Strategic Cost of Diversification

Evgeny Lyandres
Rice University

This article proposes a new explanation for the large cross-sectional variation in the excess values of diversified firms. The model applies the idea of shareholders' limited liability affecting firms' output market strategies to the analysis of financial and operating choices of conglomerates. The inability of conglomerates to commit to unconstrained optimal operating strategies, following from the lack of flexibility in choosing their divisions' capital structures, reduces their value. Thus, the model highlights a new type of inefficiency of the conglomerate organizational structure, which is suboptimal financing. The predictions of the model are generally supported by the data. (*JEL* G32, G34, L13)

The valuation of diversified firms (conglomerates) that operate divisions in multiple industries has attracted significant attention in recent years. Early evidence suggests that conglomerates are discounted, on average, relative to their single-division rivals (e.g., Lang and Stulz (1994), Berger and Ofek (1995), Lins and Servaes (1999), and Klein (2001)). More recent studies show that carefully controlling for the endogeneity of the decision to diversify reduces conglomerate discounts and, in some cases, results in diversification premiums (e.g., Campa and Kedia (2002) and Villalonga (2003, 2004)).

Regardless of whether conglomerates trade at a discount or premium on average, there is no debate about the existence of a large cross-sectional variation in conglomerate discounts/premiums. All of the studies above have found that some diversified firms trade at substantial discounts, while others trade at sizeable premiums.

The variation in conglomerates' excess values is due to various costs and benefits of diversification. The benefits are numerous. Economies of scope can allow greater operating efficiency. The convexity of the tax code creates tax advantages that follow from a smoother profit stream. Diversification can mitigate Myers (1977) underinvestment problem by creating larger internal capital markets (see Stulz (1990)), reduce the

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likelihood of bankruptcy (see Lewellen (1971)), and enhance divisions' ability to prey on their rivals (see Bolton and Scharfstein (1990)).

The costs of conglomeration follow from various agency conflicts between firms' managers and shareholders, to which conglomerates are especially susceptible. The agency problems include the free cash flow problem (see Jensen (1986, 1988)), managerial risk aversion (see Amihud and Lev (1981)), rent seeking by divisional managers that causes investment distortions (see Scharfstein and Stein (2000)), and influence costs that can lead to inefficient transfers among conglomerates' divisions (see Rajan, Servaes and Zingales (2000)). In addition, diversification can serve managers' empire building objectives, given the antitrust opposition to horizontal and vertical mergers.

In this article I propose another cost of conglomeration. Unlike the agency-related costs, it does not rely on the differences between the objective functions of firms' shareholders and managers. In my model, the managers maximize shareholder value, but the combined value of the conglomerate's divisions is still lower than the combined value of its stand-alone rivals that possess the same technology and the same market power as the conglomerate's divisions.

The model is based on the limited liability literature that examines the links between firms' capital structures and their product market decisions. Limited liability causes a firm to pursue a riskier output strategy that increases returns in good states, while reducing returns in bad states. In the presence of debt, the debtholders own all the claims to the firm's assets in bankrupt states. Knowing that, the managers, acting in the shareholders' interests, do not take the reduction in the firm's returns in bankrupt states into account when choosing its product market strategy. Therefore, the firm's financial structure serves as a pre-commitment to a more aggressive behavior in the product markets and affects the optimal output market strategies of its rivals. Hence, debt financing may have a strategic advantage if the distortion of the firm's operating strategy influences the product market choices of the firm's rivals in a way that benefits the firm.

The magnitude of the strategic benefit of debt financing depends on the degree to which firms' product market strategies affect their industry rivals. As a consequence, a firm's optimal capital structure is related to the competitive structure of the industry in which it operates. A conglomerate operating in several industries with different competitive structures loses the ability to choose separate capital structures that maximize the values of each of its divisions. Unlike a single-division firm, the conglomerate chooses a common debt level that affects the product market strategies of each of its divisions. The divisions' optimal operating strategies are constrained by this common debt level. This results in the diversified firm being discounted despite optimal operation after conglomeration.[1]

Thus, the main idea of the article is that conglomerates, whose divisions' value functions are identical to those of their single-division rivals, *optimally* choose product market strategies that are different from those of the stand-alone firms. In other words, the conglomerate organizational structure has a cost of not allowing the diversified firms to fine-tune their capital structures in order to fully use the strategic benefit of debt and pursue first-best operating strategies. The value loss following from employing these second-best operating strategies is the *strategic cost of diversification*.

My model is different from the agency models mentioned above in that it is based on the inefficient financing that is a feature of the conglomerate organizational structure, rather than on the inefficient investment following from various agency conflicts. Thus, the first contribution of this article is identifying another source of inefficiency of the conglomerate organizational structure. The second contribution is relating the conglomerates' excess values to the variation in the extent of competitive interaction in their industries. The extent of competitive interaction in an industry determines that industry's optimal leverage. The larger the differences among the unconstrained optimal capital structures of the conglomerate's divisions, the larger the deviation of the joint capital structure from each division's optimum, the larger the distortion in the divisions' operating strategies, and the lower the diversified firm's excess value.

The article's third contribution is an attempt to reconcile the existence of conglomerate discounts with the positive market reactions to announcements of conglomerate acquisitions, while not relying on agency conflicts or on the *ex ante* inferiority of diversifying firms. The direct effect of the decision to diversify is on the combined value of the merging firms. It can be positive or negative, depending on whether the benefits of diversification more than offset its strategic and other costs. If the managers of the merging firms act in the best interest of the firms' shareholders, conglomeration should happen only when its benefits outweigh its costs. The indirect effect of the decision to diversify is on the merging firms' product market rivals, which serve as a benchmark for valuing the diversified firm. This indirect effect can be larger than the direct effect on the combined value of the merging firms. Therefore, we can observe a situation in which conglomeration increases the merging firms' combined value but results in an *ex post* discount because the combined value of the rivals increases even more.

[1] I discuss below various alternatives to a firm-wide common debt level and argue that none of the potential remedies can solve the inefficient financing problem.

The remainder of this article is organized as follows. The next section contains a brief review of the literature on the valuation of diversified firms and on the limited liability effect of debt. Section 2 starts by developing a simple framework for analyzing the relation between the competitive structure of an industry and its participants' optimal capital structures. This framework is then extended to an analysis of the strategies and valuation of a firm that operates divisions in more than one industry. Section 2 also contains a discussion of why it is impossible to solve the inefficient conglomerate financing problem through allowing division-specific debt, intra-firm borrowing or performance-dependent executive compensation contracts. Section 3 describes an algorithm for gauging the extent of strategic interaction among firms in an industry and develops empirical proxies for the variation in competitive interaction in a conglomerate's industries. Section 4 tests the model's predictions using segment reporting data. Section 5 provides empirical tests using data on conglomerate mergers and acquisitions. Section 6 summarizes the theoretical and empirical findings and concludes. Proofs are provided in the Appendix.

1. Related Literature

1.1 Valuation of conglomerates and market reaction to conglomerate acquisitions

As mentioned in the introduction, there is an ongoing debate regarding the average diversification discount/premium. This debate notwithstanding, there is no question that there are plenty of diversified firms trading at discounts. However, the trade-off between the costs and benefits of diversification implies that if the objectives of firms' managers and shareholders are aligned *ex ante* (prior to conglomeration), then conglomeration should only occur when its benefits outweigh its costs. The empirical evidence on the market reaction to announcements of conglomerate acquisitions suggests that the merging firms' managers indeed act in the shareholders' interests. For example, Graham, Lemmon and Wolf (2002) document the mean bidder's and target's combined abnormal return of 3% on announcements of conglomerate acquisitions in the 80s and 90s and Matsusaka (1993) reports that the announcement returns were positive during the 60s and close to zero in the 70s.[2]

There are a number of models that attempt to reconcile the diversification discounts with the positive market reactions to announcements of conglomerate acquisitions. The general argument is that the conglomerate discounts occur in an equilibrium in which diversification enhances firm

[2] In addition, Billett and Mauer (2000) find that the market usually reacts favorably to announcements of tracking stock, which may be an alternative to spinning off divisions. This evidence implies a favorable reaction to the preservation of diversification.

value, while some conglomerates appear discounted. In Burch, Nanda and Narayanan (2004), the conglomerate discounts follow from a weaker competitive position of firms that choose to diversify.[3] Similarly, in Gomes and Livdan (2004), less productive firms are more likely to diversify. In Maksimovic and Phillips (2002), as a firm's returns within an industry decrease, the firm limits its growth within that industry and moves into other industries. The optimal number and size of industry segments the firm operates depend on its comparative advantages across industries.

These explanations for why some conglomerates trade at discounts rely on the idea that the discounts reflect the characteristics of firms that choose to diversify. These firms can be discounted prior to conglomeration because of an inferior market position or poorer investment opportunities. Empirically, however, it is not clear whether diversifying firms are *ex ante* inferior to their industry peers. For example, Lang and Stulz (1994) do not find that diversifying firms are poor performers relative to their industry rivals. Schoar (2002) provides evidence that diversified firms are more productive than specialized firms.[4]

Unlike the aforementioned studies, my model is not based on the *ex ante* inferiority of diversifying firms. Instead, it highlights the organizational inefficiency of the conglomerate structure that does not allow divisions to choose optimal divisional capital structures, resulting in a value loss. The model brings together the conglomerate valuation literature and the limited liability literature, which establishes the link between firms' financial strategies and their product market strategies. The limited liability literature is discussed next.

1.2 Limited liability and product market competition

A growing literature, starting with the work of Titman (1984), Brander and Lewis (1986), and Poitevin (1989), examines the effects of the interaction among firms in the output markets on their financial and operating choices. Because of the limited liability, debt commits a firm to a riskier output strategy, which, in turn, can affect the optimal product market strategies of the firm's rivals, potentially benefiting the firm.

Models that are based on the idea that the choice of debt in the first stage of the game serves as a commitment to subsequent output strategies in the second stage, in which the product market competition takes place, have traditionally been developed in the Cournot-type quantity competition setting. These models include the seminal work of Brander and Lewis

[3] Diversification adds value by allowing firms to shift resources between industries. The ability to shift resources is more important for firms with a lower ability to respond to industry shocks.

[4] On the other hand, Graham, Lemmon and Wolf (2002), Servaes (1996), and Villalonga (2004) find that targets in conglomerate mergers are usually discounted prior to their acquisition. In addition, Maksimovic and Phillips (2002) report that the productivity of single-business firms' is significantly higher than the productivity of conglomerates.

(1986), as well as studies by Maksimovic (1988) and Glazer (1994). In the framework of Cournot competition, debt commits firms to a more aggressive product market behavior (higher quantity choices), and the equilibrium debt levels are positive, even in the presence of the agency costs of debt and in the absence of the tax-related or other benefits of debt.

Alternative frameworks of oligopolistic competition are Bertrand-type price competition (see Showalter, (1995)) and capacity-price competition (see Schuhmacher, (2001)). Showalter shows that in the case of price competition, firms choose debt in equilibrium if the uncertainty is demand-related. In contrast, when costs are uncertain, debt carries a strategic disadvantage and is not chosen in equilibrium. Schuhmacher demonstrates the opposite result for the case of capacity-price competition. When demand conditions are uncertain, firms do not use debt, while in the case of uncertain costs, firms choose positive debt levels.

The aforementioned limited liability models show the conceptual difference between the optimal choice of debt in a perfectly competitive environment and in an environment where the strategic interaction among rivals is present. However, they do not explicitly examine the links between the extent of competitive interaction among firms in an industry, their optimal leverage, and the aggressiveness of their operating strategies. These links are established in the next section. They are then applied to the analysis of conglomerates' strategies and valuation.

2. The Model of Strategic Cost of Diversification

In this Section 1 first develop a single-industry framework for analyzing the relation between the extent of competitive interaction among firms and their equilibrium financial and operating strategies.[5] Next, I extend the one-industry model to two industries and analyze the financial and operating choices of a conglomerate that operates divisions in both industries. The model demonstrates that, *ceteris paribus*, the conglomerate organizational structure results in an inefficient financing that leads to suboptimal product market strategies and a value loss. Finally, I discuss why division-specific financing, intra-firm debt or executive compensation contracts are unable to solve the inefficient financing problem.

2.1 Competitive interaction, leverage, and product market strategies

2.1.1 Setup. The model has one period that is divided into two stages. In the first stage, firms simultaneously choose their financial structures. In the second stage, firms observe their rivals' financial structures and

[5] The single-industry model is a concise version of the model in Lyandres (2006), where the relation between the extent of competitive interaction in firms' product markets and their leverage ratios is examined theoretically and empirically.

simultaneously choose their output market strategies, which determine the distributions of their cash flows. Each firm then observes the realization of its cash flow, which determines whether it is solvent or it defaults. If a firm is solvent, it repays its debt and distributes the residual cash flow to its shareholders. The model is based on the following assumptions.

Assumption 1. *Managers' objectives*

At both stages of the game, managers act in the interests of their firm's shareholders.

Assumption 2. *Industry structure*

There are two firms in the industry. The competitive interaction between them is summarized by the "interaction parameter", $-1 < r < 1$, which measures the extent to which the firms' output strategies affect their rival's value. If $r > 0$, then the firms compete in strategic substitutes, while for $r < 0$, the competition is in strategic complements. (Strategic substitutes and complements are defined by whether a more "aggressive" strategy by a firm lowers or raises its rival's marginal profits.) This setup allows examining the effects of the extent of competitive interaction on the firms' financial and operating decisions, as opposed to concentrating on the number of firms operating in the industry, which is one of the possible determinants of the degree of interaction.

Assumption 3. *First stage*

In the first stage of the game, each firm chooses the face value of its debt maturing at the end of the game, denoted F_i for firm $i = \{1, 2\}$. Debt is assumed to be fairly priced. The proceeds from the debt issues are immediately distributed to the shareholders. Since the managers maximize shareholder value, each firm chooses its debt level with the objective of maximizing its total *ex ante* value, while taking its own and its rival's subsequent output market strategies into account.

Assumption 4. *Second stage*

In the second stage of the game, each firm makes its output market choices, summarized by the variable c_i for firm i, $c_i \in (F_i, 1]$.[6] Specifically, firm 1 receives the cash flow of c_1 with probability $1 - c_1 - rc_2$ and 0 with probability $c_1 + rc_2$, and similarly for firm 2. Since the managers act in the shareholders' interests, in the second stage they maximize the residual shareholder value because debt has already been issued and the proceeds distributed to the shareholders.

[6] As shown below, the constraint $c_i > F_i$ is required to ensure nonzero expected payoff to firm i's shareholders.

Higher c_i increases firm i's cash flow in the solvent state and also increases the probability of zero cash flow, leading to default. It is, thus, interpreted as the choice of the aggressiveness of the firm's product market strategy. In addition to affecting the distribution of firm i's cash flow, c_i impacts the default probability of firm i's competitor, thus influencing the rival's optimal operating strategy, which indirectly affects firm i's value. The model is not restricted to a specific type of oligopolistic competition. If the competition is in strategic substitutes (complements), then increasing c_i increases (reduces) the probability of firm i's rival's default.

The assumption on the distribution of the firms' cash flows can be interpreted as follows. Assume that each firm faces a stochastic shock to its cash flow, z_i, which is distributed uniformly between 0 and 1. The choice of c_i determines the threshold of the realization of the shock, above which firm i is solvent and receives the cash flow equaling c_i. Then, firm 1's default threshold and the probability of its default are $T_1 = prob(z_1 < T_1) = c_1 + rc_2$, and similarly for firm 2.

Assumption 5. *Risk-free discount rate and risk neutrality*

The risk-free discount rate is zero and all agents are risk-neutral. Zero risk-free rate, risk neutrality, zero cash flow in the bankrupt state, and the fair pricing of debt imply that the market value of firm 1's debt at the time of issuance (the *ex ante* value of debt), D_1, equals its face value times the probability of firm 1 being solvent.

$$D_1 = [1 - c_1 - rc_2]\, F_1 \tag{1}$$

Similarly, the value of firm 1's equity after the debt has been issued and distributed to the shareholders, E_1, equals

$$E_1 = [1 - c_1 - rc_2]\,[c_1 - F_1] \tag{2}$$

and the combined value of firm 1's debt and equity, given its own and its rival's operating choices, is

$$V_1 = [1 - c_1 - rc_2]\, c_1 \tag{3}$$

and similarly for D_2, E_2, and V_2.

2.1.2 Solution and discussion. The game will be solved by finding a subgame perfect equilibrium, in which I first determine the firms' equilibrium second-stage choices (product market strategies) conditional on the first-stage choices (debt levels). I then find the equilibrium debt levels that maximize firm values, while taking subsequent equilibrium output market strategies into account. The strategic effect of debt follows from the fact that after the debt levels have been chosen, each firm takes only the cash flow in the solvent state into account when it chooses its operating strategy.

In the second stage of the game, each firm's manager maximizes the firm's equity value in (2) with respect to its operating strategy, conditional on its rival operating strategy and on its own previously chosen debt level:

$$\begin{aligned} c_1^*(c_2, F_1) &= \arg \max_{F_1 \le c_1 \le 1} (E_1) \\ &= \arg \max_{F_1 \le c_1 \le 1} ([1 - c_1 - rc_2][c_1 - F_1]) \end{aligned} \tag{4}$$

and similarly for firm 2. The solution of Equation (4) results in the two firms' reaction functions in operating strategies, whose intersection determines the second stage equilibrium product market strategies, $c_1^*(F_1, F_2)$ and $c_2^*(F_1, F_2)$.

In the first stage, each firm maximizes its overall value in Equation (3) with respect to its own debt level, conditional on its rival's debt level:

$$\begin{aligned} F_1^*(F_2) = \arg\max_{F_1 \ge 0} (V_1) = \arg\max_{F_1 \ge 0} \\ \left(\left[1 - c_1^*(F_1, F_2) - rc_2^*(F_1, F_2)\right] c_1^*(F_1, F_2)\right) \end{aligned} \tag{5}$$

for firm 1, and similarly for firm 2.

The solution of Equation (5) provides the two firms' reaction functions in debt levels. Their intersection determines the first-stage equilibrium debt levels. Solving the two-step maximization problem leads to the following result, which establishes the relation between the firms' equilibrium financing choices and the extent of competitive interaction in their industries.

Proposition 1. *There exists a unique stable equilibrium in the firms' debt levels. The firms' equilibrium leverage ratios are increasing in the absolute value of the interaction parameter,* $|r|$. *The equilibrium face values of the firms' debt and their leverage ratios approach zero as* r *approaches zero.*

The intuition for this result is straightforward. The absolute value of the interaction parameter determines the degree of influence of a firm's operating strategy on its rival's value function and on its resulting operating choice. This is true regardless of whether the competition is in strategic substitutes or in complements. The higher the absolute value of the interaction parameter, the larger the strategic benefit of debt. Thus, increasing the interaction parameter when it is positive and decreasing it when it is negative results in higher equilibrium debt levels and leverage ratios.

This result should be interpreted cautiously. Positive equilibrium debt levels and leverage ratios, following from the strategic benefit of debt, are consistent with the conclusion of Brander and Lewis (1986) for the case of quantity competition. Proposition 1 is also in line with the positive equilibrium debt levels in some of the parametrizations of price competition in Showalter (1995) and capacity-price competition in Schuhmacher (2001). It is, however, inconsistent with other parametrizations in Showalter and in Schuhmacher, in which debt reduces the optimal aggressiveness of a firm's operating strategy, exhibits a strategic disadvantage, and is not chosen in equilibrium. In the model presented here, I do not analyze the case in which an increase in a firm's debt level reduces the optimal aggressiveness of its strategy. An implicit assumption of the model is that an increase in a firm's debt level raises the aggressiveness of its own operating strategy regardless of whether the firm competes in strategic substitutes or in strategic complements. Thus, the result in Proposition 1 would not hold in a setting in which an increase in debt reduces the firm's optimal aggressiveness, as in some parametrizations in Showalter and in Schuhmacher. The correct interpretation of the model is that whenever an increase in debt causes an increase in the optimal aggressiveness of the firm's operating strategy, debt carries a strategic benefit, which is increasing in the extent of competitive interaction among product market rivals. Thus, if the strategic effect of debt is positive, the firms' optimal leverage ratios are increasing in the extent of interaction among them.

An empirical prediction following from Proposition 1 is that the extent of competitive interaction in a firm's industry is expected to be positively related to the optimal leverage ratios of firms operating in it. Lyandres (2006) tests this prediction while employing proxies similar to those described in Section 4 below, and finds a strong empirical support for it. This is comforting, given that the model of the cross-sectional variation in the valuation of conglomerates, developed in the next subsection, is based on the result in Proposition 1.

2.2 Inefficient financing and the valuation of diversified firms

In this Section I extend the single-industry framework to examine financial and operating choices of a diversified firm operating in more than one industry.

2.2.1 Setup. The extension to multiple industries requires additional assumptions.

Assumption 6. *Competition in strategic substitutes*

The possibility of debt causing a reduction in the aggressiveness of a firm's own operating strategy can emerge only in the case of competition in strategic complements (price competition or capacity-price competition). Thus, in this Section 1 restrict the model to the case of competition in strategic substitutes, for which the result in Proposition 1 is robust.

Assumption 7. *Two industries*

There are two industries: industry A and industry B, characterized by the interaction parameters $0 < r_A < 1$ and $0 < r_B < 1$ respectively (positive interaction parameters correspond to competition in strategic substitutes). Each of the two industries consists of two firms, denoted $A1$, $A2$, $B1$, and $B2$. Their operating strategies are denoted by c_{A1}, c_{A2}, c_{B1}, and c_{B2} respectively. Firms $A1$ and $B1$ operate as stand-alone firms. Firms $A2$ and $B2$ form a conglomerate, firm 2, and maximize their combined value.

Assumption 8. *Conglomerate's debt*

The conglomerate chooses a firm-wide debt level with the face value F_2. The debt is backed by the cash flows of both divisions, $A2$ and $B2$.

Assumption 9. *Correlation between shocks to conglomerate's divisions*

The conglomerate's financial and operating strategies depend on the correlation between the shocks and the cash flows of its two divisions, z_A and z_B. I assume that z_A and z_B are distributed uniformly between 0 and 1 with the correlation coefficient, ρ_{AB}, equaling -1. While perfect negative correlation between the shocks and the divisions' cash flows is unrealistic, this assumption has an important advantage. The basic driving force behind the model's results is that when the shock to a division's cash flow is unfavorable, the other division is responsible for repaying the firm's total debt. As shown below, perfect negative correlation results in a situation in which the two divisions cannot receive positive cash flows simultaneously. Thus, $\rho_{AB} = -1$ maximizes the proportion of cases in which a division is solely responsible for the overall conglomerate's debt and highlights the intuition behind the results.[7]

2.2.2 Solution and discussion. The solution of the two-industry model follows the same logic as the solution of the one-industry model in Section 3.1.2. The next proposition shows that when the shocks to the conglomerate's divisions are perfectly negatively correlated, the divisions never receive positive cash flows simultaneously.

Proposition 2. *If $\rho_{AB} = -1$, then the probability of firms/divisions $A1$, $A2$, $B1$, and $B2$ receiving positive cash flows never exceeds $\frac{1}{2}$ in equilibrium, regardless of their own and their rivals' debt levels.*

[7] Another advantage of the assumption of perfect negative correlation between the shocks to the divisions' cash flows is that, unlike any other correlation coefficient, it allows a closed-form solution of the model. However, a numerical solution of the model for the case of $\rho_{AB} = 0$, available upon request, shows that all the qualitative results are robust to the choice of ρ_{AB}.

It follows from Proposition 2 that only three states of the conglomerate's cash flows are possible: the cash flow of division $A2$ is positive, while the one of division $B2$ is zero; the cash flow of $B2$ is positive, while the one of $A2$ is zero; the cash flows of both divisions equal zero. Thus, each division is fully responsible for repaying the conglomerate's debt when its cash flow shock is favorable. This means that the optimal operating strategies of the two divisions are independent of each other, and the value of the conglomerate's debt is given by

$$D_2 = [1 - c_{A2} - r_A c_{A1}]\, F_2 + [1 - c_{B2} - r_B c_{B1}]\, F_2 \tag{6}$$

The value of its equity is

$$E_2 = [1 - c_{A2} - r_A c_{A1}][c_{A2} - F_2] + [1 - c_{B2} - r_B c_{B1}][c_{B2} - F_2] \tag{7}$$

and its overall value is

$$V_2 = [1 - c_{A2} - r_A c_{A1}]\, c_{A2} + [1 - c_{B2} - r_B c_{B1}]\, c_{B2} \tag{8}$$

In the second stage of the game, each firm chooses its product market strategy with the objective of maximizing its shareholders' residual expected cash flow given its rivals' operating strategies and its own debt level. The conglomerate's optimization problems are:

$$\begin{aligned} c^*_{A2}(c_{A1}, F_2) &= \arg \max_{F_2 \leq c_{A2} \leq 1} (E_2) \\ &= \arg \max_{F_2 \leq c_{A2} \leq 1} ([1 - c_{A2} - r_A c_{A1}][c_{A2} - F_2]) \text{ and} \\ c^*_{B2}(c_{B1}, F_2) &= \arg \max_{F_2 \leq c_{B2} \leq 1} (E_2) \\ &= \arg \max_{F_2 \leq c_{B2} \leq 1} ([1 - c_{B2} - r_B c_{B1}][c_{B2} - F_2]) \end{aligned} \tag{9}$$

The optimization problem of the single-division firms is given in Equation (4).

In the first stage of the game, each firm maximizes its overall value with respect to its debt level, while taking into account its own and its rivals' subsequent operating choices. The optimal debt level of the conglomerate is given by

$$\begin{aligned} F^*_2\ (F_{A1}, F_{B1}) &= \arg\max_{F_2 \geq 0}(V_2) = \arg\max_{F_2 \geq 0} \\ &\big(\big[1 - c^*_{A2}(F_{A1}, F_2) - r_A c^*_{A1}(F_{A1}, F_2)\big]\, c^*_{A2}(F_{A1}, F_2) \\ &+ \big[1 - c^*_{B2}(F_{B1}, F_2) - r_B c^*_{B1}(F_{B1}, F_2)\big]\, c^*_{B2}(F_{B1}, F_2)\big) \end{aligned} \tag{10}$$

where $c^*_{A1}(F_{A1}, F_2)$, $c^*_{A2}(F_{A1}, F_2)$, $c^*_{B1}(F_{B1}, F_2)$ and $c^*_{B2}(F_{B1}, F_2)$ are the firms' second-stage equilibrium operating choices, conditional on their own and their rivals' debt levels. The single-division firms' optimal debt levels are determined as in Equation (5).

In order to simplify the exposition, I report the results in this section graphically.[8] I first summarize the results and then provide the intuition for them. Figure 1 plots the equilibrium excess value of the conglomerate, defined as the natural logarithm of the ratio of the equilibrium value of the conglomerate, V_2^*, and the combined equilibrium value of the stand-alone firms, $V_{A1}^* + V_{B1}^*$

$$ExValue = \ln\left[\frac{V_2^*}{V_{A1}^* + V_{B1}^*}\right]$$

as a function of the interaction parameters, r_A and r_B. Figure 1 illustrates the following result:

Proposition 3. *(1) For $r_A \neq r_B$, the conglomerate's equilibrium value, V_2^*, is lower than the sum of the stand-alone firms' values, $V_{A1}^* + V_{B1}^*$. For $r_A = r_B$, $V_2^* = V_{A1}^* + V_{B1}^*$.*
(2) The conglomerate's excess value, $\ln\left[\frac{V_2^*}{V_{A1}^*+V_{B1}^*}\right]$, is decreasing in the absolute value of the difference between r_A and r_B.

Conglomeration affects not only the values of the diversified firm's divisions but also the values of its single-division rivals. Figure 2 depicts the ratio of the equilibrium combined value of the stand-alone firms $A1$ and $B1$ following the formation of the conglomerate, to the combined value of $A1$ and $B1$ prior to the merger between $A2$ and $B2$. It illustrates the following result:

Proposition 4. *For $r_A \neq r_B$, the equilibrium combined value of the stand-alone firms, $V_{A1}^* + V_{B1}^*$, increases as a result of the merger between $A2$ and $B2$. The change in the combined value of the stand-alone firms following the conglomerate merger is increasing in the absolute value of the difference between r_A and r_B.*

The intuition for the results is rather simple. The optimal debt level that trades off the agency cost of debt and its strategic benefit depends on the extent of competitive interaction among industry rivals. The single-division firms are able to choose debt levels that maximize the effect of the strategic benefit of debt net of its agency cost, given the operating choices of the conglomerate. The latter, on the other hand, has to choose a debt level that is common to both divisions it operates. It is, thus, unable to fine-tune its debt to the level that is optimal for each of its industries.

[8] The analytical proofs, which are available upon request, involve numerous manipulations of high-order polynomials and do not add anything to understanding the intuition behind the results.

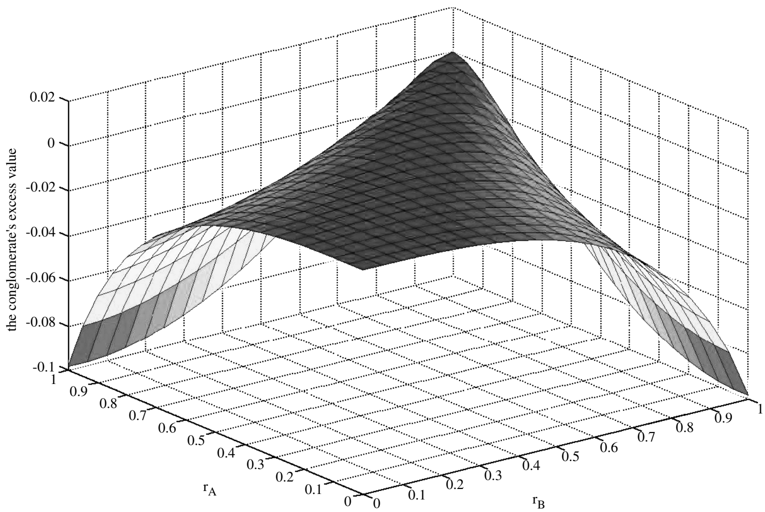

Figure 1
The conglomerate's excess value
This figure presents the relation between the excess value of the conglomerate, defined as the natural logarithm of the ratio of the conglomerate's value and the sum of the values of its single-division rivals, and the interaction parameters of industries A and B, r_A and r_B, respectively.

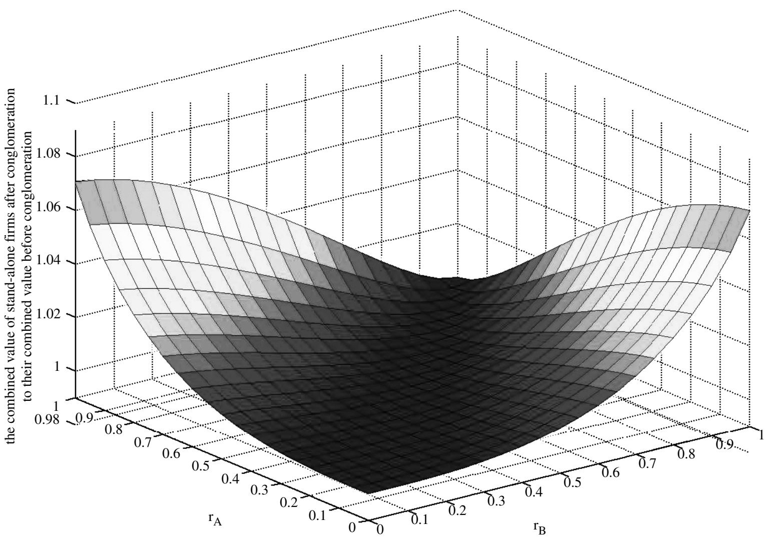

Figure 2
The combined value of firms $A1$ and $B1$ after conglomeration relative to their combined value before conglomeration
This figure presents the ratio of the combined value of stand-alone firms $A1$ and $B1$ after the conglomerate between $A2$ and $B2$ is formed, and the combined value of $A1$ and $B1$ before the conglomerate is formed, as a function of the interaction parameters, r_A and r_B.

The larger the difference between the interaction parameters of the two industries, the larger the deviation of the conglomerate's leverage from the level that is optimal for each industry, and the more severe the value loss.

The effect of conglomeration on the value of the conglomerate's rivals is that the conglomerate reduces its aggressiveness in an industry with a higher degree of competitive interaction, and increases its aggressiveness in an industry with a lower degree of interaction. An increase (decrease) in the conglomerate's division's aggressiveness is detrimental (beneficial) to the rival's value since the competition is assumed to be in strategic substitutes. It turns out that the negative impact of the conglomerate merger on the rival operating in the industry with less competitive interaction is dominated by the positive effect on the rival operating in the industry with more interaction. As a result, the combined value of the two stand-alone firms increases after conglomeration. The larger the difference between the interaction parameters, the larger the net positive effect of the conglomerate's suboptimal operating strategies on the combined value of its stand-alone rivals.

Without endogenizing the decision to merge, I show in Figure 3 that it is possible for a diversifying acquisition to create value, but also to result in the conglomerate being discounted relative to its single-division rivals. Assume that besides the strategic cost of diversification modeled here, other (exogenous) benefits of diversification net of its costs equal β. Figure 3 plots the ratio of the value of the diversified firm after conglomeration to its value before conglomeration against the *ex post* conglomerate's excess value for different values of β for the extreme case of $r_A = 1$ and $r_B = 0$.[9]

Figure 3 can be divided into three regions. In region 1, in which β is low, the costs of diversification outweigh its benefits and the conglomerate's excess value is negative. In region 3, where β is high, conglomeration creates value and the excess value is positive. The interesting region in Figure 3 is region 2, in which conglomeration is beneficial to the merging firms (i.e., the ratio of the post-conglomeration value to the pre-conglomeration value is above one). However, at the same time, it is creating an *ex post* diversification discount (i.e., the conglomerate's excess value is negative). The diversification discount follows from the fact that the increase in the combined value of the nonmerging firms, $A1$ and $B1$, is larger than the increase in the combined value of the merging firms, $A2$ and $B2$. This is an important result. Diversification can lead to an increase in the combined value of the merging firms, but it can also result in a conglomerate

[9] The shape of the relation in Figure 3 is the same for all other combinations of r_A and r_B.

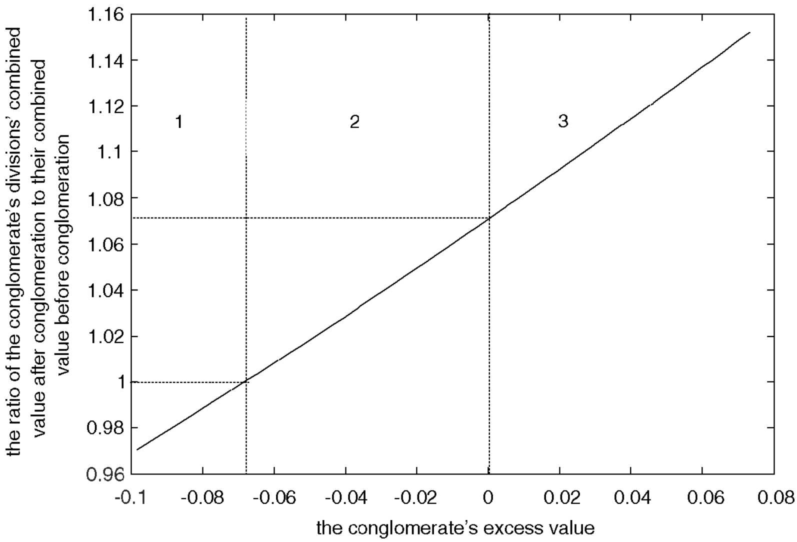

Figure 3
The conglomerate's excess value and the change in the combined value of the conglomerate's divisions after the merger
This figure presents the relation between the conglomerate's excess value and the ratio of the combined value of the conglomerate's divisions after conglomeration to their combined value before conglomeration. r_A is assumed to be 1, and r_B is assumed to be 0.

discount after the acquisition, even if the conglomerate's divisions were not discounted prior to the acquisition.[10]

One caveat of the discussion above is that the construction of Figure 3 is based on the assumption that one set of firms, $A2$ and $B2$, merges, while the other set of firms, $A1$ and $B1$, remains separate. The question is whether this assumption is an equilibrium outcome. There are two ways to justify the existence of an equilibrium in which only one set of firms chooses to conglomerate. First, for a given value of β, the strategic cost of conglomeration is higher if two firms facing a merger decision compete against a conglomerate than if they compete against two single-division firms.[11] Therefore, there exists a range of β for which only one pair of firms chooses to conglomerate, while the other pair optimally chooses to remain separate. Second, the nonstrategic net benefits of conglomeration can be different across firms. Then, in equilibrium, pairs of firms with high β would merge, while pairs of firms with low β would stay separate. The

[10] This change in the combined value of the conglomerate's divisions corresponds to a return on an announcement of a conglomerate acquisition if it is completely unanticipated by the market. If the market assigns a nonzero probability to the conglomerate merger event, then the slope of the curve in Figure 3 decreases. However, this does not affect the existence of three regions and the general conclusion from Figure 3, as long as the conglomerate merger is at least partially unanticipated.

[11] The proof of this statement is available upon request.

result in Figure 3 would still hold: the increase in the rivals' combined value following the conglomerate merger can be larger than the increase in the merging firms' combined value.

2.3 Potential solutions to the inefficient financing problem

The model examined in the previous section illustrates a new cost of diversification, which I call inefficient financing. The conglomerate's choice of a single debt level causes the product market strategies of its divisions to be suboptimal, which results in the reduction in the conglomerate's excess value.

However, there exist potential solutions for this inefficiency. First, firms can introduce intra-company debt and allow divisions to borrow from each other in order to enable differences in divisional debt levels, so that each division would choose a first-best operating strategy. Alternatively, firms can use performance-dependent executive compensation contracts, which would make divisional managers act as if their division is responsible for repaying a certain amount of debt. Finally, firms can issue division-specific debt, secured only by the cash flow of a specific division. In what follows, I discuss why none of these potential remedies is likely to solve the inefficient financing problem.

2.3.1 Intra-company debt and executive compensation contracts. Let the optimal debt level of the single-division firm in industry A be F_A^* and the optimal debt level of the single-division firm in industry B be F_B^*. Without loss of generality, assume that $F_A^* \geq F_B^*$. Assume now that the conglomerate's divisions can borrow from each other. Then, the diversified firm can issue external debt with a face value of F_B^*, backed by the cash flows of both divisions, and make division $A2$ borrow $F_A^* - F_B^*$ from division $B2$.[12] With such capital structure, it appears that the conglomerate eliminates the inefficient financing problem, since both divisions' debt levels are optimal for their respective industries.

This conclusion, however, is wrong. Debt has two effects in the model. On the positive side, it commits an issuing firm to a more aggressive product market strategy, affecting the operating strategies of the firm's rivals. This has an indirect positive effect on the issuing firm's value. On the negative side, debt creates a distortion by separating the *ex post* equity value maximization problem from the *ex ante* firm value maximization problem. Potential debtholders anticipate that the equityholders will maximize their own value after the debt is issued. Hence, the equityholders are those who bear the agency cost of debt, following from the distortion above.

[12] In order not to create cash reserves, assume that no actual cash changes hands at the time of the intra-firm loan initiation.

Because the cost and benefit of debt come into play at different stages of the game, intra-company debt suffers from time inconsistency. It is always optimal for the issuing firm to undo (cancel) the intra-company debt once the rivals' capital structures have been determined. The reason is that the strategic benefit of debt exists only in the first (capital structure choice) stage of the game. In the second (operating strategy choice) stage, debt is costly because it distorts the firm's objective function. The firm's rivals know that the intra-company debt is going to be undone in the second stage of the game. Thus, borrowing among divisions cannot achieve the goal of committing to more aggressive output market strategies and cannot affect the rivals' operating strategies.

A similar logic applies to performance-dependent executive compensation contracts. It is possible to use compensation contracts for divisional managers so as to force them to choose certain operating strategies, while avoiding debt altogether. However, even if credibly signaling to rival firms the structure of the divisional managers' compensation contracts were possible, the firm's shareholders would undo these contracts as soon as the rivals' capital structures are determined. The reason is that after the firm has signaled the aggressiveness of its product market strategy, it would like to align the managers' interests with the interests of the shareholders in order to eliminate the distortion of the value maximization problem. Thus, similar to intra-company debt, incentive-based executive compensation contracts suffer from time inconsistency and cannot affect rivals' product market strategies.

2.3.2 Division-specific debt. While intra-company debt and executive remuneration contracts cannot solve the inefficient financing problem of a conglomerate, it is possible to issue division-specific debt that is backed by each division's cash flow. It is easy to show that in the single-period setting, division-specific debt would allow the conglomerate to pursue the same output market strategies as those of its stand-alone rivals and would eliminate the value loss. However, this result is specific to the single-period setting and does not hold in a multiperiod game. As noted by Inderst and Müller (2003), the benefit of centralized borrowing is that it allows buying continuation rights for low cash flow divisions. If each of the conglomerate's divisions has a continuation value, then keeping a division solvent can be valuable.

Assume that a division's continuation value is unobservable to the firm's outsiders, so that it is impossible to issue additional debt/equity backed by its continuation value. In such a situation two scenarios are possible. First, if the continuation value of a division that has defaulted on its debt obligation is higher than the face value of its debt, then the firm would like to voluntarily repay the debt of the failed division using the cash flow of the other division, if that cash flow is sufficient. However, if the debt level is high enough, the division receiving a favorable cash flow shock may not be capable of repaying the debt of both divisions. This means that in equilibrium, the conglomerate would issue divisional debt with face values that would enable repaying the debt of both divisions using the cash flow of a division receiving a favorable cash flow shock. If issuing debt were costless, the effect of such borrowing would be identical to the effect of centralized borrowing (in the amount equaling to the combined division-specific debt). In the case of costly debt issuance, the conglomerate is likely to be better off issuing a single tranche of debt rather than going through multiple issues.

Second, if the continuation value of a division is not high enough to justify a voluntary repayment of its debt, then the firm would lose the continuation value in the case of a negative shock to that division's cash flow. In any of the two scenarios above, there is a potential value loss associated with issuing debt secured by divisional cash flows.[13] To conclude, in a more realistic, multiperiod setting, division-specific debt does not solve the inefficient financing problem.

3. Assessing the Extent of Competitive Interaction

3.1 Proxies for the extent of competitive interaction

Empirical tests of the model's predictions require proxies for the degree of competitive interaction among product market rivals. The simplest possible proxy for the extent of competitive interaction in an industry is the number of rival firms competing in it. Assuming appropriate industry definitions, the number of industry participants can serve as indicator of the degree of influence of firms on their product market competitors. As the number of firms in an industry increases, one moves from a duopoly, in which firms' profits and product market strategies are expected to be strongly dependent on their rival's strategies, to perfect competition, in which firms are price-takers and are unable to influence their rivals' decisions. This is true regardless of whether the competition is in strategic substitutes or in complements.

The number of firms operating in an industry is expected to be negatively related to the absolute value of the slope of firms' reaction functions. Therefore, despite the limitations that follow from problematic industry definitions and from the heterogeneity of industry participants' products, production methods, and sizes, the number of firms in an industry can serve as a proxy for their ability to influence their competitors' strategies. This being said, the extent of competitive interaction in an industry is not likely to be linear in the number of firms. Thus, I use the logarithm of

[13] A formal analysis of these two scenarios is available upon request.

the number of firms operating in an industry as an (inverse) proxy for the extent of competitive interaction in that industry.

While (the logarithm of) the number of firms is a simple and intuitive proxy for the extent of competitive interaction, it does not account for private firms. This can introduce considerable noise into the estimates of the number of firms competing in each industry. An alternative proxy for the extent of competitive interaction in an industry is the median leverage of single-division firms operating in that industry. Single-division firms' median leverage serves as a proxy for the optimal capital structure in the industry. The model in Section 3.1 showed that the higher the extent of competitive interaction in the industry, the larger the strategic benefit of debt, and the higher the optimal leverage of the industry participants. In addition, Lyandres (2006) demonstrates empirically that firms' leverage ratios are positively related to the extent of competitive interaction in their industries in the cross-section.

The disadvantage of the median-leverage-based proxy for the extent of competitive interaction is that there are numerous determinants of firms' optimal capital structures other than the extent of interaction in their industries (see, for example, Rajan and Zingales (1995) and Frank and Goyal (2004)). Since both proxies have their deficiencies, the pieces of evidence obtained using them should be seen as complementary.

3.2 Variation in the extent of competitive interaction

The model predicts a negative relation between a conglomerate's excess value and the variation in the extent of competitive interaction in its industries. The measure of the variation in competitive interaction, VarInt, is defined as the standard deviation of a measure of interaction across the diversified firm's industries:

$$\text{VarInt} = \sqrt{\sum_{i=1}^{n} \frac{1}{n} \left[Int_i - \overline{Int}\right]^2} \tag{11}$$

where n is the number of the conglomerate's divisions and Int_i is the measure of the extent of competitive interaction in industry i. Int_i is either the natural logarithm of the number of firms operating in division i's industry,[14] or, alternatively, the median leverage of the stand-alone firms

[14] Industries are defined at the level of four-digit SIC codes. I count both the single-division firms and the conglomerates' segments as firms operating in the industry.

in that industry. $\overline{Int}$ is the mean measure of the extent of interaction across the conglomerate's industries.[15]

3.3 Determining the nature of competitive interaction

As discussed above, the two-industry model was developed under the assumption of competition in strategic substitutes. Thus, the sign of the relation between a conglomerate's excess value and the variation in competitive interaction in its industries in the case of competition in strategic complements is an empirical question. While it is interesting to examine the aforementioned relation within the full sample of conglomerates, a clean test of the model's prediction has to be performed using the subsample of diversified firms operating all their divisions in industries with competition in strategic substitutes.

According to Bulow, Geanakoplos and Klemperer (1985) definition, a positive (negative) cross-partial derivative of a firm's value with respect to its own and its rivals' operating strategies, $\frac{\partial^2 V_1}{\partial c_1 \partial c_2}$, where c_1 and c_2 denote the operating choices of the firm and its competitors, corresponds to competition in strategic complements (substitutes). Sundaram, John and John (1996) were the first to construct an empirical measure of the responsiveness of firms' profits to changes in their competitors' actions, which is directly related to Bulow, Geanakoplos and Klemperer's definition. Sundaram, John and John's competitive strategy measure (CSM) is the correlation between the ratio of the change in a firm's profit to the change in its sales and the change in the firm's rivals' combined sales. For firm 1 it is

$$\mathrm{CSM}_1 = corr\left[\frac{\Delta\pi_1}{\Delta S_1}, \Delta S_2\right] \tag{12}$$

where $\Delta\pi_1$ is the change in firm 1's profit between two consecutive periods, ΔS_1 is the change in its sales, and ΔS_2 is the change in its product market rivals' combined sales. More generally, the CSM in Equation (12) can be thought of as the correlation between the ratio of the change in a firm's value to the change in its operating strategy and the change in the firm's rivals' operating strategies, $corr\left[\frac{\Delta V_1}{\Delta c_1}, \Delta c_2\right]$.

Following Sundaram, John and John (1996), I define a firm's profit as its operating profit and define rivals' sales as the combined annual sales of all other single-division firms and segments of conglomerates, operating in the

[15] In order to incorporate the differences in segments' sizes, I define additional, asset- and sales-based, measures of the variation in competitive interaction: $VarInt = \sqrt{\sum_{i=1}^{n} w_i \left[Int_i - \overline{Int}\right]^2}$, where w_i is the weight assigned to industry i, taking values of $A_i / \sum_{k=1}^{n} A_k$ and $S_i / \sum_{k=1}^{n} S_k$. A_i is the book value of assets allocated to segment i, and S_i is the sales of segment i. The results obtained using the asset- and sales-weighted measures of variation are similar to those reported below.

firm's four-digit SIC industry. I calculate the correlation in Equation (12) for each single-segment firm using all available time-series observations,[16] and then compute the mean CSM for each four-digit SIC industry each year, which is assigned to all firms operating in that industry during that year. This procedure reduces the noise involved in estimating each firm's CSM and also enables time-varying CSM for each firm.[17] When CSM is positive, it corresponds to firms competing in strategic complements, while a negative CSM corresponds to firms competing in strategic substitutes.

4. Diversification Discounts and the Variation in the Extent of Competitive Interaction

This section along with the next one contain the empirical tests of the model's predictions. These predictions are summarized below.

First, a conglomerate's excess value is expected to be negatively related to the variation in the degrees of competitive interaction across its industries, while controlling for nonstrategic costs and benefits of diversification.

Second, *ceteris paribus*, the combined bidder's and target's announcement return in a conglomerate acquisition is expected to be negatively related to the difference between the degrees of competitive interaction in the industries within which the merging firms operate.

Third, following a conglomerate acquisition, the combined return of rival firms operating in the two industries involved in the merger is expected to be positive. Also, the rivals' combined return is expected to be increasing in the difference between the degrees of competitive interaction in the merging firms' industries.

4.1 Data on segment reporting

The compustat industry segment (CIS) database, which contains segment information on firms operating multiple divisions, is well suited to investigate the existence and determinants of conglomerate excess values (e.g., Lang and Stulz (1994), Berger and Ofek (1995), Comment and Jarrell (1995), Campa and Kedia (2002), and Graham, Lemmon and Wolf (2002)). The starting sample consists of all firms reporting multiple business segments, found in the CIS database for years 1984–1998.[18]

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[16] The correlations in (12) are only calculated for firms with at least five observations of the changes in profits and sales.

[17] This procedure is different from that of Sundaram, John and John (1996), who only calculate CSM for one firm in an industry (in their case, the firm announcing a change in R&D expenditures) and assign this CSM to all firms in the industry.

[18] The number of multi-segment firms in the CIS database declines abruptly in 1999. This steep decline in the number of firms reporting multiple segments in 1999 follows from the adoption in 1997 of SFAS 131, which provides firms' management with flexibility in segment reporting. (FASB 14, which was in effect prior to the adoption of SFAS 131, required firms to provide information about segments whose sales, assets or profits exceed 10% of their firms' totals.) Therefore, in order to avoid a possible selection bias, the final year of my sample is 1998, before SFAS 131 had taken effect.

I follow Berger and Ofek (1995) and exclude firms with sales smaller than \$20 million, measured in 1972 dollars. Since the model is based on the competitive interaction among firms, I exclude firms that report segments operating in monopolistic four-digit SIC industries. I merge the CIS database with the Compustat Annual Industrial files and exclude observations with missing data on either of the following items: sales, book assets, market value of equity or book value of debt. In addition, I eliminate outliers, defined as firm-years with the market-to-book and market-to-sales ratios belonging to the upper or lower 1% of all observations. These exclusion criteria result in the final sample of 18,244 multi-segment firm-years.

Table 1 presents the summary statistics for the samples of multi-segment and single-segment firms. Consistent with Berger and Ofek (1995), whose sample spans years 1986–1991, conglomerates are significantly larger than single-segment firms. The market-to-book and market-to-sales ratios of stand-alone firms are higher than those of conglomerates. Conglomerates typically have higher leverage ratios. The results of comparing conglomerates' segment sizes to those of single-segment firms are inconclusive. The mean sales and assets of conglomerates' segments are significantly smaller than those of single-segment firms, however the medians are larger. The median number of segments is three. Importantly, diversified firms exhibit a substantial variation in each of the two measures of competitive interaction in their segments' industries.

When calculating the conglomerates' excess values I follow closely Berger and Ofek (1995). Their algorithm for calculating the excess value of a conglomerate compares its market value, defined as the sum of the market value of its equity and the book value of its debt, to the sum of the imputed values of its segments. A segment's imputed value is the product of the industry asset-based (sales-based) multiplier and the segment's assets (sales). An industry asset-based (sales-based) multiplier for a given year is the median ratio of the sum of the market value of equity and the book value of debt to the book value of assets (sales) for single-segment firms operating in the industry during that year. The imputed asset-multiplier-based value of a segment of firm j operating in industry i, $\mathrm{Seg}_{ij}(A)$, is calculated as

$$\mathrm{Seg}_{ij}(A) = \mathrm{Ind}_i \left[\frac{F+E}{A} \right] A_{ij}$$

where A is the book value of assets, F is the book value of debt, E is the market value of equity, $\mathrm{Ind}_i\,[\bullet]$ is the median value for single-segment firms operating in industry i, and A_{ij} is the book value of assets of firm j allocated to segment i. A segment's imputed sales-multiplier-based value is calculated similarly. The asset-multiplier-based imputed value of multi-segment firm j, $IV_j(A)$, is the sum of the asset-based imputed values

Table 1
Summary statistics for multi-segment and single-segment firms

	Multi-segment firms			Single-segment firms			Difference	
	Mean	Median	Standard deviation	Mean	Median	Standard deviation	Mean	Median
Assets	2821	405	10, 966	1977	136	12337	843*	268*
Sales	2071	392	6078	734	118	3365	1336*	273*
Market-to-book	1.072	0.905	0.633	1.262	0.982	0.968	−0.190*	−0.077*
Market-to-sales	1.344	0.949	1.233	1.766	1.175	1.726	−0.422*	−0.226*
Market leverage	0.339	0.309	0.234	0.298	0.243	0.260	0.041*	0.066*
Book leverage	0.298	0.283	0.207	0.245	0.212	0.206	0.053*	0.071*
Operating margin	0.141	0.120	0.121	0.154	0.127	0.175	−0.013*	−0.007*
Dividend/repurchases dummy	0.755	1.000	0.430	0.579	1.000	0.494	0.176*	0.000
Assets per segment	839	143	3318	1977	136	12337	−1138*	7
Sales per segment	622	137	1920	734	118	3365	−112*	19*
Number of segments	3.06	3.00	1.22					
Asset-based Herfindahl index	0.531	0.519	0.188					
Sales-based Herfindahl index	0.552	0.528	0.191					
Ln (# firms)-based variation	0.881	0.836	0.539					
Median-leverage-based variation	0.113	0.092	0.092					
# observations	18244			41942				

This table presents the summary statistics for firms operating a single business segment and those operating multiple segments. Segments are lines of business for which there is a separate accounting reporting in accordance with FASB 14. The sample period is 1984–1998. Assets is the firm's book value. Market-to-book (sales) is the ratio of the firm's market value to the book value of its assets (sales). The firm's market value is the sum of the book value of its debt and the market value of its equity. The market value of equity is defined as the share price at the end of the year times the number of shares outstanding. Market (book) leverage is the ratio of the book value of debt to the firm's market (book) value. Operating margin is the ratio of operating profit before interest and taxes to sales. Dividend/repurchases dummy equals one if the firm paid dividends/repurchased shares in the year of observation. Asset-based (sales-based) Herfindahl index of a multi-segment firm is the ratio of the sum of its segments' squared assets (sales) to the squared sum of its segments' assets (sales). Ln (# firms)-based variation is the standard deviation of the natural logarithm of the number of product market rivals across the conglomerate firm's industries. Median-leverage-based variation is the standard deviation of the median market leverage ratio of firms operating across the conglomerate's industries. An asterisk in the mean (median) difference column indicates that the difference between the mean (median) statistic of multi-segment and single-segment firms is significant at the 5% level. The significance of the difference in medians is assessed using Wilcoxon test.

of its segments times the adjustment factor, which is due to the fact that segments' assets do not always sum up to the total firm's assets:

$$IV_j(A) = \sum_{i=1}^{n} \text{Seg}_{ij}(A) \frac{A_j}{\sum_{i=1}^{n} A_{ij}}$$

where n is the number of business segments firm j reports, and A_j is the book value of firm j's assets.

For the purpose of calculating the multipliers, industries are defined according to four-digit SIC codes, unless a four-digit industry includes less than five stand-alone firms. In the latter case, a three-digit SIC industry is used if it includes no less than five single-segment firms and a two-digit SIC industry is used otherwise. The asset-multiplier-based excess value of multi-segment firm j is defined as the natural logarithm of the ratio of the sum of the market value of the firm's equity and the book value of its debt to its imputed asset-multiplier-based value:

$$\text{ExValue}_j(A) = \ln\left[\frac{F_j + E_j}{IV_j(A)}\right] \tag{13}$$

The sales-based excess value is defined similarly.

Table 2 presents the annual mean and median conglomerates' excess values. The left part of Table 2 reports the excess values for the full sample of multi-segment firms. The right part of the table presents the excess values for the sample of firm-years in which all segments belong to industries with competition in strategic substitutes (industry-years with negative values of the CSM).

For the full sample of multi-segment firms, the mean and median industry-adjusted excess values are negative during all years and are significant during most years. The discounts are, on average, smaller than those reported by Berger and Ofek (1995). The mean (median) asset-based discount is 7.4% (9.1%), while the mean (median) sales-based discount is 7.4% (8.3%). The picture arising from the right part of Table 2 is less clear. While the overall mean and median asset-based and sales-based discounts are significantly negative, the annual mean and median discounts are significantly negative in only 35 out of 60 years/specifications.

4.2 Empirical tests

In order to examine the relation between the multi-segment firms' excess values and the measures of variation in competitive interaction in their industries I estimate the following regression:

$$\text{ExValue}_{i,t} = \alpha + \beta_1 \text{VarInt}_{i,t} + \overrightarrow{\beta_2} \text{Cont}_{i,t} + \epsilon_{i,t} \tag{14}$$

Table 2
Conglomerates' excess values

	All multi-segment firms					Multi-segment firms with all segments competing in substitutes				
	Asset-based excess values		Sales-based excess values			Asset-based excess values		Sales-based excess values		
Year	Mean	Median	Mean	Median	# firms	Mean	Median	Mean	Median	# firms
1984	−0.103*	−0.117*	−0.145*	−0.161*	1532	−0.088*	−0.118*	−0.146*	−0.183*	517
1985	−0.112*	−0.132*	−0.116*	−0.147*	1391	−0.108*	−0.131*	−0.136*	−0.163*	474
1986	−0.092*	−0.110*	−0.097*	−0.126*	1320	−0.076*	−0.117*	−0.131*	−0.183*	446
1987	−0.040*	−0.069*	−0.053*	−0.060*	1243	−0.031	−0.065*	−0.106*	−0.095*	417
1988	−0.060*	−0.074*	−0.072*	−0.095*	1201	−0.062*	−0.090*	−0.113*	−0.135*	402
1989	−0.062*	−0.088*	−0.060*	−0.080*	1138	−0.032	−0.079*	−0.065*	−0.075*	365
1990	−0.041*	−0.077*	−0.075*	−0.065*	1115	0.018	−0.047	−0.018	−0.014	381
1991	−0.084*	−0.094*	−0.078*	−0.077*	1077	−0.035	−0.054	−0.002	−0.022	389
1992	−0.080*	−0.087*	−0.068*	−0.070*	1086	−0.031	−0.066*	−0.045	−0.058*	401
1993	−0.078*	−0.090*	−0.063*	−0.073*	1103	−0.046	−0.027	−0.068	−0.076*	364
1994	−0.122*	−0.121*	−0.079*	−0.098*	1148	−0.122*	−0.133*	−0.049	−0.081*	428
1995	−0.096*	−0.096*	−0.061*	−0.065*	1131	−0.140*	−0.140*	−0.059*	−0.068*	420
1996	−0.100*	−0.104*	−0.072*	−0.054*	1161	−0.090*	−0.105*	−0.055	−0.090*	409
1997	−0.046*	−0.046*	−0.036	−0.021	1160	0.005	−0.027	0.005	0.023	375
1998	0.000	−0.034	−0.021	−0.014	1438	0.007	−0.032	0.032	0.047	587
All	−0.074*	−0.091*	−0.074*	−0.083*	18244	−0.056*	−0.086*	−0.063*	−0.077*	6375

This table reports conglomerates' excess values by year. The sample consists of all diversified firms satisfying the criteria listed in Section 4. A multi-segment firm's asset-based (sales-based) mean (median) excess value in a given year is the mean (median) logarithm of the ratio of the multi-segment firm's market value to its asset-based (sales-based) imputed value. The asset-based (sales-based) imputed value is the sum of the imputed values of its segments, adjusted for missing segments. The asset-based (sales-based) imputed value of a segment is the product of the segment's assets (sales) and the asset-based (sales-based) multiplier of the industry the segment belongs to. An asset-based (sales-based) multiplier is the market-to-book (market-to-sales) ratio of a median single-segment firm in the segment's industry. Industries are defined according to four-digit SIC codes, unless the four-digit classification results in less than five single-segment firms, in which case industries are defined according to three-digit SIC codes, or two-digit codes if a three-digit industry contains less than five firms. An asterisk next to a mean or median excess value indicates that it is different from zero at the 5% confidence level. The significance of the median excess values is assessed using Wilcoxon test.

where the dependent variable, $\mathrm{ExValue}_{i,t}$, is defined in Equation (13), and $\mathrm{VarInt}_{i,t}$, is the variation in competitive interaction in conglomerate i's industries during year t, defined in Equation (11). $\mathrm{Cont}_{i,t}$ is the vector of control variables. The variables that were hypothesized and found in past studies to be important in explaining conglomerates' excess values are firm size (Compustat item 6; see Lang and Stulz (1994), Berger and Ofek (1995), and Campa and Kedia (2002)), profitability (item 13 scaled by item 12; see Berger and Ofek, and Campa and Kedia), the ability to access financial markets (a dummy variable equaling one if the value of either dividends, item 21, or stock repurchases, item 115, is positive; see Lang and Stulz),[19] the degree of diversification (see Comment and Jarrell (1995)),[20] and the diversity in segments' investment opportunities (see Rajan, Servaes and Zingales (2000)).[21]

The results of estimating Equation (14) are presented in Table 3. Panel 1 reports the results for the whole sample of conglomerates, while Panel 2 presents the results for the subsample of conglomerates operating all their divisions in industries with competition in strategic substitutes. The regressions are estimated by OLS using pooled time-series cross-sectional data over the 15- year period 1984–1998. T-statistics are calculated using White heteroskedasticity-consistent variance-covariance matrices. However, the t-statistics can still be inflated because of the contemporaneous correlations in regression residuals across firms. In order to mitigate the problem of cross-correlations, I also estimate Equation (14) using the Fama–MacBeth (1973) technique. I first estimate annual cross-sectional regressions, and then average the slope coefficients of the cross-sectional regressions and calculate the t-statistics using time-series standard errors of the average slope coefficients.

[19] A firm's payout policy is a part of its financial policy and is, therefore, endogenous. Using a dividend and repurchases dummy on the right-hand side of a reduced-form regression may result in biased coefficient estimates. Excluding this variable from the regressions does not cause significant changes to the estimated relation between firms' excess values and the measures of variation in competitive interaction.

[20] I use the following four measures of the degree of diversification. The first one is the number of segments a conglomerate reports. The second and third measures are the asset-based and sales-based Herfindahl indexes. The asset-based Herfindahl index is defined as $\sum_{k=1}^{n} A_k^2 / \left[\sum_{k=1}^{n} A_k\right]^2$, where A_k is the value of assets of segment k, and n is the number of segments a firm operates. The sales-based Herfindahl index is defined similarly. The fourth measure is a dummy variable equaling one if a conglomerate reports segments belonging to multiple two-digit SIC industries.

[21] The diversity in a conglomerate's divisions' investment opportunities is defined as $DiverInvOp = \sqrt{\sum_{k=1}^{n} \left[w_k MB_k - \overline{wMB}\right]^2 / \overline{MB}}$, where w_k is the asset-based (sales-based) weight of segment k, $A_k / \sum_{i=1}^{n} A_i$ $(S_k / \sum_{i=1}^{n} S_i)$, MB_k is the median market-to-book ratio of single-segment firms in industry k, and $\overline{wMB}$ and $\overline{MB}$ are the mean asset-weighted (sales-weighted) and equally weighted market-to-book ratios respectively of firms operating in the conglomerate's industries.

The main finding from Panel 1 is that, consistent with the model's prediction, both the sales-based and asset-based excess values are generally negatively related to the measures of the variation in competitive interaction. This relation is statistically significant for the sales-based excess values using the number-of-firms-based measure of variation in competitive interaction and in three out of four specifications employing the median-leverage-based measure. In Panel 2, in which only firms with all divisions competing in substitutes are examined, the results are even stronger. The relation between the variation in competitive interaction and the excess values is negative and highly significant in all specifications that employ the number-of-firms-based measure. This relation is negative and significant in the regressions using the median-leverage-based measure when the excess values are asset-multiplier-based.

The association between the excess values of diversified firms and the variation in competitive interaction in their industries is economically significant in most cases. Increasing the number-of-firms-based variation in interaction by one standard deviation (0.539, from Table 1) reduces a conglomerate's excess value by 0.3–1.2 percentage points within the full sample and by 1.5–3.6 percentage points within the restricted sample. Similarly, increasing the median-leverage-based variation by one standard deviation (0.092, from Table 1) reduces a typical excess value by 0.4–3.6 percentage points in Panel 1 and by 0.5–2.4 percentage points in Panel 2. These numbers are substantial, given that the average excess value is −7.4%.

It is important to note that the results in Table 3 are not likely to be driven by the differences among industries in which conglomerates operate other than their competitive structures, since I control for the degree of relatedness among industries and for the diversity in investment opportunities. The negative relation between the conglomerates' excess values and the variation in competitive interaction in their industries supports the idea that strategic considerations have an impact on diversified firms' valuation.

5. Market Reactions to Conglomerate Acquisitions

In this Section I test the predictions of the model regarding the returns of merging firms and of their rivals following conglomerate acquisition announcements.

5.1 Data on conglomerate acquisitions

The sample of conglomerate acquisitions is constructed using the Securities Data Company (SDC) Mergers and Acquisitions database. The sample period is 1970–2003. I restrict the sample to completed acquisitions, in which a bidder ends up owning 100% of a target after the acquisition,

Table 3
Conglomerates' excess values and the variation in the extent of competitive interaction

Panel 1 – All multi-segment firms

	Ln (# firms)-based variation				Median-leverage-based variation			
	Asset-based excess values		Sales-based excess values		Asset-based excess values		Sales-based excess values	
	Pooled	Fama–MacBeth	Pooled	Fama–MacBeth	Pooled	Fama–MacBeth	Pooled	Fama–MacBeth
Intercept	−0.068	−0.068	−0.577	−0.600	0.028	0.033	−0.607	−0.624
	(−2.70)	(−2.45)	(−17.82)	(−14.72)	(1.07)	(1.15)	(−17.99)	(−16.18)
Ln (assets)	−0.026	−0.027	0.045	0.044	−0.029	−0.030	0.045	0.044
	(−12.70)	(−8.39)	(17.21)	(9.09)	(−13.96)	(−8.24)	(16.71)	(8.74)
Operating margin	1.058	1.075	1.740	1.769	1.004	1.019	1.710	1.738
	(36.44)	(26.23)	(46.50)	(27.67)	(34.03)	(22.38)	(44.69)	(24.98)
Dividend/repurchases dummy	0.055	0.057	−0.047	−0.045	0.029	0.028	−0.051	−0.049
	(6.70)	(6.62)	(−4.61)	(−3.24)	(3.38)	(3.01)	(−4.56)	(−3.54)
# segments	−0.026	−0.025	−0.025	−0.022	−0.023	−0.023	−0.022	−0.020
	(−6.73)	(−8.91)	(−5.00)	(−4.62)	(−5.96)	(−8.29)	(−4.48)	(−4.15)
Asset/sales-based Herfindahl index	0.142	0.138	0.140	0.160	0.120	0.114	0.132	0.138
	(3.77)	(2.92)	(2.88)	(3.53)	(3.11)	(3.31)	(2.63)	(3.29)
Diversity in investment opportunities	−0.322	−0.318	−0.127	−0.136	−0.309	−0.304	−0.142	−0.138
	(−9.36)	(−6.55)	(−2.87)	(−4.79)	(−8.63)	(−7.71)	(−3.07)	(−4.32)
Two-digit SIC relatedness dummy	0.059	0.062	0.092	0.095	0.086	0.093	0.086	0.094
	(6.26)	(7.55)	(7.60)	(10.27)	(8.92)	(10.54)	(6.94)	(8.88)
Variation in competitive interaction	−0.006	−0.007	−0.023	−0.020	−0.346	−0.394	−0.076	−0.046
	(−0.94)	(−1.40)	(−2.94)	(−2.67)	(−14.95)	(−6.75)	(−2.55)	(−0.77)
# observations	18244	1216	18244	1216	18244	1216	18244	1216
Adj. R^2	0.081	0.083	0.155	0.156	0.093	0.100	0.153	0.158

(continued overleaf)

Table 3
(Continued)

Panel 2–Multi-segment firms with all divisions competing in strategic substitutes

	Ln (# firms)-based variation				Median-leverage-based variation			
	Asset-based excess values		Sales-based excess values		Asset-based excess values		Sales-based excess values	
	Pooled	Fama–MacBeth	Pooled	Fama–MacBeth	Pooled	Fama–MacBeth	Pooled	Fama–MacBeth
Intercept	−0.211	−0.214	−0.709	−0.764	−0.112	−0.132	−0.760	−0.822
	(−4.24)	(−4.92)	(−11.04)	(−11.85)	(−1.98)	(−2.58)	(−10.39)	(−11.28)
Ln (assets)	−0.007	−0.006	0.057	0.055	−0.011	−0.010	0.055	0.052
	(−1.84)	(−1.75)	(11.92)	(9.58)	(−2.75)	(−2.41)	(10.43)	(7.96)
Operating margin	0.979	1.020	1.736	1.771	0.846	0.868	1.567	1.599
	(18.84)	(18.14)	(25.90)	(15.94)	(15.18)	(13.54)	(21.72)	(11.71)
Dividend/repurchases dummy	0.058	0.055	−0.025	−0.022	0.032	0.027	−0.029	−0.024
	(4.27)	(4.27)	(−1.45)	(−1.06)	(2.08)	(1.49)	(−1.44)	(−0.93)
# segments	−0.012	−0.012	−0.019	−0.011	−0.018	−0.015	−0.013	−0.006
	(−1.46)	(−1.77)	(−1.69)	(−1.09)	(−1.93)	(−1.92)	(−1.13)	(−0.61)
Asset/sales-based Herfindahl index	0.373	0.350	0.427	0.477	0.254	0.256	0.413	0.447
	(5.23)	(5.70)	(4.64)	(5.66)	(3.20)	(4.98)	(4.02)	(4.87)
Diversity in investment opportunities	−0.432	−0.409	−0.232	−0.259	−0.369	−0.360	−0.269	−0.276
	(−7.46)	(−6.19)	(−3.11)	(−4.50)	(−5.56)	(−6.84)	(−3.14)	(−4.04)
Two-digit SIC relatedness dummy	0.012	0.011	0.068	0.077	0.055	0.068	0.062	0.094
	(0.72)	(0.72)	(3.17)	(3.72)	(2.94)	(3.59)	(2.54)	(0.05)
Variation in competitive interaction	−0.030	−0.028	−0.067	−0.063	−0.220	−0.266	−0.088	−0.053
	(−3.16)	(−3.32)	(−5.42)	(−4.31)	(−5.39)	(−3.65)	(−1.66)	(−0.66)
# observations	6375	425	6375	425	6375	425	6375	425
Adj. R^2	0.070	0.120	0.157	0.157	0.063	0.069	0.143	0.147

This table presents regressions of conglomerates' excess values on the variation in the extent of competitive interaction in their industries. The sample in Panel 1 consists of all diversified firms satisfying the criteria listed in Section 4. The sample in Panel 2 is restricted to firms operating all segments in industries with competition in strategic substitutes. The dependent variable is the asset-based excess value in columns 1–2 and 5–6 and the sales-based excess value in columns 3–4 and 7–8. Ln (assets) is the natural logarithm of a firm's assets. Operating margin is the ratio of operating profit before interest and taxes to sales. Dividend/repurchases dummy equals one if a firm paid regular dividends or repurchased shares in a year of the observation. A firm's asset-based (sales-based) Herfindahl index is the ratio of the sum of the firm's segments' squared assets (sales) to the squared sum of its segments' assets (sales). Asset (sales)-based index is used in the regressions in which the dependent variable is asset (sales)-based excess value. Diversity in investment opportunities is described in footnote 21. Two-digit SIC relatedness dummy equals one if a conglomerate reports segments in more than one two-digit SIC industry. The variation in the extent of competitive interaction is based on the natural logarithm of the number of industry rivals in columns 1–4 and on the median leverage in a conglomerate's industries in columns 5–8. It is calculated according to (11). Odd columns report the results of pooled regressions estimated by OLS with White correction for heteroskedasticity. t-statistics are reported in parentheses. Even columns report the results of Fama-MacBeth regressions, which are estimated annually, and the reported values are the averages of the coefficients of annual regressions. t-statistics of the annual coefficients are reported in parentheses. For the case of Fama-MacBeth regressions, the number of observations and the adjusted R^2 are mean values of annual regressions.

while owning less than 50% of the target at the time of the acquisition announcement. I match this sample with Compustat in order to obtain the firm and industry characteristics. Merging SDC with Compustat eliminates acquisitions of private targets. An acquisition is defined as diversifying (unrelated) if the acquirer's and target's main four-digit SIC codes are different. I exclude firms with missing data on the bidder's or target's book assets, sales, market value of equity or book value of debt.

Firms' daily returns are from the Center for Research in Security Prices (CRSP). I eliminate acquisition announcements in which the returns for 3 trading days around the announcement are missing for either the bidder or target. The final sample includes 811 diversifying mergers.[22] As in the previous section, part of the tests are performed using the subsample of acquisitions in which both the bidder and target operate in industries with competition in strategic substitutes. There are 481 conglomerate acquisitions in that subsample. For each conglomerate acquisition, I identify the merging firms' rivals, defined as firms that operate in the bidder's and target's main four-digit SIC industries. Similar to Comment and Jarrell (1995), I define an abnormal return as the market-adjusted return.[23] I calculate cumulative abnormal returns for two windows around the acquisition announcement date. The first window is $[-1, 1]$, where day 0 is the announcement date. I include days -1 and 1 because it is hard to identify the exact timing of acquisition announcements, and estimating the abnormal returns for day 0 may induce measurement errors. Similar to Graham, Lemmon and Wolf (2002), I also use the $[-3, 3]$ window.[24]

The summary statistics for the full sample of bidders and targets are presented in Table 4. The summary statistics for the subsample of mergers in which both the bidder and target compete in strategic substitutes are largely similar to those for the full sample and are available upon request. Bidders are, on average, significantly larger than targets. Bidders have higher mean and median market-to-book ratios and lower market leverage ratios than targets. The mean and median acquirers' returns are negative and small in magnitude, the mean and median targets' returns are large and positive, and a typical combined abnormal return is on the order of 1% (see Table 5 below).

[22] Eliminating mergers between firms having financial segments, like in Graham, Lemmon and Wolf (2002), reduces the sample size but generates similar (albeit, less significant) results to those reported below.

[23] Defining a firm's abnormal return as the difference between its return and the equally weighted average return of firms belonging to its beta-decile does not affect the qualitative results.

[24] Eckbo (1983) and Schwert (1996) use longer windows around merger announcements. I measure cumulative abnormal returns for windows $[-10, 10]$ and $[-40, 10]$, similar to Eckbo and to Schwert. However, because of the noise associated with estimating abnormal returns, the results for these longer windows are largely statistically insignificant.

Table 4
Summary statistics for bidders and targets in conglomerate acquisitions

	Bidders			Targets		
	Mean	Median	Standard deviation	Mean	Median	Standard deviation
Assets	10926	2102	39700	788	145	3394
Sales	4642	1380	9246	441	104	1356
Market-to-book	1.404	1.140	1.009	1.219	0.995	0.851
Market leverage	0.243	0.184	0.204	0.284	0.244	0.246
Book leverage	0.225	0.204	0.161	0.240	0.220	0.200
CAR [−1, 1]	−1.24%	−0.94%	6.12%	22.77%	18.84%	25.18%
CAR [−3, 3]	−1.63%	−1.59%	7.80%	24.75%	21.50%	26.29%
# observations	811			811		

This table presents the summary statistics for bidders and targets in conglomerate acquisitions. The sample consists of all diversifying acquisitions completed during the period 1970–2003, in which a bidder ends up owning 100% of a target, while owning less than 50% of the target before the acquisition. An acquisition is defined as diversifying if the bidder's and target's main four-digit SIC codes are different. The accounting variables are described in Table 1. All the statistics are calculated for the year preceding the year of the acquisition. CAR is the sum of abnormal returns over an announcement window. Daily abnormal return is defined as the difference between a firm's return, and the value-weighted market return. Day 0 is the day of the announcement of an acquisition bid.

5.2 Empirical tests

To examine the relation between the merging firms' combined abnormal announcement return, AbnRET_i, and the difference between the extent of competitive interaction in the bidder's and target's industries, I estimate the following regression:

$$\text{AbnRET}_i = \alpha_i + \beta_1 \text{VarInt}_i + \overrightarrow{\beta_2} \text{Cont}_i + \epsilon_i \tag{15}$$

where VarInt_i is the variation in competitive interaction between the bidder's and target's industries, calculated according to Equation (11). In the announcement return regressions, I only employ the median-leverage-based measure of the variation in interaction. The reason for not using the number-of-firms-based measure is that there is no segment information for years 1970–1983 and 1999–2003. Thus, the calculation of the number of product market rivals would be inconsistent between the period 1984–1998 and the rest of the years. Cont_i is the vector of additional variables that are likely to be related to announcement returns. Those include the ratio of the bidder's book assets to target's book assets, deal size, measured as the sum of the bidder's and target's book assets, and dummy variables equaling one if either the bidder or target belongs to a regulated industry.[25]

Panel 1 of Table 5 reports the mean and median merging firms' combined CARs, while Panel 2 contains the estimates of (15) obtained using OLS. The first two columns present the results for the full sample of conglomerate mergers, while in columns 3 and 4 the sample is restricted to acquisitions in which both the bidder and target compete in strategic substitutes. The main result is that the market reaction to a conglomerate acquisition announcement is negatively related to the difference between the degrees of competitive interaction in the bidder's and target's industries. Consistent with the model, this relation is negative within both the full sample and the restricted sample and for both announcement return windows. It is statistically significant at the 5% level in three specifications out of four, while the relation estimated using $[-1, 1]$ window and the sample of bidders and targets competing in strategic substitutes is negative and significant at the 10% level.[26] Increasing the variation in competitive interaction by one standard deviation reduces the merging firms' combined returns by 0.15–0.3 percentage points. This suggests that when the market forms its

[25] Regulated industries include telecommunications (SIC codes 4812 and 4813) before 1983, railroads (SIC code 4011) before 1981, trucking (SIC codes 4210 and 4213) before 1981, airlines (SIC code 4512) before 1979, and gas and electric utilities (SIC codes 4900–4939).

[26] Eckbo, Maksimovic and Williams (1990) argue that because of the voluntary character of merger events, standard OLS estimates in the regressions of merger announcement returns are inconsistent. Prabhala (1997) shows, however, that the standard OLS estimation leads to regression coefficients that are proportional to the true parameters, and that traditional procedures result in t-statistics that can be interpreted as conservative lower bounds on the true significance levels of estimates.

Table 5
Combined merging firms' CARs and the variation in the extent of competitive interaction

	All mergers		Mergers between firms competing in substitutes	
	CAR [−1, 1]	CAR [−3, 3]	CAR [−1, 1]	CAR [−3, 3]
Panel 1–Simmary statistics				
Mean	1.51%*	1.42%*	1.00%*	0.89%*
Median	0.93%*	0.83%*	0.61%*	0.43%
Standard deviation	6.25%	7.57%	6.39%	7.84%
Panel 2–Regression analysis				
Intercept	0.061	0.062	0.033	0.035
	(5.60)	(4.56)	(2.24)	(1.89)
Bidder size to target size ($^*10^5$)	0.038	−0.336	−0.192	−0.588
	(0.05)	(−0.33)	(−0.22)	(−0.53)
Ln (deal size)	−0.005	−0.004	−0.002	−0.002
	(−3.79)	(−2.71)	(−1.20)	(−0.81)
Regulated bidder dummy	−0.022	−0.001	−0.052	−0.030
	(−1.25)	(−0.05)	(−2.18)	(−1.02)
Regulated target dummy	0.017	−0.011	0.044	0.022
	(0.92)	(−0.49)	(1.83)	(0.72)
Variation in competitive interaction	−0.020	−0.030	−0.015	−0.025
	(−2.96)	(−3.70)	(−1.72)	(−2.26)
# obs	811	811	481	481
Adj. R^2	0.022	0.018	0.010	0.005

Panel 1 presents the summary statistics of the combined CARs of merging firms. For the calculation of returns. An asterisk next to a mean or median return indicates that it is different from zero at the 5% confidence level. The significance of the median returns is assessed using Wilcoxon test. Columns 1–2 report the results for the sample of all conglomerate acquisitions. Columns 3–4 present the results for the subsample of acquisitions involving firms operating in industries with competition in strategic substitutes. Panel 2 presents regressions of the bidders' and targets' combined CARs on the measures of variation in the extent of competitive interaction in their industries. Bidder size to target size is the ratio of the book value of bidder's assets to the book value of target's assets. Ln (deal size) is the natural logarithm of the combined bidder's and target's book value of assets. Regulated bidder (target) dummy equals one if the bidder (target) has one of the following four-digit SIC codes: 4812 or 4813 before year 1983, 4011 before year 1981, 4210 or 4213 before year 1981, 4512 before year 1979, or 4900–4939. The variation in the extent of competitive interaction is based on the median market leverage in the merging firms' industries and is calculated according to (11). The regressions are estimated using OLS with White correction for heteroskedasticity. T-statistics are reported in parentheses.

reaction to conglomerate merger announcements, it seems to incorporate the effects of changes in the merging firms' operating strategies.

The combined returns of the merging firms' rivals are presented in Table 6. For each merger I first compute the value-weighted abnormal announcement return of all firms operating in the bidder's and target's four-digit SIC industries, excluding the merging firms, for windows [−1, 1] and [−3, 3]. This results in 811 observations of rivals' combined returns for the full sample and 481 returns for the restricted sample. I then calculate the mean and median rivals' combined returns, which are presented in the upper panel of Table 6. The mean and median rivals' returns are positive and significant for both announcement windows within the full sample, and they are significantly positive for the [−3, 3] window within the restricted sample.

Table 6
Rivals' CARs and the variation in the extent of competitive interaction

	All mergers		Mergers between firms competing in substitutes	
	Rivals' CAR [−1, 1]	Rivals' CAR [−3, 3]	Rivals' CAR [−1, 1]	Rivals' CAR [−3, 3]
Panel 1–Simmary statistics				
Mean	0.39%*	0.81%*	0.25%	0.89%*
Median	0.40%*	0.64%*	0.20%	0.60%*
Std.	3.65%	5.25%	4.21%	5.99%
Panel 2–Regression analysis				
Intercept	−0.007	−0.024	−0.009	−0.027
	(−1.15)	(−2.62)	(−0.85)	(−1.86)
Bidder size to target size ($^*10^5$)	−0.783	−0.613	−0.718	−0.634
	(−1.58)	(−0.86)	(−1.22)	(−0.74)
Ln (deal size)	0.001	0.003	0.001	0.003
	(1.37)	(2.83)	(1.16)	(2.05)
Regulated bidder dummy	0.009	−0.007	0.006	−0.019
	(0.89)	(−0.47)	(0.40)	(−0.82)
Regulated target dummy	−0.012	−0.007	−0.010	0.002
	(−1.18)	(−0.48)	(−0.61)	(0.10)
Variation in competitive interaction	0.006	0.011	0.011	0.015
	(1.42)	(1.92)	(1.68)	(1.69)
# obs	811	811	481	481
Adj. R^2	0.002	0.010	0.006	0.006

Panel 1 presents the summary statistics of CARs of the merging firms' industry rivals. For the calculation of returns. An asterisk next to a mean or median return indicates that it is different from zero at the 5% confidence level. The significance of the median returns is assessed using Wilcoxon test. Columns 1–2 report the results for the sample of all conglomerate acquisitions. Columns 3–4 present the results for the subsample of acquisitions involving firms operating in industries with competition in strategic substitutes. Panel 2 presents regressions of the merging firms' rivals' CARs on the measures of variation in the extent of competitive interaction in the merging firms' industries. Bidder size to target size is the ratio of the book value of bidder's assets to the book value of target's assets. Ln (deal size) is the natural logarithm of the combined bidder's and target's book value of assets. Regulated bidder (target) dummy equals one if the bidder (target) has one of the following four-digit SIC codes: 4812 or 4813 before year 1983, 4011 before year 1981, 4210 or 4213 before year 1981, 4512 before year 1979, or 4900–4939. The variation in the extent of competitive interaction is based on the median market leverage in the merging firms' industries and is calculated according to (11). The regressions are estimated using OLS with White correction for heteroskedasticity. T-statistics are reported in parentheses.

The positive rivals' returns are consistent with the model. However, the positive market reactions for rival firms may follow from various sources. For example, a merger can increase the perceived probability of additional acquisitions within an industry. Thus, in order to examine whether the positive rivals' returns are due to the strategic effect of diversification, I estimate regressions of the combined rivals' returns on the difference in competitive interaction in the bidder's and target's industries, similar to Equation (15). The only difference is that the dependent variable now is the rivals' abnormal announcement return instead of the merging firms' combined return. Consistent with the model, the rivals' returns are positively related to the difference between the degrees of competitive interaction in the merging firms' industries. This relation is positive and significant at the 10% level for the [−3, 3] window within the full sample, and for both announcement windows within the restricted sample. To summarize, while the merger-based evidence is not overwhelming, it supports the hypothesis that the ability of firms to commit to certain product market strategies influences the valuation of diversified firms and their rivals.

6. Conclusions

I develop and test a model that attempts to explain the variation in the excess values of diversified firms. The model applies the idea of shareholders' limited liability affecting firms' output market strategies to the analysis of the behavior and valuation of conglomerates. A firm's optimal capital structure balances the agency cost of debt and its strategic advantage. The latter varies with the extent to which a firm's operating choices affect the optimal strategies of its product market rivals. This trade-off implies an optimal capital structure for each industry structure. A conglomerate foregoes the flexibility of choosing separate capital structures for each of its industries, so as to optimally trade off the agency cost of debt and its strategic benefit. Therefore, the conglomerate's divisions' operating strategies are different from the unconstrained optimal ones, and its value is, *ceteris paribus*, lower than the combined value of its stand-alone rivals, which are *ex ante* identical to the conglomerate's divisions. This is the *strategic cost of diversification*.

This cost is increasing in the variation in the extent of competitive interaction in the conglomerate's industries. The higher the variation in competitive interaction, the larger the deviation of the conglomerate's equilibrium leverage from the optimal one in each of its industries, and the bigger the value loss. Thus, the model shows that the conglomerate's excess value is negatively related to the variation in competitive interaction in its industries. I find empirical support for this prediction within the sample of firms reporting multiple business segments in the period 1984–1998. A related prediction is that a bidder's and target's combined return following a conglomerate acquisition announcement is expected to be negatively related to the difference between the degrees of competitive interaction in the merging firms' industries. The analysis of abnormal announcement returns of conglomerate acquisitions that occurred between 1970 and 2003 generally supports this prediction.

Conglomerates' capital structure choices cause the equilibrium product market strategies of their divisions to be different from the optimal strategies of single-division firms. The changes in operating strategies of the merging firms' divisions affect the values of the firms competing with these divisions in product markets. The model predicts that following a conglomerate merger, the change in the combined value of the nonmerging (rival) firms is expected to be positively associated with the difference between the degrees of competitive interaction in the merging firms' industries.

The data are generally consistent with this prediction. This supports the hypothesis that the market takes strategic considerations and, specifically, the changes in conglomerates' divisions' output market strategies following a merger into account when assessing the effects of conglomerate acquisitions. Despite the low average returns of rival firms, this result may help reconcile the existence of diversification discounts with the generally positive returns on conglomerate acquisition announcements. The idea is that while a conglomerate merger can be value-increasing because of its nonstrategic benefits, its effect on the combined value of the conglomerate's competitors can turn out to be stronger than the effect on the joint value of the merging firms. This moves the benchmark used for valuing the conglomerate upwards and can result in observing a postmerger diversification discount together with a positive market reaction to the conglomerate acquisition announcement.

Appendix A:

Proof of Proposition 1. Since firms 1 and 2 are symmetric, I only present the proofs for firm 1. The solution of Equation (4) is

$$c_1^*(c_2, F_1) = \frac{1 + F_1 - rc_2}{2} \tag{A1}$$

The expression for $c_2^*(F_2, c_1)$ is similar. Both firms' reaction functions in output market choices are linear and therefore the equilibrium, if exists, is unique. Since $|r| < 1$, the reaction functions intersect and the equilibrium exists. The stability condition (see Dixit (1984), and Tirole (1988)), is

$$\frac{\partial^2 V_1}{\partial c_1^2}\frac{\partial^2 V_2}{\partial c_2^2} > \frac{\partial^2 V_1}{\partial c_2^2}\frac{\partial^2 V_2}{\partial c_1^2} \tag{A2}$$

In this case, $\frac{\partial^2 V_1}{\partial c_1^2} = \frac{\partial^2 V_2}{\partial c_2^2} = -2$, and $\frac{\partial^2 V_1}{\partial c_2^2} = \frac{\partial^2 V_2}{\partial c_1^2} = -r$. Thus, the stability condition in (A2) is easily satisfied.

Solving the system of two equations given in (A1) for $c_1^*(c_2, F_1)$ and a similar expression for $c_2^*(c_1, F_2)$, results in

$$c_1^*(F_1, F_2) = \frac{2 - r + 2F_1 - rF_2}{4 - r^2} \tag{A3}$$

and similarly for $c_2^*(F_1, F_2)$

The solution of Equation (5) is

$$F_1^*(F_2) = \frac{1}{4}\frac{r^2\,[2 - r - rF_2]}{2 - r^2} \tag{A4}$$

Obtaining the reaction function of firm 2, $F_2^*(F_1)$, similarly to (A4), and solving the resulting system of two equations in F_1 and F_2 gives the equilibrium debt levels:

$$F_1^* = F_2^* = \frac{r^2}{4+2r-r^2} \tag{A5}$$

The proof of existence, uniqueness and stability of equilibrium of debt levels is similar to the above proof of existence, uniqueness and stability of equilibrium of operating strategies. Plugging (A5) into the expression for firms' equilibrium operating choices into (A3) results in firms' equilibrium operating choices:

$$c_1^* = c_2^* = \frac{2}{4+2r-r^2} \tag{A6}$$

Plugging (A6) into firms' value functions in (3) results in the equilibrium firm values:

$$V_1^* = V_2^* = \frac{2\left[2-r^2\right]}{\left[4+2r-r^2\right]^2} \tag{A7}$$

Dividing (A5) by (A7) gives firms' quasi-market leverage-ratios:

$$\frac{F_1^*}{V_1^*} = \frac{F_2^*}{V_2^*} = \frac{1}{2}\frac{r^2[4+2r-r^2]}{2-r^2} \tag{A8}$$

Multiplying the quasi-market leverage ratio in (A8) by the probability of the solvent state, $1-c_1^*-rc_2^*$, results in firms' market leverage ratios:

$$\frac{D_1^*}{V_1^*} = \frac{D_2^*}{V_2^*} = \frac{r^2}{2} \tag{A9}$$

Firms' equilibrium market leverage in (A9) is clearly increasing in r^2, and is, thus, increasing in $|r|$. Both (A5) and (A9) $\to 0$ as $r \to 0$. ■

Proof of Proposition 2. The probability of a firm/conglomerate's division receiving a positive cash flow is $1-c_{A1}^*-rc_{A2}^*$ for firm $A1$, and similarly for firms/divisions $B1$, $A2$, and $B2$. Firms'/divisions' equilibrium operating strategies, conditional on debt levels, are given in (A3). Thus, the probability of firm 1 being solvent, conditional on its own and firm 2's debt levels is given by

$$prob_{A1}^*(\text{positive cash flow}|F_{A1}, F_2) = \frac{2-r-\left[2-r^2\right]F_{A1}-rF_2}{4-r^2} \tag{A10}$$

and similarly for $B1$, $A2$, and $B2$. (A10) is clearly decreasing in F_{A1} and F_2. It is lower than $\frac{1}{2}$ when $F_1 = F_2 = 0$ and $r \neq 0$, and it equals $\frac{1}{2}$ when $F_1 = F_2 = 0$ and $r = 0$. ■

References

Amihud, Y., and B. Lev. 1981. Risk Reduction as a Managerial Motive for Conglomerate Mergers. *Bell Journal of Economics* 12:605–17.

Berger, P., and E. Ofek. 1995. Diversification's Effect on Firm Value. *Journal of Financial Economics* 37:39–65.

Billett, M., and D. Mauer. 2000. Diversification and the Value of Internal Capital Markets: The Case of Tracking Stock. *Journal of Banking and Finance* 24:1457–90.

Bolton, P., and D. Scharfstein. 1990. A Theory of Predation Based on Agency Problems in Financial Contracting. *American Economic Review* 80:93–106.

Brander, J., and T. Lewis. 1986. Oligopoly and Financial Structure: The Limited Liability Effect. *American Economic Review* 76:956–70.

Bulow, J., J. Geanakoplos, and P. Klemperer. 1985. Multimarket Oligopoly: Strategic Substitutes and Complements. *Journal of Political Economy* 93:488–511.

Burch, T., V. Nanda, and M. P. Narayanan. 2004. Industry Structure and Value-Motivated Conglomeration. Working paper, University of Michigan.

Campa, J., and S. Kedia. 2002. Explaining the Diversification Discount. *Journal of Finance* 57:1731–62.

Comment, R., and G. Jarrell. 1995. Corporate Focus and Stock Returns. *Journal of Financial Economics* 37:67–87.

Dixit, A. 1984. Comparative Statics for Oligopoly. *International Economic Review* 27:107–22.

Eckbo, E. 1983. Horizontal Mergers, Collusion and Stockholders Wealth. *Journal of Financial Economics* 11:241–73.

Eckbo, E., V. Maksimovic, and J. Williams. 1990. Consistent Estimation of Cross-Sectional Models in Event Studies. *Review of Financial Studies* 3:343–65.

Fama, E., and J. MacBeth. 1973. Risk, Return, and Equilibrium: Empirical Tests. *Journal of Political Economy* 81:607–36.

Frank, M., and V. Goyal. 2004. Capital Structure Decisions: Which Factors are Reliably Important? Working paper, University of Minnesota.

Glazer, J. 1994. The Strategic Effects of Long-Term Debt in Imperfect Competition. *Journal of Economic Theory* 62:428–43.

Gomes, J., and D. Livdan. 2004. Optimal Diversification. *Journal of Finance* 59:507–35.

Graham, J., M. Lemmon, and J. Wolf. 2002. Does Corporate Diversification Destroy Value. *Journal of Finance* 57:695–720.

Inderst, R., and H. Müller. 2003. Internal versus External Financing: an Optimal Contracting Approach. *Journal of Finance* 58:1033–62.

Jensen, M. 1986. Agency Costs of Free Cash Flow, Corporate Finance and Takeovers. *American Economic Review* 76:323–29.

Jensen, M. 1988. Takeovers: Their Causes and Consequences. *Journal of Economic Perspectives* 2:21–48.

Klein, P. 2001. Were the Acquisitive Conglomerates Inefficient? *RAND Journal of Economics* 32:745–61.

Lang, L., and R. Stulz. 1994. Tobin's q, Corporate Diversification, and Firm Performance. *Journal of Political Economy* 102:1248–80.

Lewellen, W. 1971. A Pure Financial Rationale for the Conglomerate Merger. *Journal of Finance* 26:521–37.

Lins, K., and H. Servaes. 1999. International Evidence on the Value of Corporate Diversification. *Journal of Finance* 54:2215–39.

Lyandres, E. 2006. Capital Structure and Interaction among Firms in Output Markets: Theory and Evidence. *Journal of Business* 79:2381–421.

Maksimovic, V. 1988. Capital Structure in Repeated Oligopolies. *RAND Journal of Economics* 19:389–407.

Maksimovic, V., and G. Phillips. 2002. Do Conglomerate Firms Allocate Resources Inefficiently Across Industries? Theory and Evidence. *Journal of Finance* 57:721–67.

Matsusaka, J. 1993. Takeover Motives During the Conglomerate Merger Wave. *RAND Journal of Economics* 24:357–79.

Myers, S. 1977. The Determinants of Corporate Borrowing. *Journal of Financial Economics* 5:147–75.

Poitevin, M. 1989. Collusion and the Banking Structure of a Duopoly. *Canadian Journal of Economics* 22:263–77.

Prabhala, N. R. 1997. Conditional Methods in Event Studies and an Equilibrium Justification for Standard Event-Study Procedures. *Review of Financial Studies* 10:1–38.

Rajan, R., H. Servaes, and L. Zingales. 2000. The Cost of Diversity: The Diversification Discount and Inefficient Investment. *Journal of Finance* 55:35–80.

Rajan, R., and L. Zingales. 1995. What do we Know about Capital Structure? Some Evidence from International Data. *Journal of Finance* 50:1421–60.

Scharfstein, D., and J. Stein. 2000. The Dark Side of Internal Capital Markets: Divisional Rent-Seeking and Inefficient Investment. *Journal of Finance* 55:2537–64.

Schoar, A. 2002. Effects of Corporate Diversification on Productivity. *Journal of Finance* 57:2379–403.

Schuhmacher, F. 2001. Capacity-Price Competition and Financial Structure. Working paper, Aachen University of Technology.

Schwert, W. 1996. Markup Pricing in Mergers and Acquisitions. *Journal of Financial Economics* 41:153–92.

Servaes, H. 1996. The Value of Diversification during the Conglomerate Merger Wave. *Journal of Finance* 51:1201–25.

Showalter, D. 1995. Oligopoly and Financial structure, Comment. *American Economic Review* 85:647–53.

Stulz, R. 1990. Managerial Discretion and Optimal Financing Policies. *Journal of Financial Economics* 26:3–27.

Sundaram, A., T. John, and K. John. 1996. An Empirical Analysis of Strategic Competition and Firm Values. The Case of R&D Competition. *Journal of Financial Economics* 40:459–86.

Tirole, J. 1988. *The Theory of Industrial Organization*. Cambridge, MA: MIT Press.

Titman, S. 1984. The Effect of Capital Structure on a Firm's Liquidation Decision. *Journal of Financial Economics* 13:137–51.

Villalonga, B. 2003. Diversification Discount or Premium? New Evidence from BITS Establishment-Level Data. *Journal of Finance* 59:475–502.

Villalonga, B. 2004. Does Diversification Cause the "Diversification Discount"? *Financial Management* 33:5–27.