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Corporate Financing and Product Market Competition: An Overview

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Abstract

This paper offers an overview of the main interactions between corporate financing decisions and product market competition. Financial policy may affect the market game in several ways. It can make a firm more or less vulnerable to predation, commit the firm to a particular market strategy, or convey signals to the firm's competitors. Financial policy matters also in that the decision to resort to a common lender can facilitate collusion among competing firms. Finally, an appropriate design of financial claims can commit the lender not to provide potential entrants with funding or expertise.

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Table of contents

1 Introduction

This paper reviews the literature on corporate financing and product market competition, studying *how firms' financial policy affects the market game*. Since Harris-Raviv's (1991) survey, which reviewed the early work on the subject, many economists have approached the above question. Here we will try to assess how the literature has evolved and what are the main ideas currently proposed.

In order to assess the real effects of financial decisions, economists have studied the interrelations between the credit market and other markets in which firms operate. Models of corporate financing and product markets are part of this wide research project. These models depart from the Modigliani-Miller (1958) theorem along two dimensions. First, as it is standard in modern corporate finance, asymmetric information between firms and investors is assumed, so that financial policy affects financing costs. Second, financial policy, by modifying the product market game, also affects firms' profits (gross of financing costs).[1] Therefore, firms' financial decisions must take into account product market considerations.

A main theme in this work is that market imperfections reinforce one another. For instance, credit market imperfections may favour exit or create financial barriers to entry so as to make oligopolistic industries even more concentrated. The appeal of these models, then, is that they delineate the channels through which firms' financial structure and industry structure are linked. As we will see later, this linkage implies that the degree of competition in the credit market affects competition in the product market. Some models also have important policy implications related to the debate on universal banking. It has been argued that, through an appropriate design of financial claims, firms can modify the competitive environment; banks' equity holdings, for instance, can favor collusion or concentration in the industry. This would suggest that banks should not be allowed to hold equity stakes in the firms they fund.

The idea that financial decisions have real product market effects is largely supported by the existing empirical evidence. Chevalier (1995) finds that a firm's stock market value positively responds to the announcement that a rival is going to issue debt, suggesting that leverage softens product market competition. In a recent paper, Zingales (1998) studies the survival of trucking companies after the deregulation of the U.S. trucking industry, and finds that leverage negatively affects the probability that a firm survives to increased competition. These results confirm that

[1] An important point that will emerge from this survey is that *any element* of the product market game is endogenously determined by firms' financial policy. The set of players crucially depends on how many firms manage to obtain enough liquidity to enter the market. The payoff functions are affected by the issuance of financial claims that modify the insiders' objectives. Capital structure decisions may convey information about firms' profitability, thus changing the information structure of the game. Finally, the strategy space may be easily constrained by financial conditions (think about a highly leveraged firm that cannot expand productive capacity and thus is constrained to choose low output levels).

finance cannot be neglected when trying to explain industry structure.

Offering a unified survey of the topic is a complex task for at least two reasons. First, the question of how a firm's financial decisions interact with its product market activity has no unique answer. As it is standard in industrial organization theory, the answer critically depends on which feature of a firm's market activity one focuses on (interaction with competing firms, with customers, or suppliers) and on the mode of competition one considers: price competition, Cournot competition, R&D races, and so on. Second, in order to explain why financial decisions are constrained, most papers assume that firms are faced with capital market imperfections. The source of these imperfections, however, differs from model to model: firms may be credit-rationed because of adverse selection problems, for moral hazard reasons, or because their income is unverifiable by outside investors.

If the first source of variety is itself the main attractiveness of the literature, the second may hamper a clear understanding and comparison of the different models and of the economic forces at work. What is needed in most of the surveyed papers is *some* form of credit-rationing; the main results *do not* depend on the specific model of corporate financing adopted. This survey tries to analyze the main concepts and ideas of the literature within a unified framework. A model of credit-rationing (in particular, a 'moral hazard story') is developed and then enriched in each section in order to illustrate the main relationships between a firm's financial policy and its product market performance. Theories that cannot be nested in our moral hazard model will be discussed at a more informal level. Throughout the paper we focus on the interaction between a firm and its competitors. We *do not* discuss the effect of capital structure on the interaction with customers and suppliers. This topic is already treated in Harris-Raviv (1991) and Faure-Grimaud (1998).

The paper is organized as follows. In section 2 we outline the basic corporate finance model, that describes a simple financing problem for a firm. Variants of this model are used throughout the paper. In section 3 we review the well-known "Long Purse" theory, the first attempt to argue that finance matters for product market competition. Section 4 is about strategic security design. We use this expression to refer to all theories trying to assess how a profit-maximizing firm can include strategic considerations when choosing the design of its capital structure. Unfortunately, these theories yield very different predictions on how firms' capital structure should affect the intensity of competition in the product market. Section 5 reviews a recent paper by Aghion-Dewatripont-Rey (1998), where increasing a firm's leverage makes the firm a tougher or a weaker competitor according to whether it relies much or little on external financing. Section 6 highlights the idea that a firm' financial structure may convey information to both the capital and the product market. Section 7 analyzes the role of the lender in affecting product market interactions. In particular, the role of a common lender as a device to coordinate firms' decisions and to induce collusive outcomes is a new and interesting issue. We also review recent works arguing that the design of the common investor's claim may have pro-competitive

as well as anti-competitive effects. Section 8 concludes.

2 The basic model

In what follows we will use modifications of the following model, based on Holmström-Tirole (1997). This describes the simplest financing problem for a firm. In order to enter the industry or to stay in the market, the firm must make a fixed investment I. The firm has cash A (in case of an established firm, this can be interpreted as retained earnings from past production); so it needs to borrow just $I - A$ from investors. If the firm is financed, then it can either succeed and obtain profit $R > 0$, or fail and get zero income. For the moment we abstract from the effect of competition on the probability distribution of profits. Later we will make different assumptions (for instance R will be a function of the quantity produced by the firm and its rivals).

The question is: under what conditions is the firm funded?

The Agency Problem

The firm is subject to moral hazard. After the investment is made and before returns are realized, the firm's manager can either work or shirk. If he works, the firm succeeds with probability p and fails with probability $1 - p$; shirking induces failure with probability 1, but it gives a private benefit B to the manager. B can also be interpreted as the disutility of effort saved by the manager when shirking.

Preferences

Throughout the paper the rate of interest and the rate of time preference will be taken to be zero. Both the borrower and the investors are risk neutral. Borrowing firms are protected by limited liability.

The Financial Contract

In this simple context the financial contract is just a cash flow splitting rule. The borrower's limited liability implies that in case of failure both parties receive a zero payment. In case of success, the parties share the profit: R_b goes to the borrower, and $R - R_b$ goes to the investor.

It is assumed that production is profitable if the manager works:

$$pR - I > 0 \tag{1}$$

This means that in a world of perfect financial markets (i.e. if managerial effort was verifiable) the firm would always be financed. If the manager shirks, the investment has net present value equal to $-I$. Thus, the firm cannot be funded unless the contract gives the manager the incentive to work. This will happen if the financial contract satisfies the following incentive compatibility constraint:

$$(IC_b) \quad pR_b \geq B \tag{2}$$

from which we know that the highest return that can be pledged to investors in case of success while preserving the manager's incentives is equal to $R - \frac{B}{p}$. Therefore, a necessary and sufficient condition for the firm to be funded is:

$$p\left(R - \frac{B}{p}\right) \geq I - A \tag{3}$$

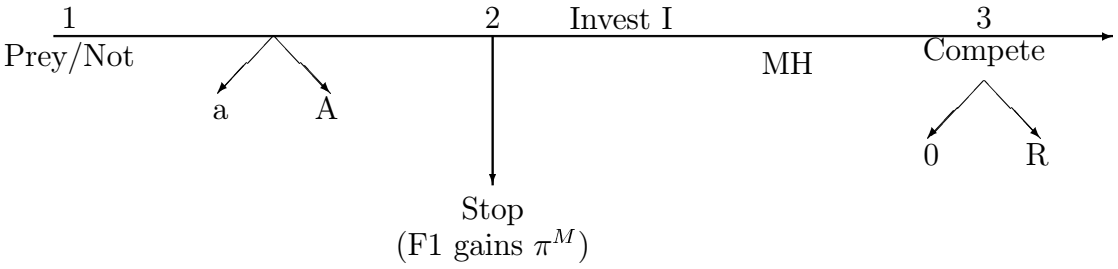
That is, expected pledgeable income must exceed the investor's financial outflow.

3 The long purse story

The idea that capital market imperfections can affect the structure of the product market dates back to Telser (1966) and his long purse story. The argument goes as follows: an entrant typically comes into the market with a more vulnerable financial structure than an incumbent. Therefore, an incumbent with a "deep pocket" can engage in predatory practices in order to exhaust the entrant financially and drive him out of the market. Capital market imperfections are implicitly assumed in order to justify the entrant's financial vulnerability.

The above argument is easily incorporated in our basic model. Assume two firms, F1 and F2, compete in the product market. We can abstract from the initial investment problem, and assume that no investment cost must be incurred to start production. At stage 1, Firm 1 can prey or not prey; each firm's return is a (A) if predation does (does not) occur, where $A > a > 0$. At stage 2, each firm must invest I in order to update its technology. Inability to invest forces a firm out of the market. At stage 3, if F2 did not invest, F1 enjoys expected monopoly profits π^M; otherwise, both firms have a stochastic structure of returns as in the basic model: conditional on exerting a high level of effort, return is R with probability p and 0 with probability $1 - p$. Expected duopoly profits are thus $2pR < \pi^M$. The timing is summarised in the following figure:

Figure 1



F1 starts the game with no financial resources, but at date 2 it can use retained earnings from date 1 towards covering the cost of investment. Therefore, depending on whether short-term profits were low or high it must borrow $I - a$ or $I - A$. The crucial point here is that retained earnings are in turn affected by product market competition. By reducing retained earnings, predatory practices may consistently reduce a firm's borrowing capacity. We assume that:

$$I - A < p\left(R - \frac{B}{p}\right) < I - a \tag{4}$$

If predation occurs, F2's internal funds at stage 2 are too small to obtain external financing; conversely, in the absence of predation, F2 will be able to raise funds $I - A$ on the capital market and compete at date 3.

Contrary to F2, F1 is a cash-rich firm. It has enough financial resources to fund I internally, whether predation occurs or not. By preying at t=1 it will be able to drive F2 out of the market and enjoy a monopoly rent later. Therefore F1 will prey if the condition $\pi^M + a > pR + A$ holds, that is if the cost of preying is more than offset by the gain from becoming a monopolist at t=3.

A few articles have formalized the long purse story, by endogenizing the firms' financial structure. The financial fragility that makes one firm vulnerable to predation may originate from different sources. In our simple model we assumed that both firms have potential agency problems, but that F1 is a cash-rich firm, and thus can finance investment internally. In Fudenberg-Tirole (1986) corporate cash flow is not verifiable, which makes debt an optimal financial arrangement for each firm.[2]

[2]When cash flow is not verifiable, the only way to induce managers to pay back the investors is to threaten to liquidate the firm if they do not. This kind of arrangement is easily interpreted

The entrant, though, has a financing requirement larger than the incumbent and thus must issue more debt. Being more leveraged than his rival, it is easily induced to default on his debt and exit the market by predatory strategies that decrease his cash flow. In Poitevin (1989a), the asymmetry between a new and established firm with respect to credit capacity is motivated by the latter having a past track record that reduces uncertainty about its quality[3]. As the entrant has no past track record, its financial decisions are constrained by asymmetric information vis à vis the investors: to signal its quality to the capital market, a high-value entrant must issue debt.[4] The established firm, instead, can resort to equity financing as its value is known to the capital market. As in Fudenberg-Tirole, debt financing makes the entrant vulnerable to predation.

In its attempt to study how capital market imperfections can affect competition in the product market, the "long purse" literature has established an important principle: *when firms have limited access to credit, "financial muscles" are a source of competitive advantage.* Therefore, financial factors are a crucial determinant of industry structure. Zingales (1998) provides some evidence supporting the idea that leverage makes a firm a weak competitor. He studies the survival of trucking companies after the regulatory reform that opened the U.S. trucking industry to competition, and finds that leverage negatively affects the probability that a firm survives after deregulation. Unfortunately, the source of the observed relationship between leverage and survival is not clear. It may be that leverage indirectly reduces a firm's probability of survival *by weakening its competitive position*, as the long purse theory predicts. But it is also possible that highly leveraged firms are forced out of the market because they are unable to finance new investments due to a debt overhang problem (Myers, 1977).

If a firm's financial structure can affect its interaction with competitors, a profit-maximizing firm will take this into account when taking its corporate financing decisions. The objective of the next section is to investigate how the design of financial arrangements can include product market considerations.

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as a debt contract, where the inability to repay triggers default and liquidation. For more details, see Hart-Moore (1989).

[3]The idea that an established reputation helps raise external finance is stressed by Diamond (1991). If lenders have a borrower's track record at their disposal, they can use it to update their beliefs about the borrower's reliability, which increases their willingness to provide funds. It is then likely that firms with a longer track record are also less credit-constrained than new firms. In their empirical study of lending relationships, Petersen-Rajan (1994) find that the availability of finance significantly increases with both a firm's age and the lenght of its credit relationships.

[4]A standard result in financial signalling models is that a good borrower may signal its quality to lenders by issuing debt. For example, if a project may yield a high or a low return (succeed or fail) and if the probability of the project yielding a high return is private information of the borrower, the latter may signal that this probability is high by writing a contract that pays out the whole profit to the lender in case of failure, i.e. a debt contract. By doing this, he shows that he is sufficiently confident that the project will succeed. For a formal treatment of financial signalling, see Ross (1977).

4 Strategic security design

4.1 The optimal financial response to predation

The threat of predation can be limited through a long term contract between the cash-poor firm and the investor. Let us go back to our "long purse" model. Before facing F1's competition (and possibly predation), F2 and its financier can sign a *long-term* contract whereby the investor commits to always fund the firm at stage 2 of the game in exchange for a repayment $R - \frac{B}{p}$ in case of success. If this contract is observable, it will discourage any predatory behavior of the incumbent: preying would cost the incumbent $A - a$, but it would fail to drive F2 out of business.[5]

Bolton-Scharfstein (1990) show that this response to predation may affect agency problems within the firm. In their model, the financial contract that minimizes agency problems maximizes rivals' incentives to prey. Therefore, optimal financial contracts result from a trade-off between deterring predation and mitigating incentive problems within the firm. This idea is illustrated in the following variant of the model.

Let us introduce a further stage at which a moral hazard problem arises within the firm, between date 0 (the financial contracting stage) and date 1: if F2's manager works, the short-term return with no predation is A with probability q and a with probability $1 - q$; if he shirks, he gets private benefit b and the return is a with probability 1. Predation induces the return a irrespective of managerial effort. The time line is therefore:

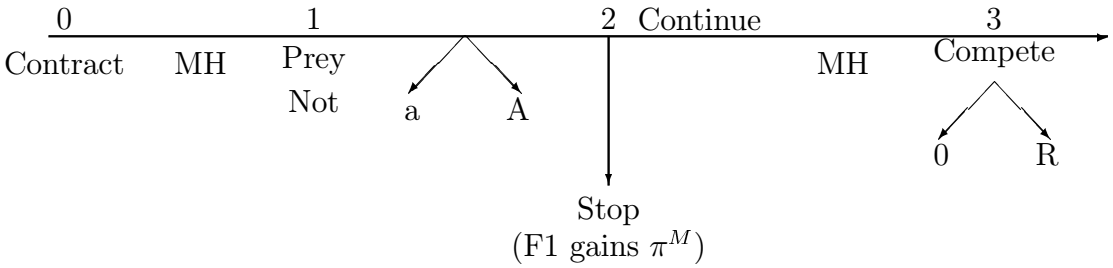

Figure 2

[5]The investor will accept such a contract: as predation will not occur in equilibrium, he expects to disburse $I - A$, which is smaller than the investor's expected return $p(R - \frac{B}{p})$.

Ideally, the optimal financial arrangement would take care of the firm's agency problem. In a long term credit relationship, date-0 effort can be induced through a commitment to terminate funding if the firm's short term performance is poor. More formally, consider the following class of contracts: "The firm is refinanced at date-2 with probability 1 if date-1 profit is A and with probability $x < 1$ if this profit is a. F2's manager receives a payment $\frac{B}{p}$ if F2 is refinanced *and* succeeds at t=3, and 0 otherwise". An optimal contract belongs to this class and sets the probability of refinancing x^* such as to maximize F2's net present value (conditional on the manager working):[6]

$$[qA + (1-q)a] + [q + (1-q)x](pR - I) \tag{5}$$

under the following constraints:

$$(IC)_0 \qquad [q + (1-q)x]B \geq xB + b \tag{6}$$

This constraint ensures that the manager works at date 0. The left-hand side is the firm's expected payoff from working: if predation does not occur and F2 works at t=0, the firm is refinanced with probability $[q+(1-q)x]$. Thus, it survives to date 3, when it gets a payoff $\frac{B}{p}$ with probability p. The right-hand side is the firm's payoff from shirking at t=0: if the firm shirks, it enjoys private benefit b today, and with probability x it survives to date 3, when it gets a payoff $\frac{B}{p}$ with probability p. The second constraint is:

$$(NP) \qquad [q + (1-q)x]pR + (1-q)(1-x)\pi^M + A \geq xpR + (1-x)\pi^M + a \tag{7}$$

This constraint ensures that the rival does not prey. With no predation (and F2 working), F1 earns duopoly profits pR with probability $[q + (1-q)x]$, and enjoys monopoly profits π^M with probability $(1-q)(1-x)$. Also, it earns the short-term return A. If instead it preys, F1 expects to face competition with probability x; however, predation reduces F1's short-term return to a.

Studying the above constraints, a potential conflict between agency problems and strategic objectives emerges. On the one hand, the incentive constraint requires a tough termination threat (x sufficiently small); on the other hand, predation is deterred if refinancing is not too sensitive to short term performance (x not too small). This tension captures the basic trade off in Bolton-Scharfstein's model. When the agency problem and the predatory threat are not too serious, there exists an optimal contract that satisfies both the incentive constraint and the no-predation constraint.

[6] The incentive power of the termination threat depends on its credibility, that is on the contract being "renegotiation-proof". We abstract here from this problem by assuming that renegotiation is not feasible at stage 2.

Otherwise, the financial contract must leave the agency problem unsolved in order to deter predation.[7]

4.2 Financial contracts as strategic commitments

Financial contracts may also be used as strategic commitments to take actions that are optimal *ex-ante* but not *ex post*. This feature of financial contracting emerges once this is modeled as the first stage of a delegation game.[8] Consider two firms playing a two-stage game: at the first stage, each firm designs its financial structure, at the second-stage firms compete on the product market. Market strategies are chosen by the firms' managers-shareholders, who are residual claimants to the firms' profits after outside financial claims are paid. The shape of the managers' objective functions, and thus of the reaction functions in the second-stage market game, is implicitly chosen at the first stage, when outside financial claims are designed. This implies that, by committing to observable financial contracts, firms can precommit to product market strategies, and thus affect the outcome of the market game.[9]

Brander-Lewis (1986) attribute such a strategic property to debt financing. They argue that oligopolistic firms may issue debt in order to commit to more aggressive output strategies. It is a well-known fact that in a Cournot game firms would like to precommit to high-quantity responses since this causes rivals to produce less at equilibrium. Debt financing is a way to achieve this commitment, owing to the "limited liability effect": as firms take on debt, their managers - being residual claimants over the firm's profits - just maximize equity value as opposed to total value. Thus they prefer output strategies that raise returns in good states and

[7] More formally, if the condition $\frac{b}{B} < \frac{A-a}{\pi^M - pR}$ is satisfied, then the optimal probability of refinancing x^* satisfies both constraints and is equal to $1 - \frac{b}{qB}$. Otherwise, predation can only be deterred at the expense of date-0 effort. In a more general model, the optimal contract may or may not deter predation (and leave the agency problem unsolved) according to the relative importance of these two problems.

[8] In a delegation game, competing principals "choose a compensation scheme for their agents, while these latter play a game on behalf of the principals. The payoffs of all players are determined by the actions chosen by the agents. The principals can influence the outcome of the game indirectly, by shaping their own agent's reaction function through the design of an incentive scheme, which becomes public information once chosen". For this definition, as well as for a general characterisation of equilibria in delegation games, see Polo-Tedeschi (1997).

[9] The idea that managerial incentives may be used as strategic tools is explored by Fershtman-Judd (1987). They study the incentive contracts that principals (owners) will choose for their agents (managers) in an oligopolistic context. At equilibrium, profit-maximising owners will distort the managers' incentives from profit maximisation, when competing managers observe these incentives. The nature of the desired distortion critically depends on the nature of oligopolistic competition. For example, if firms compete in quantities, a firm's owner will give his manager extra incentives to produce, as this will cause competing firms to reduce their production. By converse, if firms compete in prices, each owner will want his manager to set a high price, as this causes competing managers to also raise prices.

lower returns in bad states. If the marginal returns from output are larger in good states, then the quantity that maximizes the value of the manager's equity holdings is larger than the value-maximizing quantity.

To clarify this point, consider a simplified version of Brander-Lewis' two-stage oligopoly game. Two firms, F1 and F2, are rivals in the product market. At date 1, firms commit simultaneously to debt levels D_1 and D_2. At date 2, Cournot competition takes place on the product market. A firm's profit is $R_i(q_i, q_j, \theta_i)$, where q_i is firm i's output and θ_i is a random shock that is realized *after* production levels are chosen. θ_i and θ_j are i.i.d. random variables; the value is high (H) with probability p and low (L) with probability $1-p$. A high θ_i represents 'good news' about firm i's profit (R_i is increasing in θ_i). Two main assumptions are needed:

(A1) $$\frac{\partial^2 R_i}{\partial q_i \partial q_j} < 0$$

that is, firms compete in strategic substitutes, and

(A2) $$\frac{\partial R_i(H)}{\partial q_i} > \frac{\partial R_i(L)}{\partial q_i}$$

that is, marginal profit is increasing in the random shock. As standard in oligopoly models, it is also assumed that marginal profit is decreasing in the firm's output. Firm i's expected profit is:

$$pR_i(q_i, q_j, H) + (1-p)R_i(q_i, q_j, L) \tag{8}$$

Therefore, for an all-equity firm the first order condition for the output choice is:

$$p\frac{\partial R_i(H)}{\partial q_i} + (1-p)\frac{\partial R_i(L)}{\partial q_i} = 0 \tag{9}$$

Suppose that for some reason the firm takes on risky debt D_i. This means that $R_i(q_i, q_j, L) < D_i < R_i(q_i, q_j, H)$, for any couple q_i, q_j. Thus when the low state occurs the firm defaults and pays out all its earnings to debt-holders. Being residual claimants over the firm's profits, shareholders choose the firm's production level by maximizing the value of their equity-holding: $p\left[R_i(q_i, q_j, H) - D_i\right]$. Then the choice of output for firm i is given by the condition:

$$p\frac{\partial R_i(H)}{\partial q_i} = 0 \tag{10}$$

From assumption A2, this condition yields a higher output choice than the previous one. As managers choose output taking into account only the high marginal profit state, a leveraged firm has an incentive to choose a higher output than an all-equity firm. As leverage provides a commitment to more aggressive output strategies, at equilibrium both firms issue debt. As a consequence, the market outcome is

more competitive and both firms end up being worse off than if they were prevented from borrowing. Obviously, the above results crucially depend on the assumption that marginal profits are higher in good states of the world. However, in a Cournot game, this assumption seems quite reasonable (it holds either if θ_i is interpreted as a positive shift in the firm's demand function, or as a negative shift in the firm's cost function).

Brander-Lewis' model has been criticized on several grounds. The prediction that firms will prefer debt financing strongly depends on the fact that strategic objectives are the only determinant of financial decisions. The potential trade-off between strategic objectives and incentives - that characterises Bolton-Scharfstein's (1990) model - is completely neglected in their analysis. In a sense, this focus on strategic objectives is also a merit: it allows to show that - provided product markets are imperfectly competitive - even without credit market imperfections a firm's financial structure is *not* irrelevant, i.e. Modigliani-Miller (1958) theorem does not apply.

Secondly, as in any delegation game, the main results hold under the restrictive assumption that agents' contracts are observable and *not renegotiable*. In the Brander-Lewis' game, the commitment value of debt financing would be undermined by the possibility of renegotiation: if the two firms could secretly buy back debt just prior to choosing their outputs, they would repurchase all of it, thus completely undoing the ex-ante commitment. Fulghieri-Nagarajan (1992) suggest that asymmetric information between the firm and the investor may preclude debt renegotiation, making debt contracts a *credible* commitment.

Finally, the nature of the results critically depends on the mode of competition within the industry. This is a further shortcoming of delegation games, where different results emerge according to whether firms compete in strategic substitutes - and thus want to commit to more aggressive market strategies- or they compete in strategic complements - and thus want to commit to more friendly strategies.[10] Showalter (1995) studies the incentives to issue strategic debt when firms compete in prices (i.e. strategic complements). He shows that in this context, whether or not firms choose to issue strategic debt depends on the type of uncertainty that exists in the output market. When demand is uncertain, marginal profits are higher in the good state of nature; thus, a leveraged firm chooses a higher equilibrium price. In this context, debt carries a positive strategic effect, inducing the firm's rival to also raise its price. If instead, the uncertainty is on the firm's cost, debt does not have a strategic advantage. In this case, marginal profits are lower when costs are low (i.e. in the good state of nature). Therefore, a leveraged firm chooses a lower equilibrium price. This commitment effect of debt is undesirable, as it induces the

[10] Two firms compete in strategic substitutes (complements) if their reaction functions are downward (upward) sloping. This definition is due to Bulow-Geanakoplos-Klemperer (1985). For more details, see Tirole (1988), The Theory of Industrial Organization, pp.207-208.

rival to also decrease its price.

Chevalier-Scharfstein (1996) have a model that shares with Brander-Lewis the delegation game structure, but where firms compete in strategic complements at the second stage. At this stage, firms' pricing decisions trade off current profit maximization against the objective of building market share; this second objective induces more aggressive pricing strategies than in a standard Bertrand game. By issuing debt a firm becomes more short sighted,[11] and thus less inclined to invest in market share. Thus, debt financing leads to higher prices (i.e. shifts the firms' reaction functions outwards) and a less competitive outcome. This implies that, as in Brander-Lewis, firms may choose debt financing for strategic reasons. There is, however, a sharp difference between the two models. In Brander-Lewis, leverage - owing to the limited liability effect - "toughens" product market competition. Chevalier-Scharfstein's empirical prediction is that increased leverage - giving short–sighted incentives to managers - makes competition softer.

Existing empirical works provide an indirect test to discriminate between the two theories. Chevalier (1995) studies the effect of debt on product market competition in the supermarket industry. Her approach consists in observing how competitors react to a firm undergoing a leveraged buyout (LBO). She finds that a firm's LBO announcement causes the rivals' stock price to rise; it also induces expansion and entry of new competitors, suggesting that rivals perceive a leveraged firm as *a weaker competitor*. This evidence is consistent with the Chevalier-Scharfstein model, while rejecting Brander-Lewis' theory. A problem with Chevalier's empirical test is that capital structure decisions (in this case, the decision to undertake an LBO) are endogenous to the competitive environment, so it is difficult to say whether it is capital structure that affects competition or rather the competitive environment that induces a given capital structure. A more rigorous empirical approach consists in studying the product market response to *exogenous* events that imposed a change in firms' financial strength. Using the same set of data, Chevalier-Scharfstein (1996) test their theory by looking at the price response to recessions that reduced supermarket chains' liquidity. According to the theory, highly leveraged supermarket chains should respond to a recession by increasing prices, as the boost increases their probability of default. This prediction is confirmed by the empirical findings in the paper.[12]

[11] Leveraged firms are more short-term oriented as they may be unable to pay back debt, and thus face a positive probability of being liquidated in the future.

[12] The appeal of this evidence is that it supports a theory of countercyclical markups: markups are increased during boosts because, for financially constrained firms, the incentive to price for market share is reduced as they perceive a higher probability of default.

4.3 Capital structure and tacit collusion

In a repeated oligopoly model, Maksimovic (1988) shows that debt reduces firms' ability to collude, and thus toughens product market competition. As in Brander-Lewis (1986), this result is due to the limited liability effect. A well known result in the I.O. literature is that in an infinitely repeated Cournot model, tacit collusion can be sustained in a subgame perfect equilibrium in which each firm reverts to the Cournot output forever after a firm deviates from the collusive agreement.[13] Limited liability, by protecting managers from the price-quantity war triggered by a deviation, makes deviation relatively more attractive, and collusion more difficult to support.

Consider 2 identical firms competing in an infinitely-repeated Cournot oligopoly. Let r be the discount rate, π^C the per-period profit when firms stick to the collusive agreement, π^D the one-period profit from deviating when rivals collude, and π^{NC} the per-period profit when the Nash-Cournot equilibrium is played. Consider first the case of unleveraged firms. Then the collusive agreement can be sustained if net short-run gains from deviating are not larger than discounted losses from the punishment phase, that is, if:

$$\pi^D - \pi^C \leq \frac{\pi^C - \pi^{NC}}{r} \tag{11}$$

which is true if $r \leq r^\star = \frac{\pi^C - \pi^{NC}}{\pi^D - \pi^C}$.

This condition must be modified for a leveraged firm, where managers maximise the value of equity. Suppose the firm has borrowed an amount I against the obligation to pay bondholders an amount b in every period, with $b > \pi^{NC}$. Then, the condition for the collusive agreement to be sustained by trigger strategies becomes:

$$\pi^D - \pi^C \leq \frac{\pi^C - b}{r} \tag{12}$$

or equivalently, $r \leq r^{\star\star} = \frac{\pi^C - b}{\pi^D - \pi^C}$. This condition is stricter than condition (11). Moreover, $r^{\star\star}$ is decreasing in b, i.e. tacit collusion becomes more difficult to support as the firm's leverage increases. The intuition for this result is the following. In the punishment phase, profits π^{NC} are so low as to drive the firm bankrupt and the manager's payoff to zero. However, limited liability implies that increasing the amount of debt b above π^{NC} cannot reduce further the punishment payoff for the manager. Rather, it reduces the manager's payoff from collusion, $\pi^C - b$. As a consequence, an increase in the per-period debt obligation b can only make deviations more attractive for the manager, and tacit collusion more difficult to support. Maksimovic identifies several financial instruments, such as warrants, convertible debt and dividend restrictions, that can moderate this pro-competitive effect of debt by committing the managers-shareholders to a more conservative behaviour.

[13] For more more on this, see Green-Porter (1984).

In a very recent paper, Spagnolo (1998) studies how the choice of a manager and the design of managerial incentives affect the firm's ability to support tacit collusion in Maksimovic's model. He argues that shareholders can commit to a "conservative" behaviour by hiring a manager with a valuable reputation or building low-powered managerial incentives. This commitment vis a vis debtholders also facilitates tacit collusion in the product market. A highly reputed manager has much to lose from bankruptcy, and thus will stick to the collusive agreement in order to avoid the punishment phase that provokes bankruptcy. Moreover, if the manager is paid a fixed wage W, plus a bonus B whenever profits are higher than π^{NC}, he has no incentive to deviate for any discount rate: his net short-run gain from deviation is zero (as he earns $W + B$ both when deviating and when colluding); whereas, his discounted loss from the punishment phase is $\frac{B}{r}$. Spagnolo argues that this result can explain Jensen-Murphy's (1990) evidence on the relatively low power of real world managerial incentive schemes: when oligopolies persist over time, "low powered incentives, besides reducing the agency cost of finance, also maximise firms' value by allowing higher (collusive) profit streams to be supported in equilibrium".

A problem with the above reasoning is that, as in delegation games, managerial incentives are not credible commitments. Assume a firm's shareholders design a managerial incentive scheme that makes the manager strictly prefer collusion to deviation (for instance, the bonus contract above). Then, if condition (11) does not hold (that is, deviating increases a firm's value), in any period shareholders have an incentive to secretely renegotiate this contract and induce the manager to deviate from the collusive agreement. The possibility of renegotiation destroys the commitment to a collusive behaviour vis a vis the product market rival. Spagnolo suggests that issuing debt to a *common lender* and conferring him the formal right to control managerial contracts is a way to restore the commitment to tacit collusion. Suppose both competing firms issue debt to lender L and set up the pro-collusive managerial contract. Then, if one firm deviates the lender will lose from both borrowers, and therefore he will be opposed to any renegotiation of managerial contracts leading to unilateral deviations. The idea that a common lender may facilitate collusion in the product market is explored in more detail in section 7.

5 Finance and the nature of competition

The models surveyed so far assume a particular mode of competition in the product market and study the impact of firms' capital structure on the competitiveness of the industry. Unfortunately, this approach generates very context-specific results. A further step consists in endogenising the mode of competition among firms. In a very recent paper, Aghion-Dewatripont-Rey (1998) argue that *the very nature of strategic interaction is influenced by the firms' needs for outside finance.* In their paper, the need for outside finance interacts with product market behaviour in a non-monotonic

way. According to the level of outside finance required $(I - A)$, a firm is subject to two regimes. A firm with a small financial needs is in a *shirking regime*: here a small increase in the level of outside finance makes the firm a weaker competitor. Moreover, a tougher competitor makes the firm softer, i.e. firms compete in strategic substitutes. A firm with large financial needs is in a *bonding regime*: here a small increase in the level of outside finance makes the firm a tougher competitor. In this regime firms compete in strategic substitutes, that is, a tougher competitor makes the firm tougher.

Assuming two symmetric firms, the paper's predictions are summarised as follows:

	Shirking	**Bonding**
$I - A \uparrow$	*Weak*	*Tough*
Competition	*Strat. subst.*	*Strat. compl.*

Aghion-Dewatripont-Rey analyse a two-stage game. At stage 1, firms write financial contracts (or equivalently, managerial incentives are set up) and obtain funds $I-A$. At stage 2, R&D competition takes place, returns are realised, and firms' managers are paid. The strategic variable is R&D effort e_i. Effort is non-verifiable, and it increases the probability of innovation: $p(e_i) = e_i$. If both firms make an innovation, then Bertrand competition drives market profits to zero. Therefore, a firm receives the innovation profit R if and only if it is the sole inventor in the industry, 0 otherwise. A financial contract splits the return in case of success between the firm (R_b), and the investor $(R - R_b)$.

The firm is run by a risk neutral manager, whose private cost of R&D is $\Psi(e_i, a_i)$. The variable a_i represents all privately costly *observable* actions such as hiring R&D specialists, setting up monitoring systems, buying an R&D lab. These actions are taken before effort is chosen, and involve a large increase in total private cost Ψ, but help the firm commit itself to high levels of R&D. It is assumed that an increase in a_i reduces the marginal cost of effort: $\frac{\partial^2 \Psi}{\partial e \partial a} < 0$.

In order to obtain funds $I - A$, the firm must be able to satisfy the investor's participation constraint:

$$(IR) \quad e_i(1 - e_j)(R - R_b) \geq I - A \tag{13}$$

Consider first the case of a small financial need $I - A$. In this case the firm can obtain funding without resorting to costly commitment devices. Thus, at t=1 it is optimal to set $a_i = 0$. Then, date-2 R&D effort is determined by the manager's incentive constraint:

$$(1 - e_j)R_b = \Psi_e(a_i = 0) \tag{14}$$

where Ψ_e is the partial derivative of Ψ with respect to e_i. From (12) it is immediate that R&D efforts are strategic substitutes: an increase in the competitor's effort e_j

reduces the marginal expected benefit of R&D, thus reducing e_i. This is the shirking regime.

When instead the need for outside funds $I - A$ is large, the firm is obliged to take observable costly actions to commit to a high level of effort, otherwise (11) does not hold and the investor refuses to fund the firm. Therefore, $a_i > 0$ and effort is defined by:

$$(1 - e_j)R_b = \Psi_e(a_i > 0) \tag{15}$$

The costly commitment must be stronger (i.e. a_i larger) as financial needs (the right hand side of (11)) are increased, or - equivalently - as the investor's expected returns (the left hand side of (11)) are decreased. In particular, as the competitor's effort increases, *ceteris paribus* the expected return to investors is reduced. In order to obtain funding, the firm must compensate this reduction through *an increase* in its own effort e_i (this is done by increasing a_i) Therefore, in the bonding regime, R&D efforts are strategic complements.

Within this framework, the authors reinterpret the standard entry deterrence problem analysed in Fudenberg-Tirole's (1984) seminal paper. There, an incumbent willing to accomodate entry may undergo strategic overinvestment or underinvestment, according to whether competition is in strategic substitutes or strategic complements, and whether overinvestment makes the incumbent tougher or softer. Aghion-Dewatripont-Rey's analysis adds several insights to that problem. First, it is argued that an increase in capital investment is not the only instrument to affect the firm's competitiveness. The incumbent may also commit to a tougher/softer product market behaviour by modifying its outside financial needs (for instance by distributing or retaining prior earnings). Second, an increase in outside financial needs will make the incumbent softer or tougher according to the *initial* level of outside finance (i.e. whether it is in a shirking or a bonding regime). Third, the level of the entrant's outside finance modifies the slope of its reaction function and thus the incumbent's strategic incentives: if the entrant's need for outside finance is large, its reaction function is sloped downwards, and thus the incumbent wants to commit to be tough. If the entrant's need for outside finance is small, its reaction function is upward sloped, and the incumbent wants to commit to be soft. As a consequence, the strategic incentives of the incumbent crucially depend on the prior level of outside finance of both the incumbent and the entrant.

In our view, Aghion-Dewatripont-Rey model offers a unifying framework to revisit the literature on capital structure decisions and product market competition. As we already pointed out, a major limit in this literature is that results critically depend on the nature of competition in the product market. Conversely, Aghion-Dewatripont-Rey do not make any assumption on the nature of competition, which is endogenously determined by the level of internal funds. Unfortunately, in their

model capital structure is irrelevant,[14] and thus the paper does not provide any prediction on the interplay between capital structure and market behaviour. One might want to generalise their model to discuss *how* additional external finance is obtained (through debt or equity issues) as the need for outside finance grows. We plan to address this issue in future research.

6 Simultaneous signalling to capital and product market

There is a growing literature studying how a firm's financial structure may convey information about the firm's profitability to both the capital market and the product market. Standard models of financial signalling (Ross 1977, Myers-Majluf 1984) analyse how informed managers attempt to signal private information to the capital market through financial decisions, but abstract from the other markets in which the firm operates. Bhattacharya-Ritter (1983) are the first to argue that private information disclosed to the capital market may be observed and exploited by a firm's competitors. In their model, a firm engaged in R&D activity possesses private information that enhances its research as well as that of competitors. Therefore, when choosing the amount of information disclosure, the firm faces a trade-off between raising funds at better terms and reducing the value of its informational advantage.

Gertner-Gibbons-Scharfstein (1988) focus on *indirect* information revelation through capital structure, rather than direct and verifiable information disclosure. Their paper builds on Myers-Majluf (1984) financial signalling game, where high-profit firms may separate from low-profit ones by issuing more debt,[15] and introduces the product market as a second audience to the firm's signalling. If product market profits are lower for a firm when capital structure reveals its value to competitors, then there is a tension between the need to signal value to investors (to increase credit availability) and the objective of maximizing profits. For instance, a firm may want to signal to investors that the demand for its product is high, but still be reluctant to convey this information to potential entrants in that market, as this would encourage entry and thus reduce product market profits. In contrast, the firm faces no trade-off between signalling that it has low costs to the capital market and to the potential rivals whose entry it wants to deter.

In a very recent paper by Benveniste-Busaba-Wilhelm (1997), the existence of informational externalities among product market rivals leads firms to delay going public. The idea is that when a firm undergoes an IPO, information regarding not only the firm's profitability, but also the whole industry in which it operates,

[14] As returns are either R or 0, the investor's repayment $(R - R_b)$ can be implemented both through debt $D = (R - R_b)$ and an equity share s=$\frac{(R-R_b)}{R}$.

[15] On this, see footnote 4.

is acquired by investors and then aggregated in primary market prices. Both the IPO firm and its rivals can usefully condition their production and investment decisions on this information.[16] This information externality created by the issuing firm is particularly valuable in emerging industries. As going public is costly, firms belonging to the same industry have an incentive to "free ride" on one another, waiting for their rivals to bear the cost of information production. Financial policy is thus affected by the interaction with competitors also in terms of the decision to go public.

In Benveniste-Busaba-Wilhelm firms delay going public just in order to free ride on the rivals's IPO costs. However, the authors do not explore the possibility that firms may strategically delay going public in order to hide valuable information from current and potential rivals. Conversely, Yosha (1995) argues that firms with valuable private information may *strategically choose the financing source* that imposes the lowest information disclosure requirement. This leads to the theoretical prediction that higher quality firms prefer bilateral financing to multilateral financing arrangements, and private equity placements to public offerings, in order to reduce the risk of information leakage to competitors. Moreover, innovative firms may be reluctant to go public, fearing the reaction of competitors to information disclosed through the IPO.

7 The role of the lender in the product market

Yosha's (1995) results on the choice of the financing source uncover another important idea: the lender's identity is itself a crucial determinant of the product market game. In his model, however, the lender is assigned a passive role in the market game. The lender's identity matters in that different financing sources impose different disclosure requirements on firms. Recent developments in the literature on corporate finance and product market competition have assigned a more active role to the lender, and investigated various ways in which he can affect the market game. In particular, it has been stressed that the choice to resort to a common lender may induce collusive outcomes in the product market.

7.1 Common lender as a coordination device

Recent works have suggested that a common lender, acting as a common contracting party, may help competing firms coordinate their production and investment deci-

[16] This last claim is supported by the casual evidence that the successful Netscape's 1995 IPO encouraged many new firms to enter the internet business. The extraordinarily positive reception for Netscape's IPO reduced any doubts that potential rivals might have about the profitability of commercial applications for the internet.

sions.[17] This idea is not new to the industrial organization literature: Bernheim-Whinston (1985) already pointed out that rival firms may achieve the fully collusive outcome by selling their products through a common marketing agent, with no need for explicit collusive agreements. In their model the common agent, internalizing the externality that one firm's strategy exerts on the rivals, will choose the fully collusive prices and marketing strategies.

In Poitevin (1989b) centralized financing is proposed as a collusive practice within the Brander-Lewis market game, where at equilibrium both firms issue debt for strategic purposes, and are worse off than under the full-equity solution. Poitevin suggests that a common lender could drive the industry towards more collusive outcomes; therefore, centralized financing will be preferred to bilateral financing, where each firm is funded by a different bank.

To understand why, consider the continuous version of the model in section 4.2. As returns are distributed on a continuous support, each debt level induces a different shape of the manager's residual claim, and thus a different output strategy. In particular, higher debt levels make the firm's managers more and more risk-loving, generating more aggressive output strategies. In this context, loans' values are correlated through the output market: raising firm i's debt repayment D_i increases firm i's output and decreases firm j's output, thus reducing firm j's debt value. A common lender internalizes the externality that a firm's output has on the rival's market value and expected debt value, and therefore limits the amount of debt issued by each firm with respect to the bilateral financing case (where two investors choose debt levels for firms i and j non-cooperatively). As a result, equilibrium output is also lower with respect to the bilateral financing configuration. Thus, from an industry point of view, the common-bank configuration dominates the bilateral financing one.

The above analysis has an important implication. As Poitevin points out, "*the identity of the lender becomes a relevant choice of the firm's financial policy. The lender's identity may be value-creating for firms in imperfect output markets*".

According to Bhattacharya-Chiesa (1995), a common lender can implement efficient knowledge spillovers among competing firms, when knowledge-licensing contracts are not available. In their model two firms engage in costly research in order to gather technological knowledge to be used in a subsequent R&D race. Possession of technological knowledge increases the probability of discovering a patentable in-

[17] This hypothesis is supported by the empirical observation (Hellwig, 1991) that German and Austrian banks facilitated product market collusion among their borrowing firms. The claim that monopolistic lenders may facilitate product market collusion is also a main argument against the "money trust", i.e. the group of investment bankers (led by J.P. Morgan's partnership) that in the early 1900 dominated the business of issuing securities for big US corporations. As B. De Long (1990) points out, this dominance "...meant the creation of value for shareholders by the extraction of monopoly rents from consumers: if Westinghouse and G.E. share controlling directors, their competition is unlikely to be too intense..." ("Did J.P. Morgan's Men Add Value? An Economist's Perspective on Financial Capitalism", p.7).

novation at the R&D stage. The market value of an innovation depends on whether the firm is the sole inventor or not: if just one firm succeeds in the R&D activity, the innovation yields a profit R; if both firms innovate, competition drives profits to zero. There are thus three relevant states of nature:

R&D success	**Profit**
No firm	0
Both firms	0
One firm	R

In this setting, sharing interim knowledge between competing firms before the R&D race starts has two opposite effects on industry-wide profits. On the one hand, it acts as an insurance system. With no knowledge sharing, if just one firm succeeds in gathering interim knowledge but then fails in the subsequent R&D activity, its interim knowledge is wasted. Thus, knowledge sharing decreases the probability that no firm in the industry makes an innovation. On the other hand, knowledge sharing increases the probability that both firms make the innovation. The ex-ante optimal level of knowledge sharing is computed by trading-off these effects so as to maximize the probability that *exactly one* firm makes an invention. Indeed, this is the only event that creates value for the industry.

If knowledge licensing contracts are not feasible, firms are unable to commit to efficient knowledge sharing, since at the interim stage it is *never* optimal for a firm to disclose any information to its rivals. Bhattacharya-Chiesa argue that *a centralized financing arrangement, whereby a common bank funds both firms and learns their private information, can implement the efficient knowledge sharing*. If the bank holds debt in both firms, it will select the efficient level of information sharing. In other words, it will disclose interim information by one firm to the rival exactly when this is optimal from the industry point of view.

Although the idea that a common lender may facilitate desirable knowledge spillovers is correct, the result that debt is the optimal contract strongly depends on the structure of the model, in particular on the assumption that industry profits are zero when both firms innovate. Under this assumption, there is no difference between maximizing overall debt value and maximizing firms' value, which explains why the common bank chooses the first best level of knowledge sharing.[18] To understand why, consider a more general model where the innovation yields profit R^H if the firm is the sole inventor, and a lower profit, say R^L, if both firms innovate.

[18]This observation is based on the more general principle that when returns are either R or 0 like in Bhattacharya-Chiesa, debt and equity are equivalent, linear claims. For instance, a debt claim D can be reinterpreted as an equity share $s = \frac{D}{R}$, as both give rise to the same payments to the investor. In this simple model, both an equityholder and a debtholder want to maximize the probability that just one firm innovates.

R&D success	Profits
$No\ firm\ (N)$	0
$Two\ firms\ (T)$	R^L
$One\ firm\ (O)$	R^H

Expected industry profits are equal to $\Pr(T)2R^L + \Pr(O)R^H$, where $2R^L < R^H$. Therefore, as in the first example, optimal knowledge sharing maximizes the probability that exactly one firm innovates.

If the common lender is entitled to a share s of profits he chooses to disclose knowledge when this maximizes industry value; a debt holder, instead, would disclose knowledge more often than optimal. The reason is that, holding a concave claim, the debt holder strongly dislikes the state where no firm innovates but is not much affected by the event that both firms innovate. Therefore, he favors a policy of information disclosure as it reduces the risk of no invention at all. For example, if the common lender is entitled to a debt repayment $D < R^L$ from each firm, his payoff is D if just one firm innovates and $2D$ if both do. Therefore, it is always in his interest to disclose information to a firm's rival.

The above comment should make it clear that the design of financial claims is more important than has hitherto been realised. Once it is recognised that the investor is an active player in the product market game, it is important to ask which are the investor's (financial) incentives to modify the competitive interaction among firms. In Bhattacharya-Chiesa, for example, it is not enough for firms to enjoy a common investor; they must have an investor with the *right* financial incentives to knowledge disclosure. Little attention has been addressed so far to the issue of investors' incentives in the product market game. In the next section we study two papers that look at this problem more closely.

7.2 Anti-competitive financial contracts

The *type* of claim that investors should be allowed to hold in firms has at times been an important policy issue. The literature on the universal banking system has often criticized banks' equity-holdings on the grounds that they might hamper funding possibilities for young firms and distort competition in the product market.[19] Cestone-White (1998) provide a theoretical argument supporting this conventional wisdom. They argue that *investors might choose to hold equity (and more generally, risky claims) in the firms they fund in order to credibly commit not to fund the entry of potential competitors.*

In the simplest version of their model, an investor is the sole provider of capital to a new industry. There are two potential entrants, F1 and F2. Each needs to

[19] See Benston (1994) and Saunders (1994) for a discussion of the costs and benefits of universal banking.

pay a cost I in order to enter the market. As firms have no internal funds, a firm's entry is deterred unless it is financed by the monopolistic investor.[20] After a firm is funded, the firm's manager exerts an unobservable effort e_i, at cost $\Psi(e_i)$. Then, the firm can either succeed and obtain profit R^H, or fail and obtain profit $R^L > 0$. The probability of success is affected by both managerial effort and product market competition: if only one firm is in the market, its probability of success is e_i; otherwise it is $e_i - \Delta$. A financial contract between a firm and the investor is a cash flow splitting rule $\left\{R_b^L, R_b^H\right\}$, specifying the borrower's compensation in case of failure and success. Assume first that firm 2 does not exist. Then, the optimal contract for F1 maximises the firm's net present value:

$$e_i R^H + (1 - e_i)R^L - \Psi(e_i) - I \tag{16}$$

subject to the manager's incentive constraint:

$$(IC) \quad R_b^H - R_b^L = \Psi_e \tag{17}$$

and the investor's participation constraint:

$$(IR) \quad e_i(R^H - R_b^H) + (1 - e_i)(R^L - R_b^L) \geq I \tag{18}$$

In the simple case $I \leq R^L$ the optimal contract is *safe debt* $D = I$. This induces the first best level of effort, as: $R_b^H - R_b^L = R^H - R^L = \Psi_e(e^{FB})$. More generally, the optimal contract links the managerial compensation to the firm's profit, so as to induce a high effort. This is equivalent to issuing a relatively safe claim to the investor. For illustrative purposes, we focus hereafter on the simple case $I \leq R^L$.

Assume now that firm 2 is willing to enter the industry and compete. As competition reduces industry profits, it is ex ante optimal to let just one firm, say F1, enter the industry and deny funding to F2. There is however a commitment problem which had not previously been recognised by the literature. Assume the investor signs a contract in which he agrees to supply funds to F1 in return for safe debt. Then, after the contract with F1 is signed, the investor is tempted to fund the second firm to enter the industry, as his claim is safe and thus unaffected by product market competition.[21] Thus a common lender is not sufficient to coordinate industry outcomes; the investor's claim must also be designed appropriately.[22] The solution

[20] For those who are familiar with the literature on *foreclosure*, this is simply the idea that the owner of an essential input (in this case, money) may extend his monopoly power to a potentially competitive segment by denying proper access to the essential input. For a complete survey of the foreclosure arguments, see Rey-Tirole (1997).

[21] The expected value of the claim is D, whether F2 is funded (and thus F1 succeeds with probability e_1), or F2 is not funded (and thus F1 succeeds with probability $e_1 - \Delta$).

[22] Ideally, the investor should write an exclusive dealing clause in his contract with F1, promising not to fund any competing firm. But such a clause is likely to be prohibited by anti-trust laws. Therefore the investor must be given a financial incentive not to fund F2.

consists in making the investor's claim in F1 more sensitive to the effect of competition. Cestone-White show that the optimal anti-competitive financial arrangement gives the investor debt *plus an equity stake* α in F1. Then, the expected value of the investor's claim in F1 becomes:

$$D + e_1\alpha(R^H - D) + (1 - e_1)\alpha(R^L - D) \tag{19}$$

with no product market competition, and:

$$D + (e_1 - \Delta)\alpha(R^H - D) + (1 - e_1 + \Delta)\alpha(R^L - D) \tag{20}$$

with product market competition. Holding an equity stake in F1, the investor internalizes part of the externality that funding F2's entry has on F1's probability of success and profits. Provided the equity stake is sufficiently large, it is not in the investor's interest to fund F2. He then acts like a monopolistic supplier who vertically integrates with a retailer to commit not to supply competing retailers.

As in Bolton-Scharfstein (1990), achieving product market goals (in this case, entry deterrence) through the firm's financial structure may worsen agency problems within the firm. On the one hand, alleviating agency problems would require leaving the manager with most of the risk; on the other hand, committing the investor not to fund F2 requires issuing a risky claim. This conflict between the manager's and the investor's incentives implies that F1's monopoly position can only be preserved at the expense of a lower managerial effort.

Of course, shutting out firm 2 completely is only possible if there are no other banks to lend to F2. Then, the absence of competition in the credit market leads to no competition and managerial slack in the product market. In a more general model with imperfect competition among investors, Cestone-White also show that the rate of entry, and thus the degree of competition in an industry is positively related to the degree of competition in the financial market. Thus, the paper has strong implications for banks'equity-holdings: under certain conditions (above all, limited competition in the financial sector) banks' equity stakes in industrial firms may have anti-competitive effects. This is a further argument in favor of the Glass-Steagall Act and the prohibition of universal banking.

In contrast, Arping (1997) studies the case of perfect competition in the capital market. He shows that in this case banks' industrial ownership can facilitate financing for young firms and thus has pro-competitive effects. In his model *a bank holding an equity stake in an incumbent firm can improve the credit relationship with a new entrant, by alleviating a "soft budget constraint" (SBC) problem.* SBC problems arise when the borrower's incentives (to make short term repayments if income is unverifiable, or to exert effort in a moral hazard model) must come from a termination threat. If information accrues to the investor at an intermediate stage that sheds light on date-0 moral hazard, it is optimal to commit to liquidate the firm if a bad signal arrives. If the termination threat is not credible (because continuation

is ex post Pareto efficient), the firm anticipates this soft budget constraint and its incentives are destroyed.[23] Arping argues that an equity stake in a competing firm makes the investor "tougher", i.e. less prone to renegotiate away his liquidation rights, and therefore gives credibility to the termination threat. The reason is that the equity claim makes the investor internalize the effect of the entrant's termination on the incumbent's profit. This in turn improves the entrant's incentives and thus its prospects of receiving finance.

8 Conclusion

We have highlighted the different channels through which firms' financial decisions and product market strategies interact. Financial structure determines the ability to resist to predation without defaulting on debt obligations; it changes the equity holders' objective function, and thus their preferred market strategy; it conveys signals on the firm's profitability not only to the capital market, but also to competing firms in the product market. The decision to resort to a common lender may help competing firms collude in the product market, and more generally to coordinate their production, investment and R&D activities. Finally, the design of financial claims crucially affects the investor's incentives to coordinate firms' activities and to fund the entry of competing firms in the product market.

The papers we have surveyed have contributed to establish two important principles. First, firms' financial conditions are a determinant of the product market game, and thus cannot be neglected when trying to predict the market outcome. Second, financial structure design must include product market considerations. The first can be regarded as a novel contribution to the Industrial Organization literature and the second to Corporate Finance.

There is a number of interesting issues that remain unexplored. First, most of the papers have restricted attention to a subset of the feasible financial instruments. In this work, we will look at a wider set of instruments, and ask how more sophisticated financial instruments, such as convertible debt and convertible preferred stock, affect the product market outcome. A second direction for further research is represented by the strategic allocation of control rights. A formal allocation of control rights between the firm and the investors, and among different types of investors, is part of any financial deal. Thus, one would wonder how this is affected by the same product market considerations that influence the design of income rights and the choice of the financing source. With regard to empirical work, there are several theoretical predictions that have not been tested yet. While many papers have tried to verify the effect of leverage on entry, exit and pricing decisions, there exists no evidence

[23]For more details on the soft budget constraint phenomenon, see Dewatripont (1988), Dewatripont-Maskin (1995).

on how the choice to resort to a common lender affects competition in the product market. We plan to address this question in related empirical work.

References

[1] AGHION P. - DEWATRIPONT M.- REY P. (1998), "Agency Costs, Firm Behavior and the Nature of Competition", IDEI, Document de Travail n.77, Toulouse

[2] ARPING S. (1997), "Industry Banking, Product Market Competition, and Regulation of Bank Equity Stakes", unpublished manuscript, ECARE, Université Libre de Bruxelles

[3] BENSTON G. (1994), "Universal Banking", *Journal of Economic Perspectives*, vol. 8, pp. 121-143

[4] BENVENISTE L.M. - BUSABA W.Y. - WILHELM W.J.(1997), "Information Externalities in Primary Equity Markets", unpublished manuscript

[5] BERNHEIM B.D. -WHINSTON M.D. (1985), "Common Marketing Agency as a Device for Facilitating Collusion", *RAND Journal of Economics*, vol. 16, pp.269-281

[6] BHATTACHARYA S. - CHIESA G.(1995), "Proprietary Information, Financial Intermediation, and Research Incentives", *Journal of Financial Intermediation*, vol. 4, pp.328-357

[7] BHATTACHARYA S. - RITTER J.R. (1983), "Innovation and Communication: Signalling with Partial Disclosure", *Review of Economic Studies*, vol. 50, pp.331-346

[8] BOLTON P. - SCHARFSTEIN D.S.(1990), "A Theory of Predation Based on Agency Problems in Financial Contracting", *American Economic Review*, vol. 80, pp.93-106

[9] BRANDER J.A. - LEWIS T.R. (1986), "Oligopoly and Financial Structure: the Limited Liability Effect", *American Economic Review*, vol. 76, pp.956-970

[10] BULOW J. - GEANAKOPLOS J. - KLEMPERER P. (1985), "Multimarket Oligopoly: Strategic Substitutes and Complements", *Journal of Political Economy*, vol. 93, pp.488-511

[11] CESTONE G. - WHITE L. (1998), "Anti-Competitive Financial Contracting: the Design of Financial Claims", unpublished manuscript, GREMAQ, Université de Toulouse and Nuffield, Oxford University

[12] CHEVALIER J.A. (1995), "Capital Structure and Product-Market Competition: Empirical Evidence from the Supermarket Industry", *American Economic Review*, vol. 85, pp.415-435

[13] CHEVALIER J.A. - (1996), "Capital-Market Imperfections and Countercyclical Markups: Theory and Evidence", *American Economic Review*, vol. 86, pp.703-725

[14] DE LONG B. (1990), "Did Morgan's Men Add Value? An Economist's Perspective on Financial Capitalism", NBER Working Paper n. 3426

[15] DEWATRIPONT M. (1988), "Commitment Through Renegotiation-Proof Contracts with Third Parties", *Review of Economic Studies*, vol. 55, pp.377-390

[16] DEWATRIPONT M. - MASKIN E. (1995), "Credit and Efficiency in Centralized and Decentralized Economies", *Review of Economic Studies*, vol. 62, pp.541-555

[17] DIAMOND D. (1991), "Monitoring and Reputation: the Choice Between Bank Loans and Directly Placed Debt", *Journal of Political Economy*, vol. 99, pp.688-721

[18] FAURE-GRIMAUD A. (1998), "Structure Financière et Concurrence Imparfaite: Modigliani-Miller 40 Ans Après", Revue d'Economie Politique, vol. 108, pp.16-36

[19] FERSHTMAN C. - JUDD K.L. (1987), "Equilibrium Incentives in Oligopoly", *American Economic Review*, vol. 77, pp.927-940

[20] FUDENBERG D. - TIROLE J. (1986), "A Signal-Jamming Theory of Predation", *RAND Journal of Economics*, vol. 17, pp.366-376

[21] FULGHIERI P. - NAGARAJAN S. (1992), "Financial Contracts as Lasting Commitments: The Case of a Leveraged Oligopoly", *Journal of Financial Intermediation*, vol. 2, pp.2-32

[22] GERTNER R. - GIBBONS R. - SCHARFSTEIN D.S. (1988), "Simultaneous Signalling to the Capital and Product Markets", *RAND Journal of Economics*, vol. 19, pp.173-190

[23] GREEN E. - PORTER R. (1984), "Non-Cooperative Collusion under Imperfect Price Information", *Econometrica*, vol. 52, pp.87-100

[24] HARRIS M. - RAVIV A. (1991), "The Theory of Capital Structure", *Journal of Finance*, vol. 46, pp.297-355

[25] HART O. - MOORE J. (1989), "Default and Renegotiation: A Dynamic Model of Debt", LSE, FMG Discussion Paper n.57

[26] HELLWIG M. (1991), "Banking, Financial Intermediation, and Corporate Finance", in A. Giovannini and C. Mayer, *European Financial Integration*, Cambridge University Press

[27] HOLMSTROM B. - TIROLE J. (1997), "Financial Intermediation, Loanable Funds and the Real Sector", *Quarterly Journal of Economics*, vol. 62, pp.663-691

[28] JENSEN M. - MURPHY K. (1990), "Performance Pay and Top Management Incentives", *Journal of Political Economy*, vol. 98, pp.225-264

[29] MAKSIMOVIC V. (1988), "Capital Structure in Repeated Oligopolies", *Rand Journal of Economics*, vol. 19, pp.389-407

[30] MODIGLIANI F. - MILLER M. (1958), "The Cost of Capital, Corporation Finance and The Theory of Investment", *American Economic Review*, vol. 48, pp.280-312

[31] MYERS S. (1977), "Determinants of Corporate Borrowing", *Journal of Financial Economics*, vol. 5, pp.147-175

[32] MYERS S. - MAJLUF N. (1984), "Corporate Financing and Investment Decisions when Firms Have Information that Investors Do Not Have", *Journal of Financial Economics*, vol. 13, pp.187-221

[33] PETERSEN M.A. - RAJAN R.G. (1994), "The Benefits of Lending Relationships: Evidence from Small Business Data", *The Journal of Finance,* vol. 59, pp.3-37

[34] PHILLIPS G.M. (1995), "Increased Debt and Industry Product Markets. An Empirical Analysis", *Journal of Financial Economics*, vol. 37, pp.189-238

[35] POITEVIN M. (1989a), "Financial Signalling and the Deep-Pocket Argument", *RAND Journal of Economics*, vol. 20, pp.26-40

[36] POITEVIN M. (1989b), "Collusion and the Banking Structure of a Duopoly", *Canadian Journal of Economics*, vol. 22, pp.263-277

[37] POLO M. - TEDESCHI P. (1997), "Equilibrium and Renegotiation in Delegation Games", IGIER Working Paper n.116, Milan

[38] ROSS S. (1977), "The Determination of Financial Structure: The Incentive Signalling Approach", *Bell Journal of Economics*, vol. 8, pp.23-40

[39] SAUNDERS A. (1994), "Banking and Commerce: An Overview of the Public Policy Issues", *Journal of Banking and Finance*, vol. 18, pp.231-254

[40] SHOWALTER D. (1995), "Oligopoly and Financial Structure: A Comment", *American Economic Review*, vol. 85, pp.647-653

[41] SPAGNOLO G. (1998), "Debt as a (Credible) Collusive Device", Working Paper No. 243, Stockholm School of Economics

[42] TELSER L.G. (1966), "Cutthroat Competition and the Long Purse", *Journal of Law and Economics*, vol. 9, pp.259-277

[43] TIROLE J. (1988), *The Theory of Industrial Organization*, MIT Press, Cambridge, Massachusetts

[44] YOSHA O. (1995), "Information Disclosure and the Choice of Financing Source", *Journal of Financial Intermediation*, vol. 4, pp.3-20

[45] ZINGALES L. (1998), "Survival of the Fittest or the Fattest? Exit and Financing in the Trucking Industry", *Journal of Finance*, vol. 53, pp.905-938