 3 are such that one firm does not obtain funding or diverts its funds in stage 5, there is only one firm on the market in stage 6 to 8, and transparency does not matter.[25] We can, therefore, focus on the case of two firms who will compete on the product market.

Consider first a firm that is equity financed. The following proposition is a straightforward implication of Proposition 1.

Proposition 2 *For an equity-financed firm, transparency is a dominant strategy in the subgame of transparency choice in stage 4.*

[24] Note that in the case of a pooling concentrated debt contract in stages 2 and 3, the investor does not know whether (5) is satisfied. But she will monitor as long as (5) is satisfied for at least one type of firm.

[25] Remember that transparency is a strategic tool to influence product market competition. It does not matter for a monopolist, because consumer purchases are made under full information.

Indeed, because transparency causes an increase in mean profits regardless of the competitor's choice, whoever controls the firm prefers transparency over opaqueness, as long as his payoff is increasing in $E\pi$.[26] As mentioned earlier, Proposition 2 continues to hold if the firm has debt outstanding, but is equity controlled. This follows from the next proposition, which considers the subgames following dispersed debt financing (where the firm's equity holders are in control).

Proposition 3 *If a firm is financed through dispersed debt, transparency is a dominant strategy in the subgame of transparency choice.*

As discussed in Section 3, the effect of information revelation is in general to produce some implicit coordination in output decisions, as the informed firm conditions its production on the actual strength of its competitor's demand and thus on the competitor's ability to market aggressively. This implicit coordination is so valuable that an equity-controlled firm unilaterally prefers to become transparent. Hence, the case of equity control is a direct generalization of the literature on endogenous information sharing, cited in Section 3, to the case of a capital structure with debt and equity.

The final subgames to consider at the stage of transparency choice are those in which a creditor is in control (CD). Here, two special cases of little economic interest can be discussed apart. First, if the required loan, I, is smaller than $V_L + \pi_{LH}^{TC}$ (the smallest possible return to investing if the other firm chooses C), then debt will be riskless, $D = I$, and lenders will be indifferent between transparency and opaqueness. And second, if debt is so high (close to $V_H + \pi_{HL}^{TC}$ in Figure 1 in the appendix) that the debtor goes bankrupt almost all the time, then the creditor will behave like the residual claimant and is, of course, indistinguishable from an equity investor. To focus the exposition we shall ignore both these cases in the following proposition. For the first problem, this amounts to assuming that I is sufficiently large to make debt risky, independent of the transparency choice of the other firm. For the second, this requires to assume that I is not so big as to make debt

[26] Dominance is only weak in some off-the equilibrium- path subgames, because the firm may be a monopolist or embezzle regardless of transparency choice (which is the case if (6) holds even if the firm chooses T).

look like equity. More precisely, we assume[27]

$$V_L + \max(\pi_{LH}^{TT}, \pi_{LH}^{TO}) < I \ll V_H + \pi_{HL}^{TT}. \tag{7}$$

We can now state the sequel to Propositions 2 and 3.

Proposition 4 *Assume that a firm is financed with concentrated debt and that condition (7) holds. If the creditor believes with some positive probability that the firm is of type V_L, then the creditor's dominant strategy in the transparency subgame in stage 4 is opaqueness.*

The key feature of the case of creditor control is that the dominant interest now is to protect the downside of profits. Because of the variance result of Proposition 1 (see also Figure 1), this downside is greater under opaqueness than under transparency. Hence, the creditor will prefer opaqueness, even though its expected value is lower, if his debt is risky under transparency. As long as the creditor is not certain that the firm is of type V_H, (7) is a sufficient condition for debt being risky under transparency: as $D > I$, there is a positive probability ($q(1-q)$ times the probability the creditor attaches to V_L) that $V_L + \pi_{LH}^{TO} < D$.

Proposition 4 provides a converse to Propositions 2 and 3: whereas in the case of equity control firms will be transparent, dominant lenders will avoid transparency, if debt is risky. These results are surprisingly strong, as this behavior is produced by dominant strategies. Hence, if a firm is debt controlled, its dominant investor will choose opaqueness, a strategy which reduces the firm's expected profits. The interesting question, to which we turn now, is why a firm may approach such an investor.

5 Finance

The last step in our backwards induction analysis is the financing game in stages 2 and 3. Because the continuation equilibria in the last section were

[27] The second inequality states that I should be sufficiently smaller than the right hand side. The precise threshold is given by the smaller of the two I^C, $C \in \{T, O\}$, for which $I^C = E_\pi h \min(V_H + \pi^{OC}, D) + (1-h)\min(V_L + \pi^{OC}, D) = E_\pi h \min(V_H + \pi^{TC}, D) + (1-h)\min(V_L + \pi^{TC}, D)$. This threshold lies between $V_L + \pi_{HH}^{OO}$ and $V_H + \pi_{HL}^{TT}$ (the maximum possible return). In the equilibrium exhibited in Proposition 5 below, neither of the constraints in (7) is binding.

in dominant strategies, we can restrict attention to the interaction between one firm and the capital market; the case of two firms follows as a simple extension.

In our analysis we shall focus on the pooling equilibrium in which both types of each firm issue concentrated debt with zero expected profits to the investors. Depending on the parameter values, there will be other equilibria, but they involve at least some equity control and transparency. Hence, the concentrated-debt-pooling equilibrium is the one of interest if one wants to understand corporate opaqueness.[28] In this equilibrium, the firm's debt level, D^*, is given by

$$E_{\pi,V} \min(V + \pi^{OO}, D^*) = I. \tag{8}$$

Under this contract, both types of firms will be bank-monitored and non-transparent. Denote the expected payoff of firm type $i = L, H$ under this contract by

$$P_i = E_\pi \max(V_i + \pi^{OO} - D^*, 0). \tag{9}$$

In order for this contract to arise in equilibrium, several conditions need to be satisfied. We will first derive these conditions and later discuss their restrictiveness. The first condition is that both types of firm must be willing to undertake the project at all under these terms. This means

$$P_L \geq V_L, \tag{10}$$
$$P_H \geq V_H. \tag{11}$$

The next two assumptions concern deviations by the firm to different financing choices. In order to establish the proposed pooling equilibrium, we require that under the most unfavorable market belief following a deviation, such a deviation is less profitable to the firm than the equilibrium contract. In other words, we assume that off-the-equilibrium-path beliefs by the market are pessimistic. This assumption is in the spirit of Myers and Majluf's (1984) original work and of most of the empirical work on the pecking order, and yields a minimal set of restrictions for our analysis.

[28] In particular, it is straightforward to adopt the analyis of this section to characterize the "hybrid" case, in which one firm is always (i.e. for both of its types) controlled by debt and the other by equity.

The first assumption in this vein excludes deviations to dispersed debt:

$$E_\pi \max(V_L + \pi^{TO} - D, 0) < I + \max(V_L - D, 0), \tag{12}$$

$$\text{where } D \text{ is given by } E_\pi \min(V_L + \pi^{TO}, D) = I. \tag{13}$$

Condition (13) describes the off-the-equilibrium scenario in which the firm raises fairly priced dispersed debt (with pessimistic market beliefs). Then there is no monitoring (by assumption), in which case we know from Proposition 3 that the firm prefers transparency over opaqueness. Condition (12) now states that the V_L type of firm in this situation will prefer to divert its funds. The payoff expected by investors, therefore, is $\min(V_L, D)$ (remember the assumption that market beliefs are pessimistic), which, by condition (7), is strictly smaller than I. Thus fairly priced dispersed debt financing is not an option, as investors would refuse to underwrite it. Clearly, unfairly priced debt would only increase the firm's moral hazard problem.

Condition (12) can be simplified by recognizing that $D > V_L$ and by substituting in D from (13). Hence, the condition is equivalent to

$$V_L + E\pi^{TO} < 2I. \tag{14}$$

The second assumption concerning alternative funding choices concerns equity finance. In order for a firm not to deviate to equity finance, we must assume that

$$P_L \geq (1 - s)(V_L + E_\pi \pi^{TO}), \tag{15}$$

$$P_H \geq (1 - s)(V_H + E_\pi \pi^{TO}), \tag{16}$$

$$\text{where } s \text{ is given by } s(V_L + E_\pi \pi^{TO}) = I. \tag{17}$$

Given our assumption of zero monitoring costs, (15) and (16) are necessary and sufficient for a deviation to equity finance to be unprofitable under pessimistic market beliefs (remember that by Proposition 2 controlling equity holders will choose transparency).

Conditions (10), (11), (14), (15) and (16), together with (7), are necessary and sufficient for a pooling equilibrium with concentrated debt and opacity to exist. The discussion up to now has assumed the behavior of the other firm and its financiers to be fixed. Given the dominant strategy results of

the last section, our discussion now implies the following proposition (the remaining formal proof is in the appendix).

Proposition 5 *Let D^* be given by (8) and suppose that (11), (14), (15) and (16) hold. Then there exists a Perfect Bayesian equilibrium of the overall financing game in which both types of each firm are financed by concentrated debt with face value D^* and in which both firms are opaque.*

Note that the four conditions in Proposition 5 imply condition (7), which was necessary for opaqueness in the analysis of concentrated debt in Section 4. In particular, in the equilibrium exhibited in Proposition 5, debt is risky.

The conditions in Proposition 5 are fairly natural. Condition (11) is the participation constraint for the V_H-type. If it is violated, the more valuable firm prefers to forego raising funds for the new venture. It is intuitive that the participation constraint of the V_L-type is redundant: if the V_H-type accepts the dilution of existing firm value brought about by the debt contract, the V_L type does so, too (since it stands to gain from the overpriced funding). Condition (11) is a strengthening of the condition that the project has positive net present value: the project should be sufficiently profitable for the firm to be interesting, even if the mispricing of the issued securities implies that the firm must give up part of its existing value in some contingencies.

Condition (14) concerns the moral hazard problem. In the given simple form, it is easy to interpret: If investors receive a sufficient part of total returns of a bad firm, $V_L + E\pi^{TO}$, to break even, then the remainder is not attractive enough to keep the firm honest (in the terms of Holmström and Tirole (1997), the firm's pledgeable income is not sufficient). Conditions (15) and (16) concern the dilution problem of equity, which must be sufficiently strong for both types of firms, in order to rule out equity finance. Different from the simplest Myers-Majluf case, it can be shown that neither of the two conditions implies the other.

Clearly, there are conditions under which other equilibria are possible. The case we study is one in which the investment is valuable enough to encourage external financing even if securities are mispriced, but not so much as to make owners insensitive to a proper pricing of existing activities or to make moral hazard negligeable.

A qualitative interpretation of the conditions in Proposition 5 yields the following rough taxonomy. For the proposed pooling equilibrium to exist,

the difference between returns under transparency and opaqueness should not be too large (in order to make the deviations in (14) and (15) and (16) not too attractive), V_H should not be too large (for the high type's participation constraint (11)) and not too small (for the dilution constraint (15)), V_L should not be too large (for the moral hazard constraint (14) and the dilution constraint (16)), and I should be neither too high (for the participation constraint (11)) nor too low (for the moral hazard constraint (14) and the dilution constraint (15)).[29] Finally, as product market competition becomes more intense (γ increases), profits decrease, which strengthens the moral hazard problem, but increases the relative value of transparency,[30] which decreases the attractiveness of controlling debt. Hence, we expect higher γ, ceteris paribus, to lead to more transparency.

This allows us to characterize the firm characteristics for which our equilibrium of bank dominance and opaqueness is most relevant: firms with a relatively large investment opportunity of limited profitability and moderate amount of assets in place, but with sufficient uncertainty concerning their value, prone to a moral hazard conflict between insiders and outsiders, and with limited product market competition.

Notice that if the firm is a young venture with few initial assets and little uncertainty about these assets (V_H small), the value of the new project will swamp any consideration of dilution, and equity financing would be preferred. This suggests that new firms with high growth opportunities are less likely to use bank debt, particularly if they are in a sector in which the gain from establishing leadership (i.e. the ability to show a strong competitive position via transparency) far exceed the cost of mispricing initial assets.

6 Conclusions

In this paper we have highlighted the impact of the dominant investors on the diffusion of information. In particular, we provide a rationale for the observation that lender-dominated firms are often more opaque. We suggest that even besides the lower degree of transparency accompanying private debt financing, public disclosure and the informativeness of security prices may be deliberately discouraged by a dominant lender in order to reduce the

[29] Numerical simulations, available on request and partially given in an earlier version, show that the range of parameters identified in Proposition 5 is large and plausible.

[30] Formally, this can be shown by differentiating (20) and (21) in the appendix.

riskiness of his loan.

In fact, the paper predicts that opaqueness may be self-reinforcing. In equilibrium, investors in firms which are difficult to monitor and control in the first place will choose bank monitoring, which further entrenches opaqueness. Hence, if the firm is difficult to monitor ex ante, it will be non-transparent ex-post.

An interesting side result is that the informational advantage of an opaque firm facing a transparent competitor does not translate in an outright competitive advantage. While lack of transparency ensures that it is shielded when in a weak competitive position, when the firm is in a strong position it cannot take full advantage of mutual knowledge of its strength to restrain output by competitors, losing market share precisely when its product is relatively profitable. Hence, the value of transparency depends on whether investors are interested in the upside or the downside of profits.

As a basis for our analysis of the influence of investors on firm transparency, the paper also provides a rational for lender control. Our argument synthesizes two strands of the literature that have up to now been studied in isolation - the capital structure theory in the tradition of Myers and Majluf (1984) and the corporate control literature in the spirit of Holmström and Tirole (1997). We argue that although there is a downside to lender control - strategic interference which yields excessively conservative decisions -, there is an important upside - the control of managerial moral hazard. If these two dimensions of investor involvement cannot be contractually separated, which is likely to be the case if the environment and decisions are sufficiently complex, firms may find it optimal to seek debt finance from a dominant investor.

In an international context, our notion of debt control is certainly more relevant to Japanese or continental European than to US companies, where equity or management control seems to be the norm out of Chapter 7 bankruptcy. Thus on average our model predicts higher corporate transparency in the US relative to Japan and Europe, which is what we observe. Whether the recent (modest) trend in continental Europe towards more transparency and in general more market-friendly corporate governance is related to a decline in bank influence, is a question that remains to be studied in more detail.

7 Appendix

In this appendix, we provide the formulae for the analysis of product market competition leading to Proposition 1 and sketch the remaining proofs.

The formulae for section 3 are obtained by standard calculations. Throughout, we consider the case in which quantities and prices are positive. For the case of competition under symmetric information (T,T), the equilibrium quantities are

$$\begin{aligned}
Q_{HL}^{TT} &= \frac{1}{2+\gamma}\left(\theta_H + \frac{\gamma}{2-\gamma}(\theta_H - \theta_L)\right), \\
Q_{HH}^{TT} &= \frac{\theta_H}{2+\gamma}, \\
Q_{LL}^{TT} &= \frac{\theta_L}{2+\gamma}, \\
Q_{LH}^{TT} &= \frac{1}{2+\gamma}\left(\theta_L - \frac{\gamma}{2-\gamma}(\theta_H - \theta_L)\right),
\end{aligned}$$

The corresponding profits (remember that costs are normalized to zero) are

$$\pi_{ij}^{TT} = (Q_{ij}^{TT})^2.$$

In the case where both firms' quality is private information, (O,O), each firm maximizes its expected profit, taking expectations over the other firm's θ.

The logic behind the payoff formula (3) is simple: if firm i chooses a very high quantity ($Q_i \geq \theta_i - \gamma Q_L^{OO}$), then it is sure to drive prices to zero; if it chooses a smaller, but sufficiently high quantity ($\theta_i - \gamma Q_H^{OO} \leq Q_i \leq \theta_i - \gamma Q_L^{OO}$), prices will be zero if the opponent is strong and positive if the opponent is weak; and for all other quantities ($Q_i \leq \theta_i - \gamma Q_H^{OO}$) prices will always be positive.

As assumed in Section 2, we restrict attention to parameters for which the first case in (3) is relevant, in order to keep the calculations simple. It is then straightforward to show that the unique symmetric Bayesian Nash equilibrium is given by

$$Q_H^{OO} = \frac{1}{2+\gamma}\left(\theta_H + \frac{\gamma}{2}(1-q)(\theta_H - \theta_L)\right),$$
$$Q_L^{OO} = \frac{1}{2+\gamma}\left(\theta_L - \frac{\gamma}{2}q(\theta_H - \theta_L)\right),$$

which are positive by (2). The corresponding profit levels in the four possible states are

$$\begin{aligned}
\pi_{HL}^{OO} &= \frac{1}{(2+\gamma)^2}\left(\theta_H^2 + \frac{\gamma}{2}(2+\gamma q)\theta_H(\theta_H - \theta_L)\right. \\
&\qquad \left. + \frac{\gamma^2}{4}(1-q)(1+(1+\gamma)q)(\theta_H - \theta_L)^2\right), \\
\pi_{HH}^{OO} &= \frac{1}{(2+\gamma)^2}\left(\theta_H^2 - \frac{\gamma^2}{2}(1-q)\theta_H(\theta_H - \theta_L)\right. \\
&\qquad \left. - \frac{\gamma^2}{4}(1-q)^2(1+\gamma)(\theta_H - \theta_L)^2\right), \\
\pi_{LL}^{OO} &= \frac{1}{(2+\gamma)^2}\left(\theta_L^2 + \frac{\gamma^2}{2}q\theta_L(\theta_H - \theta_L) - \frac{\gamma^2}{4}q^2(1+\gamma)(\theta_H - \theta_L)^2\right), \\
\pi_{LH}^{OO} &= \frac{1}{(2+\gamma)^2}\left(\theta_L^2 - \frac{\gamma}{2}(2+\gamma-\gamma q)\theta_L(\theta_H - \theta_L)\right. \\
&\qquad \left. + \frac{\gamma^2}{4}q(1+(1+\gamma)(1-q))(\theta_H - \theta_L)^2\right).
\end{aligned}$$

In the asymmetric case, where one firm's type is publicly revealed and the other's only privately known, the equilibrium is given by

$$
\begin{aligned}
Q_H^{TO} &= \frac{1}{2+\gamma}\left(\theta_H + \frac{\gamma(1-q)}{2-\gamma}(\theta_H - \theta_L)\right), \\
Q_L^{TO} &= \frac{1}{2+\gamma}\left(\theta_L - \frac{\gamma q}{2-\gamma}(\theta_H - \theta_L)\right), \\
Q_{HH}^{OT} &= \frac{1}{2+\gamma}\left(\theta_H - \frac{\gamma^2(1-q)}{2(2-\gamma)}(\theta_H - \theta_L)\right), \\
Q_{HL}^{OT} &= \frac{1}{2+\gamma}\left(\theta_H + \gamma\frac{2-\gamma(1-q)}{2(2-\gamma)}(\theta_H - \theta_L)\right), \\
Q_{LL}^{OT} &= \frac{1}{2+\gamma}\left(\theta_L + \frac{\gamma^2 q}{2(2-\gamma)}(\theta_H - \theta_L)\right), \\
Q_{LH}^{OT} &= \frac{1}{2+\gamma}\left(\theta_L - \gamma\frac{2-\gamma q}{2(2-\gamma)}(\theta_H - \theta_L)\right),
\end{aligned}
$$

with profits

$$
\pi_{ij}^{OT} = (Q_{ij}^{OT})^2
$$

for $ij = HH, HL, LH, LL$, and

$$
\begin{aligned}
\pi_{HH}^{TO} &= \frac{1}{(2+\gamma)^2}\left(\theta_H^2 + \frac{\gamma^3(1-q)}{2(2-\gamma)}\theta_H(\theta_H - \theta_L)\right. \\
&\qquad \left. -\frac{\gamma^2(1-q)^2(2-\gamma^2)}{2(2-\gamma)^2}(\theta_H - \theta_L)^2\right), \\
\pi_{HL}^{TO} &= \frac{1}{(2+\gamma)^2}\left(\theta_H^2 + \frac{\gamma(4-\gamma^2 q)}{2(2-\gamma)}\theta_H(\theta_H - \theta_L)\right. \\
&\qquad \left. +\frac{\gamma^2(1-q)}{2(2-\gamma)^2}(2+2q-\gamma^2 q)(\theta_H - \theta_L)^2\right), \\
\pi_{LL}^{TO} &= \frac{1}{(2+\gamma)^2}\left(\theta_L^2 - \frac{\gamma^3 q}{2(2-\gamma)}\theta_L(\theta_H - \theta_L) - \frac{\gamma^2 q^2(2-\gamma^2)}{2(2-\gamma)^2}(\theta_H - \theta_L)^2\right), \\
\pi_{LH}^{TO} &= \frac{1}{(2+\gamma)^2}\left(\theta_L^2 - \frac{\gamma(4-\gamma^2(1-q))}{2(2-\gamma)}\theta_L(\theta_H - \theta_L\right. \\
&\qquad \left. +\frac{\gamma^2 q}{2(2-\gamma)^2}(2(2-q)-\gamma^2(1-q))(\theta_H - \theta_L)^2\right).
\end{aligned}
$$

Proof of Proposition 1: Comparing the means of profit levels under transparency and opacity, using the above formulae, yields

$$E\pi^{TT} - E\pi^{OT} = q(1-q)\frac{\gamma^2}{(2-\gamma)^2}(\theta_H - \theta_L)^2(2 - \frac{\gamma^2}{4}) > 0 \tag{20}$$

$$E\pi^{TO} - E\pi^{OO} = q(1-q)\frac{\gamma^2}{(2+\gamma)^2(2-\gamma)^2}(\theta_H - \theta_L)^2(3 - \frac{\gamma^2}{4}) > 0 \tag{21}$$

The result for the variances follows similarly. ■

Proof of Proposition 3: Denote the debt level of the firm in question by D. Given the choice $C \in \{T, O\}$ of the other firm, the firm prefers to be transparent if and only if

$$\delta_C(D) := E \max(V + \pi^{TC} - D, 0) - E \max(V + \pi^{OC} - D, 0) \geq 0.$$

As discussed in Section 3, it is straightforward to show by direct calculation that profits under TC are more variable than under OC (for $C \in \{T, O\}$), with π^{TC} being a "median-preserving spread" of π^{OC}, in the sense that π^{TC} is statewise lower than π^{OC} in the two unfavorable states for the firm in question (LL, LH) and statewise higher in the two favorable states (HH, HL) (see Figure 1 in Section 3).

This state-by-state comparison of profit levels implies that $\delta_C(D) > 0$ for all $D < V + \pi^{TC}_{HL}$ if only $\delta_C(0) > 0$. This is because the graph of δ_C is (weakly) single-peaked, which becomes clear when walking backwards from $V + \pi^{TC}_{HL}$ (where $\delta_C = 0$) in Figure 2.

In other words, δ_C is positive for all D if only $E\pi^{TC} > E\pi^{OC}$, which has been shown in Proposition 1. ■

The proof of Proposition 4 is similar and omitted. A minor twist compared to the previous proof is that the controlling party here may not know the firm's profitability (if the financing in stage 2 and 3 is pooling). Therefore, the proof is in two (very similar) parts, one for the case of pooling, one for separating (and has more parts if one wants to consider mixed-strategy equilibria in the financing game).

Proof of Proposition 5: Written out, the four conditions of Proposition 5 are

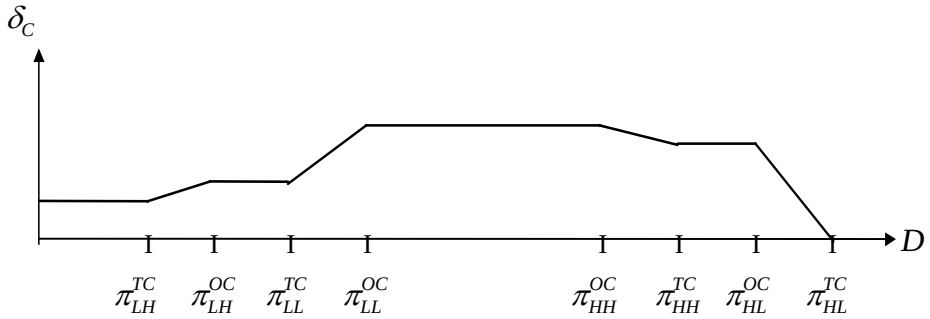

Figure 2: The graph of δ_C

$$
\begin{aligned}
&E_\pi \max(V_H + \pi^{OO} - D^*, 0) \geq V_H \\
&V_L + E\pi^{TO} < 2I \\
&E_\pi \max(V_H + \pi^{OO} - D^*, 0) \geq (1 - \frac{I}{V_L + E_\pi \pi^{TO}})(V_H + E_\pi \pi^{TO}) \\
&E_\pi \max(V_L + \pi^{OO} - D^*, 0) \geq V_L + E_\pi \pi^{TO} - I
\end{aligned}
$$

It is easy to see that the last condition implies the first part of (7) for $C = O$: if, contrary to the first part of (7), $V_L + \pi_{LH}^{TO} \geq I$, then $D^* = I$ and the last condition, (15), would be violated. Similar, it is straightforward to show that the first condition, (11), implies the second part of (7). It remains to show that the relevant participation constraint is the one for the V_H-type. Indeed, writing out the condition for the V_L-type (denoting the c.d.f. of π^{OO}

by F), one has

$$\begin{aligned}
E_\pi \max(V_L + \pi^{OO} - D^*, 0) - V_L &= \int_{\pi \geq D^* - V_L} (V_L - D^* + \pi) dF(\pi) - V_L \\
&= \int_{\pi \geq D^* - V_H} (V_H - D^* + \pi) dF(\pi) - \int_{\pi \geq D^* - V_H} (V_H - V_L) dF(\pi \\
&- \int_{D^* - V_H}^{D^* - V_L} (V_L - D^* + \pi) dF(\pi) - V_H + (V_H - V_L) \\
&= E_\pi \max(V_H + \pi^{OO} - D^*, 0) - V_H \\
&+ (V_H - V_L) F(D^* - V_H) + \int_{D^* - V_H}^{D^* - V_L} (D^* - V_L - \pi) dF(\pi) \\
&\geq E_\pi \max(V_H + \pi^{OO} - D^*, 0) - V_H.
\end{aligned}$$

■

8 References

Admati, Anat and Paul Pfleiderer (1998), "Forcing Firms to Talk: Financial Disclosure Regulation and Externalities", manuscript, Stanford University.

Ang, James and Stephen Ciccone, "International Differences in Financial Transparency", manuscript, Florida State University mimeo, 2000.

Becht, Marco and Colin Mayer (2000), "Corporate Control in Europe", manuscript, Oxford University.

Bhattacharya, Sudipto and Gabriella Chiesa (1995), "Proprietary Information, Financial Intermediation, and Research Incentives", Journal of Financial Intermediation 4, 328-357.

Bhattacharya, Sudipto and J. Ritter (1982), "Innovation and Communication Signalling with Partial Disclosure", Review of Economic Studies 50, 331-346.

Böhmer, Ekkehart (2000), "Business Groups, Bank Control, and Large Shareholders: An Analysis of German Takeovers", Journal of Financial Intermediation 9, 117-48.

Boot, Arnoud and Anjan Thakor (2000), "The Many Faces of Information Disclosure", Review of Financial Studies 13.

Bolton, Patrick and David Scharfstein (1990), "A Theory of Predation Based on Agency Problems in Financial Contracting", American Economic Review 80, 93-106.

Bolton, Patrick and Ernst-Ludwig von Thadden (1998), "Blocks, Liquidity, and Corporate Control", Journal of Finance 53, 1-25.

Brander, James and Tracy Lewis (1986), "Oligopoly and Financial Structure", American Economic Review 76, 956-970.

Burkart, Mike, Denis Gromb, and Fausto Panunzi (1998), "Why Higher Takeover Premia Protect Minority Shareholders", Journal of Political Economy 106, 172-204.

Burkart, Mike and Fausto Panunzi (2000), "Agency Conflicts, Owner Concentration and Legal Shareholder Protection", manuscript, Stockholm School of Economics.

Chirinko, Robert and Julie Ann Elston (1997), "Finance, Control, and Profitability: An Evaluation of German Bank Influence", manuscript, Johns Hopkins University.

Chevalier, Judith (1995), "Capital Structure and Product Market Competition: Empirical Evidence from the Supermarket Industry", American Economic Review 85, 415-435.

Dewenter, Kathryn and Vincent Warther, (1998) "Dividends, Asymmetric Information and Agency Conflicts", Journal of Finance 53, 879-904.

Dewenter, Kathryn, Walter Novaes, and Richard Pettway (2001), Visibility versus Complexity in Business Groups: Evidence from the Japanese Keiretsu, Journal of Business, forthcoming.

Diamond, Douglas (1984), "Financial Intermediation and Delegated Monitoring", Review of Economic Studies 51, 393-444.

The Economist (2000), "Cross about Holdings - A Survey of European Business", April 29, 2000.

Fan, Joseph and T. J. Wong (2000), "Corporate Ownership Structure and the Informativeness of Accounting Earnings in East Asia", manuscript, Hong Kong University of Science and Technology.

Fried, David (1984), "Incentives for Information Production and Disclosure in a Duopolistic Environment", Quarterly Journal of Economics 99, 367-381.

Gertner, Robert, Robert Gibbons, and David Scharfstein (1988), "Simultaneous Signalling to the Capital and Product Markets", RAND Journal of Economics, 173-190.

Goebel, Andreas und M. Fuchs (1995), "Die Anwendung der International Accounting Standards in den Konzernabschlüssen deutscher Kapitalgesellschaften", Der Betrieb 48, 1521-1527.

Hart, Oliver, *Firms, Contracts and Financial Structure,* Oxford University Press, 1995.

Hegde, Shantaram and John McDermott (2000), "Firm Characteristics as Cross Sectional Determinants of Adverse Selection", mimeo, University of Connecticut.

Holmström, Bengt and Jean Tirole (1997), "Financial Intermediation, Loanable Funds, and the Real Sector", Quarterly Journal of Economics.

Hoshi, Takeo, Anil Kashyap and David Scharfstein (1991), "Corporate Structure, Liquidity, and Investment: Evidence from Japanese Industrial Groups", Quarterly Journal of Economics 106, 33-60.

Jensen, Michael and Wilhelm Meckling (1976), "Theory of the Firm: Managerial Behavior, Agency Costs and Capital Structure", Journal of Financial Economics 3, 305-360.

Khanna, Tarun and Jan Rivkin (1999), "Estimating the Performance Effects of Networks in Emerging Markets", manuscript, Harvard Business School.

Kühn, Kai-Uwe and Xavier Vives (1994), "Information Exchanges among Firms and their Impact on Competition", manuscript, Barcelona.

Leuz, Christian (1998), "Voluntary Disclosure of Cash Flow Statements and Segment Data in Germany", manuscript, Universität Frankfurt.

Li, L. (1985), "Cournot Oligopoly with Information Sharing", RAND Journal of Economics 16, 521-536.

Myers, Stewart and N. Majluf (1984), "Corporate Financing and Investment Decisions when Firms Have Information that Investors Do not Have", Journal of Financial Economics 13, 187-221.

Nakatani, I. (1984), "The Role of Financial Corporate Grouping", in M. Aoki, ed. "Economics Analysis of the Japanese Firm", North Holland.

OECD (1999), "OECD Principles of Corporate Governance", OECD Paris.

Perlitz, Manfred and Frank Seger (1994), "Regarding the Particular Role of Universal Banks in German Corporate Governance", manuscript, Universität Mannheim.

Perotti, Enrico and Ernst-Ludwig von Thadden (1998), "Strategic Transparency and Dominant Investors", manuscript, Université de Lausanne.

PricewaterhouseCoopers (2000), "The Opacity Index", http://www.opacityindex.com/scripts/dow_download.pl?qfilename=deterredfdi.zi

Rajan, Raghuram (1992), "Insiders and Outsiders: The Choice between Informed and Arm's Length Debt", Journal of Finance 47, 1367-1400.

Showalter, Dean M. (1995), "Oligopoly and Financial Structure: Comment", American Economic Review 85, 647-653.

Singh, Nirvikar and Xavier Vives (1984), "Price and Quantity Competition in a Differentiated Duopoly", RAND Journal of Economics 15, 546-554.

von Thadden, Ernst-Ludwig (1998), "Asymmetric Information, Bank Lending and Implicit Contracts: The Winner's Curse", manuscript Université de Lausanne.

Weinstein, David and Yishay Yafeh (1998), "On the Costs of a Bank-Centered Financial System: Evidence from the Changing Main Bank Relations in Japan", Journal of Finance 53, 635-672.

Yosha, Oved (1995), "Information Disclosure Costs and the Choice of Financing Source", Journal of Financial Intermediation 4, 3-20.