Strategic Debt in Vertical Relationships

Gianni De Fraja* Claudio A. G. Piga†

December 9, 1999

Abstract

We study a vertical relationship between two firms, and we show that the extent of the downstream firm's borrowing affects the contract offered by the upstream firm. We establish a negative relationship between the level of debt and the downstream firm's probability of bankruptcy. We also show that, unless the interest rate is very high, there exists a conflict of interest between the upstream and the downstream firm: the latter wants to take on more debt than the former would like it to. We interpret this finding as an explanation of the constraint imposed by franchisors on the debt level of their franchisees. Such a result is tested using a dataset combining both survey and balance sheet data. We find some support for our theoretical prediction that agent firms can use debt strategically.

Keywords:	Contract Theory, Capital Structure, Franchise
JEL classification:	G32

Address for correspondence
Claudio Piga
Business School
University of Nottingham
Nottingham, NG8 1BB
Great Britain
fax. (++44)(0)115-846 6667
email: claudio.piga@nottingham.ac.uk

*Department of Economics, University of York, Heslington, York YO1 5DD, UK – C.E.P.R., 90-98 Goswell Street, London, EC1V 7DB, UK, email: gd4@york.ac.uk

†Business School, University of Nottingham, Wollaton Road, Nottingham NG8 1BB, UK, email: claudio.piga@nottingham.ac.uk. We would like to thank Dr. G. Scanagatta and Dr. A. Riti from Mediocredito Centrale for kindly providing the data used in the study.

1 Introduction

Why do many companies explicitly require their potential franchisees a considerable amount of personal financial investment, and, in general, frown upon franchisees taking on large amount of debt? A prime example is McDonald's, who require a minimum of between \$75,000 and \$258,000 of non-borrowed personal resources to consider an individual for a franchise.[1]

Prima facie, this is an irrational a priori exclusion of potential franchisees, who may be good entrepreneurs, but short of liquid capital. The literature has proposed several explanations, usually based on some form of asymmetry of information. For example, according to Norton (1995), debt can be used as a screening device by franchisors who need to separate good managers from bad ones. This adverse selection explanation can be complemented with a moral hazard one: debt has a disciplining role on management in so far as the associated risk of business failure motivates owner-managers of franchised outlets not to shirk (Jensen, 1986). A further point is made by Williamson (1985). He argues that when quality is non-contractible, franchisees would chisel on any quality level agreed with the franchisor, thereby damaging the image of the chain. The franchisor therefore requires the franchisee to finance a specific investment by personal resources, reserving at the same time the right to terminate the contract. Termination occurs if the franchisor believes that the quality provided falls short of the required threshold. If the franchisee chisels on quality, she loses the investment. If, on the other hand, the franchisee could borrow, then the cost of early termination would be borne by the lender.

In this paper, we offer an additional explanation for the reluctance of franchisors to allow franchisees to take on debt. Our analysis is not restricted to franchising, but applies to any vertical relationship where there exists a continuing relationship between an upstream firm (franchisor, manufacturer) and a downstream firm (franchisee, retailer). We argue that the level of debt affects the vertical relationship between these two firms. Our paper shows that, when the owner of the downstream firm has an informational advantage, then she can take on debt in order to constrain to her advantage the range of contracts which the upstream firm can offer her. This is because the upstream firm, in choosing the contract to offer, needs to take into account that the downstream firm can always opt to go bankrupt, and is more likely to do so the higher its level of debt.

Our main result is Proposition 3. We show that, unless the interest rate is very high, the downstream firm wants to take on as much debt as the market is willing to

[1] The lower minimum applies only to highly qualified franchisees. See the website `www.mcdonalds.com/a_system/factsheet`. Another example is offered by the Starway Corporation's web page `www.starway.net.au/ukfrcapital.html`:

> We recommend that you be able to fully fund the purchase of any small business. On the other hand, Starway Corporation understands that few people have enough cash lying around to buy a business. Thus we have no objection to franchisees borrowing a small portion of the capital cost to get started. However, we do suggest that borrowings be kept to a minimum. . . . . If you intend to fund a franchise with borrowed money, you should discuss the matter with us in person.

lend. A conflict of interest arises because the upstream firm would prefer to deal with an unleveraged firm (Proposition 4). It therefore becomes rational for the upstream firm to impose a limit on the extent of the downstream firm's borrowing as a precondition for engaging in a relationship at all.

Our analysis can also be seen as a contribution to the theory of the firm. A common stylised way of modeling the entrepreneur is as a wealth constrained individual who must therefore resort to external funding to finance a business idea (Holmstrom and Tirole, 1989). In this literature, the individual with the specialised knowledge/expertise would not want to resort to debt if she had enough personal resources. We depart from this assumption: in our model, the owner of the downstream firm has enough personal wealth to pay for the entire investment. Nevertheless, she prefers to finance her activity through debt.

We obtain therefore an instance of the strategic use of debt: if allowed, the downstream firm takes on more debt than she needs. She does so in order to manipulate the behavior of another agent to her advantage. This is reminiscent of the principle highlighted in Brander and Lewis (1986). They show that oligopolists artificially increase their debt/equity ratio in order to commit to a more aggressive output strategy. In the Brander and Lewis model, the financial structure of a firm, i.e. its debt to equity ratio, affects the behaviour of its product market competitors; in our paper, the financial structure of the downstream firm affects the behaviour of the upstream firm. In both cases the channels through which this influence occurs are the increase in the probability of bankruptcy brought about by debt, and the limited liability effect, which limits the extent of the losses incurred by the agent who takes on debt.[2]

In a recent paper, Subramaniam (1998) reverses the results of our theoretical model. He finds that a firm's propensity to behave opportunistically towards its suppliers either by cutting prices (so that sunk costs cannot be recovered) or by reneging on its obligation to provide enough business, can be mitigated when the firm commits to an optimal level of debt. Thus, in Subramaniam's analysis it is the principal, not the agent, that uses debt to strategically affect the terms of the contract.

We test the two conflicting hypotheses by developing an empirical model that builds on other empirical papers from the capital structure literature (Demsetz and Lehn, 1985; Kim and Sorensen, 1986; Titman and Wessels, 1988; Friend and Lang, 1988). Our estimates show that firms selling mainly to other firms, i.e. acting as agents for other firms, are characterised on average by a higher level of indebtedness. Although such a finding is robust to different specifications of the model and different estimation methods, we interpret it as weak evidence supporting our theoretical predictions, as statistical significance is not always found.[3]

[2] The Brander and Lewis' seminal work has been extended in various directions. Glazer (1994) considers the effect of long term debt on market competition. Showalter (1995) modifies the Brander and Lewis model to show that under price competition, the use of strategic debt is advantageous only in the presence of demand uncertainty, but it is disadvantageous when costs are uncertain.

[3] Only a few articles have attempted to provide empirical support for the hypothesis of a connection between a firm's financial structure and its behaviour in the product market. See, among others, Chevalier (1995), Kovenock and Phillips (1997), Phillips (1995) and Showalter (1999).

Firms whose revenues derive mainly from outsourced production should be, according to Subramaniam (1998), more leveraged. Our data, however, do not lend much support to this theory. Firms relying heavily on outsourcing tend to be characterised by lower levels of short-term debt and higher levels of trade credit, i.e. credit offered by suppliers to their buyers.

The paper is organised as follows. In the next section we describe the model. Section 3 studies the contract offered by the upstream firm, while Section 4 illustrates the choice of debt by the downstream firm. The methodological aspects of the empirical analysis, and its results, are illustrated in section 5. Section 8 concludes. Proofs of all the propositions are available on request from the authors.

2 The model

We consider an upstream manufacturer who supplies his product to a downstream retailer. The market demand, Q, is a function of the retail price, p_r: $Q(p_r)$, with $Q'(p_r) < 0$.

The retailer has constant marginal cost, θ. $\theta \in [\underline{\theta}, \overline{\theta}]$ is a random variable with distribution $F(\theta)$ and density $f(\theta) = F'(\theta)$. The hazard rate is $h(\theta) = \frac{F(\theta)}{f(\theta)}$. We make the standard assumption that $h(\theta)$ is non decreasing:[4]

$$h'(\theta) = \frac{d}{d\theta}\left[\frac{F(\theta)}{f(\theta)}\right] \geq 0. \tag{1}$$

We follow Gal-Or (1991) in assuming that the actual realisation of θ is the retailer's private information. This implies that the presence of the retailer is necessary for any sales to occur. We simplify Gal-Or's model by assuming that the demand function is common knowledge. We extend her approach by adding investment and debt to her analysis. Specifically, we assume that, in order for any sales to take place at all, as well as the retailer's presence, an investment in a relation specific asset is also necessary. The characteristics of the investment make it impossible for the manufacturer to take charge of retailing himself.[5]

Let $I > 0$ be the cost of the sunk investment. The retailer chooses an amount E of her personal wealth, and borrows the remaining $(I - E)$ at the exogeneously given borrowing rate, r_d. This rate is independent of the proportion of the asset's cost which is financed by debt up to a maximum $G_{max} > 0$. This simple relationship between the amount borrowed and the interest rate may reflect the use of rules of thumb, or industry/category specific lending guidelines by the lender. Including interest, the retailer's financial obligation, G,

[4]See Laffont and Tirole (1993, p.67) for a discussion.

[5]In the fast food industry, this investment could be a market research which reveals the type of advertisement necessary in a given location. Another industry where franchise can occur is mining. The investment could be the purchase of a test drill; only the mining engineer (the downstream firm) has the expertise to interpret the results (learn θ); the extraction is then conducted on behalf of the owner of the land (the upstream firm). In these examples it is clear that no production can take place if either the personal expertise or the machinery is not there.

is therefore given by:

$$G = (I - E)(1 + r_d). \tag{2}$$

We assume limited liability, so that the retailer can keep any money not used in the purchase of the asset. This is invested in a riskless project which pays an interest rate r_l, normalised, without loss of generality, to zero. We also assume that there are no bankruptcy costs. In the case of bankruptcy the salvage value of the equipment bought from investment I is assumed, without loss of generality, to be zero.

The sequence of events is described in Figure 1.

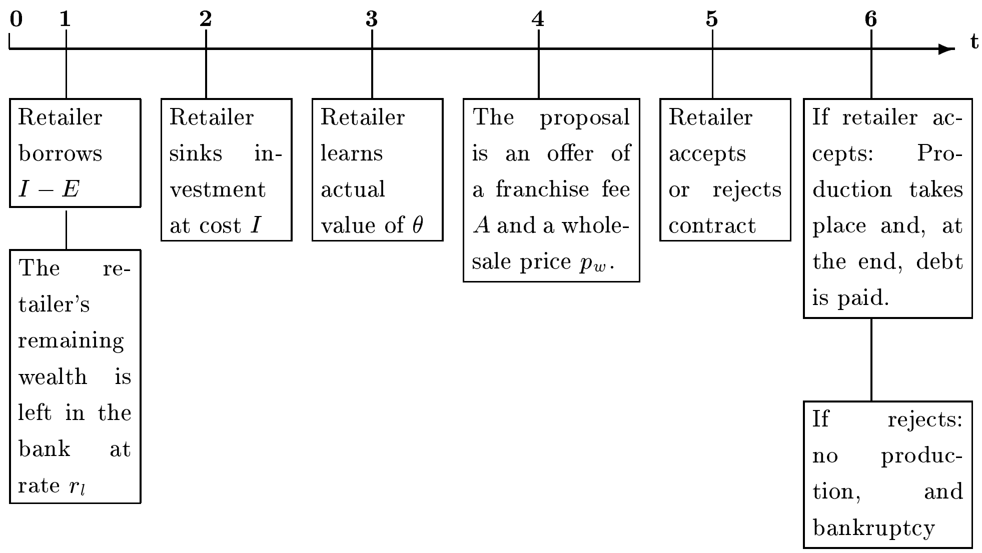

Figure 1: Timing of the game

3 The manufacturer's problem

The analysis of the contract proposed by the manufacturer to the retailer follows closely Gal-Or (1991).

The manufacturer's only decision occurs at date 4. He maximises his expected profit, taking the decisions made at dates $1-3$ as given. The solution technique uses the revelation principle: the manufacturer asks for a report on θ, and commits to a wholesale price $p_w(\theta)$ and a fee $A(\theta)$ as functions of the reported θ. These functions are incentive compatible if the retailer is better off reporting θ truthfully than reporting any different value $\hat{\theta}$. According to the revelation principle, the manufacturer cannot do better than choosing the pair of incentive compatible functions which yield the highest profit. Once θ is known, retailer and manufacturer have aligned objectives with regard to the retail price: it will simply be the monopoly price given θ (this ceases to be the case if the retailer has superior information about demand; see Gal-Or (1991) for details). The retailer is of course free not to sign any contract and go bankrupt. This implies that if the contract is signed, the retailer's overall utility, including repayment of the debt, must be at least equal to his reservation utility, here normalised to zero. Formally, the manufacturer chooses the contract subject to two constraints: the individual rationality constraint (guaranteeing that the retailer makes non-negative profits) and the incentive compatibility constraint. The incentive compatibility constraint for this problem is shown by Gal-Or (1991) to be given by:

$$\dot{\pi_r}(\theta) = -Q\left(p_r(\theta)\right), \tag{3}$$

where $\pi_r(\theta)$ denotes the retailer's ex-post profit as a function of the realised value of θ, after the debt is paid back:

$$\pi_r(\theta) = Q(p_r(\theta))\big(p_r(\theta) - p_w(\theta) - \theta\big) - A(\theta) - G. \tag{4}$$

Note that it is not generally optimal to proceed with retailing for any value of θ: for θ sufficiently high, the joint incentive of manufacturer and retailer might be not to undertake production and let the latter go bankrupt. In this case, the retailer loses her own share of the investment, E, and the lender incurs a loss of G. Therefore, unlike Gal-Or, we endogenise the highest value of θ for which production occurs. Formally, the manufacturer solves a free terminal point optimal control problem:

$$\max_{\pi_r(\theta),\theta^*,p_r(\theta)} = \int_{\underline{\theta}}^{\theta^*} \Big\{Q\left(p_r(\theta)\right)\big[\left(p_r(\theta) - \theta\right)\big] - \pi_r(\theta) - G\Big\} f(\theta)d\theta \tag{5}$$

$$\text{s.t.} \quad \dot{\pi_r}(\theta) = -Q(p_r(\theta)) \tag{6}$$

$$\text{and} \quad \pi_r(\theta) \geq 0 \; ; \; \pi_r(\theta^*) = 0. \tag{7}$$

In (5) $A(\theta)$ is substituted away using (4). For cost realisations above θ^*, the retailer is bankrupt and the project is abandoned. For states of the world below θ^*, the retailer pays back G and, at the end, production takes place. Finally, the participation constraint (7) is derived from the consideration that it must be $\pi_r(\theta) \geq 0$ for $\theta \leq \theta^*$, and $\pi_r(\theta) < 0$ for $\theta > \theta^*$. Given that $\pi_r(\theta)$ is decreasing in θ (by (6)), these conditions are implied by (7).

Proposition 1 *At the solution of the manufacturer's problem, the wholesale price, $p_w(\theta)$, the franchise fee, $A(\theta)$, the retail price $p_r(\theta)$, and the retailer's profit $\pi_r(\theta)$ are given by the following expressions for $\theta \leq \theta^*$:*

$$Q\left(p_r(\theta)\right) + Q'\left(p_r(\theta)\right)\left[p_r(\theta) - \theta - h(\theta)\right] = 0 \tag{8}$$

$$p_w(\theta) = p_r(\theta) - \theta \tag{9}$$

$$A(\theta) = -\left[\pi_r(\theta) + G\right] \tag{10}$$

$$\pi_r(\theta) = \int_{\theta}^{\theta^*} Q(p_r(\tilde{\theta}))d\tilde{\theta} \tag{11}$$

where θ^* is given by:

$$Q\left(p_r(\theta^*)\right)\left[p_r(\theta^*) - \theta^* - h(\theta^*)\right] = G \tag{12}$$

As (8) shows, the retailer charges a price higher than that of a vertically integrated monopolist, unless $\theta = \underline{\theta}$. This is defined "excessive retail price distortions" by Gal-Or (1991) who discusses it in more detail. We refer the reader to her paper for a full discussion of (8) and (9). According to (9) the wholesale price is set to a level which enables the retailer to cover exactly its retailing cost. This avoids double marginalisation.

As in Gal-Or (1991), the franchise fee is set at a negative level: it is a fixed transfer from the manufacturer to the retailer. When $\theta = \theta^*$, this transfer is equal to the retailer's debt obligation G, to leave $\pi_r(\theta^*) = 0$. For $\theta < \theta^*$, the transfer increases in order to induce truthful revelation of θ.

The cut-off point θ^* is determined by the trade-off between two opposing forces. On the one hand, reducing θ^* reduces the probability that production takes place. On the other hand, it also reduces the rent that must be left to the retailer if production does take place (from (11)). The following proposition shows that this cut-off point, and hence the probability of bankruptcy, is an increasing function of the level of debt G.

Proposition 2 *The cut-off point θ^* and the level of debt G are related as follows:*

$$\frac{d\theta^*}{dG} = -\frac{1}{Q\left(p_r(\theta^*)\right)\{1 + h'(\theta^*)\}} < 0. \tag{13}$$

4 The choice of debt by the retailer

We are now ready to study the retailer's choice of debt, which is made at date 1, when θ is still unknown. A trade-off is involved in this decision. On the one hand, given the investment specificity, the amount financed by the retailer's personal contribution is lost if the realisation of θ is sufficiently high that bankruptcy is chosen at date 6. Increasing debt reduces this personal contribution and therefore allows the retailer to keep for herself a larger share of her own personal wealth in the event of bankruptcy. On the other hand, from Proposition 2 we know that the greater the value of debt, the larger the probability of bankruptcy and therefore the more likely that the share of personal wealth invested in the project is lost.

The retailer is risk neutral, and chooses G to maximise her expected profit. Her problem therefore is:

$$\max_{G \in [0, G_{max}]} V(G) = \int_{\underline{\theta}}^{\theta^*(G)} \left[\int_{\theta}^{\theta^*(G)} Q(p_r(\tilde{\theta}) d\tilde{\theta} \right] dF(\theta) - \left(I - \frac{G}{1 + r_d} \right), \tag{14}$$

where the dependence of θ^* on G is made explicit. The term in round brackets in (14) is the portion of the investment paid for by the retailer.

Assumption 1 *For every $\theta \in [\underline{\theta}, \overline{\theta}]$:*

$$h''(\theta) < \frac{1 + h'(\theta)}{h(\theta)}. \tag{15}$$

$h(\theta)$ is defined in (1) as the hazard rate. This assumption holds for most commonly used distribution functions.

Proposition 3 *Let Assumption 1 hold. Then $V(G)$ is convex. Therefore any stationary point is a local minimum, and the maximum must be at one of the extreme points of the domain, either 0 or G_{max}.*

The following Corollary determines a sufficient condition for the retailer to choose the maximum level of debt.

Corollary 1 *If $h'(\theta) > r_d$ for $\theta \in [\theta^*(G_{max}), \overline{\theta}]$, then the retailer's profit is strictly increasing in G.*

Thus, for sufficiently low values of the interest rate, the retailer wants to borrow as much as she can. For higher values of the interest rates, whether the retailer chooses 0 or G_{max} depends on the sign of the difference $V(G_{max}) - V(0)$. The next result gives an expression for this difference.

Corollary 2

$$V(G_{max}) - V(0) = \frac{G_{max}}{1 + r_d} - \int_{\theta^*(G_{max})}^{\overline{\theta}} Q\big(p_r(\theta)\big)\, F(\theta) d\theta. \tag{16}$$

The interest rate negatively affects the choice between no debt and maximum debt: for fixed G_{max}, $V(G_{max}) - V(0)$ is decreasing in r_d. This is natural: a higher cost of debt makes it less likely that debt will be taken on.

The next result illustrates the potential for conflict between the manufacturer and the retailer.

Proposition 4 *The date 1 expected profits of the manufacturer are strictly decreasing in G.*

The intuition is simply that if the retailer decides to borrow, then the manufacturer is compelled to pay a transfer fee, given by (10), which unambiguously reduces his expected profits.

Taken together, Propositions 3 and 4 highlight a potential conflict of interest between the retailer and the manufacturer. They also illustrate why the latter may wish to impose an exogenous constraint on debt. In the presence of this conflict of interest, and given that both parties are risk-neutral, it makes sense to investigate how their joint profit varies with the retailer's debt.

The relationship between joint profit and debt is not in general unambiguous. It becomes so, however, with the natural assumption that G_{max} is determined by a competitive process among lenders, with value determined by the condition that the expected profit from lending is zero.[6]

[6] For a model with a similar assumption, see Brander and Spencer (1989). Like the assumption of an exogenously fixed (up to G_{max}) interest rate, this might reflect a relatively passive role of the lenders, or their reliance on aggregate statistics for an industry.

Assumption 2 *G_{max} is the solution in G of the zero expected profit condition for lenders:*

$$F\left(\theta^*(G)\right)\, r_d\, G - \left(1 - F\left(\theta^*(G)\right)\right)\, G = 0. \tag{17}$$

Hence:

$$F\left(\theta^*(G_{max})\right) = \frac{1}{1 + r_d}. \tag{18}$$

This is the supply curve of loans; naturally, it is an increasing function of r_d. For any strictly positive lending rate r_d, (17) has the interesting implication that $\theta^*(G_{max}) < \overline{\theta}$; that is, the probability of bankruptcy is always positive when the retailer chooses the highest possible level of debt.

In this case we have

Proposition 5 *Let Assumption 2 hold. At date* 1*, the sum of the expected profit of manufacturer and retailer is a strictly decreasing function of* G*.*

This result shows that it is in the joint interest of the two firms to commit not to take on debt. Moreover, Proposition 4 shows that the manufacturer, unlike the retailer, has an individual incentive to enforce the rule. When the retailer prefers to take on as much debt as possible, there exists a Pareto improving long term contract. At date 0 in Figure 1, the parties agree that the retailer is not to take on debt. Indeed, this is typical of franchise contracts, and Proposition 5 offers a rationale for this type of conditions. Both parties can be made better off if, before any activity is undertaken, the retailer agrees not to take on any debt. The additional surplus generated in this way could make both parties strictly better off. [7]

We end the section with a numerical example. This is important because it shows that both the minimum and the maximum value can be chosen in plausible situations.

Let the demand be linear, $Q = a - p_r$ with $a = 3.2$, and let the distribution of θ be exponential, $F(\theta) = \frac{1-e^{-\lambda(\theta-\underline{\theta})}}{1-e^{-\lambda(\overline{\theta}-\underline{\theta})}}$. This has hazard function $h(\theta) = \frac{\lambda\, e^{\lambda(\theta-\underline{\theta})}-1}{\lambda}$ increasing in θ and satisfying Assumption 1 for $\underline{\theta} = 0.1$, $\overline{\theta} = 3.0$, $\lambda = -5.8$. The simulation results are listed in Table 1.[8]

Table 1 shows that, for low interest rates, the difference in (16) is positive and therefore the retailer prefers G_{max}. An increase in the interest rate leads to higher borrowing and an increase in the probability of bankruptcy, as indicated in Proposition 2. For $r_d \geq 0.35$, $V(G_{max}) - V(0)$ becomes negative and the retailer, rather than borrowing and facing a high risk of bankruptcy, chooses to finance the investment entirely via personal resources.

[7] While we find that the franchisor would prefer the initial investment to be entirely equity-financed, the literature has highlighted a positive role of debt. Norton (1995) argues that debt can signal the franchisee's ability and also limit the incentive to free-ride. In practice, this implies a minimum proportion of equity financing of less than 1. For instance, McDonald's requires that at least 40% of the total cost of a new restaurant (estimated between $408,600 and $647,000) must be paid from the franchisee's personal resources; the franchisee is then allowed to finance the remainder through a loan.

[8] Details of their derivation are available on request.

Table 1: Numerical values of the cut-off point θ^*, of the debt level G_{max}, of eq. (16), of the probability of bankruptcy, $1 - F(\theta^*)$, for different values of the interest rate r_d.

r_d	θ^*	G_{max} x 1,000	$V(G_{max}) - V(0)$ x 1,000	$1 - F(\theta^*)$
0.01	2.998	.2146	.188246	.0099
0.11	2.982	.5193	.156708	.0991
0.21	2.967	.9136	.104260	.1735
0.31	2.953	1.374	.032776	.2366
0.32	2.952	1.423	.024687	.2424
0.33	2.950	1.472	.016440	.2481
0.34	2.949	1.522	.00803641	.2537
0.35	2.948	1.573	-.000520443	–

5 Testing the theory

To test the theoretical predictions obtained in the previous sections jointly to those derivable from Subramaniam (1998) we consider measures for debt and for the various theoretical factors that influence debt that often appear in the empirical capital structure literature. We also investigates whether group membership (Cable and Yasuki, 1985; Chang and Choi, 1988; Barbetta et al., 1996) and insider ownership (Jensen et al., 1992; Cho, 1998) help explain debt usage.

5.1 Debt

We consider more than one dependent variable. This allows us to check the robustness of the model to different specification of debt usage. We prefer to investigate the use of short-term debt as such a variable is normally responsible for firms' bankruptcy and therefore more appropriate in the analysis of the strategic use of debt (Brander and Lewis, 1988). This is a main departure from Showalter (1999), where total debt is used. The ratio between short-term debt toward banks over total assets (STDEBAVG) and the ratio short-term debt toward banks over total sales (STDB_SLS) are often used to measure how risky a firm's financial position is (Titman and Wessels, 1988; Marsh, 1982). Low values of another variable, STDBCAAV, given by the ratio short-term debt to banks over current assets[9], suggest that firms are more likely to keep up repayment of short-term loans and therefore do not use debt strategically. Finally, we use the ratio current liabilities[10] over current assets (CL_CAAVG) to study how trade credit affects debt usage. When trade credit substitutes for bank loans, we can assume that the strategic motives related to debt usage are absent. The analysis of trade credit also helps us to shed some light on the financial role of a firm's position within the group organisation.

[9]Inventories plus current financial assets (liquidity plus commercial credits plus financial credits).

[10]Short term debt to financial institutions plus trade credit.

5.2 Identifying the extent to which a firm operates as an agent or as a principal.

The theoretical model assumes that it is optimal for the principal to have a particular good or service (retailing in that instance) supplied by the agent, despite the informational advantage enjoyed by the latter and the possibility of strategic use of debt. However, it is not necessary that the agent is positioned downstream of the principal, as in the case of franchising. For instance, many Italian clothing manufacturers outsource production to "cut-make-trim" (CMT) firms that assemble the garment (Besanko et al., 1999, pp. 133). To all effects, CMT firms operate as agents of the main manufacturer that remains in charge of the retailing strategy. Another way in which outsourcing can occur is when a customer commissions a product to a firm, who in turn hires another, an agent, to produce a part of the product. The agent is responsible only towards the firm and not towards the main client.

To our needs, it is therefore crucial to identify the extent to which one firm supplies other firms with its products. The data bank used in this study contains two variables describing the percentage of revenues from selling to other manufacturing (i.e. not wholesalers) firms and the percentage of revenues from works carried out on behalf of another firm. The variable AGENT, given by the sum of these two percentages, captures therefore the extent to which a firm operates as an agent of another. Corollary 1 predicts that higher values of such a variable should be associated with higher debt usage.

Subramaniam (1998) shows that buyers can use debt to limit the incentives to hold-up their suppliers. Therefore, a higher reliance on outsourcing should be associated with a higher leverage. The data bank reports the percentage of sales due to outsourced production which we take as a proxy for the degree with which the firms operate as principals (OUTSOURC).

It could be argued that AGENT and OUTSOURC represent two sides of the same medal and that the correlation between these two variables should be highly negative. Interestingly enough, Table 4 shows that this correlation in our sample is weakly positive. This may be due to various factors. Firstly, it is very unlikely that the sample includes all the buyers to whom agents supply, or all the sellers from whom principals buy. Secondly, firms in the sample do not necessarily operate as either principal or agents. Finally, firms may operate in an intermediate position of the vertical chain and hence play both roles. Therefore the simultaneous inclusion of AGENT and OUTSOURC allows us to distinguish between the two categories and to ascertain their relative use of debt.

5.3 Group Membership.

Cable and Yasuki (1985) argue that intra-group trading reduce transaction costs, thereby avoiding the augmentation of management costs that vertical integration entails. Strategic behaviour is less likely to occur when the transaction involves firms of the same group, as the scope for asymmetric information or the hold-up problem is non-existent. Group membership should reduce the propensity to use debt strategically and consequently, groups should be less indebted. A dummy variable detailing whether the firm is part of a group is available in the data bank (GROUP).[11]

The literature has also emphasised that groups can operate as internal capital markets, where bank loans are negotiated by the holding to take advantage of economies of scale, and then redistributed among the other firms of the group in accordance to each firm's investment projects (Barbetta et al., 1996). The databank describes the firm's position within the group. A value of 1 was assigned to the dummy GRPHEAD if the firm declared to be the leading firm in its group. Another dummy, GRPCONTR, takes the value of 1 when a firm is controlled by another firm. We expect the GRPHEAD coefficient to be greater than that of GRPCONTR.

5.4 Ownership Structure

The data bank contains four variables detailing the ownership shares of, respectively, the first three shareholders (or owners if the firm's capital is not divided in shares) and the remaining ones. There is also information regarding whether these shareholders/owners exert direct control of the firm. We constructed a proxy for insider ownership as the sum of capital shares belonging to shareholders who are directly involved in running the firm (INSOWNCT). Such a measure does not capture the extent to which insider ownership is dispersed, as the same value is returned when the firms is entirely owned by a single shareholder/manager and when the firm' s ownership is shared equally among four individuals all directly controlling the firm. Thus, a Herfindahl index of the first three shareholders' ownership shares was calculated, and then raised to the square to capture a possible non-linear relationship between insider ownership concentration and debt usage (HER3OWN2).[12] These two variables are obviously positively correlated (see Table 4), although they pick up different aspects of a firm's ownership structure, namely insider ownership and dispersion of ownership. Thus, the joint analysis of these variables allows an empirical investigation of the relative importance of agency costs of equity and debt under different ownership structures.

For an interpretation of the more traditional regressors reported in Table 2, see Showalter (1999).

5.5 Industry Classification

The data bank includes information regarding the ATECO81 industry classification of each firm, which is used to construct 24 dummies based on the classification's first two digits. These variables are included to capture industry-specific, unobserved characteristics as discussed in Showalter (1999).

Table 3 reports some descriptive statistics for the model's variables.

---

[11] The data bank does not allow the identification of the group to which firms belong.

[12] Results do not change when the index is calculated using the four ownership shares available in the data bank. Such a variable is biased upward as we cannot ascertain the number of shareholders included in the last variable, and is therefore not used.

DEPRINAS (-)	Depreciation of intangible assets
DEPRTASS (-)	Depreciation of physical capital
EBITAVG (-)	Ratio of "earnings before interest and taxes" (EBIT) over total assets
FIXASSAV (+)	Net plant and equipment over total assets
LASSETS (+)	Natural Log of total assets
RISK3 (-)	Standard deviation of the first difference in EBIT divided by average EBIT in 1989-1994

Table 2: Some explanatory variables of debt and their expected sign.

Variable	Mean	Std.Dev	Min	Max	N
STDEBAVG	0.168	0.123	0	0.66	2318
STDB_SLS	0.178	0.181	0	3.28	2310
STDBCAAV	0.252	0.19	0	1.43	2318
CL_CAAVG	0.819	0.314	0.13	5.72	2318
AGENT	50.50	44.92	0	100.0	2318
DEPRINAS	0.50E-02	0.987E-02	0	0.16	2318
DEPRTASS	0.39E-01	0.25E-01	0	0.22	2318
EBITAVG	0.796E-01	0.58E-01	-0.32	0.42	2317
FIXASSAV	0.228	0.135	0	0.89	2318
HER3OWN2	0.439	0.384	0	1.00	2318
INSOWNCT	0.834	0.28	0	1.0	2318
LASSETS	9.90	1.40	5.628	16.05	2318
RISK3	2454.2	8098.52	6.82	139278.8	2318
OUTSOURC	8.07	17.89	0	100.0	2318

Table 3: Descriptive statistics.

6 Data and Methodology

To test for the use of strategic debt by firms working as agents of other firms, we employ a methodology used in previous capital structure studies and in Showalter (1999). A cross-sectional firm-level linear regression is used, where various measures of debt are taken in turn as the dependent variable and regressed over a set of independent variables.

The data is taken from a database originally collected by an Italian investment bank, *Mediocredito Centrale*. The database includes almost 500 variables, with balance sheet data for up to six years (1989-1994) relating to 5,415 businesses.[13] In order to take into account the possibility of anomalous values in a particular year and to smooth out any measurement error, the variables of interest from the balance sheet data are measured as

[13]The sample, which was stratified according to size, industry and location, constitutes a statistically significant representation of the Italian manufacturing industry. A description of the questionnaire and of the Bank's main activities can be found on the Internet at *www.mcc.it*.

firm-specific averages over the six years period. Unfortunately, only 3000 firms provided balance sheet data for the entire period 1989-94. Thus, we chose to restrict the sample to only these firms, as a period of six years is shorter than that used in other studies (Jensen et al., 1992; Showalter, 1999). After rejecting missing values for the other variables, the sample size varied from 2309 to 2317 depending on the model specification (see Table 3). The sample size when only firms that are part of a group are considered equals 889.

As Table 3 shows, a few firms report a debt value of zero. Dropping these observations actually yields results that reinforce those that follow. We chose however to test the theory using the most general conditions and considered these observations in our estimations.

All results are corrected for heteroscedasticity using White's standard errors estimates. Thus, even when the form of heteroscedasticity is unknown, we can still make appropriate inferences based on the results of the least squares.

We also estimated the same models using the HREG type of regression available in LIMDEP v. 7.0, which considers a specific type of multiplicative heteroscedasticity:

$$\mathrm{Var}(\epsilon_i) = e^{\gamma_0 + \gamma_1' \ w_i}. \tag{19}$$

This implies that the form of heteroscedasticity is known and depends on the variables w_i. To explain the variance in the regressions' residuals, we always use FIXASSAV and, in some cases, EBITAVG. All parameters in the HREG command are estimated using the maximum likelihood method. Results from this specification generally confirm the findings from the OLS with White's standard errors estimates (see Appendix).

The sample contains only one firm with industry classification 21, 30, 38 and 40: these industries are used as control in the regressions. Moreover, industries with classifications 10 to 19 and 51 to 92 are clustered in two different variables (IND1019 and IND5192).

7 Results.

Table 5 to Table 8 report the results from the OLS regressions of, respectively, STDEBAVG, STDB_SLS, STDBCAAV, and CL_CAAVG. The first four columns consider the entire sample, whereas the last two take into account a sub-sample made up of only firms operating within a group.

The comment draws from the results of the OLS with White's standard errors estimations, as such method was more extensively used in the previous literature.

7.1 Debt and vertical relationships

The variable AGENT is positive in all regressions, and statistically significant in the STDB_SLS, STDBCAAV and CL_CAAVG regressions, although only weakly in the first two.[14] As the last two dependent variables have the same denominator, and the difference

[14] The weak statistical significance may be partly due to methodological issues. Indeed, the test to theoretical propositions should be carried out on data reporting information from contracts between a principal and its agent. In particular, for our purposes it would be important to identify whether suppliers had to make an investment specific to the given transaction. Data with such micro-analytic level of details are usually very difficult to obtain, and therefore we had to rely on the use of a proxy.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
AGENT (1)	1.0									
DEPRINAS (2)	-0.07	1.0								
DEPRTASS (3)	0.186	-0.0425	1.0							
EBITAVG (4)	-0.009	-0.1068	0.069	1.0						
FIXASSAV (5)	0.122	-0.026	0.582	-0.143	1.0					
HER3OWN2 (6)	-0.017	0.0258	0.0591	-0.0804	0.0068	1.0				
INSOWNCT (7)	-0.040	-0.008	0.050	0.028	0.005	0.357	1.0			
LASSETS (8)	-0.081	0.054	-0.084	-0.113	-0.085	0.297	0.033	1.0		
RISK3 (9)	-0.057	0.0053	-0.050	-0.046	-0.050	0.146	0.031	0.534	1.0	
OUTSOURC (10)	0.009	0.048	-0.127	0.013	-0.154	0.002	0.011	0.031	0.034	1.0

Table 4: Correlation Matrix.

in the numerator is due to trade credit, the high significance in the CL_CAAVG regression indicates that agent firms manage to consistently obtain more credit from their suppliers.

An important difference can be observed when OUTSOURC is considered. Its coefficient alternates in sign in the first two regressions, is negative in the STDBCAAV regression and positive and significant in the last regression. Thus, as in the case of AGENT, suppliers offer credit to their principal buyers. An important distinction should be made: in fact, principal firms are characterised by a lower level of indebtedness (Table 7). In principle, as in Italy any creditor can initiate a bankruptcy procedure and limited liability applies to any form of debt, trade credit and bank loans could be seen as equivalent forms of liabilities, both equally usable for strategic reasons. But this argument has at least two related shortcomings. First, trade credit generally reflects buyer power and second, it does not constitute a credible commitment device as it is cheaper to obtain than bank loans. Subramaniam (1998) explicitly recognises the difference in the two measures and the potential conflict between bondholders and suppliers when they both become residual claimants in case of buyer's bankruptcy. As debt is the only strategic financial variable in Subramaniam, we can conclude that our data do not provide any support to the hypothesis of strategic use of debt by principal firms.

The previous discussion leads us to draw the following conclusions:

i. we find weak statistical evidence supporting the hypothesis that agent firms use debt to affect their relationship with their principal and no evidence for the opposing theory;

ii. trade credit is more intensively offered by suppliers when production involves a highly disintegrated vertical chain. Indeed, Tables 7 and 8 indicate that both agent and principal firms are characterised by high levels of trade credit relative to firms who do not specifically work for a main buyer or outsource most of their production.

7.2 Debt and group organisation

The dummy GROUP is always negative and often very significant. The absence of a strategic role for debt within group firms is thus supported by the data.

Columns (3) and (4) in each regression show whether the holding firm and the subsidiaries are characterised by different levels of indebtedness. Our findings reveal an interesting pattern: within the entire sample, the GRPCONTR coefficient is negative and significant, while the GRPHEAD one is positive but non-significant. This indicates that, as far as indebtedness is concerned, the controlled firms of a group differ significantly from the firms that are not group members, while holding firms do not. This result also lends further support to our theoretical hypothesis. In the group organisation the interests of the agents, i.e., the controlled firms, are more likely to be aligned with those of the principal, i.e., the head of the group, especially when the size of the group is small, which is often the case in the Italian reality. Thus the incentive to use debt strategically disappear.

Tables 7 and 8 reveal that the sign of GRPCONTR moves from negative and significant to positive and non-significant, i.e., controlled firms obtain financing in the form of trade credit. We infer that the financing provider is likely to be the holding firm by examining

Columns (5) and (6). Firstly, the dummy GRPHEAD continues to be positive and significant, except in the CL_CAAVG regression, where it is only positive. Secondly, there is a sharp reduction in the value of this coefficient in the last table, indicating that the holding firms retain, relative to the controlled firms, less liabilities in the form of trade credit. These results are consistent with the view of the holding firm as a financial intermediary for the rest of the group.

7.3 Debt and Insider Ownership

Both variables -INSOWNCT and HER3OWN2 - carry the expected sign, with the latter being highly significant in most of the regressions. Taken together, the two variables indicate a non-linear, inverted-U shaped relationship between insider ownership and debt. Jensen and Meckling's analysis demonstrates that agency cost of equity is high when ownership and control are separated, which presumably occurs when ownership is more dispersed, i.e. for low values of HER3OWN2. In these circumstances, equity issuance is particularly costly and financing occurs mainly through loans and bonds. As insider ownership increases, the agency cost of equity reduces while the agency cost of debt rises, because the shareholders/managers may choose to undertake a highly risky project with very high returns. In case of success, the shareholders reap the benefits while if the project fails, the bondholders bear most of the costs, as the shareholders are protected by limited liability.[15] The bondholders anticipate such behaviour and require a risk premium on their bonds: the agency cost of debt is ultimately borne by the shareholders.[16] Bearing this in mind, our finding that a highly concentrated ownership is associated with a lower level of indebtedness is not surprising: owners/managers could only reduce the agency cost of debt by securing the loan, which may not be feasible as managers may be risk-averse and/or wealth constrained.

However, we tested for the joint significance of these two variables by calculating the following statistic: $F = \dfrac{(R^2_{ur} - R^2_r)/m}{(1 - R^2_{ur})/(N-k)}$, where subscripts ur and r represent the unrestricted and the restricted model, m is the number of variables omitted from the restricted model, k is the number of regressors in the unrestricted equation. The null hypothesis that the coefficients of INSOWNCT and HER3OWN2 are both zero is rejected only in a few regressions: some caution should therefore be taken with regard to the robustness of the previous findings.[17]

7.4 The other factors explaining debt

All the remaining variables under study are highly significant and carry the expected sign, with one exception. The variable DEPRINAS, like DEPRTASS, should have a negative coefficient if the depreciation of intangible assets lessens the tax advantage of debt. Table

[15] The work by Brander and Lewis (1986) is a formalisation of the above discussion.

[16] Shareholders/managers may be asked to secure the loan by offering assets from personal wealth as collateral: unfortunately, this kind of information is not available in the data bank.

[17] The values of the F distribution at the 5% point for $F_{(2,\infty)}$ and $F_{(2,1000)}$ are, respectively, 2.99 and 3.00, while the 1% point is given by the values 4.60 and 4.62.

4 shows that the correlation between EBITAVG and DEPRINAS is negative, while that of the former variable with DEPRTASS is positive: only the depreciation of tangible assets is used as a tax shield and thereby reduces the tax burden. The positive sign and the high significance of DEPRINAS actually indicate that firms' leverage is somehow positively correlated with the investment in intangible assets, notably advertising and/or R&D. These types of investments are generally carried out by well established firms with a bigger market share. When these firms seek to borrow funds, lenders can rely on the reputation of the borrowing firm when they decide whether to open or extend a line of credit. Potential entrant or smaller firms may not have had a chance to build enough "goodwill" and see therefore their chance to obtain credit at market rates reduced (Martin, 1994).

8 Conclusion

The paper illustrates how financial arrangements can affect the relationship between an upstream and a downstream firm. In particular, we suggest a reason for a franchisor to impose limits on the franchisees' borrowing. We show that a franchisee may prefer to finance the investment necessary to carry out the franchised operation, with borrowed funds. This unambiguously reduces the franchisor's expected profit and creates a conflict of interest between the parties. This conflict can be solved, with possible beneficial effects for both firms, by imposing an upfront restriction on the franchisee's ability to borrow. Our explanation is thus complementary to existing theories of franchising based on a one-sided moral hazard perspective, where equity financing constitutes a device against quality chiseling by franchisees (Mathewson and Winter, 1985).[18]

A traditional argument for franchising is that franchisors face a binding capital constraint and resort to franchising to overcome it.[19] In our analysis, the franchisor resorts to a downstream firm because the latter has superior skills in retailing. If the franchisee is wealth constrained, and considering the negative effects of the franchisee's debt on the franchisor's profit, the franchisor can find it beneficial to provide capital to the franchisee. This is often observed in practice.[20]

An empirical model tested whether firms acting mainly as principals or agents are characterised by higher leverage. Some evidence indicates that agent firms retain a higher proportion of liabilities in the form of short-term debt, thereby supporting the notion that these firms use debt to affect the relationship with their principals.

An interesting result arises from the study of debt usage within the group organisation. The absence of strategic motives among firms of the same group explains why group firms are less indebted than independent ones. The breakdown of group membership that takes

[18] Alternative explanations consider a two-sided moral hazard problem, where both the franchisor and the franchisee need incentives to perform. See Bhattacharyya and Lafontaine (1995), and Lal (1990). Empirical findings in Lafontaine (1992) show that franchising is best explained by a model that assumes moral hazard on the part of both firms.

[19] See Norton(1995) for a critical analysis.

[20] Lafontaine (1992) reports that 223 out of 1,114 franchisors declared in a survey that they are willing to provide financing to their franchisees.

into account the position of a firm within a group, reveals that the holding firm is generally more indebted than the subsidiaries, thereby supporting the notion that financial activities are concentrated inside the holding to take advantage of economies of scale.

Our estimations also suggest that buyer power is likely to be exercised in highly disintegrated vertical chains, as buyers tend to enjoy higher levels of trade credit. Further analysis is needed before conclusions on this matter can be definitely drawn.

We pointed out several limitations in our study. The data bank used is not perfectly suited to our needs and it may explain the low R^2 in our regressions.[21] To test our theory conclusively, we would need to combine actual contractual arrangements with the parties' balance sheet data. As firms are often reluctant to provide copies of signed contracts, a viable alternative would be the setting-up of an *ad hoc* questionnaire, which is left for future research.

Appendix

A HREG estimation

As the following tables indicate, changing the estimation method to take into account a specific form of multiplicative heteroscedasticity does not significantly alter the nature of the results previously shown. As in the absence of spherical disturbances OLS and ML estimations are equivalent, the differences between the following set of tables and those in the text is due to the different corrections for heteroscedasticity. Indeed, the Breusch-Pagan χ^2-statistic is particularly high in the regressions of STDB_SLS and CL_CAAVG, and it is actually in these cases that the main divergences, mainly related to the coefficients' significance, can be found.

References

Barbetta, P., Piga, C., and Vivarelli, M. (1996). Il fenomeno dei Gruppi di Imprese in Italia. *Quaderni di Politica Industriale, Mediocredito Centrale*, 6:1–101.

Besanko, D., Dranove, D., and Shanley, M., editors (1999). *Economics of Strategy.* John Wiley & Sons, New York.

Bhattacharyya, S. and Lafontaine, F. (1995). Double-sided moral hazard and the nature of share contracts. *RAND Journal of Economics*, 26:761–781.

Brander, J. A. and Lewis, T. R. (1986). Oligopoly and financial structure: The limited liability effect. *The American Economic Review*, 76:956–970.

Brander, J. A. and Lewis, T. R. (1988). Bankruptcy costs and the theory of oligopoly. *Canadian Journal of Economics - Revue Canadienne d'Economique*, XXI:221–243.

[21] This is however a common feature of these type of studies.

Brander, J. A. and Spencer, B. J. (1989). Moral Hazard and Limited Liability: Implications for the Theory of the Firm. *International Economic Review*, 30:833–849.

Cable, J. and Yasuki, H. (1985). Internal Organisation, Business Groups and Corporate Performance: an empirical test of the Multidivisional Hypothesis in Japan. *International Journal of Industrial Organization*, 3:401–420.

Chang, S. and Choi, U. (1988). Strategy, Structure and Performance of Korean Business Groups: a Transaction Cost Approach. *Journal of Industrial Economics*, 37:141–158.

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

Cho, M. (1998). Ownership structure, investment, and the corporate value: an empirical analysis. *Journal of Financial Economics*, 47:103–121.

Demsetz, H. and Lehn, K. (1985). The Structure of Corporate Ownership: Causes and Consequences. *Journal of Political Economy*, 93:1155–1177.

Friend, I. and Lang, L. H. (1988). An Empirical Test of the Impact of Managerial Self-Interest on Corporate Capital Structure. *Journal of Finance*, 63:271–281.

Gal-Or, E. (1991). Vertical restraints with incomplete information. *Journal of Industrial Economics*, 39:503–516.

Glazer, J. (1994). The strategic effects of long-term debt in imperfect competition. *Journal of Economic Theory*, 62:428–443.

Holmstrom, B. R. and Tirole, J. (1989). The theory of the firm. In Schmalensee, R. and Willig, R., editors, *Handbook of Industrial Organization*, pages 61–133. Elsevier Science Publisher, Amsterdam.

Jensen, G. R., Solberg, D. P., and Zorn, T. S. (1992). Simultaneous determination of insider ownership, debt, and dividend policies. *Journal of Financial and Quantitative Analysis*, 27:247– 263.

Jensen, M. C. (1986). Agency cost of free cash flow, corporate finance and takeovers. *The American Economic Review*, 16:323–339.

Kim, W. S. and Sorensen, E. H. (1986). Evidence on the Impact of the Agency Costs of Debt on Corporate Debt Policy. *Journal of Financial and Quantitative Analysis*, 21:131–144.

Kovenock, D. and Phillips, G. M. (1997). Capital structure and product market behavior: An examination of plant exit and investment decisions. *Review of Financial Studies*, 10:767–803.

Laffont, J. J. and Tirole, J. (1993). *A Theory of Incentives in Procurement and Regulation*. The MIT Press, Cambridge, MA.

Lafontaine, F. (1992). Agency theory and franchising: some empirical results. *RAND Journal of Economics*, 23:263–283.

Lal, R. (1990). Improving channel coordination through franchising. *Marketing Science*, 9:299–318.

Leonard, D. and Van Long, N. (1992). *Optimal Control Theory and Static Optimization in Economics*. Cambridge University Press, Cambridge.

Marsh, P. (1982). The choice between equity and debt: an empirical study. *Journal of Finance*, 37:121–144.

Martin, S. (1994). *Industrial Economics. Economic Analysis and Public Policy*. Prentice Hall, Englewood Cliff, NJ.

Mathewson, G. F. and Winter, R. A. (1985). The economics of franchise contracts. *The Journal of Law and Economics*, 28:503– 526.

Phillips, G. M. (1995). Increased debt and industry product markets an empirical analysis. *Journal of Financial Economics*, 37:189–238.

Showalter, D. (1999). Strategic Debt: evidence in manufacturing. *International Journal of Industrial Organization*, 17:319–333.

Showalter, D. M. (1995). Oligopoly and Financial Structure - A Comment. *The American Economic Review*, 85:647–653.

Subramaniam, V. (1998). Efficient Sourcing and Debt Financing in Imperfect Product Markets. *Management Science*, 44:1167–1178.

Titman, S. and Wessels, R. (1988). The Determinants of Capital Structure Choice. *Journal of Finance*, 43:1–19.

Williamson, O. (1989). Transaction cost economics. In Schmalensee, R. and Willig, R., editors, *The Handbook of Industrial Organization*, pages 135–182. Elsevier Science Publisher, Amsterdam.

	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.385	0.99	0.914	0.808	0.135	0.135
	(2.227)†	(2.65)‡	(2.29)†	(1.99)†	(2.61)‡	(2.49)†
AGENT	0.35	0.38	0.403	0.38	0.752	0.703
(10^{-4})	(0.593)	(0.640)	(0.682)	(0.644)	(0.805)	(0.757)
GROUP	-0.16	-0.22				
(10^{-1})	-(2.57)‡	(-3.71)‡				
GRPHEAD			0.562	0.75	23.82	16.8
(10^{-3})			(0.06)	(0.08)	(2.5)†	(1.64)*
GRPCONTR			-0.271	-0.21		
(10^{-1})			(-4.35)‡	(-3.1)‡		
INSOWNCT	0.127			0.123		0.107
(10^{-1})	(1.288)			(1.25)		(0.564)
HER3OWN2	-0.235			-0.195		-0.22
(10^{-1})	(-3.07)‡			(-2.46)†		(-1.68)*
DEPRINAS	0.57	0.58	0.55	0.55	0.619	0.561
	(2.23)†	(2.23)†	(2.21)†	(2.18)†	(1.795)*	(1.61)
DEPRTASS	-0.906	-0.925	-0.925	-0.911	-0.824	-0.798
	(-7.65)‡	(-7.82)‡	(-7.80)‡	(-7.67)‡	(-4.7)‡	(-4.53)‡
EBITAVG	-0.184	-0.175	-0.186	-0.192	-0.12	-0.127
	(-4.4)‡	(-4.19)‡	(-4.45)‡	(-4.57)‡	(-2.0)†	(-2.11)†
FIXASSAV	0.402	0.403	0.427	0.442	0.665	0.635
(10^{-1})	(1.72)*	(1.72)*	(1.82)*	(1.80)*	(1.915)*	(1.822)*
LASSETS	0.824	0.74	0.73	0.797	-0.097	-0.026
(10^{-2})	(3.2)‡	(2.90)‡	(2.87)‡	(3.10)‡	(-0.275)	(-0.072)
RISK3	-0.137	-0.135	-0.133	-0.135	-0.055	-0.058
(10^{-5})	(-3.19)‡	(-3.14)‡	(-3.09)‡	(-3.14)‡	(-1.31)	(-1.37)
OUTSOURC	0.291	0.322	0.396	0.35	0.31	0.31
(10^{-4})	(0.197)	(0.217)	(0.268)	(0.236)	(0.128)	(0.128)
N	2317	2317	2317	2317	889	889
R^2	0.10	0.097	0.10	0.102	0.111	0.114
F	3.802†			2.539		0.9498

Table 5: Dependent variable STDEBAVG. OLS regression corrected for heteroscedasticity. t-statistic in parentheses. * Significant at the 10% level; † Significant at the 5% level; ‡ Significant at the 1% level. 24 industry dummy variables were included in the regressions.

	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-0.054	-0.05	-0.057	-0.06	0.07	0.08
	(-1.1)	(-1.05)	(-1.14)	(-1.16)	(0.852)	(1.00)
AGENT	1.59	1.637	1.66	1.62	1.31	1.2
(10^{-4})	(1.772)*	(1.835)*	(1.86)*	(1.803)*	(0.863)	(0.795)
GROUP	-0.132	-0.182				
(10^{-1})	-(1.404)	(-2.135)†				
GRPHEAD			0.314	0.326	2.42	1.74
(10^{-2})			(0.258)	(0.267)	(1.84)*	(1.262)
GRPCONTR			-0.233	-0.184		
(10^{-1})			(-2.53)†	(-1.74)*		
INSOWNCT	0.342			0.307		-0.611
(10^{-2})	(0.273)			(0.244)		(-0.221)
HER3OWN2	-0.182			-0.142		-0.178
(10^{-1})	(-1.77)*			(-1.33)		(-0.915)
DEPRINAS	1.04	1.057	1.033	1.02	1.22	1.14
	(2.96)‡	(3.01)‡	(2.96)‡	(2.93)‡	(2.15)†	(2.001)†
DEPRTASS	-1.95	-1.98	-1.976	-1.96	-2.66	-2.622
	(-8.75)‡	(-8.84)‡	(-8.82)‡	(-8.77)‡	(-5.51)‡	(-5.44)‡
EBITAVG	-0.44	-0.433	-0.443	-0.44	-0.352	-0.357
	(-6.13)‡	(-5.99)‡	(-6.12)‡	(-6.19)‡	(-3.2)‡	(-3.26)‡
FIXASSAV	2.7	2.7	2.72	2.71	4.08	4.05
(10^{-1})	(5.48)‡	(5.47)‡	(5.52)‡	(5.52)*	(3.71)‡	(3.68)‡
LASSETS	0.194	0.188	0.187	0.191	0.0507	0.058
(10^{-1})	(5.21)‡	(5.06)‡	(5.05)‡	(5.17)‡	(0.775)	(0.886)
RISK3	0.37	0.383	0.399	0.386	0.147	0.145
(10^{-5})	(0.251)	(0.261)	(0.272)	(0.262)	(0.906)	(0.883)
OUTSOURC	-0.107	-0.107	-0.099	-0.101	0.141	0.152
(10^{-3})	(-0.55)	(-0.547)	(-0.511)	(-0.521)	(0.386)	(0.414)
N	2309	2309	2309	2309	883	883
R^2	0.126	0.125	0.126	0.127	0.149	0.150
F	1.30			1.301		0.498

Table 6: Dependent variable STDB_SLS. OLS regression corrected for heteroscedasticity. t-statistic in parentheses. * Significant at the 10% level; † Significant at the 5% level; ‡ Significant at the 1% level. 24 industry dummy variables were included in the regressions.

	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-0.191	-113	-144	-284	0.0344	0.044
	(-0.231)	(-0.014)	(-0.167)	(-0.329)	(0.352)	(0.436)
AGENT	0.137	0.144	0.149	0.142	0.186	0.142
(10^{-3})	(1.56)	(1.63)*	(1.69)*	(1.621)*	(1.323)	(1.238)
GROUP	-0.944	-0.202				
(10^{-2})	(-1.029)	(-2.331)†				
GRPHEAD			0.188	0.191	0.442	0.3
(10^{-1})			(1.405)	(1.43)	(3.145)‡	(1.939)*
GRPCONTR			-0295	-0.183		
(10^{-1})			(-3.2)‡	(-1.8)*		
INSOWNCT	0.176			0.171		0.111
(10^{-1})	(1.185)			(1.15)		(0.398)
HER3OWN2	-0.414			-0.345		-0.422
(10^{-1})	(-3.53)‡			(-2.83)‡		(-2.146)†
DEPRINAS	1.675	1.697	1.655	1.647	1.83	1.703
	(4.20)‡	(4.31)‡	(4.23)‡	(4.16)‡	(3.34)‡	(3.05)‡
DEPRTASS	-1.67	-1.71	-1.71	-1.681	-1.847	-1.788
	(-7.69)‡	(-7.83)‡	(-7.81)‡	(-7.70)‡	(-5.06)‡	(-4.93)‡
EBITAVG	-0.172	-0.156	-0.175	-0.184	-0.09	-0.102
	(-2.65)‡	(-2.40)†	(-2.70)‡	(-2.84)‡	(-1.001)	(-1.138)
FIXASSAV	0.533	0.533	0.538	0.537	0.585	0.579
	(11.3)‡	(11.3)‡	(11.4)‡	(11.4)*	(8.1)‡	(8.07)‡
LASSETS	0.148	0.133	0.131	0.143	0.0484	0.0627
(10^{-1})	(5.21)‡	(5.06)‡	(5.05)‡	(5.17)‡	(0.775)	(0.886)
RISK3	-0.142	-0.138	-0.136	-0.14	-0.574	-0.063
(10^{-5})	(-2.49)†	(-2.414)†	(-2.346)†	(-2.43)†	(-1.027)	(-1.132)
OUTSOURC	-0.428	-0.386	-0.248	-0.321	0.801	0.739
(10^{-3})	(-0.205)	(-0.185)	(-0.119)	(-0.877)	(0.253)	(0.231)
N	2317	2317	2317	2317	889	889
R^2	0.161	0.156	0.16	0.163	0.199	0.204
F	6.797‡			4.086‡		2.679

Table 7: Dependent variable STDBCAAV. OLS regression corrected for heteroscedasticity. t-statistic in parentheses. * Significant at the 10% level; † Significant at the 5% level; ‡ Significant at the 1% level. 24 industry dummy variables were included in the regressions.

	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.619	0.639	0.633	0.615	0.442	0.444
	(3.67)‡	(3.85)‡	(3.75)‡	(3.61)‡	(2.403)†	(2.401)†
AGENT	0.489	0.491	0.493	0.491	0.503	0.494
(10^{-3})	(3.60)‡	(3.63)‡	(3.64)‡	(3.62)‡	(2.483)†	(2.47)†
GROUP	0.259	0.189				
(10^{-1})	(1.962)†	(1.464)				
GRPHEAD			0.376	0.378	0.27	0.153
(10^{-1})			(2.11)†	(2.13)†	(1.447)	(0.742)
GRPCONTR			0.15	0.232		
(10^{-1})			(1.072)	(1.56)		
INSOWNCT	0.198			0.198		0.157
(10^{-1})	(0.909)			(0.913)		(0.432)
HER3OWN2	-0.291			-0.269		-0.36
(10^{-1})	(-1.754)*			(-1.56)		(-1.352)
DEPRINAS	4.138	4.15	4.128	4.12	4.604	4.507
	(5.15)‡	(5.17)‡	(5.13)‡	(5.12)‡	(4.53)‡	(4.37)‡
DEPRTASS	-1.902	-1.92	-1.922	-1.904	-2.072	-2.03
	(-5.59)‡	(-5.66)‡	(-5.65)‡	(-5.6)‡	(-3.47)‡	(-3.41)‡
EBITAVG	-0.185	-0.173	-0.182	-0.19	-0.4	-0.41
	(-1.388)	(-1.307)	(-1.37)	(-1.42)	(-2.484)	(-2.56)
FIXASSAV	1.068	1.068	1.07	1.07	1.025	1.021
	(12.5)‡	(12.5)‡	(12.5)‡	(12.6)*	(6.31)‡	(6.31)‡
LASSETS	-0.756	-0.864	-0.878	-0.78	1.19	1.311
(10^{-2})	(-0.983)	(-1.135)	(-1.16)	(-1.018)	(1.311)	(1.435)
RISK3	0.314	0.317	0.32	0.315	0.211	0.207
(10^{-5})	(2.55)‡	(2.57)‡	(2.58)‡	(2.56)‡	(1.705)*	(1.675)*
OUTSOURC	0.752	0.73	0.737	0.73	1.016	1.017
(10^{-3})	(2.01)†	(2.02)†	(2.04)†	(2.02)†	(2.15)†	(2.14)†
N	2317	2317	2317	2317	889	889
R^2	0.198	0.197	0.197	0.198	0.26	0.261
F	1.422			1.42		0.577

Table 8: Dependent variable CL_CAAVG. OLS regression corrected for heteroscedasticity. t-statistic in parentheses. * Significant at the 10% level; † Significant at the 5% level; ‡ Significant at the 1% level. 24 industry dummy variables were included in the regressions.

	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.073	0.087	0.08	0.068	0.122	0.121
	(1.359)	(1.65)*	(1.502)	(1.27)	(1.99)†	(1.94)*
AGENT	0.393	0.422	0.452	0.426	0.795	0.745
(10^{-4})	(0.671)	(0.72)	(0.772)	(0.729)	(0.868)	(0.811)
GROUP	-0.164	-.225				
(10^{-1})	(-2.662)‡	(-3.85)‡				
GRPHEAD			0.142	0.361	23.96	16.96
(10^{-3})			(0.015)	(0.037)	(2.5)†	(1.65)*
GRPCONTR			-0.274	-0.21		
(10^{-1})			(-4.44)‡	(-3.13)‡		
INSOWNCT	0.142			0.138		0.12
(10^{-1})	(1.551)			(1.508)		(0.731)
HER3OWN2	-0.243			-0.206		-0.227
(10^{-1})	(-3.23)‡			(-2.65)‡		(-1.88)*
DEPRINAS	0.564	0.574	0.55	0.55	0.693	0.64
	(2.21)†	(2.24)†	(2.154)†	(2.147)†	(1.96)†	(1.79)*
DEPRTASS	-0.872	-0.892	-0.892	-0.877	-0.75	-0.72
	(-7.4)‡	(-7.57)‡	(-7.58)‡	(-7.44)‡	(-4.19)‡	(-4.04)‡
EBITAVG	-0.175	-0.165	-0.176	-0.182	-0.112	-0.119
	(-3.99)‡	(-3.78)‡	(-4.01)‡	(-4.14)‡	(-1.76)*	(-1.86)*
FIXASSAV	0.03	0.031	0.034	0.033	0.044	0.04
	(1.389)	(1.424)	(1.553)	(1.5)	(1.306)	(1.19)
LASSETS	0.897	0.805	0.794	0.87	-0.05	0.03
(10^{-2})	(3.79)‡	(3.42)‡	(3.37)‡	(3.68)‡	(-0.144)	(0.081)
RISK3	-0.14	-0.136	-0.134	-0.137	-0.054	0.06
(10^{-5})	(-3.87)‡	(-3.77)‡	(-3.72)‡	(-3.81)‡	(-1.39)	(1.5)
OUTSOURC	0.354	0.403	0.453	0.73	1.04	1.05
(10^{-4})	(0.248)	(0.282)	(0.317)	(0.277)	(0.459)	(0.467)
N	2317	2317	2317	2317	889	889
Variance						
γ_0	0.131	0.131	0.131	0.131	0.129	0.129
	(34.6)‡	(34.6)‡	(34.6)‡	(34.6)‡	(22.1)‡	(22.1)‡
FIXASSAV	-1.07	-1.05	-1.04	-1.06	-1.43	-1.45
	(-4.91)‡	(-4.81)‡	(-4.78)‡	(-4.81)‡	(-4.03)‡	(-4.06)‡

Table 9: Dependent variable STDEBAVG. Multiplicative heteroscedastic regression model. ML estimates. t-statistic in parentheses. * Significant at the 10% level; † Significant at the 5% level; ‡ Significant at the 1% level. 24 industry dummy variables were included in the regressions.

	(1)	(2)	(3)	(4)
Constant	-0.025	-0.017	-0.023	-0.287
	(-0.306)	(-0.209)	(-0.29)	(-0.36)
AGENT	0.478	0.502	0.52	0.5
(10^{-4})	(0.677)	(0.71)	(0.737)	(0.702)
GROUP	-0.732	-1.36		
(10^{-2})	(-0.943)	(-1.86)*		
GRPHEAD			0.357	0.426
(10^{-2})			(0.313)	(0.373)
GRPCONTR			-0.19	-0.121
(10^{-1})			(-2.43)†	(-1.42)
INSOWNCT	0.56			0.52
(10^{-2})	(0.469)			(0.44)
HER3OWN2	-0.225			-0.192
(10^{-1})	(-2.42)‡			(-2.01)†
DEPRINAS	0.91	0.93	0.92	0.9
	(2.79)‡	(2.84)‡	(2.82)‡	(2.78)†
DEPRTASS	-1.41	-1.43	-1.43	-1.42
	(-9.5)‡	(-9.57)‡	(-9.61)‡	(-9.5)‡
EBITAVG	-0.47	-0.466	-0.467	-0.468
	(-12.2)‡	(-12.2)‡	(-12.2)‡	(-12.2)‡
FIXASSAV	0.22	0.22	0.22	0.22
	(7.34)‡	(7.3)‡	(7.4)‡	(7.4)‡
LASSETS	0.169	0.16	0.161	0.17
(10^{-1})	(5.73)‡	(5.5)‡	(5.52)‡	(5.7)‡
RISK3	-0.777	-0.762	-0.734	-0.756
(10^{-6})	(-1.72)*	(-1.69)*	(-1.63)*	(-1.67)*
OUTSOURC	-0.16	-0.16	-0.153	0.153
(10^{-3})	(-0.97)	(-0.98)	(-0.94)	(-0.94)
N	2309	2309	2309	2309
Variance				
γ_0	0.242	0.242	0.242	0.242
	(26.6)‡	(26.6)‡	(26.6)‡	(26.6)‡
FIXASSAV	-0.422	-0.42	-0.415	-0.42
	(-1.92)*	(-1.9)*	(-1.9)*	(-1.9)*
EBITAVG	-9.88	-9.85	-9.9	-9.89
	(-19.4)‡	(-19.3)‡	(-19.4)‡	(-19.4)‡

Table 10: Dependent variable STDB_SLS. Multiplicative heteroscedastic regression model. ML estimates. t-statistic in parentheses. * Significant at the 10% level; † Significant at the 5% level; ‡ Significant at the 1% level. 24 industry dummy variables were included in the regressions.

	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.037	0.051	0.04	0.026	0.06	0.07
	(0.459)	(0.644)	(0.468)	(0.33)	(0.643)	(0.732)
AGENT	0.13	0.137	0.139	0.134	0.22	0.2
(10^{-3})	(1.51)	(1.6)	(1.63)	(1.57)	(1.62)	(1.5)
GROUP	-0.95	-0.19				
(10^{-2})	(-1.07)	(-2.28)†				
GRPHEAD			0.211	0.213	0.444	0.313
(10^{-1})			(1.56)	(1.58)	(3.21)‡	(2.1)†
GRPCONTR			-0.29	-0.2		
(10^{-1})			(-3.3)‡	(-2.07)†		
INSOWNCT	0.128			0.123		0.087
(10^{-1})	(0.971)			(0.934)		(0.364)
HER3OWN2	-0.36			-0.272		-0.377
(10^{-1})	(-3.27)‡			(-2.4)†		(-2.1)†
DEPRINAS	1.581	1.61	1.56	1.55	1.65	1.54
	(4.58)‡	(4.66)‡	(4.55)‡	(4.5)‡	(3.51)‡	(3.2)‡
DEPRTASS	-1.69	-1.73	-1.72	-1.7	-1.84	-1.78
	(-8.7)‡	(-8.88)‡	(-8.9)‡	(-8.76)‡	(-6.08)‡	(-5.9)‡
EBITAVG	-0.164	-0.144	-0.163	-0.175	-0.0005	-0.0232
	(-2.6)‡	(-2.27)†	(-2.56)‡	(-2.76)‡	(-0.006)	(-0.248)
FIXASSAV	0.512	0.511	0.514	0.514	0.57	0.565
	(13.22)‡	(13.2)‡	(13.3)‡	(13.3)‡	(9.2)‡	(9.1)‡
LASSETS	0.125	0.114	0.111	0.121	0.042	0.054
(10^{-1})	(3.7)‡	(3.3)‡	(3.37)‡	(3.57)‡	(0.803)	(1.03)
RISK3	-0.135	-0.132	-0.131	-0.133	-0.55	-0.06
(10^{-5})	(-2.78)‡	(-2.71)‡	(-2.71)‡	(-2.76)‡	(-1.02)	(-1.1)
OUTSOURC	-0.651	-0.666	-0.43	-0.47	-1.55	-1.52
(10^{-4})	(-0.338)	(-0.345)	(-0.224)	(-0.243)	(-0.512)	(-0.503)
N	2317	2317	2317	2317	889	889
Variance						
γ_0	0.128	0.128	0.127	0.127	0.126	0.127
	(26.7)‡	(26.7)‡	(26.7)‡	(26.7)‡	(17.2)‡	(17.2)‡
FIXASSAV	2.16	2.18	2.2	2.18	1.78	1.74
	(9.8)‡	(9.9)‡	(10.0)‡	(9.9)‡	(4.9)‡	(4.8)‡
EBITAVG	0.95	1.05	1.08	1.0	1.86	1.7
	(1.9)*	(2.06)†	(2.13)†	(1.97)†	(2.38)†	(2.17)†

Table 11: Dependent variable STDBCAAV. Multiplicative heteroscedastic regression model. ML estimates. t-statistic in parentheses. * Significant at the 10% level; † Significant at the 5% level; ‡ Significant at the 1% level. 24 industry dummy variables were included in the regressions.

	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.61	0.62	0.61	0.6	0.51	0.51
	(5.31)‡	(5.55)‡	(5.4)‡	(5.2)‡	(3.91)‡	(3.86)‡
AGENT	0.44	0.44	0.44	0.44	0.57	0.56
(10^{-3})	(3.63)‡	(3.66)‡	(3.66)‡	(3.65)‡	(3.05)‡	(2.99)‡
GROUP	0.28	0.22				
(10^{-1})	(2.28)†	(1.87)*				
GRPHEAD			0.486	0.488	0.316	0.175
(10^{-1})			(2.56)‡	(2.57)‡	(1.69)*	(0.86)
GRPCONTR			0.154	0.215		
(10^{-1})			(1.25)	(1.58)		
INSOWNCT	0.136			0.138		0.141
(10^{-1})	(0.773)			(0.746)		(0.425)
HER3OWN2	-0.25			-0.193		-0.413
(10^{-1})	(-1.61)			(-1.2)		(-1.66)*
DEPRINAS	3.15	3.17	3.13	3.12	4.15	4.03
	(7.01)‡	(7.1)‡	(7.0)‡	(6.96)‡	(6.5)‡	(6.3)‡
DEPRTASS	-1.72	-1.75	-1.75	-1.73	-2.06	-1.99
	(-5.8)‡	(-5.9)‡	(-5.9)‡	(-5.85)‡	(-4.61)‡	(-4.4)‡
EBITAVG	-0.246	-0.232	-0.248	-0.256	-0.537	-0.55
	(-2.75)‡	(-2.6)‡	(-2.77)‡	(-2.86)‡	(-4.14)‡	(-4.25)*
FIXASSAV	0.766	0.765	0.766	0.766	0.7	0.7
	(12.6)‡	(12.6)‡	(12.6)‡	(12.6)‡	(7.4)‡	(7.3)‡
LASSETS	0.524	-0.25	-0.4	0.25	14.7	15.8
(10^{-3})	(0.111)	(-0.05)	(-0.09)	(0.053)	(2.05)†	(2.2)†
RISK3	0.203	0.205	0.205	0.2	0.11	0.106
(10^{-5})	(-3.2)‡	(3.24)‡	(3.24)‡	(3.2)‡	(1.48)	(1.44)
OUTSOURC	0.764	0.764	0.788	0.783	0.723	0.72
(10^{-3})	(2.93)‡	(2.93)‡	(3.02)‡	(3.0)‡	(1.81)*	(1.8)*
N	2317	2317	2317	2317	889	889
Variance						
γ_0	0.136	0.136	0.136	0.136	0.166	0.166
	(26.7)‡	(26.7)‡	(26.7)‡	(26.7)‡	(17.2)‡	(17.2)‡
FIXASSAV	4.22	4.22	4.23	4.23	3.14	3.15
	(19.2)‡	(19.2)‡	(19.2)‡	(19.2)‡	(8.6)‡	(8.65)‡
EBITAVG	3.41	3.45	3.46	3.43	-0.2	-0.25
	(6.7)‡	(6.79)†	(6.8)‡	(6.7)‡	(-0.25)	(-0.32)

Table 12: Dependent variable CL_CAAVG. Multiplicative heteroscedastic regression model. ML estimates. t-statistic in parentheses. * Significant at the 10% level; † Significant at the 5% level; ‡ Significant at the 1% level. 24 industry dummy variables were included in the regressions.