

On the Interactions between Capital Structure and Product Markets: a Survey of the Literature

By T. FRANCK and N. HUYGHEBAERT



Tom Franck
Lessius Hogeschool, Department of
Business Studies, Antwerpen and
KULeuven, AFI Leuven Research
Center, Leuven.



Nancy Huyghebaert
KULeuven, Department of Applied
Economics, AFI Leuven Research
Center, Leuven.

ABSTRACT

This paper surveys capital structure theories based on product characteristics and the structure of input and output markets. In this manner, it extends the work of Harris and Raviv (1991). Simultaneously, we relate capital structure to decisions in the input and output markets, such as production and pricing, investments, and entry and exit. We briefly discuss each of the central papers in these literatures and relate them to the other models. Next, we present the known empirical evidence that either supports or rejects these models. Finally, we offer our conclusions and elaborate on this review article's implications for future research.

* The authors are grateful to Arthur Ravid and Kose John, for their insights provided during the EIASM 2004 doctoral workshop on corporate finance in Brussels.

I. INTRODUCTION

In their seminal articles of 1958 and 1963, Modigliani and Miller show that in a frictionless world without taxes and information asymmetries and with no influence of financing choices on corporate investment decisions, capital structure has no impact on firm value. If this proposition is reversed, as suggested by Miller (1988), firm value can be affected by financing decisions if (1) different tax regimes exist, (2) information asymmetries between the firm's management and outside investors are present, (3) "real" decisions differ across financing decisions, because of agency costs for example, and/or (4) other frictions, such as costs of financial distress, are introduced.

A recent article by Graham (2003) reviews the vast literature on taxes. A highly regarded survey on the other capital structure determinants is that of Harris and Raviv (1991), who discuss four distinctive categories of determinants, namely: agency problems, information asymmetries, products and product market characteristics, and corporate control contests. In their conclusion, Harris and Raviv refer to the third determinant as the most promising for future research:

"In our view, models which relate capital structure to products and inputs are the most promising. This area is still in its infancy and is short on implications relating capital structure to industrial organization variables such as demand and cost parameters, strategic variables, etc."

(Harris and Raviv (1991), p. 351)

Our article extends the work of Harris and Raviv on the interactions between capital structure and product markets, both in volume and content. While the seminal papers in this field were published in the second half of the 1980's (and covered by Harris and Raviv), a lot of new theoretical and – especially – empirical work has emerged since then. Also, we not only examine product market determinants of capital structure, but elaborate on the implications of financing choices for various product market decisions. Firms can use their financial policy towards product market participants (customers, suppliers, employees, competitors) to solve asymmetric information and agency problems. Also, capital structure can serve as a signaling device to these non-financial stakeholders (NFS), and affect their behavior. This subdomain of the corporate finance literature bears a clear link with the industrial organization literature.

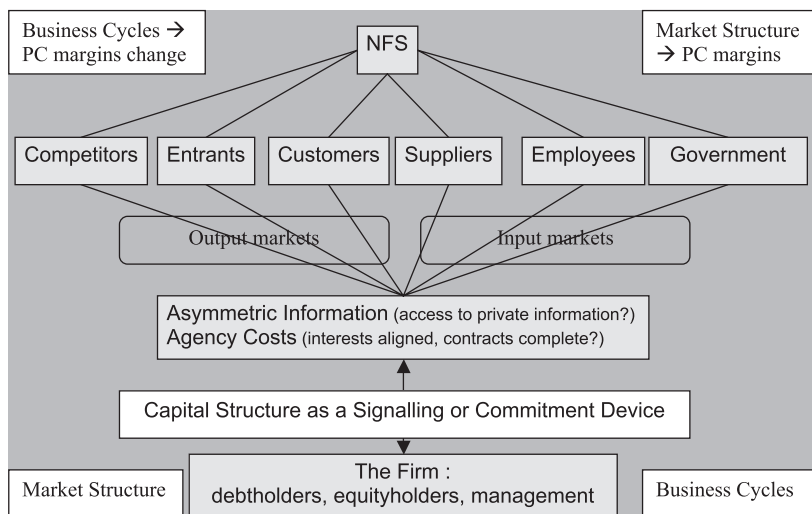
Our survey contains discussions of papers that we consider central to the development of our understanding of how products and product markets affect a firm's financing choices and vice versa. The process of deciding which papers to include was tedious, and some interesting papers may have been left out of the discussion, due to a difference in focus or because of neglect from our part, for which we apologize. The structure of this paper is as follows. Section II defines NFS, Section III discusses the selected theoretical articles arranged by capital structure determinants, respectively product market decisions. Section IV presents some major empirical papers whereas Section V concludes our article.

II. NON-FINANCIAL STAKEHOLDERS

Non-financial stakeholders have no direct monetary stake in the firm. Also, they have no direct influence on the firm's financial policy (no decision or voting power). However, a firm's capital structure can affect NFS both directly, for instance by affecting the probability of default on their explicit and implicit claims with the firm, as well as indirectly, for instance by influencing the firm's production and pricing decisions. NFS, as a result, are interested in the firm's financing choices and firms may be forced (implicitly) to take their NFS' objectives into account when determining their capital structure. Figure 1 gives a broad overview of the relations between the firm and its NFS.

Competitors and entrants may wish to predict the firm's pricing, production and investment decisions in order to respond optimally. By observing the firm's financial policy, (potential) competitors may be able to infer information on the firm's output market behavior. Customers and suppliers prefer solid contracts, depending on product (e.g., durability, exclusivity, quality, price) and firm characteristics. They will assess and price the probability of rupture of their explicit and implicit contracts with the firm; the firm's capital structure may be informative for this purpose. Employees also favor reliable contracts, depending on input (education, experience, job-specific investments) and job market characteristics (e.g., unions, labor opportunities). Finally, the government can be considered as a special NFS. In contrast to the other NFS, it has a direct stake in the firm's results and its income (from taxes) straightforwardly depends on the firm's financing choices. Nevertheless, the government has no direct power over the firm.

FIGURE 1
Framework



III. THEORY ON THE INTERACTIONS BETWEEN CAPITAL STRUCTURE AND PRODUCT MARKETS

The firm is a set of interrelated contracts among its various input suppliers and the purchasers of its final output good. Following Jensen and Meckling (1976), this concept of the firm has been translated into the corporate finance literature. However, the role of NFS in the firm's capital structure choice only recently received attention in this literature. In Section III.A, we discuss the main NFS determinants of capital structure. The implications of a firm's capital structure for its decisions in the product market are treated in Section III.B. Our discussion of the theoretical models is summarized in Table 1.

A. NFS determinants of capital structure

In this section we look at how relationships with NFS influence or firm's capital structure decision. The theoretical literature in this field basically has raised three issues: expected bankruptcy costs of NFS, the negotiation power of clients, suppliers and workers, and the competitive power of industry incumbents and entrants.

TABLE 1
Theoretical models

Author(s)	Results
<i>1. NFS determinants of Capital Structure</i>	
<i>1.1. Expected Bankruptcy Costs of NFS</i>	
Cornell and Shapiro, 1987	Implicit claims affect capital structure; a low debt ratio can serve as a pre-commitment mechanism to make large payouts on implicit contracts.
Titman, 1984	NFS' expected liquidation costs negatively affect debt ratios.
Maksimovic and Titman, 1991	Firms that wish to maintain a reputation for producing high-quality goods assume lower debt ratios. When the firm's assets have a high liquidation value, this effect can be reversed.
<i>1.2. Negotiation Power of NFS vis-à-vis the Firm</i>	
Subramaniam, 1998	Leverage can serve as a commitment device against firm-suppliers hold-up problems: leverage increases the number of suppliers and lowers input prices for a monopolist in the product market. Trade credit reduces the optimal debt ratio.
Krishnaswami and Subramaniam, 2000	Subramaniam's (1998) strategic debt effect is reversed and firm profits are lowered in a duopoly model unless external economies of scale in the supplier industry and demand elasticity for the firm's products are small.
Bronars and Deere, 1991	Firms facing a greater threat of unionization choose a higher debt-equity ratio to prevent paying out quasi-rents from sunk investments to the workforce. The optimal amount of debt depends on the probability of forming a union, the nature of the bargaining process, and the bankruptcy probability.

Author(s)	Results
Perotti and Spier, 1993	By exchanging junior debt for equity, shareholders alter their own incentives to invest and can extract concessions from senior creditors.
Sarig, 1998	Firms can increase their bargaining power vis-à-vis suppliers of specialized production factors by lowering their debt ratio. The use of debt increases with the market alternatives of employees.

2. Impact of Capital Structure on Product Market Decisions

2.1. Production and Pricing Decisions

Brander and Lewis, 1986	Debt increases the firm's aggressiveness in the output market through a limited liability effect.
Brander and Lewis, 1988	With fixed bankruptcy costs, the effects of Brander and Lewis (1986) are replicated. With proportional bankruptcy costs, the relation between debt and output is convex (U-shaped).
Showalter, 1995	Under Bertrand competition, the output market aggressiveness of firms depends on the type of uncertainty. Under cost uncertainty, debt makes competition tougher; under demand uncertainty, debt makes competition softer. The results under Cournot competition are not affected by the type of uncertainty.
Wanzenried, 2003	The relation between product differentiation and the optimal debt level is U-shaped under Cournot and Bertrand competition. When competing in strategic substitutes, the probability of bankruptcy increases in product substitutability and vice versa for competition in strategic complements. A rise in demand volatility induces firms to increase their debt.
Dasgupta and Shin, 1999	Information sharing through a trade association decreases aggressiveness in the output market as demand uncertainty is resolved; less-informed firms assume higher debt ratios.

Author(s)	Results
Glazer, 1994	Long-term debt makes firms compete less aggressively and makes prices fluctuate more.
Faure-Grimaud, 2000	Debt can have anti-competitive effects when a reward that induces firms to repay their creditors instead of strategically defaulting is included in debt contracts.
Maksimovic, 1988	The firm's debt level affects the viability of collusive agreements. The maximal debt ratio sustaining collusion declines in the discount rate and increases in the number of firms in the industry and in the elasticity of demand. The effect of capacity constraints depends on the properties of demand and cost, the discount rate and the number of firms in the industry. Specific financial instruments, such as warrants and convertibles, also affect the collusive debt level.
Spagnolo, 2000	Debt has anti-competitive effects when collusive credit markets or banking groups force firms to behave debtholder-friendly.
Dasgupta and Titman, 1998	Under Nash competition, pre-committing with debt reduces market aggressiveness. Under Stackelberg competition, a less levered leader has incentives to react aggressively to debt increases. Optimal debt rises as the liquidation value rises and falls as competition rises.

2.2. Investment Decisions

Myers, 1977	The optimal debt ratio is inversely related to the ratio of the firm value accounted for by growth options relative to the value of assets in place.
Dotan and Ravid, 1985	Taking on more debt increases the probability of incurring an accounting loss, which reduces the present value of non-debt related tax shields. So, debt and investments are negatively related.
Hart and Moore, 1995	Long-term debt is more optimal in curbing managers' incentives to overinvest than short-term debt. The debt-equity mix and the seniority structure of debt depend on the relative profitability of assets in place versus new investments.

Author(s)	Results
Allen, 2000	Strategic bankruptcy costs should include the costs due to the delay in investment decisions during the bankruptcy process. This strategic cost depends on the relative solvency of firms, fixed capacity costs and the state of demand. Marginal bankruptcy costs together with tax benefits determine the firm's debt ratio. As a result, similar firms in one industry can have different capital structures.
<i>2.3. Predatory Models of Entry and Exit</i>	
Fudenberg and Tirole, 1986	Incumbents prey upon entrants by decreasing current entrant profitability when entrants are uncertain about future profitability. The prey can be forced to exit the market if it is incapable of renewing capital or financing new projects.
Poitevin, 1989	Information asymmetries in financial markets can increase the entrant's financial vulnerability. A separating equilibrium where a low-cost entrant signals with debt and a high-cost entrant with equity exists. Incumbent incentives to prey are a function of the entrant's financial structure.
Bolton and Scharfstein, 1990	Agency problems in financial contracting can give rise to predation. Shallow pockets are mostly optimal.
Fernandez-Ruiz, 2004	Adverse selection problems in financial contracting can give rise to predation. The probability of predation depends on the cost of preying, the difference in profit with or without the entrant, and the distortion created by the predatory action. Deep pockets are mostly optimal.
Rotemberg and Scharfstein, 1990	Firms choose to pay out cash (dividends, stock repurchases), depending on whether industry or relative profitability affects stock prices the most, given that there is imperfect competition.

Author(s)	Results
Maurer, 1999	Predation by internally financed rivals reduces the probability of refinancing, which is lower under Stackelberg competition.
Lambrecht, 2001	High leverage of incumbents leads to faster entry. Higher operating profits, lower debt repayments, larger incremental gains from becoming a monopolist, and higher bankruptcy costs help firms to survive. The relative importance of these factors depends on macro-economic variables, such as interest rates, profit volatility and profit growth rates. Finally, macro-economic variables also influence the order in which firms default if firms differ sufficiently.
Kanas and Qi, 2001	Short-term and bank debt induce firms to act strategically in the output market to distort information to investors and induce firms to prey. Short-term debt is decreasing in concentration. Long-term debt is increasing in price elasticity of demand.

1. Expected bankruptcy costs of NFS

By definition, expected bankruptcy costs are influenced by both the likelihood and the magnitude of costs incurred by NFS upon the firm's bankruptcy. The *likelihood* is largely determined by the firm's capital structure. Generally, it can be assumed that a rise in leverage increases this probability, although not linearly. Other elements of financing policy such as debt ownership, maturity, covenants, etc. may also play an important role (e.g., Gilson et al. (1990)). The *magnitude* of bankruptcy costs is determined by direct (switching) costs and implicit costs, which are discussed by Cornell and Shapiro (1987). If NFS are rational, they price these expected bankruptcy costs when negotiating with the firm, thereby affecting firm value. Based on this argument, Titman (1984) and Maksimovic and Titman (1991) show that firms may wish to pre-commit to a low likelihood of bankruptcy by lowering their debt ratio.

Cornell and Shapiro (1987) define implicit contracts as claims that are nebulous and state-contingent so that the costs of writing a contract on them are prohibitive. A second characteristic is that they cannot be unbundled and traded independently from the goods and services the firm sells. Defaulting on implicit claims does not automatically trigger bankruptcy. However, the value of implicit claims is sensitive to the firm's financial condition, even when bankruptcy is remote. Implicit claims also suffer from a time-inconsistency problem, namely how to assure NFS that the firm's future decisions will involve large payouts on these claims. One solution is for the firm to make claim-specific investments, whose value is tied to the payouts on implicit contracts. Another solution is to alter the firm's financial structure as a pre-positioning mechanism, as argued hereafter.

In a two-period model Titman (1984) examines how the firm's liquidation policy affects its NFS. Customers and other NFS assess the probability of liquidation in period 1 for every state of nature and price this probability rationally. The firm thus bears the liquidation costs imposed on NFS *ex ante*. Titman now shows that a value-maximizing firm adopts an enforceable policy of only liquidating in those states of nature where the value of the assets if liquidated exceeds their value if not liquidated by an amount greater than the liquidation costs imposed on NFS. The firm thus will be liquidated only in those states of nature (θ_i) where $\delta(\theta_i)K(M^*) - C(\theta_i) > V_1(\theta_i)$ with $\delta(\theta_i)K(M^*)$ the liquidation value in state θ_i , $C(\theta_i)$, the costs

imposed on NFS, and $V_1(\theta_i)$ the operating value at time 1. The liquidation costs $C(\theta_i)$ equal the selling price of the firm's products if not liquidated minus the selling price after liquidation.

Proposition 1: a firm will liquidate according to its optimal policy if its financing contracts are chosen such that:

It is bankrupt in all those states of nature and only those states in which $V_1(\theta_i) < \delta(\theta_i)K - C(\theta_i)$.

- (a) $D \geq \delta(\theta_i)K - C(\theta_i)$ whenever the firm is bankrupt, and
- (b) $P_f + D \geq \delta(\theta_i)K, \forall \theta_i$ with P_f the claims of preferred stockholders and
- (c) D the claims of debtholders.

A crucial assumption in this framework is that stockholders and debtholders have different incentives to liquidate. Debtholders liquidate in more states of nature than equityholders, and the probability of liquidation depends on the bankruptcy decision.¹ Liquidation in an additional period 1 state θ_i lowers the firm's value in period 0 by $[V_1(\theta_i) - \delta(\theta_i)K + C(\theta_i)]p(\theta_i)$, with $p(\theta_i)$ a discount factor. In this framework, capital structure thus "controls" future liquidation decisions through the bankruptcy mechanism. As a result, financing choices serve as a pre-positioning mechanism to maximize firm value.

Maksimovic and Titman (1991) extend Titman's (1984) theory that NFS' pricing of future liquidation costs affects firm value and capital structure to situations where NFS do not suffer such direct costs if the firm goes out of business. Rather, they focus on firms trying to maintain a reputation for product quality, which can be considered as an implicit contract. Firm value will be affected by the reluctance of NFS to deal with a near-bankrupt firm as financial distress may affect the firm's incentives to honor its implicit contracts. Maksimovic and Titman investigate in which situations debt influences the firm's ability to credibly offer high-quality goods. As NFS price this credibility, capital structure affects firm value.

In their framework, firms do not need to be on the verge of bankruptcy. In Proposition 6, they even show that if there is no probability of financial distress or bankruptcy, a levered firm has a greater tendency to reduce quality. The reason is that a reduction in quality has a similar effect as obtaining an (involuntary) loan from customers as profits rise in the short run. This "loan" will be repaid through reductions in future revenues after customers have priced the decrease in

product quality. As these “repayments” are senior to debt repayments, the claims of existing creditors are diluted. So, debtholders share the costs of the loan with shareholders.² Now, firms that experience a financial shortfall may reduce quality rather than borrow in cases where the costs associated with borrowing at unfavorable terms more than offset the reputational benefits of being considered a high-quality producer. Maksimovic and Titman specify conditions under which firms will lower their debt ratio (which depend on the ratio of low-quality producers in the market, the relative cost of producing low- and high-quality goods, the firm’s financial health, dividend policy, etc.). Finally, Maksimovic and Titman examine the role of the firm’s liquidation (salvage) value in capital structure decisions. They show that the value of a firm with an opportunity to liquidate may be lower than that of a firm that doesn’t have this chance. Two ways to commit to not liquidating are to have a low salvage value or to change the liquidation policy of the firm by issuing senior claims whose face value exceeds the firm’s liquidation value without causing bankruptcy. This way, the equityholders never choose to liquidate. As in Titman (1984), such a capital structure has the property that the firm goes bankrupt only in those states of nature where the firm would optimally choose to liquidate.

2. Negotiation power of NFS vis-à-vis the firm

As the firm is a nexus of contracting relationships, it is constantly negotiating with its customers, suppliers and workers. The outcome of these negotiations is determined by the relative bargaining power of the different players, which can be influenced by financial policy. Subramaniam (1998) and Krishnaswami and Subramaniam (2000) show that a firm can be forced to increase its leverage when it has too much negotiation power vis-à-vis its suppliers. Other papers look at how leverage affects a firm’s bargaining position with unions. Bronars and Deere (1991) and Perotti and Spier (1993) show that a firm can extract more rents from its workers by raising debt. By contrast, Sarig (1998) finds that high debt diminishes a firm’s negotiation power when bargaining with specialized input providers.

Subramaniam (1998) looks at how leverage influences the firm-supplier relationship for a monopolist dealing with a competitive suppliers’ market. He shows that the monopolist is eager to behave opportunistically, by asking for lower input prices or demanding lower input

quantities. Proposition 1 states the firm-supplier hold-up problem: for an unlevered firm, the quantity that maximizes shareholder value in the presence of firm-supplier interactions is lower than Q^* , the quantity produced in the absence of such interactions. Unfortunately for the monopolist, suppliers anticipate this hold-up behavior, and fewer suppliers service the firm, thereby increasing its input costs. However, the monopolist can pre-commit to producing a certain quantity. Subramaniam examines the debt ratio as such a commitment device. He shows that due to limited liability, shareholders of a levered firm prefer to produce more than debtholders do, or than is produced by an unlevered firm (e.g., Brander and Lewis (1986)). Although the optimal output level is increasing in leverage, the agency costs of debt are also increasing. Proposition 2 states that for small levels of debt, the number of suppliers servicing the monopolist increases with debt. For larger levels of debt, the agency costs associated with the increased debt grow larger than the benefits. Proposition 3 states that it is in the shareholders' interest to have a strictly positive debt level. Subramaniam even models in Corollary 2 an equilibrium level of debt where benefits outweigh costs and where the monopolist produces Q^* . The final section of the paper discusses the influence of trade credit on the model. Trade credit can change the results as suppliers may become reluctant to accept debt since it influences the default risk on their trade credit. Subramaniam, however, finds that if suppliers price the trade credit correctly, a small level of debt is still optimal.

Krishnaswami and Subramaniam (2000) extend the above model and show that when duopolists in the output market can influence input quantities or prices after suppliers have entered a fully competitive input market, Subramaniam's (1998) strategic advantage of debt when selling substitutes may be cancelled by lowering input costs of the firm's rival.

In their model, a firm's leverage is also used to pre-commit to producing more than the Cournot outcome (Brander and Lewis (1986)). As a result, more inputs are required and more suppliers are lured into the input market. Proposition 2 shows that if there are sufficient external economies of scale in the supplier industry, a unilateral increase in debt increases the number of suppliers servicing both the firm and its rival and the individual output of each firm increases. The consequence of the rise in production at the industry level is that profits are lowered. For the levered firm, market share has not risen because the rival's output has risen proportionally, and the lower output price can

depress the firm's profits more than the lower input price raises profits. Proposition 3 posits that in a duopoly, both firms prefer debt financing if the external economies of scale in the supplier industry and demand elasticity of the final product are small. Otherwise, firms are fully equity financed.

Bronars and Deere (1991) argue that if workers are likely to establish a union, raising debt can protect the wealth of shareholders. In the presence of collective bargaining, firms tend to underinvest in assets that are sunk to some extent as the quasi-rents generated by these investments accrue partially to the workforce. By issuing debt, the firm lowers the amount of quasi-rents to be bargained on with the union as a fixed share of earnings is needed to service the debt. To the extent that labor compensation is lowered, raising debt can increase shareholder wealth. Debt is incurred until the marginal expected gain from limiting the union's payoff equals the expected increase in bankruptcy costs. In this model, the probability of bankruptcy should be positive; otherwise shareholders are unable to shield any revenues from the union. The optimal amount of debt is shown to depend on the probability of forming a union, the nature of the bargaining process, and the probability of bankruptcy.

Perotti and Spier (1993) examine how the underinvestment effect induced by debt can serve as a bargaining tool to force the renegotiation of senior claims (by creditors, employees or suppliers) through the exchange of junior debt for equity. In a two-period dynamic model, they look at the conflict of interest between shareholders and risk-averse workers represented by a union. Outstanding debt can make the shareholders' threat not to invest more credible, and will lead to wage concessions over a larger set of states of nature. The presence of junior debt can also reduce the union's share of the surplus during the contract renegotiation stage.

In their model, second-period investment is needed to guarantee full payment of the union's claim. They first show that when renegotiation is impossible and debt-for-equity exchanges are not feasible, the firm only invests when profits are high. If renegotiation is possible, but debt-for-equity exchanges are not, wages are only renegotiated if the firm is not able to pay these. Finally, Perotti and Spier examine the situation where contracts can be renegotiated and debt-for-equity exchanges are feasible. If only shareholders and workers negotiate, then debt-for-equity exchanges have strategic value (unions will agree to larger wage concessions), new investments are always made and

unions fully miss out the NPV of new investments (Proposition 2). When debtholders are also part of the renegotiations, similar results hold, but the union now receives part of the return from new investments.

Sarig (1998) looks at how the supply of specialized production factors interacts with the leverage of the firm that employs them. He uses a bargaining model to determine the dependency of the outcome of wage negotiations on capital structure. Focusing on the supply of firm-specific human capital, Sarig shows that the workforce's share of the quasi-rents to specialization increases with debt (Proposition 1). This effect realizes during the wage negotiation process, where a levered firm is more vulnerable to bankruptcy after the supply of specialized production factors is suspended. It is clear that when debt weakens the bargaining position of shareholders, they would like to use less of it, but Proposition 2 shows that shareholder wealth may decrease following a reduction in leverage. The reason is that the resulting decrease in labor costs benefits both shareholders and debtholders. Finally, considering the employees' bargaining power, Proposition 3 states that the use of debt increases with the market alternatives of employees. As employees have more market alternatives, the quasi-rents to be bargained on decrease. Sarig also argues that unionized labor can demand wages exceeding their market alternatives, even when there is no firm-specific human capital. As a consequence, firms use less debt if their employees' labor union is powerful.

3. Market structure and competition

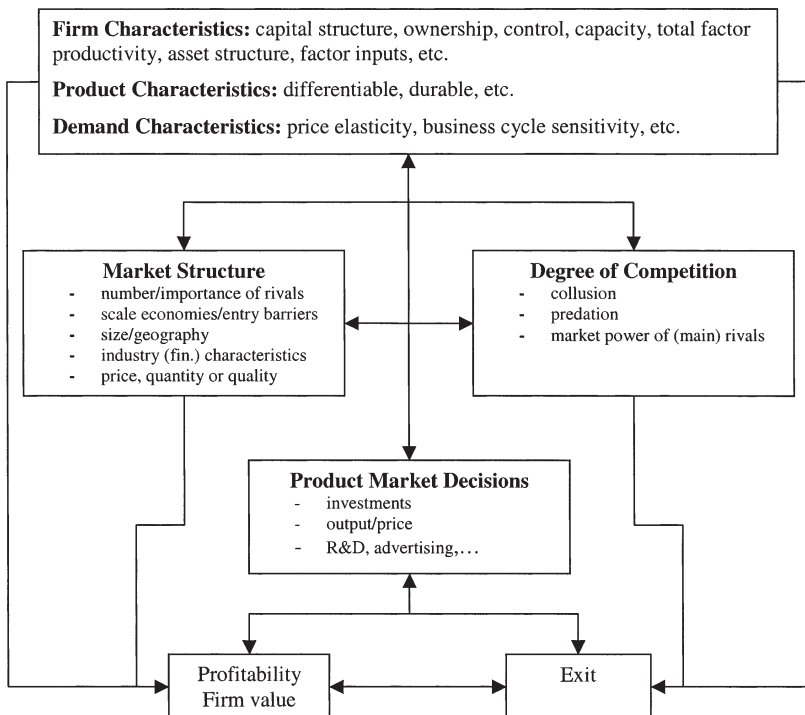
A third important NFS determinant of capital structure is market structure and the behavior and characteristics of competitors in the output market. As most of the papers discussing these determinants also deal with the effects of capital structure on product market decisions, we discuss all papers on strategic market interactions in Section III.B hereafter.

B. Impact of capital structure on product market decisions

In a world with perfectly competitive product markets, perfect capital markets and no information asymmetries or agency problems, financial policy does not interfere with product market decisions. But upon introducing imperfections, firms may increase their value by

strategically changing their behavior, depending on their own and their rivals' capital structure. In our framework, we distinguish between three categories of product market decisions. A first category concerns production and pricing decisions. Models of imperfect competition show that a firm can use its capital structure to pre-commit to a strategic output or price level. Second, investments are most directly affected by managers' incentives. Managers may have a tendency to overinvest in market share and size, and capital structure can be used to restrain these incentives. Simultaneously, too much debt can result in underinvesting in positive NPV projects. Third, financial structure can influence entry and exit decisions through incumbent predatory behavior. Figure 2 presents the general framework in which product market decisions are made and by which they are affected.

FIGURE 2
A competition model



1. Production and pricing decisions

Equityholders and debtholders may disagree on the product market strategy the firm should follow. The reason is that their payoffs differ. Debtholders are only entitled to fixed debt servicing payments whereas shareholders receive residual payoffs and thus prefer riskier projects. The seminal paper by Brander and Lewis (1986) shows that debt increases the firm's output market aggressiveness as managers acting in the interests of shareholders maximize profits over only (a more limited number of) good states of the world. Brander and Lewis (1988) find that this model outcome is affected by the type of bankruptcy costs (fixed or proportional). Showalter (1995) shows that the results are also sensitive to the form of competition (Bertrand or Cournot) and the type of uncertainty (demand or cost) that firms face. Wanzenried (2003) examines the role of product differentiation and demand volatility. Dasgupta and Shin (1999) argue that trade associations can reduce the product market aggressiveness of levered firms. Glazer (1994) examines the role of debt maturity and finds that long-term debt softens competition. Similarly, Faure-Grimaud (2000) finds that including a reward in debt contracts makes firms compete less aggressively. Maksimovic (1988) shows that the amount of debt affects the willingness of managers to honor collusive agreements in repeated oligopolies. Spagnolo (2000) uses Maksimovic's model to show that debt can also have anti-competitive effects when creditors export their own collusive behavior to output markets. Finally, Dasgupta and Titman (1998) demonstrate that the relation between leverage and pricing strategies depends on the nature of the competitive game (Nash or Stackelberg).

Brander and Lewis (1986) argue that financial structure changes the relative payoffs to stock- and debtholders, which influences a firm's product market behavior. They find that debt intensifies firm competitive behavior due to a limited liability effect. As debt rises, low (marginal) value states of nature become irrelevant to the shareholders for the firm is turned over to its debtholders. So, as firms take on more debt, they pursue output strategies that raise returns in good states and lower returns in bad states. Brander and Lewis now show that increasing output enlarges the variance in profits. As a result, the Nash equilibrium production level in a Cournot duopoly model is increasing in leverage (Proposition 1). Proposition 2 shows that if one firm increases its debt, it increases its output at the expense of rival output. Propositions 1

and 2 thus state that a high debt level credibly pre-commits a firm to following an aggressive output stance. Debtholders likely will take this limited liability effect into account in their bond prices. Brander and Lewis show that for sufficiently low debt levels, the strategic effect of debt compensates for this negative price effect. For larger debt levels, the costs of the conflict of interest between debt- and equityholders outweigh the benefits of strategic debt. In equilibrium, industry debt will be strictly positive, so that more output is produced than in the traditional industrial organization oligopoly model.

In a duopoly model similar to that of their 1986 paper, Brander and Lewis (1988) find that the form of bankruptcy costs (fixed versus proportional) influences the outcome of their earlier model. The reason is that bankruptcy costs affect the payoffs to debt- and equityholders. The results under *fixed* bankruptcy costs are comparable to those of their 1986 limited liability model: own output is increasing in the debt level (Proposition 1), albeit starting from a lower level than the Cournot outcome of unlevered firms (Proposition 3). Proposition 2 states that a unilateral debt increase raises own output and decreases rival output. With *proportional* bankruptcy costs, firms always produce less than the Cournot outcome of unlevered firms, and the strategic effect of debt on output is a convex (U-shaped) function of leverage. Proposition 5 states that at low (but positive) debt levels, output is decreasing in own debt and increasing in rival debt. At high levels of debt, reverse results emerge.

When considering how limited liability influences the optimal debt level, Brander and Lewis find that the form of bankruptcy costs plays an important role. Whereas fixed bankruptcy costs induce firms to hold higher debt ratios, proportional bankruptcy costs have more mixed effects. Absent all other capital structure determinants, firms prefer to hold no debt at all as then rival output and the own probability of bankruptcy are minimized. But if other capital structure determinants induce firms to hold positive debt levels, strategic debt effects might lead firms to hold higher or lower debt levels, depending on the state of the world. Brander and Lewis also examine the effect of a rival's bankruptcy (strategic bankruptcy effect). As the payoff of increasing output rises through this additional effect, firms raise own output and industry output increases.

Showalter (1995) shows that Brander and Lewis' (1986) conclusion that firms have a strategic incentive to increase their debt depends both on the type of strategic interactions within the product market and

on the type of uncertainty faced by the firm. Whereas Cournot (output) competition induces firms to compete in strategic complements, Bertrand (price) competing firms are generally assumed to compete in strategic substitutes. Consequently, the conclusions of the Brander and Lewis model may be reversed.

In a duopoly model similar to Brander and Lewis (1986), but where firms compete in prices (Bertrand competition), Showalter shows that the assumption that marginal profits are higher in the better states of the world only holds under demand uncertainty; under cost uncertainty, this assumption is violated. In Theorem 1, Showalter shows that under demand uncertainty, the firm increases its price as debt increases, which is followed by its rival. When costs are uncertain, the firm prefers lower prices as debt increases and is again followed by its rival. As an increase in prices amplifies the states in which equityholders are residual claimants, the limited liability effect of debt is strategically advantageous to the firm under demand uncertainty, but harmful under cost uncertainty. Therefore, the results of a model weighing this strategic benefit against the cost of extra debt are that under cost uncertainty, firms hold no debt whereas the debt level is positive under demand uncertainty. In case of Cournot competition, the type of uncertainty is shown to have no effect on the model outcome; so, the Brander and Lewis (1986) results continue to hold.

In a two-stage game, Wanzenried (2003) studies the strategic use of debt when firms face demand uncertainty. In this framework, she examines how the substitutability of products and the volatility of demand affect financial structure. In Proposition 1, Wanzenried confirms the results of Showalter (1995). Debt induces firms to raise their output and the profitability of boosting debt depends on the nature of competition. If products are strategic complements (substitutes), higher debt raises (lowers) profits under Cournot competition. Under Bertrand competition, results reverse as the limited liability effect of debt induces firms to raise their price (and reduce total output). In Proposition 2, Wanzenried shows that the relation between product differentiation and the optimal debt level is U-shaped, under Cournot and Bertrand competition. When products are highly substitutable, competition is fierce and firms increase their output levels in the second stage, as pre-committed to in the first stage by increasing their leverage. When products are less substitutable, and thus more differentiated, firms can increase their output levels without suffering a decline in profits. Firms

thus again increase their period-one debt level.³ At an average level of substitutability, both effects are minimal and firms have minimal debt ratios. In Proposition 3, Wanzenried shows that for competition in strategic substitutes, the probability of bankruptcy is increasing in product substitutability, and vice versa for competition in strategic complements. Finally, Proposition 4 shows that a more volatile demand for the firm's products increases its indebtedness, *ceteris paribus*. In this setting, the strategic benefits of increasing debt dominate the negative effects of enlarged bankruptcy risk.

Dasgupta and Shin (1999) examine how the possibility of sharing information through a trade association can soften the aggressive output stance of levered firms. They show that one way of mitigating Brander and Lewis' (1986) limited liability effect is to resolve demand uncertainty. Dasgupta and Shin model a Cournot duopoly where firms have asymmetric access to information on future demand. Proposition 1 shows that when both firms are completely equity financed, they do not share information. In this framework, the less informed firm has an incentive to increase its leverage. The reason is that when this firm has risky debt outstanding, there is a significant benefit for the better informed firm to share its information on future market demand. If the better informed firm conveys this information, the other firm will lower its output when demand will be low.⁴ The levered firm then benefits from free-riding on the information supplied by the better informed, unlevered firm, which in turn benefits from the softer competition. Proposition 4 derives sufficient conditions for firms to form a trade association. These conditions weigh the information free-riding benefit against the loss due to the destruction of commitment power. Finally, Proposition 5 concludes that a trade association is always formed in the case of symmetric firms. The reason is that if both firms are symmetric, they have an equal chance (nature's choice) of being the Stackelberg information leader.

Glazer (1994) examines the role of debt maturity structure in product market competition. He uses the model of Brander and Lewis (1986) to show that long-term debt makes firms compete less aggressively than similar firms with short-term debt or no debt at all.⁵ In Glazer's framework, firms raise long-term debt at the beginning of the first period and repay it at the end of the second period. Period 1 profits cannot (entirely) leave the firm and thus can be thought of as servicing already part of the debt; they are not enough to completely

“repay” the debt, however. This “remaining” debt affects the competitive outcome in the second period through the Brander and Lewis’ limited liability effect. As a result, a duopolist has an incentive to lower its rival’s debt in the second period. Glazer now proves in Proposition 1 that a firm produces less than the period 1 optimizing output in order to lower the rival’s aggressiveness in period 2 and maximize its own profits.⁶ Glazer goes on to show that for symmetric firms, period 1 production is lower than the Cournot output (and lower than the output with short-term debt). Lengthening maturity structure thus makes competition less aggressive. A side-effect of his model is that prices fluctuate more if firms have long-term debt outstanding. The reason is that firms tend to behave less collusively as the maturity date of their debt comes closer.

In a framework similar to Brander and Lewis (1986), Faure-Grimaud (2000) shows that debt causes firms to behave less aggressively once firms and lenders sign a debt contract that induces firms to repay their creditors instead of strategically defaulting. This contract resembles a standard debt contract (fixed payments, control is turned to lenders after default), with an additional possibility of granting the firm a reward.⁷ When not rewarded, the firm bears an opportunity cost, which can be interpreted as a bankruptcy cost. This dead-weight loss is proportional to the expected size of the default. The more aggressive the output stance of the firm, the higher the probability of not getting the reward, and thus the higher the firm’s expected bankruptcy costs. This negative financial distress effect of debt can dominate the positive limited liability effect and can, as shown in Proposition 1, reduce the output level of a levered firm. So, debt can make firms less aggressive in order to limit the size of the default and to improve the odds of getting the reward. Furthermore, in Proposition 2, Faure-Grimaud shows that output is decreasing in the firm’s own debt and increasing in rival debt.

Maksimovic (1988) examines how debt influences the attainability of collusive agreements in repeated oligopolies, and which firm and industry characteristics shape this effect. He finds that for repeated oligopolies, capital structure endogeneously determines the type of equilibrium (Cournot competition versus collusion) in the product market. Collusive agreements last as long as for every player, the payoff of deviating is lower than the payoff of colluding. An increase in leverage is shown to increase the payoff of deviating as the generated surplus accrues entirely to the equityholders (residual claimants).

Maksimovic looks at the sustainability conditions of a trigger strategy where all firms produce Cournot quantities after deviating. He shows that the maximal debt ratio for which the trigger strategy is sustainable declines in the discount rate and increases in the number of firms in the industry. He also finds that a higher demand elasticity increases this sustainable debt ratio. Next, Maksimovic discusses the impact of capacity constraints. On the one hand, capacity constraints restrain a firm from producing the deviation output, which lowers the payoff from deviating. On the other hand, capacity constraints restrain other firms from effectively punishing the deviator as producing the higher Cournot output may be unattainable in the short run. He shows that the relative effect of capacity constraints depends on the properties of demand and cost, the discount rate and the number of firms in the industry. Finally, Maksimovic investigates how specific financial instruments, such as warrants and convertibles, affect the collusive debt level. In his model, these instruments serve as a “tax” on the cash flow to equity as they lower the residual payoff after deviating. By strategically choosing the exercise price of the warrants, a firm can provide its rivals with a guarantee against cheating. Issuing convertible debt has the mixed effect of raising leverage while simultaneously limiting the payoff from deviating.

Spagnolo (2000) uses the framework of Maksimovic (1988) to show that debt can also have anti-competitive, i.e. collusive effects. He shows that collusive credit markets or large banking groups can export their own collusive behavior to output markets by forcing firms to behave prudently. Creditors (implicitly) force firms to take creditor-friendly actions that reduce agency costs of debt (such as hiring managers who have a reputation at stake, making managers’ contracts less dependent on shareholder value, etc.). These creditor-friendly actions, which dampen the limited liability effect of debt, are sustainable if managerial contracts can be made renegotiation-proof. In Spagnolo’s model, that this can be achieved by the power to veto renegotiation or by developing information networks that render secret renegotiation impossible (e.g., being represented on the firm’s board), as shown in Proposition 5.

Dasgupta and Titman (1998) investigate how leverage, by affecting the cost of capital, influences a firm’s pricing strategy under Bertrand competition. They find that the nature of the competitive game (Nash or Stackelberg) affects the relation between leverage and prices. Dasgupta and Titman use a two-period model, where firms may invest in

market share in period 1 by lowering their prices to increase their period 2 cash flows. Proposition 1 states that first-period prices are increasing in the level of debt. If firms increase their leverage in this framework, they increase their cost of capital. The reason is that outstanding (long-term) debt increases the cost of new borrowing and thus increases the discount rate at which period 2 cash flows are discounted. As a result, firms care less about period 2 income and raise their prices in period 1. The reaction of rivals depends on their reaction curve. Two opposing effects are at work. On the one hand, when a firm increases its price, the rival can increase its profitability by increasing its own price as prices are strategic substitutes. On the other hand, when a firm increases its price, the rival's borrowing costs are reduced due to a rising profitability, and investments in market share become more attractive. Then, the rival will lower its price. Under *Nash* price competition, firms have an incentive to commit to a less aggressive pricing policy as this will induce the rival to also price less aggressively. Outstanding senior debt can be used as such a commitment device as it raises the cost of new borrowing and thus reduces the incentives to gain market share. So, firms will have higher debt ratios, *ceteris paribus*. Under *Stackelberg* price competition, a relatively less levered firm can steal away market share from its rival by lowering its price as it places a higher value on the period 2 payoff than a highly levered firm (Proposition 7). Finally, the model shows that an inelastic demand reduces the benefits of committing to a higher price, and so firms raise less debt. Another prediction of the model is that firms in industries with larger asset liquidation values may have higher debt ratios. The reason is that higher liquidation values decrease the cost of debt, thereby inducing firms to increase their debt levels. However, this latter positive effect can be undone when the lower discount rate increases the rival's incentives to invest in market share. Depending on the state of nature, one of these two effects will dominate.

2. Investment Decisions

Debt influences investments, both directly and indirectly through interest rates. In this section, we focus on the direct, strategic effects of debt on investments,⁸ thus leaving out the models that deal with interest rates. The seminal paper by Myers (1977) demonstrates the existence of an underinvestment effect induced by risky debt. Dotan

and Ravid (1985) show that through non-debt related tax shields, investments also decrease in leverage. Models focusing on managerial incentives (e.g., Jensen (1986)) show that high debt can curb negative NPV investments in market share and size. Hart and Moore (1995) take both under- and overinvestment effects into account to determine optimal leverage, debt maturity and seniority structure. Finally, Allen (2000) shows that high debt can put firms at a strategic disadvantage through a delay in investments when competition is imperfect.

Myers' (1977) seminal paper introduces conflicts of interest between debt- and equityholders into the framework of optimal capital structure. He shows that managers acting in the interest of shareholders may forego positive NPV projects if these projects' payoffs largely accrue to the firm's creditors. So, without any (tax) advantages to debt financing, a firm with access to profitable investment projects should hold no debt at all. In a more realistic setting, his model concludes that the optimal debt ratio should be inversely related to the ratio of the value of the firm accounted for by growth options relative to the value of assets in place. Underinvestment incentives thus directly link capital structure to a firm's investment opportunities. The reason is that growth options demand discretionary investment decisions by the firm's managers.

Dotan and Ravid (1985) extend the work of DeAngelo and Masulis (1980)⁹ to take into account the positive relation between investments and non-debt related tax shields. Firms that take on more debt have an increased probability of incurring accounting losses, which reduces the present value of non-debt related tax shields resulting from investments in capital goods.

Dotan and Ravid use a one-period model in which they endogenize the investment decision in a world without taxes and debt, and then gradually introduce both, endogenizing the leverage decision. They show that firm value maximization results from the simultaneous determination of output level and capital structure. Proposition 1 states that optimal capital investment is a decreasing function of the debt level. Corollary 2 shows that the simultaneous optimization of capital stock and leverage results in a higher debt ratio than in case where leverage is optimized for the optimal capital stock of an unlevered firm. They then look at how exogenous determinants of either investment or capital structure affect both endogenous variables, showing in Proposition 2 that an increase in the tax rate leads to a lower optimal capacity level and a higher optimal debt level. Proposition 3 shows

that increases in the expected price of the firm's product lead to greater optimal capacity and lower leverage.

In many models, managers are assumed to maximize total firm value or shareholder value. But managers may be more interested in maximizing a mix of shareholder value and organizational surplus, which includes benefits accruing from size, growth, above-market salaries, overstaffing, etc. Jensen (1986) states that the greater the amount of free cash flows firms generate the greater the managerial incentives to maximize this organizational surplus. Free cash flows are hereby defined as the discretionary cash flows after funding all positive NPV projects. Exchanging debt for equity has a negative impact on free cash flows as debt effectively bonds managers to pay out cash flows. Furthermore, as pointed out by Jensen and Meckling (1976), debt-for-equity exchanges where the amount of equity owned by managers is held constant increase the relative amount of equity owned by managers and thus better align their incentives with those of shareholders. Thus, by increasing debt, the firm might curb managers' incentives to invest in size and market share, thereby decreasing firm aggressiveness.

In the same spirit, Hart and Moore (1995) explain why companies issue hard (i.e. senior, non-postponable) long-term debt to curb managers. In their model, they use debt to trade off overinvestment (Jensen (1986)) and underinvestment (Myers (1977)) incentives. Overinvestment resulting from empire building projects stems from a lack of hard claims (non-postponable short-term debt that makes excess cash scarce and senior long-term debt that prevents managers from borrowing against current assets' future earnings). Too much borrowing causes current assets to be 'over-mortgaged' and could force a firm to underinvest in profitable projects. The trade-off between both effects determines the optimal debt-equity mix and the mix of junior and senior debt. As for the maturity structure of the debt, Propositions 1 and 2 show that firms optimally use only long-term debt to balance the two effects. The debt-equity mix depends on the relative profitability of assets in place versus new investments: with a lot of new profitable projects, (long-term) debt should be modest and vice versa if current assets are profitable. In an extension of the model, Hart and Moore derive the distributional assumptions of assets in place and investment opportunities under which a mix of senior and junior long-term debt is more optimal than a simple long-term debt contract (Propositions 4, 5 and 6).

Allen (2000) shows how high debt can increase expected bankruptcy costs through the strategic effect of a delay in investment decisions when product market competition is imperfect. This strategic effect depends inter alia on the (relative) solvency of both players, fixed capacity costs and the state of demand. In Allen's model, firms weigh this strategic effect against the tax advantage of debt to determine their capital structure.

Allen looks at two identical duopolists in a two-period model where investment and financing decisions are made simultaneously at the beginning of every period. Afterwards, output equal to capacity is produced, the state of demand is revealed, prices are set, and taxes and payments to securityholders are made. If a firm cannot meet its obligations, it goes bankrupt and its investment decisions in the next period are delayed. The outcome of the second period now depends on the relative solvency of firms. If both firms are in the same solvency state at the end of period 1, the outcome is determined by a Nash game. Then, both firms have the same debt level, which depends on other capital structure determinants, and have no incentive to change it. But if only one firm is solvent, the outcome is determined by a Stackelberg game. Through backward induction, Allen shows that period 0 equilibrium is symmetric (and thus firms play a Nash game in period 2) below a certain fixed cost of capital t^{**} whereas the equilibrium is asymmetric (Stackelberg game) above t^{**} . In period 2, if the firms play the Stackelberg game, the Stackelberg leader will force the follower out of the market above a fixed cost of capital t^* , with $t^* < t^{**}$. At intermediate cost of capacity levels, he raises capacity above the monopoly level to induce the follower to liquidate. At high levels, the leader produces the monopoly output, and the follower's best response is to liquidate. In sum, when only one firm is solvent and insolvency leads to a delay in investments, the fixed cost of capacity determines the outcome of the competitive game and the marginal costs of bankruptcy. These marginal bankruptcy costs together with tax benefits determine the firm's debt ratio. As more debt increases the probability of costly bankruptcy and liquidation, it is associated with less aggressive output market behavior. The model also provides evidence for the existence of different debt ratios within the same industry. When firms are asymmetric, one firm prefers the tax advantage of debt, while the other firm prefers the advantage of being able to force the rival out of the market if demand turns out to be low.

3. Predatory models of entry and exit

Firms may benefit from taking output market decisions that drive their rivals into insolvency (strategic bankruptcy effect). A seminal contribution by Telser (1966) introduced the deep-purse argument. Deep-pocketed incumbents may be able to exhaust financially constrained firms by engaging in predatory actions such as price wars. Later studies examine different forms of predation, where predators “jam” information in order to put financial constraints on the prey (Fudenberg and Tirole (1986); Poitevin (1989); Bolton and Scharfstein (1990); Fernandez-Ruiz (2004)), or to improve their relative performance (Rotemberg and Scharfstein (1990)). Maurer (1999) finds that the pattern of strategic interactions within the industry affects the probability of predation. Lambrecht (2001) looks at the firm, industry and macroeconomic conditions that influence entry and exit, and the exit order. Kanatas and Qi (2001) find that differences in maturity and sources of debt can reduce the predatory threat.

Fudenberg and Tirole’s (1986) signal-jamming model of predation differs from long-purse predation models in that current profits only matter insofar they signal future profitability. Under the informational assumptions that the incumbent’s output prices and fixed costs are not directly observable, entrants infer future profitability from their current earnings and cannot observe predatory activities by the incumbent. The incumbent then may have an incentive to abuse this inference, and “jam” the earnings signal to drive the entrant out of the market. In the long-purse model, the prey can be forced to exit the market if it is incapable of renewing capital or financing new projects.¹⁰ In equilibrium, the profits of both firms are reduced, but the entrant is not fooled as he rationally anticipates the predatory pricing of the incumbent and only leaves the market if it is unprofitable to stay. Nevertheless, predation does pay off as it lowers the probability of entry.

Poitevin (1989) formalizes the deep-pocket model of Telser (1966) by bypassing the argument that in perfect financial markets, profitable firms can always secure financing. By endogenizing the entrant’s financial structure, information asymmetries in financial markets can increase the entrant’s financial vulnerability. Poitevin develops a model with an incumbent firm, whose cost structure is known in the finance community, and an entrant whose cost (higher or lower than the cost of the incumbent) is uncertain. The entrant needs to make a

fixed investment, which can only be financed externally. In equilibrium, the low-cost entrant credibly signals its type to investors by issuing debt (Proposition 2). By contrast, the high-cost entrant and the incumbent are entirely equity financed. As debt carries the risk of bankruptcy, Poitevin shows that the incumbent firm tries to prey upon the levered entrant by increasing output. The model shows that the incumbent's incentives to prey are a function of the entrant's financial structure. Predation thus can induce (temporary) exit. Also, if there are many lemons in the market and predation is strong, signaling costs may prohibit entry in the market.

Bolton and Scharfstein (1990) look at how agency problems in financial contracts can engender rational predation. Making refinancing decisions dependent on firm performance solves incentive problems between the firm and its financiers, but at the same time increases the probability that rivals prey upon the firm to lower its performance and induce exit.

In a two-period model, a deep-pocketed firm competes with a shallow-pocketed firm that has to finance its investments in each period via the capital market. In a world without predation, investors provide second-period financing if the firm was able to pay back initial loans, thereby dealing with potential incentive problems. This optimal contract, however, maximizes the rival's incentives to prey. If predation is not ruled out, the costs and benefits of predation affect the optimal financing contract. Two possible solutions are to lower the probability of refinancing if the firm was solvent in the first period (shallow pockets), or to increase the probability of refinancing when the firm was insolvent (deep pockets). If debt contracts are observable and if deterring predation is more profitable than supporting it, investors choose for shallow pockets. If contracts are unobservable or if supporting predation is more profitable, financing contracts are not adjusted.

While Bolton and Scharfstein look at the difficulty in assessing a firm's ex post performance when incumbents have an incentive to prey, Fernandez-Ruiz (2004) examines the difficulty of determining the ex ante prospects of a project. To alleviate adverse selection problems, entrants condition their own survival on future performance assessments by investors (at the renewal of financing contracts). Incumbents again have an incentive to distort ("jam") these assessments by preying upon the entrant. Actual predation depends on the cost of preying, the difference in profit with or without the entrant

and the distortion created by the predatory action. Fernandez-Ruiz derives optimal financing contracts in this setting. He finds that the optimal contract is mostly deep-pocketed, in contrast to the findings of Bolton and Scharfstein (1990), where shallow pockets are optimal in most cases. The reason is that marginal survival after performance assessment increases managerial control rents (non-pecuniary benefits), which are not considered by Bolton and Scharfstein. An increase in marginal survival also increases the project's ex ante expected revenues (provided that the firm's expected cash flows as of date 0 are worth more than its liquidation value). Finally, Fernandez-Ruiz examines how the possibility of renegotiating financing contracts after the assessment affects the optimal ex ante contract. In Propositions 4 and 5, he finds that this possibility has no effect.

Rotemberg and Scharfstein (1990) show that the prospect of equity issues can influence output market behavior and that this mechanism can induce firms to pay out dividends or to repurchase stock. Under imperfect information, investors try to infer a firm's costs and demand from its own and its rivals' realized profits. Rotemberg and Scharfstein show that a firm's stock price reacts to its cost position relative to that of rivals. Managers now can take actions to improve investor perceptions of future profits. Rival profits have two countervailing effects on the firm's own stock price. First, higher rival profits can be interpreted as rivals having relatively lower production costs or higher firm-specific demand (and vice versa). This effect enhances the firm's aggressiveness. Second, high rival profits signal that the industry has low costs or high demand, which decreases the firm's aggressiveness. Depending on which effect dominates, a firm uses its output choice to influence rival profits and increase its own stock price. In their model, firms pre-commit to a more or less aggressive output stance by distributing cash flows as dividends or stock repurchases (equivalent to changing leverage) depending on the dominant effect. If investors value relative performance more than industry performance, firms distribute cash and/or repurchase stock. If investors attach more importance to industry performance, firms do not pay out cash flows.

Maurer (1999) shows in a two-period model, where one firm finances projects internally whereas the other (the entrant) has to contract outside debt and where the probability of getting second-period financing is made contingent on first-period profits, that the tendency of rivals to prey upon leveraged firms depends inter alia on the pattern of strategic interactions within the industry (Stackelberg or

simultaneous move). These strategic interactions are modeled by the observability of the debt contract. If debt contracts are observable before firms choose their effort levels, the relation between the internally financed firm and the lender corresponds to a Stackelberg game between the less levered firm and the investor with the investor acting as the Stackelberg leader. The optimal contract will deter predation, but the probability of refinancing is lower compared to the case where contracts are not observable (Proposition 4). If debt contracts are not observable, a simultaneous move game results. The unlevered firm will increase its period 1 effort level (Proposition 3), thereby increasing the probability that the levered firm will not be refinanced.

Lambrecht (2001) demonstrates the interrelation between firm-specific, industry-specific and macro-economic factors and their combined effect on entry and exit decisions and on the exit order. Concerning entry, Lambrecht finds in Proposition 9 that an entrant's need to borrow money tends to delay entry. An incumbent's leverage ratio, however, tends to speed up entry. These two findings support the conclusion that higher industry leverage makes competition softer. Regarding survival, Lambrecht finds that higher operating profits, lower debt obligations, larger incremental gains from becoming a monopolist and higher bankruptcy costs (highly intangible assets)¹¹ help firms in their struggle with competitors. The relative importance of these factors depends on macro-economic variables, such as interest rates, profit volatility and profit growth rates. For the firm-specific factors, Lambrecht thus extends the empirical findings of Zingales (1998) that not only the fittest (most efficient), but also the fattest (lowest coupon) firms survive, to include also the survival of the greediest firm (the firm with the largest incremental gain of becoming a monopolist). He concludes that in a duopoly, it is more important to be fat and greedy than to be fit as firms can benefit substantially from the monopoly outcome. Finally, Lambrecht shows that macro-economic factors can influence the order in which firms default if firms differ sufficiently. He finds that increases in profit volatility are to the relative advantage of the firm with the lower profit and higher coupon parameters, whereas increases in profit growth and interest rates are to the relative advantage of the firm with the higher profit and the lower coupon parameters.

Kanatas and Qi (2001) recognize the incentives of rivals to distort information to investors. Also, they take into account that investors may recognize the incentives of rivals to dilute a firm's information

stream. In a Cournot duopoly model, they examine the different information effects of short-term versus long-term debt, and bank versus capital market debt. With short-term debt, firms have to refinance early, which requires a certain degree of transparency. When making refinancing decisions, investors compare the performance of the firm relative to that of its rival. Thus, both the firm and its rival have an incentive to distort the information to their advantage when debt contracts are short-term. As the authors assume that banks monitor their loans, bank lending also induces information distortion. Long-term and capital market debt, by contrast, reduce this incentive but increase the managers' abilities to shirk and invest in negative NPV projects. Kanatas and Qi show that firms will sooner try to prey when competitors are financed with short-term or bank debt. Consistent with Glazer (1994), short-term debt and bank debt stimulate firms to act more aggressively in the output market, but do not moderate managers' information distortion incentives. Also, they show that short-term debt usage decreases in industry concentration whereas the use of long-term increases as price elasticity of demand increases.

IV. EMPIRICAL FINDINGS

Over the last decade, attention has shifted away from theoretical to empirical work on the interactions between capital structure and product markets. The main point of interest in this empirical literature is the question whether firms interact strategically through limited liability, strategic investment, strategic bankruptcy and/or predation? And how do firm and rival debt ratios affect these interactions? Relatively little attention has gone to the impact of NFS on the financing choices of a firm, largely because of a lack of data.

We structured this section conform our discussion of the theoretical models; this process was not easy as empirical papers tend to test a bulk of theories at once. We have chosen to discuss each paper entirely within one category – its dominant category – instead of slicing up the results. Mostly, the results are in line with the theoretical predictions and other empirical studies. Nevertheless, we also treat empirical evidence that disagrees with the above-discussed theoretical models. Our discussion of the empirical studies is summarized in Table 2.

TABLE 2
Empirical results

Author(s)	Hypotheses	Results	Data Set
<i>1. NFS determinants of capital structure</i>			
Titman and Wessels, 1988 Huyghebaert and Van de Gucht, 2002 Welch, 2004	<p>What are the determinants of capital structure choice? Are the effects consistent for different measures of leverage?</p> <p>What are the determinants of financial structure of start-ups? Are the effects similar for established firms? Is there a relation between leverage, debt mix, and maturity choices?</p> <p>Do capital structure determinants proposed in the literature explain active debt and equity issues, or do only stock prices explain leverage dynamics? Do firms readjust to their target debt ratios?</p>	<p>Firms with unique/specialized products have lower debt ratios. Transaction costs are more important for (small) firms than other determinants. Debt ratios are not related to the firm's expected growth, volatility of operating income, non-debt tax shields or asset collateral value.</p> <p>Decisions concerning level and composition of debt are made simultaneously and financing decisions are context-specific. Adverse selection and moral hazard affect relations with creditors. Private benefits of control, owner type and scale economies affect financing choices.</p> <p>Stock price effects are more important than other capital structure determinants in explaining debt ratios. Firms with more profitable assets and highly volatile returns avoid readjustment to their debt ratios after equity offerings.</p>	<p>469 (large) firms from Compustat Industrial Files; 1974-1982</p> <p>244 Belgian start-ups in manufacturing in 1992 and their four-digit NACE incumbents</p> <p>>40,000 firm-years from Compustat and CRSP; 1962-2000</p>

Author(s)	Hypotheses	Results	Data Set
Istaitieh and Rodriguez, 2003	How do NFS affect capital structure? How does capital structure interact with market structure? How does it enact strategic behavior by the firm and its rivals?	Employee bargaining power, customer concentration, reputation and economic growth are negatively related whereas industry concentration and vertical industry concentration and vertical integration are positively related to leverage.	1,502 Spanish manufacturing firms; 1993-1999
Showalter, 1999	How are debt ratios related to cost and demand parameters?	Demand uncertainty is positively whereas cost uncertainty is negatively related to leverage.	1,641 U.S. manufacturing firms; 1975-1994
Schargrodsy, 2002	How does market structure affect debt ratios?	Oligopolies have higher leverage than monopolies. The relation between concentration and leverage is U-shaped. The prices of oligopolists are positively related to debt ratios.	22 newspaper companies; 1957-1995

2. Impact of capital structure on product market decisions

2.1. Production decisions

Opler and Titman, 1994	What is the effect of financial distress on firm performance? What is the role of switching costs and industry concentration?	High-debt firms lose market share and firm value, sales decline during industry downturns. This loss is higher in more concentrated industries with differentiated products.	46,799 firm-years (U.S.); 3% in distressed industries; 1972-1991
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Author(s)	Hypotheses	Results	Data Set
Kovenock and Phillips, 1995	Is debt a mechanism that reduces over-investment in industries where high concentration reduces the disciplinary effect of product market competition? Limited liability effect? Strategic investment effect?	Firms are more likely to recapitalize when they have plants of low productivity, when they operate in a highly concentrated industry, and when industry capacity utilization is low. Afterwards, firms produce less but rivals increase their output.	867 firms from ten commodity industries; 1979-1990
Campello and Fluck, 2004	What dynamic effects do financing decisions have on investment decisions and output market competition over the business cycle? What effect do a firm's liquidation value, customer switching costs and rival financial structure have?	With negative demand shocks, high-levered firms loose market share. This effect is exacerbated if competitors have low debt levels or if customers face high switching costs.	1,744 U.S. manufacturing firms in 57 industries; 1989-1991 and firm-level panel data; 1976-1996
Phillips, 1995	Does recapitalization restrict empire building? Does predation occur when rivals are less levered? Does higher leverage induce stronger competition?	Leverage decreases market share and sales and increases plant closings, prices and operating margins, except when the industry has low entry barriers.	4 U.S. industries (Compustat); 1980-1990

2.2. Pricing strategies

Chevalier, 1995a	What is the impact of rival leverage on the relation between capital structure and pricing decisions? Predation?	Post-LBO, the firm's price is higher than that of less levered rivals. If rivals are highly levered, prices rise whereas prices fall if rivals have low leverage.	U.S. supermarket chains; firm-level and MSA-level data; 1985-1991
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Author(s)	Hypotheses	Results	Data Set
Chevalier and Scharfstein, 1995	Do liquidity constrained industries raise mark-ups and cut capital expenditures and inventories during cyclical downturns? Are mark-ups more countercyclical in more concentrated industries?	Mark-ups tend to be more countercyclical in highly concentrated industries that have a greater fraction of liquidity constrained firms. Investments in PPE are procyclical.	20 (two-digit SC) manufacturing industries; 1959-1989
Chevalier and Scharfstein, 1996	Is a firm's mark-up more countercyclical if it is more financially constrained? What is the effect of rival financial constraints? Are average industry mark-ups more countercyclical if firms are more financially constrained?	Liquidity constraints make firm mark-ups countercyclical. During recessions, prices rise more in MSA with a lot of financially constrained supermarket chains. Finally, firms tend to raise their prices more when their rivals are highly levered.	U.S. supermarket chains (firm and industry data); 1986-1992
Campello, 2003	Does debt, conditional on the phase of the business cycle and rival leverage, lead to underperformance as high leverage firms cut investments in market share? When are mark-ups countercyclical?	During (demand) busts, highly levered firms lose market share in relatively unlevered industries. Those losses are reversed during booms. In high-debt industries, these competitive dynamics are not observed. Mark-ups are more countercyclical if industry debt is high.	28,133 firm-quarters in 171 industries; firm- and industry-level data (Compustat); 1976-1996

Author(s)	Hypotheses	Results	Data Set
Clayton and Ravid, 2000 Borenstein and	What is the effect of leverage on the bidding behavior of firms, controlling i.a. for bankruptcy risk?	As debt levels increase, firms tend to reduce their bids. Higher rival debt ratios also induce firms to lower their bids. The probability of winning the bid is negatively related to firm and rival leverage, even though the coefficient of the latter variable is not significant.	14 companies, 150 company-bid pairs (FCC, Compustat, Warga Lehman Brothers); Dec. 1994-March 1995
Rose, 1995	Does financial distress and bankruptcy affect pricing behavior?	Airline companies threatened by bankruptcy reduce their prices to reflect the drop in customer demand. The prices of rival companies do not respond.	1,777 routes, 7 bankrupt firms and competitors; 1987-1993
<i>2.3. Investments</i>			
McConnell and Servaes, 1995	Does debt play a fundamentally different role in firms, depending on the amount of positive NPV projects? Does the presence of growth opportunities affect the relation between equity ownership and corporate value?	Firm value (Tobin's Q) is negatively related to leverage for firms with a lot of profitable investment opportunities and vice versa for low-growth firms. The relation between corporate value and insider equity ownership is quadratic. Institutional and block ownership is positively related to Q for low-growth firms. These relations are less clear-cut for high-growth firms.	1,764 U.S. firms in 1976, 1986, 1988; Compustat, Value Line investment survey

Author(s)	Hypotheses	Results	Data Set
Kovenock and Phillips, 1997	Do sharp debt increases interact with market structure to influence plant closing and investment decisions of firms and their rivals?	Recapitalizing firms in highly concentrated industries are more likely to close plants and invest less. Rival firms are less likely to close and invest more when the recapitalizing firm has a high market share. Plant-level productivity and industry capacity utilization are even more important than capital structure to explain investment and plant closing decisions.	firm-level data from 10 commodity industries in which at least one of the top-4 recapitalizes; 1979-1990

2.4. Predation, entry and exit

Chevalier, 1995b	Do share prices respond to the announcement of rival chain LBOs? Entry? Exit? Expansion? How do (non-)competitors respond in the output market?	Leverage increases (through LBOs) lead to softer product market competition. Competitors enter and expand in markets dominated by LBO firms and their share prices respond positively to an LBO announcement.	U.S. supermarket chains; 4 LBO firms and 13 rivals from 85 MSA; 1985-1991
Zingales, 1998	How does leverage affect a firm's ability to respond to unexpected changes in the competitive environment? What are the sources of these effects?	Highly levered firms in limited competitive markets are less likely to survive. High debt curtails investments and reduces the price in limited competitive markets.	941 firms, U.S. trucking industry; 1977-1985

Author(s)	Hypotheses	Results	Data Set
Khanna and Tice, 2000	What are the firm and market characteristics that affect incumbents' responses to entry?	Larger, more profitable LBO firms respond more aggressively to entry whereas highly levered incumbents that did not undergo an LBO respond less aggressively. In markets with no entry, high-debt firms compete more aggressive than low-debt firms.	69 discount store chains in 862 local markets (Compustat); 1975-1996
Huyghebaert and Van de Gucht, 2004	Is competition positively related to the exit probability of start-ups? Are highly levered start-ups less likely to survive under competitive pressure? Does financial market predation exist?	Highly levered start-ups are more likely to exit, but only in the case of strategic complements and when adverse selection and moral hazard problems in financial markets are more likely.	235 Belgian start-ups in manufacturing in 1992 and their four-digit NACE rivals

A. NFS determinants of capital structure

The first central paper discussed in this section is Titman and Wessels (1988). Their findings will be compared to those of Huyghebaert and Van de Gucht (2002), Welch (2004) and Istitieh and Rodriguez (2003). Huyghebaert and Van de Gucht examine the determinants of financial structure for start-up firms, Welch investigates how capital markets steer the relation between determinants and financial structure and Istitieh and Rodriguez approach capital structure from a stakeholders' point of view. Finally, Showalter (1999) and Schargrotsky (2002) provide evidence that market structure affects capital structure.

Titman and Wessels (1988) use a covariance structure model to estimate the impact of theoretical capital structure determinants on leverage. Such a covariance structure model consists of a structural model, which specifies the relations between constructs (the capital structure determinants) and leverage, and a measurement model, which develops the relations between constructs and their proxy variables. As theory uses different (non-trivial) definitions of leverage, Titman and Wessels separate leverage into the ratios of short-term, long-term and convertible debt to equity, where equity is measured both in market and book values.

Titman and Wessels use a sample of 469 large firms, selected from the Compustat Industrial Files between 1974-1982. The main results are that firms with unique or specialized products have relatively low debt ratios, which supports Titman (1984) and Maksimovic and Titman (1991).¹² Uniqueness is measured by three variables, namely: R&D/sales, selling expenses/sales, and job quit rates. Smaller firms use significantly more short-term debt than larger firms, which, together with the negative relation between past profitability and current leverage, indicate that transaction costs may be an important determinant of capital structure. Titman and Wessels find no evidence that debt ratios are related to a firm's expected growth, volatility of operating income, non-debt tax shields or asset collateral value. Also, the variation in convertible debt ratios across firms remains largely unexplained.

Huyghebaert and Van de Gucht (2002) examine how capital structure determinants survive in a sample of business start-ups. These firms are characterized by a lack of (financial and operating) history, which enlarges information asymmetries. Start-ups also have little reputation at stake, which together with a high ownership concentration

increase agency problems of debt. Finally, start-ups face relatively high exit rates. The paper's hypotheses are constructed starting from the firm's stakeholders. The supply-side is represented by banks and other creditors (suppliers and lessors), the demand-side by the entrepreneur. Supply-side problems include adverse selection and moral hazard (risk shifting and underinvestment incentives). Demand-side concerns mainly consider entrepreneurial control rights.

Huyghebaert and Van de Gucht simultaneously investigate three components of financial structure: the debt ratio, debt mix and maturity structure. Their sample consists of 244 Belgian manufacturing start-ups in 1992. The empirical results show that when the probability of adverse selection and moral hazard problems is high, start-up firms contract less bank debt. Banks do not limit loan maturity to curb these problems, however. The lower share of bank credit is compensated by an increase in leasing and trade credit. Overall, credit from non-bank sources cannot fully offset the lower bank debt. Finally, consistent with Myers (1977), start-ups in industries with substantial growth opportunities raise significantly less debt, but have a larger fraction of bank debt. As a number of these effects differ from the relations found for mature firms, the authors state that financing decisions are context-specific.¹³ From the demand-side point of view, entrepreneurs who value private control benefits limit bank debt and resort to trade credit and leasing. They also prefer to lengthen the maturity of their bank debt. Other interesting results are that high-quality entrepreneurs prefer short-term bank debt, and start-ups operating in industries with large scale economies raise significantly more debt.

Welch (2004) investigates whether the theoretical determinants of capital structure and/or stock prices explain active debt and equity issues. If the theoretical determinants are relevant, firms should re-adjust to their target debt ratios whenever the deviation costs are larger than the issue costs. If stock prices are important, no counterbalancing security transactions should be undertaken. Welch uses Compustat and CRSP data on more than 40,000 (large) firm-years during the period 1962-2000 to estimate the following equation:

$$ADR_{t+k} - ADR_t = a_0 + a_1 * X_{t,t+k} + \sum_{c=1}^C [a_{2c} * V_{c_t} + a_{2c+1} * V_{c_t} * X_{t,t+k}] + \varepsilon_t$$

where the LHS measures the change in the actual debt ratio over a one- or five-year horizon, and the RHS gives the sum of a constant, return-induced debt ratio changes, and determinants put forward by the literature along with interaction terms between these determinants and return-induced debt ratio changes.

Welch finds that 40% of capital structure dynamics can be explained by stock prices. Also, he finds that although firms are issuing enough securities to enable them to return to their target debt ratios after a stock return induced equity growth, firms do not neutralize stock price induced deviations from target ratios. Overall, stock price effects are considerably more important in explaining debt ratios than theoretical capital structure determinants.¹⁴ Although previous studies (e.g., Titman and Wessels, 1988) found that these variables correlate with debt ratios, Welch argues this was only an indirect effect because of the correlation of these determinants with (omitted) stock returns. Variables that remain significant after adding stock price effects are the move towards industry debt ratios and the increase in leverage for firms that engaged in M&A activities. Furthermore, firms with more profitable assets and highly volatile returns tend to avoid re-adjustments after equity offerings.

The study of Istitieh and Rodriguez (2003) is the first to explicitly test stakeholder theory. They empirically examine interaction terms between theoretical capital structure determinants and input/output market variables using panel data on 1,502 Spanish manufacturing firms in the 1993-1999 period. Istitieh and Rodriguez use a system of simultaneous equations to solve the inherent endogeneity problem when foresighted firms anticipate the output market consequences of their financing decisions.

The system contains two equations: a financial leverage equation and a product market concentration equation. Their main empirical findings regarding product market determinants of capital structure are that employee bargaining power (proxied by labor expenses minus dismissal and early retirement indemnities over value added) and customer bargaining power (proxied by customer concentration) are negatively related to leverage. These relations support Sarig's (1998) argument that lower leverage increases the firm's negotiation power when dealing with strong NFS.¹⁵ Firms with larger capital investment spending have higher debt ratios, which rejects the underinvestment argument of Myers (1977). Also industry concentration and vertical integration are positively related to leverage, whereas reputation

(measured by the firm's age) and economic growth are negatively related to debt ratios.

Showalter (1999) examines how debt ratios are related to demand and cost parameters. Using a sample of 1,641 U.S. manufacturing firms that are followed over the period 1975-1994, he regresses their debt ratio on a set of capital structure determinants and variables measuring demand and cost uncertainty (calculated as the log of the standard error of linear and non-linear sales trend regressions, respectively cost trend regressions). Showalter finds that the coefficient of the demand uncertainty variable is significantly positive whereas that of the cost uncertainty variable is significantly negatively related to the debt ratio, from which he concludes that most firms compete in prices. Consistent with Showalter (1995), debt levels are adjusted when uncertainty increases, which supports the existence of strategic debt.

Schargrodsky (2002) argues that while a lot of empirical studies have examined the relation between leverage and (price) competition, there is still no strong evidence on how market structure affects debt ratios. He studies both relations on a sample of 22 newspaper companies between 1957 and 1995 as this industry has a wide variability in market structure across local markets and across time (i.e. both monopoly and oligopoly structures are present). After controlling for a wide range of capital structure determinants, Schargrodsky finds that oligopolies have higher debt ratios than monopolies. This finding is consistent with the existence of strategic debt as monopolists and firms operating under perfect competition have no incentive to raise their debt for strategic reasons. Graphically, Schargrodsky finds the relation between concentration and leverage to be U-shaped. Finally, he finds that the prices of monopolists are not affected by debt ratios whereas the prices of oligopolists are significantly positively related to debt ratios. These findings support the models of Showalter (1995) and Dasgupta and Titman (1998) that leverage can be used to sustain collusive equilibria in market structures where firms compete in prices.

Overall, the above papers show that a lot of uncertainty remains as to which factors truly determine capital structure and that strategic uses of debt should be considered. As the results of Huyghebaert and Van de Gucht (2002) show, researchers also have to reflect on the conditions under which the results found in more general papers, like Titman and Wessels (1988) and Welch (2004), are likely to hold in other samples.

B. Impact of capital structure on product market decisions

Mid-1990s, researchers started to focus on the strategic implications of capital structure. Specifically, they examined how exogenous shifts in leverage (through recapitalizations and LBOs) and exogenous output market shocks affect product market behavior and rival firms' financing decisions. In this section, we start by discussing the models examining production, pricing and investment decisions and end by discussing predatory models of entry and exit.

1. Production decisions

Opler and Titman (1994) show that during industry downturns, highly levered firms lose market share and that this effect is exacerbated by product differentiation and industry concentration. Kovenock and Phillips (1995) find that recapitalizing firms become less aggressive whereas rivals become more aggressive. Campello and Fluck (2004) conclude that when demand decreases, especially highly levered firms lose market share. Also, this loss is larger for firms whose products involve large consumer switching costs. Finally, Phillips (1995) finds that leverage decreases market share and sales and increases prices and operating margins, except for industries with low entry barriers.

Opler and Titman (1994) investigate under which conditions financial distress costs affect firm performance on a sample of 46,799 firm-years between 1972 and 1991, of which roughly 3% were in distressed industries.¹⁶ They find that relatively highly levered publicly traded firms lose market share and firm value during industry downturns. They also show that this effect is more pronounced when firms produce differentiated goods (as measured by their R&D expenditures) and in highly concentrated industries (four-firm concentration ratio), which is consistent with Titman (1984), respectively predation models. Size has no clear effect on this relation. Next, they examine the impact of an exogenous industry downturn on firm performance (industry-adjusted sales growth, stock prices and operating income growth). If high debt would be beneficial and financial distress costs would be low, highly levered firms should perform relatively better. However, Opler and Titman find the opposite effect. These findings are in line with Titman (1984) and Maksimovic and Titman (1991) in that NFS price expected bankruptcy costs, which are higher for firms with

specialized goods and which increase faster for highly indebted firms during downturns.

Kovenock and Phillips (1995) show that debt plays an important role in highly concentrated industries. They look at ten commodity industries over the period 1979-1990 in which 40 firms discretely increased their debt. In these industries, agency costs of equity are not significantly reduced by product market competition.¹⁷ The paper shows that firms with low-productivity plants in highly concentrated industries are more likely to recapitalize and increase their debt financing. This finding can be interpreted as reflecting the disciplining effect of debt in markets that are not disciplined by output market competition (Jensen (1986)). Kovenock and Phillips introduce another explanation for their results, the strategic investment effect of debt. Consistent with Myers' (1984) pecking order theory, it states that debt payments constrain the amount of (cheap) internal funds, and thus investments need to be externally financed to a larger extent. As external financing is more expensive than internal funding, the slope of the price reaction curve (under Bertrand competition) becomes steeper at the level of output where internal funds are exhausted. From that point onwards, price responses are higher and firms compete less aggressively. Firms can thus pre-commit to a less aggressive policy by contracting debt. The model shows that after increasing its debt level, the firm produces less, but its rival increases output and both firms have higher profits. These model predictions seem to fit with the data.¹⁸

Campello and Fluck (2004) show that within an industry, following a negative shock to demand, more levered firms suffer larger losses in market share. They use two data sets on U.S. manufacturing firms and the industries in which they compete. A first one examines the effects of the exogenous 1990-1991 recession. Secondly, they use (quarterly) firm-level panel data between 1976 and 1996. Interestingly, the decline in market share is even more pronounced when competitors have only limited amounts of debt outstanding. Consumer-switching costs, however, aggravate this decline in market share during recessions as durability (measured by two-digit SIC industry dummies, labeled 'durable' by either the Bureau of Census, respectively Sharpe (1994))¹⁹ and sales growth are negatively related across low- and high-debt industries. Overall, when demand is uncertain, leverage makes firms behave less aggressively, which is consistent with the predictions of Showalter (1995) and Wanzenried (2003) under price competition.

Phillips (1995) meticulously selected four industries (fiberglass roofing and insulation, tractor trailer, polyethylene chemicals, and gypsum) to investigate the effects of exogenous capital structure changes on a firm's production and pricing decisions over the period 1980-1990. The selection of the industries is based on four criteria: the firm with the largest sales in the industry should have increased its debt-to-market value ratio by more than 25%, this leading firm should produce at least 50% of its output in that industry and there should be homogeneous products and imperfect competition in the industry. Summary statistics show that leveraged recapitalizations are followed by decreases in market share for the firm undergoing the recapitalization, except for the gypsum industry. Also, plant closings occur at a much higher rate. Next, Phillips examines the impact of a recapitalization on volumes and various performance measures at the industry level. He finds, except for the gypsum industry, decreasing output and sales and increasing operating margins. For two industries (i.e. fiberglass and tractor trailer), he also finds decreases in capital expenditures.

Next, he uses the multivariate framework of Bresnahan (1989) to examine quantity and price movements, controlling for changes in input prices and the level of production. Phillips also introduces a capital structure variable to measure the effect of debt on pricing decisions.²⁰ A product demand function and a marginal cost function are simultaneously estimated using a two-stage instrumental variables technique. The final form of both equations is:

$$\begin{aligned}
 q_t &= \alpha_0 + \alpha_1 p_t + \alpha_2 y_t + \alpha_3 r_t + \varepsilon_t \\
 p_t &= \beta_0 + \beta_1 q_t + \beta_j w_t + \gamma^*(Debtratio_t) + v_t
 \end{aligned}$$

In all four industries, the capital structure variable turns out to be significant. The average industry debt ratio is significantly positively related to prices, except for the gypsum industry where the relation is negative. Phillips attributes this negative sign for the gypsum industry to the low entry barriers and the ease of expansion in this industry, and to the fact that the third and fourth largest firms in this industry had low leverage and gained market share following the firm's recapitalization. Overall, he positions his findings in the literature that associates debt increases with reductions in agency costs of equity (Jensen (1986)).²¹ The results for the (low entry barriers) gypsum industry are placed within the Brander and Lewis (1986) framework, where debt induces firms to choose more aggressive output strategies.

2. Pricing strategies

In this section, we discuss studies that investigate how capital structure affects pricing decisions. Chevalier (1995a) finds that the price reactions to discrete capital structure changes (LBOs) are influenced by rival debt ratios. Chevalier and Scharfstein ((1995), (1996)) and Campello (2003) examine how leverage and concentration interact to affect (the cyclicity of) mark-ups. Chevalier and Scharfstein ((1995), (1996)) find that liquidity constraints make mark-ups more counter-cyclical at the industry, respectively firm level, especially if the market is highly concentrated. Campello (2003) finds that the counter-cyclicity of mark-ups depends on rival debt ratios. Clayton and Ravid (2002) show that high firm and rival debt reduces bids in auctions. Finally, Borenstein and Rose (1995) find that airline companies change their pricing behavior when faced with financial distress to take into account a drop in customer demand.

Chevalier (1995a) examines the impact of discrete capital structure changes on pricing decisions. For this purpose, she investigates LBOs in the supermarket industry. She has operational, financial and ownership data on supermarket chains in 85 Metropolitan Statistical Areas between 1985 and 1991. Next, she has a database with price data at the MSA and firm level. Chevalier regresses price changes the quarter before the LBO occurred until six quarters afterwards on variables that measure the extent to which price changes by the LBO firm should be accommodated by its rivals (size of the LBO firm and its (biggest) rivals) and some control variables. She finds that an LBO firm increases its prices if rivals are highly levered, but that prices decrease if a single lowly levered (large) competitor is present in the market. Chevalier compares the LBO results with those of the same regression that examines the six quarters before the LBO occurred. The relation between price changes and rival leverage is not significant before the LBO, which supports the conclusion that price dynamics around the LBO are truly engendered by the LBO. The argument that a common shock affects prices is refuted by the fact that price effects are opposite in different markets. Finally, Chevalier also finds that the prices of LBO firms are significantly higher than the prices of less levered firms, providing evidence that LBOs create incentives to raise prices.

The theoretical concepts behind the results are built around the price effects of an LBO. On the one hand, Chevalier looks at agency theory

and liquidity constraints to explain increasing prices following an LBO. The agency hypothesis of empire building predicts that managers may engage in value-decreasing price wars as an investment in future market share. From this perspective, an LBO aligns the incentives of managers and owners, thereby inducing higher post-LBO prices. Because of debt servicing, an LBO also constrains the firm's free cash flows, which may reduce investments in market share. As a result, firms may charge higher prices following their LBO. On the other hand, Chevalier looks at predation models to explain price decreases by LBO firms in industries where rivals are not highly levered. As an LBO usually is followed by a restructuring, whereby low-performing units are divested, rivals have an incentive to signal to the (new) owners that the LBO firm is a low-performer. They can do this by cutting prices, which the LBO firm has to follow in order to stay competitive.

Chevalier and Scharfstein (1995) investigate whether credit constrained industries have countercyclical mark-ups, controlling for industry concentration. When capital market imperfections make it difficult to raise external financing, firms are forced to cut investments during recessions, when less internal funds are generated. In a switching cost model, firms invest in market share by keeping prices low.²² Thus, just as firms cut investments in PPE and inventories when cash-constrained, they will cut investments in market share during recessions by raising mark-ups. During economic booms, when current demand is high relative to future demand, firms are more likely to decrease prices to capture the high demand.

Chevalier and Scharfstein simultaneously estimate three equations using a seemingly unrelated regression (SUR) model. They have a sample of 20 two-digit SIC manufacturing industries between 1959 and 1989. Their first regression looks at the effect of liquidity constraints, proxied by the percentage of small firms in the industry, and the four-firm concentration ratio on mark-up cyclicality. Mark-up cyclicality is hereby defined as the correlation coefficient between log detrended industry mark-up²³ and log detrended GNP. The second and the third regression look at the effect of liquidity constraints on capital expenditure cyclicality, respectively inventory cyclicality.²⁴ The first regression confirms that mark-ups are countercyclical as they find a significantly negative effect of liquidity constraints on mark-up cyclicality. The significantly negative effect of industry concentration on mark-up cyclicality shows that mark-ups are more countercyclical

in highly concentrated industries. The positive and significant effect of the percentage of small firms on the cyclicity of capital expenditures shows that investments are procyclical. Concerning inventory cyclicity, no significant results are found although signs are as expected.

Chevalier and Scharfstein (1996) look at how liquidity constraints due to capital market imperfections affect a firm's pricing behavior during economic booms and recessions. They work out a theoretical model where two firms compete during two periods in a market with switching costs. Without external financing needs, mark-ups tend to rise during booms because the increase in current demand makes it less attractive to price low to increase future market share. So, mark-ups are *pro-cyclical*. After introducing capital market imperfections, this result reverses as firms are less inclined to invest in market share during recessions, implying *countercyclical* mark-ups. The reason is that the increase in the probability of liquidation makes it less likely that the firm can take full advantage of its locked-in customers.

Their empirical study is conducted on a dataset of U.S. supermarkets. They look at the effect of exogenous liquidity shocks to circumvent the endogeneity problem between prices and liquidity. Focusing on the supermarket industry has the advantage that shocks to marginal cost are similar for all supermarkets operating in the same local market (MSA), and that a study on price changes gives comparable results to a study on changes in price-cost margins.²⁵ First, Chevalier and Scharfstein regress price changes on the market share of national supermarkets active in the local market, a dummy variable that indicates whether state earnings accounted for by oil and gas are larger than 2%, an interaction term between both variables and some control variables. They find that in oil-dependent states, prices fall more when national chains are largely present. Local supermarkets, whose liquidity is more heavily affected by the local recession than that of national (diversified) supermarkets, decrease prices to a lesser extent during recessions, as implied by their theoretical model. Second, the authors look at the effects of LBOs on pricing behavior during the economic bust at the beginning of the 90's. As LBO firms are more highly levered than their rivals, they are expected to boost short-run cash flows during busts to meet their debt servicing payments. Here, the regression shows that an interaction term between the share of local stores owned by LBO firms and the change in employment is significantly negatively related to price changes. This result

shows that during downturns, prices tend to rise more in markets with a lot of LBO firms than in markets with less liquidity constrained firms. Finally, by combining firm- and market-level data, Chevalier and Scharfstein test whether prices are more countercyclical if the firm, respectively its rivals are more liquidity constrained. Overall, the regression shows that LBO firms tend to raise prices more than non-LBO firms; they do even more so in local markets with bad economic conditions. This result is consistent with Jensen's (1986) argument that increased debt reduces managers' incentives to invest in value-decreasing empire building projects. They also find that firms tend to raise prices more when their rivals are highly levered; this relation is even stronger when supermarkets are competing in a local market with slow economic growth.

Campello (2003) shows that conditional on the phase of the business cycle and rival debt ratios, leverage can influence a firm's product market behavior. He looks at the sensitivity and the differences in sensitivity of sales growth and mark-ups to leverage following shocks to aggregate demand. More specifically, Campello looks at differences in responses of the sales growth-leverage, respectively mark-up-leverage sensitivity to macro-economic shocks across low- and high-debt industries. Campello uses firm- and industry-level data from Compustat. His dataset contains information on 128,133 firm-quarters of firms in 71 industries between 1976 and 1996. In a two-stage regression model, he first estimates the sensitivity of relative-to-industry sales growth to relative-to-industry leverage. Then, he examines how the worsening of economic conditions affects this parameter. The same approach is used for calculating the sensitivity of mark-ups to leverage.

Campello shows that when industry debt is high, mark-ups become more countercyclical. These results confirm those of Chevalier and Scharfstein (1996), who find that the degree of firm mark-up cyclicity depends both on the firm's own financial constraints as well as on the financial status of rivals. Next, when rivals are relatively unlevered, firm leverage has a negative impact on relative-to-industry sales growth during recessions, but a positive influence during booms. When rivals are relatively levered, no such effects are found. These results are in line with Telser's (1966) long-purse argument that highly levered firms in lowly levered industries are forced out of the market during recessions. In these downturns, it is also difficult to renegotiate debt contracts as credit is tight, which makes predation more likely.

No evidence is found for the limited liability model of Brander and Lewis (1986).

Clayton and Ravid (2002) investigate the link between capital structure and product market behavior in the context of firms' bidding behavior for FCC spectrum auctions (a multiple-round auction for broadband airwaves). The paper combines data from FCC spectrum auctions (between December 1994 and March 1995) with financial data from Compustat and data on the market value of debt from Warga Lehman Brothers' fixed income database. Clayton and Ravid have full information on 14 large companies involved in 150 company-bid pairs. Clayton and Ravid perform two major empirical tests. First, they regress the highest bid of a firm on the firm's leverage, the weighted average debt ratio of competitors, some proxies for the firm's bankruptcy risk (interest coverage ratio, Altman's Z-score and bond ratings),²⁶ interaction terms between firm leverage and these proxies and a set of control variables. They find that when leverage increases, firms tend to lower their bids and thus behave less competitively. Furthermore, if competitors have higher debt ratios, firms tend to reduce their bid even more. Although the effect of leverage on competition is opposite to what Brander and Lewis (1986) predict, this result is consistent with Showalter (1995) as competition here is in prices rather than quantities. The interest coverage ratio is the only significant bankruptcy proxy, but with an unexpected negative sign. So, the higher the bankruptcy threat, the higher the company's highest bid. The interaction terms are not significant. The second empirical test, which models the probability of winning the bid, largely confirms the results already found. This probability is negatively related to firm leverage and (insignificantly) negatively related to competitor leverage. Now, the bankruptcy proxies have the expected negative sign, except for the interest coverage ratio, which is insignificant in this regression.²⁷ So, firms with a larger probability of going bankrupt have a lower probability of winning the bid.

Borenstein and Rose (1995) look into the much-debated pricing strategy of firms filing for bankruptcy using data from the airline industry. From a sample of 1,777 airline routes offered by firms that file for (Chapter 11) bankruptcy between 1987-1993, they find evidence that airlines threatened by bankruptcy reduce their prices by 5,6% in the period of 6 to 3 months before they eventually file. However, in the 3 months before and the 6 months after filing, airlines do not cut prices. Also, rival prices do not seem to respond heavily to the

filing. Borenstein and Rose conclude that the price cuts may be rational in that they represent a drop in customer demand following customers' lower perceived quality of financially distressed airlines. All in all, they find little evidence that bankruptcy itself affects an airline's pricing behavior.

3. Investments

McConnell and Servaes (1995) look at how corporate value (measured by Tobin's Q) is affected by leverage and equity ownership structure (corporate insiders, institutional and block ownership) on a sample of 1,764 U.S. listed firms in 1976, 1986 or 1988. They split up their sample into high- and low-growth firms (using their P/E ratio, Value Line's sales growth forecast or five-year historical sales growth) and perform regressions of Q on leverage, ownership and some control variables. In line with the theoretical predictions of Hart and Moore (1995), they find that for high-growth firms, Q is significantly negatively related to leverage and vice versa for low-growth firms. The relation between ownership structure and corporate value is less clear-cut. First, the relation between inside ownership and corporate value is curvilinear: the simple term is significantly positive whereas the quadratic term in inside ownership is significantly negatively related to corporate value in most regressions. Second, institutional ownership is always significantly positively related to Q for low-growth firms (supporting the efficient monitoring hypothesis), and almost always positive for high-growth firms. Finally, block ownership is always positive (but not always significantly so) related to Q for low-growth firms, but not for high-growth firms.

Kovenock and Phillips (1997) examine how capital structure and product market characteristics interact to affect plant exit and investment decisions in an environment where firms increased their leverage through LBOs or recapitalizations. Their study is executed at the firm level using data from ten industries over the period 1979-1990. The industry selection is based on three criteria: one of the top-four firms in the industry increased leverage by more than 25%, the industry produces commodity goods and is in manufacturing. The dependent variables are plant closing (dummy = 1 if the firm closes a plant in a particular year), respectively investment decisions (capital expenditures/beginning period assets, respectively dummy = 1 if the firm invests >5% of year-end assets). Independent variables are from three

classes: capital structure variables, plant efficiency variables and variables capturing market structure, demand and demand changes.

The results show that although debt does not affect exit and investments directly, it plays an important role when interacted with concentration measures. Recapitalizing firms in highly concentrated industries are more likely to close down plants and invest less. Rivals are less likely to shut down plants and invest more when the leveraged firm has a high market share. So, Kovenock and Phillips find that increasing leverage is consistent with more passive investment behavior by the recapitalizing firm and more aggressive behavior by rival firms. The first observation is in line with models that find anti-competitive effects of debt (e.g., Showalter (1995); Spagnolo (2000); Faure-Grimaud (2000)). The increase in rival aggressiveness can be linked to predation models. Another important result is that plant-level productivity and industry capacity utilization are highly significant variables in explaining investment and plant closing decisions, even more important than capital structure. The results further show that industry concentration, capacity utilization, and relative plant productivity are significant determinants of recapitalization decisions. Indeed, by using lagged values of these variables, the paper shows that capital structure changes are a response to longer-run changes in industry demand and supply conditions.

4. Predation, entry and exit

In a lot of empirical contributions discussed so far (e.g., Chevalier (1995a); Phillips (1995); Kovenock and Phillips (1997); Campello (2003)), part of the results can be placed within the framework of predation. In this section, papers focus on entry and exit decisions and their relation to capital structure and market characteristics. Chevalier (1995b) concludes that rivals find entry and expansion attractive after a firm undergoes an LBO. Zingales (1998) shows that highly levered firms are less likely to survive, especially in more concentrated industries with high entry barriers. Khanna and Tice (2000) look at how firm and market characteristics affect incumbents' behavior upon entry whereas Huyghebaert and Van de Gucht (2004) investigate the relation between competition, leverage and survival for a sample of start-up firms, which are especially prone to predation.

Chevalier (1995b) examines the effect of a change in capital structure on firm value (stock prices) and product market competition

(entry, exit and expansion) by investigating LBOs in the supermarket industry. She uses the same set of firms as in Chevalier (1995a). Non-LBO rivals find expansion and entry attractive in markets dominated by LBO firms and their share prices respond positively to an LBO announcement. These results support the hypothesis that increases in debt make firms compete softer,²⁸ while the increase in rivals' aggressiveness fits into the framework of predation models (e.g., Fudenberg and Tirole (1986); Bolton and Scharfstein (1990)).

Zingales (1998) investigates how leverage affects a firm's ability to respond to unexpected changes in its competitive environment by investigating its survival as independent organization. In addition, he also examines the effects on investment and pricing decisions. His sample consists of firms in the U.S. trucking industry, where a change in regulation provoked an exogenous shock in the competitive framework and in firm leverage. It contains 941 general freight carriers with more than \$1 million in operating revenues in 1977, and covers the period 1977-1985. The main results are that, after controlling for efficiency and the ex ante probability of exit by means of Altman's Z-score, highly levered firms are less likely to survive. The less competitive (the more the firm belongs to the LTL market segment),²⁹ the stronger this effect is. With respect to investments, Zingales finds that exiting firms suffer from an underinvestment problem linked to their initial debt level, but he admits that this effect may be caused by unobserved heterogeneity in firm quality. Regarding prices, he finds that high debt reduces the price in limited competitive markets. The latter results are different from those of Chevalier ((1995a), (1995b)) and Phillips (1995), who find that prices rise after increases in leverage. Zingales assigns these differences to the fact that Chevalier and Phillips examine homogenous goods industries, where customers' perceptions of the firm's financial health do not largely influence product prices. His results thus confirm the findings of Titman (1984) and Maksimovic and Titman (1991). Furthermore, they also support predation models of Telser (1966), Poitevin (1989) and Bolton and Scharstein (1990). In sum, Zingales concludes that the relation between prices and leverage is highly dependent on the nature of goods and the financial position of rivals. It may thus be possible that not the fittest (most efficient) firms survive, particularly when shallow-pocketed firms are more prone to predation.

Khanna and Tice (2000) look at how firm and market characteristics affect incumbents' behavior once a Wal-Mart discount store enters

their market. Their sample consists of 69 discount store chains whose three-digit Zip code markets were invaded by Wal-Mart in the period 1975-1996. In total, data is available on 1,209 firm-market pairs. Firm characteristics include (inside and public) ownership, leverage, firm diversification, chain size and profitability. Market characteristics include sales growth, rival characteristics (e.g., market shares, the chain's dependency on this particular market) and competition (Herfindahl index).

Khanna and Tice use an ordered probit regression model to estimate the effect of firm and market characteristics on the firms' response (expansion, no change, plant closing) to entry. First, firms that underwent an LBO respond more aggressively, which supports the limited liability model of Brander and Lewis (1986).³⁰ However, highly levered firms that did not undergo an LBO respond less aggressively to Wal-Mart entry, which is inconsistent with Brander and Lewis (1986). Next, Khanna and Tice find that in markets with no entry, high-debt firms compete more aggressively than firms with low debt. Other interesting results from these ordered response regression models are that firms with higher inside ownership and larger market shares behave less aggressively whereas larger, more profitable and more companies behave more aggressively, *ceteris paribus*.

Huyghebaert and Van de Gucht (2004) examine the links between competition, leverage and entrepreneurial exit. They develop three main hypotheses. The first conjectures that competition is positively related to the exit probability of start-ups. The nature of industry competition is measured by industry concentration ratios and by the competitive strategy measure (CSM) developed by Sundaram et al. (1996). CSM divides markets according to whether competition is in strategic complements or in strategic substitutes.³¹ The second hypothesis investigates whether highly levered start-ups are more likely to exit under competitive pressure whereas the third hypothesis suggests a motive for the relation, in particular the existence of financial market predation.

The empirical analysis is conducted on a data set of 235 entrepreneurial start-ups in Belgian manufacturing that are followed over the period 1992-2002 and their industry (four-digit NACE) incumbents. The results show that the likelihood of exit increases when strategic actions are aggressive and decreases when the industry competes in strategic substitutes; traditional concentration ratios have no significant impact. So, CSM is found to be more representative for the nature of

industry competition than industry concentration ratios. Also, highly levered start-ups are more sensitive to competition, but only if competition is in strategic complements. Finally, the paper shows that the relation between leverage, CSM and survival is only significant when the potential for adverse selection and moral hazard (measured by the historical industry failure rate) is substantial, confirming the financial market predation model.

V. CONCLUSIONS

So, what have we learned in two decades about the interactions between capital structure and product markets? That product markets influence financial structure? Yes! That they are an important determinant of capital structure next to taxes, information asymmetries, agency costs, etc.? Sometimes, it depends. Papers have shown that this can depend on the type of product (Titman (1984); Titman and Maksimovic (1991); Wanzenried (2003); Titman and Wessels (1988)), the relative bargaining power between firms and NFS (Subramaniam (1998); Krishnaswami and Subramaniam (2000); Bronars and Deere (1991); Perotti and Spier (1993); Sarig (1998); Huyghebaert and Van de Gucht (2002); Istaitieh and Rodriguez (2003)), the type of bankruptcy costs (Brander and Lewis (1988)), the type and degree of output market competition (Showalter (1995); Schargrodsky (2002); Dasgupta and Titman (1998)), the type of uncertainty in the output market (Showalter (1995); Showalter (1999)), the elasticity of demand (Maksimovic (1988); Dasgupta and Titman (1998)). Next to further verifying, extending and institutionalizing the presented theoretical and empirical work, some other challenges for future research have emerged from the papers discussed in this article. Specifically, important avenues for future research are to further examine the dynamics of capital structure (e.g., how does reputation affect financing decisions) and to study the impact of product market characteristics on corporate financing stocks and flows (cfr. Welch (2004)).³² A good research design and data set may further offer interesting prospects on how input and output market behavior affects capital structure because, as shown by this review article, the research in this area up till now is largely theoretical.

The impact of capital structure on product market behavior is almost always an endogenous relation. This inherent endogeneity problem forces researchers examining the product market effects of financial

policy to be creative in their research design. Next, theoretical work has shown that, depending on the underlying assumptions, increases in debt can increase (Brander and Lewis (1986), Maksimovic (1988)) or decrease (Faure-Grimaud (2000), Spagnolo (2000)) firm aggressiveness, which further imposes requirements on the research design. The empirical results largely confirm the anti-competitive stream (Chevalier (1995a,b); Opler and Titman (1994); Clayton and Ravid (2002)) although some studies (e.g., Zingales (1998)) find pro-competitive effects of debt. Debt can also influence a firm's pricing (Dasgupta and Titman (1998); Clayton and Ravid (2002); Borenstein and Rose (1995)) and investment decisions (Dotan and Ravid (1985); Allen (2000); Kovenock and Phillips (1997)). Finally, capital structure decisions influence the probability of predation and exit (Fudenberg and Tirole (1986); Poitevin (1989); Bolton and Scharfstein (1990); Fernandez-Ruiz (2004); Maurer (1999); Lambrecht (2001); Kanatas and Qi (2001); Khanna and Tice (2000); Huyghebaert and Van de Gucht (2004)). Most of the papers up till now have examined how the debt-equity mix drives these decisions, but theoretical work (e.g., Glazer (1994); Faure-Grimaud (2000); Hart and Moore (1995); Kanatas and Qi (2001)) suggests that other aspects of the financing mix may also matter. Future research examining the role of capital structure on product market behavior therefore may greatly benefit from taking into account the debt mix, debt maturity structure, debt seniority structure, covenants, etc.

NOTES

1. This assumption has been disputed by Haugen and Senbet (1978), who claim that liquidation is a capital budgeting decision that should be considered independently from the event of bankruptcy. Debtholders can buy out stockholders and liquidate whenever the firm is worth more dead than alive. Titman therefore assumes that a firm can survive even when its liquidation value exceeds its operating value thanks to transaction costs and free-rider problems (e.g., Grossman and Hart (1980)).
2. It is assumed that the firm cannot issue debt of higher priority than its currently outstanding debt. If not, it would have less incentives to expropriate existing creditors by reducing quality as it can more efficiently expropriate them by issuing senior debt.
3. By contrast, Titman (1984) finds that firms selling highly differentiated products take on less debt as customers price the expected liquidation costs associated with higher leverage.
4. When demand will be high, the levered firm will produce the same output as if it was uninformed.
5. By contrast, Greer (2002) shows that in the presence of a quantity leader, long-term debt can have competitive effects. The reason is that the follower's incentives to appease the leader in earlier periods are drawn out by an increased risk of bankruptcy.

6. In an extension of his model, Faure-Grimaud (2000) finds similar results albeit under a different mechanism. In his model, firms decrease first-period output to increase the odds of getting a reward when performance is bad. In the last period, firms act more aggressively as they no longer need refinancing.
7. This reward can take many forms, such as giving back some asset initially pledged as collateral, providing additional funds for good performers or allocating a private or reputational benefit to the firm's shareholders.
8. Investment and production decisions do not entirely coincide when firms decide to invest in idle capacity.
9. DeAngelo and Masulis (1980) show that when a firm has non-debt related tax shields, debt becomes more expensive if it cannot shield any income from taxes.
10. This assumption is hard to maintain when firms with positive NPV projects have access to perfect capital markets.
11. The reason is that firms with high bankruptcy costs can renegotiate better contract terms than firms with low bankruptcy costs, which may result in a competitive advantage for the firm and even reverse the order in which firms are expected to exit.
12. Their results are confirmed by Hovakimian et al. (2001). Conversely, Welch (2004) finds no significant evidence that R&D/sales and selling expenses/sales are related to financial structure. Welch, however, points out that the proxies used by Titman and Wessels may be more related to asset intangibility than to product uniqueness.
13. Throughout the paper, the authors argue that screening and monitoring performed by banks in start-ups likely differs from that in established firms. For example, banks choose to finance a smaller fraction in firms that face large adverse selection problems, which is contrary to what has been found for large, listed firms.
14. Welch finds that adding twenty 'determinants' of capital structure to a model with only stock price effects raises the R^2 from 43% to 54% in a $k=1$ equation and from 40% to 59% in a $k=5$ equation.
15. Sarig (1998) also adds some empirical evidence to his theoretical framework. He finds that after controlling for industry-specific determinants of wages and leverage, the share of profits received by employees is increasing in leverage. However, his dataset only allows for intra-industry comparisons. By contrast, Bronars and Deere (1991) show that firms facing a higher probability of unionization, measured by the fraction of industry employees that are covered by a collective bargaining agreement, maintain higher debt-equity ratios. The latter result is also consistent with Perotti and Spier (1993), who argue that by exchanging debt for equity, a firm can extract concessions from (unionized) workers.
16. Median sales growth and median stock returns below the 30%-percentile, which are calculated across all three-digit SIC industries. The drop in sales can be interpreted as demand uncertainty.
17. Jagannathan and Srinivasan (1999) provide evidence that product market competition reduces agency problems of equity. They split up their sample of 165 U.S. companies into generalists and specialists, according to whether they service the entire market or target a niche. They find that future profitability is significantly positively related to leverage changes for specialists and significantly negatively for generalists. They show that competition reduces managerial slack and find support for Jensen's (1986) free cash flow theory when competition is weak and for Myers' (1984) pecking order theory when competition is strong.
18. When firms set quantities (Cournot competition) instead of prices, the strategic investment model shows that after increasing debt, the firm still produces less and its rival produces more, but now the firm's own profits are lower. So, it is better off without debt.

19. The two definitions largely coincide, except for two-digit SIC industries 30, 32, 38.
20. The average industry debt ratio is included as regressor variable. Also, a variable that interacts marginal revenue with a dummy variable that equals one following the recapitalization is included in the regression.
21. To further test this interpretation, Phillips examines whether managers' and shareholders' incentives become more aligned after recapitalizations. For this purpose, he compares pay-performance measures over a 15-year window by regressing changes in executive compensation on changes in shareholder wealth, stock returns, returns on assets and changes in sales. The results show that changes in compensation are positively related to changes in shareholder value for the period following the recapitalization, but not for the period before. During the latter period, executive compensation is significantly related to changes in sales, which is consistent with managerial empire building.
22. Depending on whether prices are below or above their value-maximizing level, firms will raise or cut prices during recessions. Switching cost models assume prices are below whereas collusion models assume prices are above this level. As a result, switching cost models predict that prices will be increased during recessions.
23. This is the operating margin in the industry, corrected for the procyclical effect of fixed costs (see Hall (1988)).
24. The correlation between log detrended capital expenditures, respectively log detrended inventories and log detrended GNP.
25. The supermarket industry does have the disadvantage that customer switching costs play only a minor role and that the food industry is less cyclical than other industries.
26. Clayton and Ravid (2002) pose that the choice of leverage is endogenous. To measure the effect of leverage on auction bids, they therefore control for firm characteristics and bankruptcy risk. Even though leverage is significant, the bankruptcy measures are insignificantly related to the firm's highest bid.
27. The authors blame the unexpected results for the interest coverage ratio on the noise in this variable. Operating income can vary dramatically from period to period, and if a firm experiences a period of low operating income, the interest coverage ratio can fall below 1.0 or even become negative.
28. The toughness of price competition in two markets differs if, holding constant these markets' concentration, price-cost margins in these markets differ (Sutton (1991)). Chevalier assumes that this definition of (price) competition also includes quality competition, without distinguishing between both.
29. The two main segments of the trucking industry are the truckload (TL) and the less-than-truckload (LTL) segment, where the second has less collateralizable assets, needs more specific investments (and thus higher entry barriers and more possibilities to sell differentiated goods), and is less competitive. Zingales divides the sample into three groups according to whether firms belong more or less to the TL segment and considers differences in results across the three groups as stemming from differences in the competitive setting.
30. This result is not in line with earlier research by Phillips (1995), Chevalier (1995a, b), Chevalier and Scharfstein (1996), who find that firms that underwent an LBO become less aggressive.
31. More specifically, CSM looks at whether the firm's marginal profits are increasing or decreasing in competitor outputs. Under strategic complements, firms match strategic moves, and thus compete more fiercely.
32. A firm's financing stock is its debt ratio, which can be compared to its target ratio (which results from weighing the static benefits and costs of debt). A firm's financing flows are the specific incremental choices between different securities, and depend more on information and contracting.

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