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# The WACC Fallacy: The Real Effects of Using a Unique Discount Rate

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# The WACC Fallacy: The Real Effects of Using a Unique Discount Rate [1]

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**Abstract**

We document investment distortions induced by the use of a single discount rate within firms. According to textbook capital budgeting, firms should value any project using a discount rate determined by the risk characteristics of the project. If they use a unique company-wide discount rate, they overinvest (resp. underinvest) in divisions with a market beta higher (resp. lower) than the firm's core industry beta. We directly test this consequence of the "WACC fallacy"and establish a robust and significant positive relationship between division-level investment and the spread between the division's market beta and the firm's core industry beta. Consistently with bounded rationality theories, this bias is stronger when the measured cost of taking the wrong discount rate is low, for instance, when the division is small. Finally, we measure the value loss due to the WACC fallacy in the context of acquisitions. Bidder abnormal returns are higher in diversifying mergers and acquisitions in which the bidder's beta exceeds that of the target. On average, the present value loss is about 0.7% of the bidder's market equity.

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Ever since the seminal contribution of Modigliani and Miller (1958), a key result of corporate finance theory is that a project's cash-flows should be discounted at a rate that reflects the project's risk characteristics. Discounting cash flows at the firm's weighted average cost of capital (WACC) is therefore inappropriate if the project differs in terms of its riskiness from the rest of the firm's assets. In stark contrast, however, survey evidence suggests that performing capital-budgeting using a unique firm-level WACC is quite common. Graham and Harvey (2001) show that a large majority of firms report using a firm-wide discount rate to value a project independently of its risk characteristics. Similarly, Bierman (1993) surveys the top 100 firms of the Fortune 500 and finds that 93% of the responding firms use their firm-wide WACC to value projects and only 35% also rely on division-level discount rates. The potential distortions that firms might face if they discount projects at their firm-wide WACC are prominently underlined in standard corporate finance textbooks. Grinblatt and Titman (2002) note that "the WACC of a firm is the relevant discount rate for [...] one of its projects only when the project has exactly the same risk profile as the entire firm.". Similarly, Brealey et al. (2005) explain that "the weighted average formula works only for projects that are carbon copies of the rest of the firm".

Such a gap between the normative formulation of the WACC method (the discount rate should be project-specific) and its implementation by practitioners (firms tend to use their firm-wide WACC for all projects) should lead to specific distortions in the investment policy of firms. This paper is an attempt to document and measure these distortions.

First, we use business segment data to investigate if diversified firms rely on a firm wide WACC. To do so, we examine whether diversified companies are inclined to overinvest in their high-beta divisions and underinvest in their low-beta divisions. The intuition is the following: a company using a single firm-wide WACC would tend to overestimate the net present value (NPV) of a project whenever the project is riskier than the typical project of the company. If companies apply the NPV principle to allocate capital across different divisions[2], they must have a tendency to overestimate the NPV of projects that are riskier than the typical firm project and vice versa. This, in turn, should lead to overinvestment (resp. underinvestment) in divisions that have a beta above (resp. below) the firm-wide beta.

Let us illustrate our empirical strategy with one of our datapoints: Anheuser-Busch Companies Inc. (ABC). The core business of ABC is brewing; it belongs to the "Beer and Liquor" industry (Fama-French (FF) industry code 4). In 2006, this industry represents 81% of the total sales of ABC. In this industry, we estimate the asset beta using the industry's stock returns and unlever the resulting equity beta by relying on the industry's capital structure: we obtain an asset beta of 0.12. Besides brewing, ABC operates a large number of theme parks which belong to a totally unrelated industry ("Fun", FF code 39) which amounts to about 11% of the firm's total sales. In this non-core industry, the estimated asset beta is 0.69, which is much higher than in the core business. If ABC was to use the discount rate of brewing to value investment projects in its entertainment business, it would underestimate the cost of capital by about $(0.69 - 0.12) * 7 = 4\%$ (assuming

[2]Survey evidence of CEOs and CFOs presented in Graham et al. (2010) suggests that the NPV ranking is the predominant principle governing capital budgeting decisions.

an equity risk premium of 7%). Put differently, it would consider projects with an internal rate of return as low as -4% as being value creating. Hence, the theme park division of ABC should invest "too much". To test this, we compare the investment rate of the entertainment division of ABC to the investment rate of entertainment standalones of similar size: in 2006, we find that this excess investment is 1% of the division's total assets, or about 10% of the division's total investment. Our statistical test rests on this logic.

Using a large sample of divisions in diversified firms, we show in the first part of the present paper that investment in non-core divisions is robustly positively related to the difference between the cost of capital of the division and that of the most important division in the conglomerate (the core-division). We interpret these findings as evidence that firms do in fact discount investment projects from non-core divisions by relying on the core division's cost of capital. We then discuss the cross-sectional determinants of this relationship and find evidence consistent with models of bounded rationality: whenever making a WACC mistake is costly (the division is large, the CEO has sizable ownership, the within-conglomerate *diversity* of costs of capital is high), the measured behavior is less prevalent.

In the second part of this paper, we document the present value loss induced by the fallacy of evaluating projects using a unique company-wide hurdle rate. To do this, we focus on diversifying acquisitions, a particular class of projects which are large, can be observed accurately, and whose value impact can be assessed through event study methodology. We look at the market reaction to the acquisition announcement of a bidder whose cost of capital is lower than that of the target. If this bidder takes its own WACC to value the target, it will overvalue it, and the announcement will be less of a good news to the bidder's shareholders. We find that such behavior leads to a loss of about 0.7% percent of the bidder's market capitalization. On average, this corresponds to about 7% of the deal value, or $14m per deal. This finding is robust to the inclusion of different control variables.

Our paper is related to several streams of research in corporate finance. First, it contributes to the literature concerned with the theory and practice of capital budgeting and mergers and acquisitions. Graham and Harvey (2001) provide survey evidence regarding firms' capital budgeting, capital structure and cost of capital choices. Most relevant to our study, they show that firms tend to use a firm-wide risk premium instead of a project specific one when evaluating new investment projects. Relying entirely on observed firm level investment behavior, our study is the first to test the real consequences of the finding in Graham and Harvey (2001) that few firms use project specific costs of capital. More precisely, we provide evidence that the use of a single firm-wide discount rate (the *"WACC fallacy"*) does in fact have statistically and economically significant effects on capital allocation and firm value. Since we make the assumption that managers do rely on the NPV criterion, the present paper is also related to Graham et al. (2010). This more recent contribution takes a forensic view on capital allocation and delegation of decision making in firms and provides strong survey evidence showing that the net present value rule is still the dominant way for allocating capital across different divisions.

Secondly, our paper contributes to the growing behavioral corporate finance literature. Baker et al. (2007) propose a taxonomy organizing this literature around two sets of contributions: "irrational investors" vs. "irrational managers". The more developed "irrational investors" stream assumes that arbitrage is imperfect and that rational managers, in their corporate finance decisions, exploit market mispricing. Our paper is more related to the less developed "irrational managers" literature. This approach assumes that, while markets are arbitrage free, managerial behavior can be influenced by psychological biases. So far, this stream of research has mostly focused on how psychological traits such as optimism and overconfidence can have distorting effects on managerial expectations about the future and investment decisions (see Malmendier and Tate (2005, 2008) or Landier and Thesmar (2009)). By contrast, far less attention has been paid to whether and how bounded rationality and resulting "rule of thumbs" type of behavior can shape corporate decisions. To the best of our knowledge, the present paper is the first to consider how a simplifying heuristic (using a single company wide discount rate) can have real effects on important corporate policies such as corporate investment and mergers and acquisitions. The reason why firms use a single discount rate might result from lack of sophistication. It is actually not obvious at first sight why the firm-level cost of capital is not the relevant discount rate for all the projects of the firm. A company that benefits from a low cost of capital might feel that financing risky projects is an "arbitrage opportunity". In fact, by changing the risk of the firm's cash-flows, these projects also modify the expected rate of return that the market expects from the firm (Modigliani-Miller). We also find several pieces of evidence coherent with the view that the *"WACC fallacy"* is related to managerial bounded rationality: the prevalence of this behavior seems to decrease over time, in line with the idea that CFOs are now more likely to have been exposed to modern capital budgeting. Also, the overinvestment pattern is smaller in larger divisions, in more diverse companies, and when the CEO owns a larger stake in the company. Such evidence is in line with the view that full rationality is costly and that agents become more rational when the gains of doing so increase (see e.g. Gabaix (2010)).

Finally, our paper is also related to the extensive literature on the functioning of internal capital markets (see for instance Lamont (1997); Shin and Stulz (1998)). Rajan et al. (2000) and Scharfstein and Stein (2000) show that politicking within large organizations can lead to inefficient cross-subsidization between divisions: Divisions with lower investment opportunities obfuscate information about their real needs and manage to extract from management inefficiently large capital allocations at the expense of divisions with better opportunities (conglomerate "socialism"). Rajan et al. (2000) show empirically that industry diversity within firms increases transfers toward divisions with below-average investment opportunities. Their proxy of investment opportunities is based on industry-level Tobin's $q$. Ozbas and Scharfstein (2010) show that unrelated segments of conglomerates invest less than stand-alone firms in high-$q$ industries. A contribution of our paper is to show that division-level industry *betas* (and not simply divisions' Tobin's $q$) are an important factor in understanding investment distortions within conglomerates. We relate this new type of capital misallocation to the use of a single discount rate, which we call the *"WACC fallacy"*. This bias might be related to the "politicking" argument, in that more complex, division-specific, discounting rules can potentially facilitate politicking, since divisions can advocate through various arguments (strategic choice of industry categorization and beta evaluation techniques) that their discount rate should be lower: In other words, firms might use a unique discount rate precisely because they want to limit the scope for politicking by making rules simple and non-manipulable.

The rest of the paper is organized as follows: Section 1 describes the data. Section II provides evidence on how division level investment in conglomerates is related to firm wide measures of the cost of capital. Section III presents the evidence on diversifying mergers and acquisitions. Finally, section IV concludes.

# I The data

## I.1 Sample and basic variables

Our first battery of tests, which focuses on investment in diversified conglomerates, requires a dataset of conglomerate divisions. To build it, we start with data from the Compustat Segment files, covering the period 1987-2007. From these files, we retrieve segment level information on annual capital expenditures, sales and total assets, as well as a four-digit SIC code for the segment, which we match with the relevant two-digit Fama-French industry (FF48). We rely on the variable *ssic1*, which measures the closest "Primary SIC code for the Segment". Whenever this variable is missing, we use the variable *ssicb1*. Within each firm, we then aggregate capex, sales and assets data by FF48 industry. We call "divisions" the resulting firm-industry-year observations. We then merge these data with firm-level data from Compustat North America, which provide us with firm level accounting information. Whenever the sum of division sales exceeds or falls short of total firm sales (item *SALE*) by a margin of 5 % or more, we remove all related firm-division-year observations from the sample. This is done in order to ensure consistency between the Compustat Segments and the Compustat Industrial Annual databases and to reduce the potential noise induced by a firm's incorrect reporting of segment accounts. Finally, we merge the resulting division level dataset with firm-level information about CEO share ownership from Compustat Execucomp. Such information is available only from 1992 through 2007 and for a subset of firms.

Using this merged dataset, we define a *conglomerate* firm as a firm with operations in more than one FF48 industry, whereas *standalone* firms have all their activities concentrated in a single FF48 industry. In Table I, we report descriptive statistics for all firm-level variables separately for standalone (top panel) and conglomerate firms (bottom panel). All variables names are self explanatory but their exact definition is given in the Appendix. Out of approximately 135,000 firm-year observations, about 120,000 observations correspond to standalones (i.e. firms operating in a single FF48 industry) and about 15,000 observations (or approximately 750 firms a year) operate in more than 1 industry (on average, 2.56 industries). On average, conglomerates are quite focused: about 73% of total sales are realized in the largest division. Unsurprisingly, standalones grow faster, are smaller, younger than conglomerates; conglomerates are more cash flow rich and more levered.

[Table I about here.]

For each conglomerate firm, we then identify the division with the largest sales and label it *core-division*. Conversely, divisions with sales lower than those of the core-division are referred to as *non-core divisions*. In Table II we report division-level descriptive statistics for non-core divisions only. Since there are about 15,000 observations corresponding to conglomerates, and since conglomerates have on average 1.56 non-core divisions (2.56-1), there are about 23,000 observations corresponding to non-core divisions. We define the Tobin's $q$ of a division as the average market-to-book of standalones which belong to the same FF48 industry as the division. The definition of the other variables is straightforward and detailed in Appendix. On average, Table II shows that non-core divisions are slightly smaller than standalones (log of book assets equal to 4, against 4.3 for standalones). We also compute the Tobin's $q$ directly using the firm's market and book values of assets (see Appendix for details). In line with the existing literature, we see from Table I that conglomerates tend to have lower market-to-book ratios (1.49 versus 1.88), which may reflect either slower growth, or the presence of a conglomerate discount.

[Table II about here.]

We also calculate the Tobin's $q$ of each division. Since the division has no market price, we compute the average market-to-book ratio of standalones operating in the same FF48 industry as the division. This has been shown to be a reasonable approximation: Montgomery and Wernerfelt (1988) find that industry-level Tobin's $q$ is a good predictor of firm level Tobin's $q$. For each non-core division, we also define as $Q_{CORE,t}$ the Tobin's $q$ of the core division of the conglomerate it belongs to. As we report in Table II, non-core division have on average the same $q$ as their core division.

## I.2 Mergers and acquisition data

Our second series of tests relies on a sample of diversifying acquisitions. The sample is constructed by downloading all completed transactions between 1988 and 2007 from the SDC Platinum Mergers and Acquisitions database in which both target and bidder are US companies. The bidder's and target's core activities are identified through the SDC variables *Acquiror_Primary_SIC_Code* and *Target_Primary_SIC_Code*, which we match to their corresponding FF48 industry categories. We define a *diversifying* transaction as a deal in which a bidder gains control of a target which belongs to a FF48 industry different from the bidder's core activity. We restrict the sample to these transactions only. We keep only completed mergers and acquisitions in which the bidder has gained control of at least 50 % of the common shares of the target. We include transactions that include both private and public targets. We drop all transaction announcements in which the value of the target represents less than 1 percent of the bidder's equity market value (calculated at the end of the fiscal year prior to the year of the acquisition announcement) and also drop all transactions with a disclosed deal value lower than 1 million US-$. Daily stock returns of the bidder are downloaded from CRSP for the eleven day event window surrounding the announcement date of the deal. Finally, we obtain balance sheet data for all bidders from the Compustat North America database.

[Tables III and IV about here.]

In total, we identify 6,206 of these *diversifying* transactions between 1988 and 2007 for which the sample selection criteria are satisfied. Descriptive statistics of bidder, target and deal characteristics are summarized in Table III. The typical transaction involves a small and private target. The average value of the target is slightly less than \$200m; 89% of the transactions involve a non-listed target, and only 3% correspond to tender offers. In panel B, we also report the average Tobin's $q$ of the bidder and the target, calculated as the average market-to-book of standalones in the same industries as the bidder and target respectively. The difference is, on average across transactions, zero, and statistically insignificant. Table IV reports the number of acquisitions per year in our sample: as expected, there are large year-to-year fluctuations of the number of transactions and average valuation, which broadly correspond to the last two acquisitions waves.

## I.3 Calculating the cost of capital

For both series of tests, we need to construct an annual industry-level measure of the cost of capital, which we will merge with both relevant datasets (division-level and transaction-level). We do so by regressing monthly returns of value-weighted portfolios comprised of companies belonging to the same FF48 industry on the CRSP Value Weighted Index for moving-windows of 60 months. We then unlever the estimated industry-level equity beta using the following formula:

$$\beta^A_{i,t} = \frac{E_{i,t}}{E_{i,t} + D_{i,t}} \times \beta^E_{i,t}, \tag{1}$$

where $E_{i,t}$ is the total market value of equity within the FF48 industry $i$ in year $t$, and $D_{i,t}$ is the total book value of debt (see appendix for definitions of debt and equity values). $\beta^E_{i,t}$ is the estimated equity beta of industry $i$ in year $t$. $\beta^A_{i,t}$ is the beta of assets invested in industry $i$ in year $t$. We report average per-industry asset and equity betas in Table A.I.

We then merge the information on industry cost of capital with the division-level data. For a division or a standalone, $\beta^A_{i,t}$ is the asset beta of the industry to which the standalone or the division belongs. For a conglomerate, we calculate the average of division asset betas, weighted by total (book) assets of divisions, and call it $\beta^A_{AVERAGE,t}$. We report estimates of firm and division-level asset betas in Tables I and II. With an average asset beta of 0.56, conglomerates appear slightly less risky than standalones (0.65). Non-core divisions have on average the same asset beta (0.56) as their related core divisions (0.55), so that the "beta spread", i.e. the difference between the beta of a non-core division and the beta of its core is zero, on average. The spread varies, however, a lot: from -0.2 at the 25th percentile to +0.2 at the 75th percentile.

Next, we merge the information on asset betas with the diversifying acquisitions data. The relevant information is reported in table III, Panel B. In contrast to Tobin's $q$, which tends to be similar between bidders and targets, asset betas tend to be significantly smaller for bidders (0.59) than for targets

(0.64).

## I.4 Calculating the extent of vertical relatedness between industries

In order to construct a measure of the vertical relatedness between each pair of FF48 industries, we download the Benchmark Input-Output Accounts for the years 1987, 1992, 1997 and 2002 from the Bureau of Economic Analysis[3]. We rely on the "Use Table" of these accounts, which corresponds to an Input-Output (I-O) matrix providing information on the value of commodity flows between each pair of about 500 different I-O industries. We match the I-O industries to their corresponding FF48 industry and aggregate the commodity flows by FF48 industry. This aggregation allows to calculate the total dollar value of inputs used by any FF48 industry. The aggregated table also shows the value of commodities used by any FF48 industry $i$, which is supplied to it by FF48 industry $j$. For each industry $i$, we calculate the dependence on inputs from industry $j$ as the ratio between the value of inputs provided by industry $j$ to industry $i$ and the total inputs used by industry $i$. We denote this measure by $v_{ij}$. Following Fan and Lang (2000), we define the vertical relatedness of two FF48 industries $i$ and $j$ as $V_{ij} = 1/2(v_{ij} + v_{ji})$. $V_{i,j}$ measures the extent to which the non-core division and the core division exchange inputs. In table II we show descriptive statistics of $V_{DIV,t}$. The table shows that the average exchange of inputs between non-core and their corresponding core division is about 4 % in our sample.

[3]see http://http://www.bea.gov/industry/io_benchmark.htm

# II Investment distortions within diversified firms

## II.1 Investment misallocation

Our test rests on the fact that, in "WACC fallacious" conglomerates, non-core division investment should be increasing with the "beta spread" ($\beta^A_{DIV,t} - \beta^A_{CORE,t}$). Assume a non-core division has a higher beta than the core. Controlling for investment opportunities, if this division uses the core's asset beta to discount future cash flows, it will overestimate any project's NPV, and will overinvest. Conversely, non-core divisions with low betas relative to the core should underinvest. Hence, investment increases with the spread between the beta of division and the beta of the core. If, however, the firm uses the right cost of capital in each division, then investment should be insensitive to the core's cost of capital. The beta spread should have no impact.

One variation of this idea is that, instead of using the cost of capital of its core division, the firm uses a weighted average cost of capital to value non-core division projects. In this case, the above prediction remains true as long as $\beta^A_{CORE,t}$ is a good proxy for the asset-weighted beta of the firm, $\beta^A_{AVERAGE,t}$. This is a priori reasonable since in conglomerates the core division accounts on average for 73% of total sales. But precisely because of this, both stories are difficult to distinguish empirically, although we provide evidence in our robustness checks (see below) that the beta of the core division seems more relevant. All in all, we choose to use $\beta^A_{CORE,t}$ in our main specification because we believe that the results with $\beta^A_{CORE,t}$ are more convincing as they avoid the multi-collinearity concerns that arise when putting $\beta^A_{DIV,t}$ and $\beta^A_{AVERAGE,t}$ together in a regression.

We first provide graphical evidence in Figure 1 that division investment rate is correlated with the beta spread. To do this, we sort observations (non-core division-year) into 10 deciles of beta spread. For each decile, we then compute the mean "excess Capx" of non-core divisions. To compute "excess Capx" of a non-core division, we first restrict ourselves to standalones and run a pooled regression of investment rate on industry $q$, log of assets, and cash flows to assets. We then use the estimated coefficients to predict the "hypothetical standalone investment" of each non-core division. We take division level industry $q$ and log of assets, and firm-wide cash flows as regressors. For each non-core division, the difference between the observed division investment and "hypothetical standalone investment" is the "excess Capx". As Figure 1 shows, division with relatively high beta spread (high beta compared to core-division) tend to overinvest more, compared to the standalone benchmark. Going from the $3^{rd}$ to the $7^{th}$ decile, excess investment increases by about 1 percentage point.

[Figure 1 about here]

We then report multivariate regression results in Table V, in order to control more extensively for observable determinants of investment. Standard errors are clustered at the firm-level. In unreported regressions we also cluster standard errors at the non-core division level which leaves our results unaffected. Column (1) establishes the basic fact by showing that non-core division investment depends positively on the spread between the non-core and the core division's industry betas. The larger the spread, the higher the investment in the respective non-core division. This is precisely what would be expected if companies discount risky projects using too low discount rates. The estimated order of magnitude is non-negligible: a one standard deviation increase in the beta spread (0.35) leads to an investment increase by 0.7% of division assets. This is equivalent to 10% of the average investment rate.

[Table V about here.]

In column (2), we add the main determinants of corporate investment, i.e. industry-level Tobin's $q$'s of the core and the non-core divisions, as well as cash flows (at the firm level). We control for the investment opportunities of both the core and the non-core divisions in order to address the concern that asset betas may correlate with variations in investment opportunities that are not captured by Tobin's $q$'s. After including these controls, the coefficient estimate for the spread decreases slightly but remains highly statistically significant. Columns (3) and (4) add other potential determinants of division level investment, i.e. *Division Size*, *Firm Size*, *Firm Age* and a measure of *Firm Focus* to the specification. Our results remain unchanged. In unreported regressions, we have also sought to replace industry-level Tobin's $q$ by a division level measure of investment opportunities, i.e. lagged sales growth. Again, our results remain robust in this alternative specification. In column (5) we replace the spread by its two separate components $\beta^A_{CORE,t}$ and $\beta^A_{DIV,t}$. The results show a negative sign for the coefficient estimate for $\beta^A_{CORE,t}$ and a positive sign for $\beta^A_{DIV,t}$. This suggests that whenever the company has a low risk core activity (low $\beta^A_{CORE,t}$), and therefore a low hurdle rate, it is inclined to invest more strongly in non-core divisions with a higher asset risk. The fact that $\beta^A_{CORE,t}$ is significant provides strong evidence that diversified companies look at divisions belonging to industries different from their core activity with the eyes of their core industry's characteristics.

In terms of magnitude, the investment distortion we document is quite important. Assume $\beta^A_{DIV,t} - \beta^A_{CORE,t} = 0.35$, which is about one sample standard deviation. This means the gap in discount rates between the division and its core is approximately 2% (assuming a 6% equity risk premium). Given our estimates, we would expect the non-core division's investment rate to be 0.5 (0.0155*0.35) percentage points higher. This is a non-negligible effect: the median non-core division investment rate is about 4 % in our data.

Last, we expect the documented investment distortion to be larger if the project's sales growth is bigger. To see this, assume, in the spirit of Gordon and Shapiro (1956), that an investment project in a non-core division pays a cash flow $C$, with constant growth rate $g$ smaller than the WACC. Then, the present value of the project is given by $\frac{C}{WACC-g}$. From this formula, it is obvious that the valuation mistake made by not choosing the right WACC is bigger when g is larger, in a convex fashion.[4] Hence, we expect the impact of beta spread on investment to be bigger when the division belongs to a fast growing industry.

Column (6) of Table V reports the outcome of such a consistency check. We code an indicator variable for each tercile of lagged industry sales growth *(Low, Medium and High Growth)* and interact these dummies with the spread

[4] To see this formally, assume that the conglomerate chooses $WACC - \delta$ instead of $WACC$, where $\delta$ is small. Then, the estimated present value of the project is inflated by $\delta \times \frac{C}{(WACC-g)^2}$, which is increasing and convex in $g$.

in asset betas. The results show that while investment of medium growth non-core divisions are not significantly more sensitive to the spread than low growth divisions ($Medium\ Growth \times (\beta^A_{DIV,t} - \beta^A_{CORE,t})$ is not significant), high growth divisions turn out to be significantly more sensitive to the spread than low growth divisions (t-stat 2.18). The difference is large too: while for divisions in the bottom tercile of industry growth, the coefficient is equal to 0.012, it is equal to 0.021 in the top tercile. The estimated effect is therefore twice as large. This underlines the idea that the investment sensitivity is in fact convex in lagged sales growth.

## II.2 Robustness Checks

Our sample includes all industries, even the financial sector. We have good reasons to believe that even the banking sector can be "WACC fallacious", which is why we did not remove the financial sector from our main specifications. There might, however, be concerns that investment and investment opportunities are not well captured in Compustat. To check that our results do not depend on the inclusion of the financial sector, we have replicated the results of Table V, excluding Banking and Insurance (FF48 industries 44 and 45). We report these new estimates in Table A.II. They are, if anything, stronger, consistent with the fact that accounting data are noisier in these industries.

We report further robustness checks in Table VI. First, in column (1), we seek to account for the fact that, as noticed before, instead of using the cost of capital of the division, conglomerates may be using a firm-wide average asset beta. In column (1), we thus use as regressor the weighted average division asset beta, where the weights correspond to the ratio of division to total firm assets. As expected, the coefficient estimate is significantly negative in this specification too. To distinguish between the two stories, we run in column (2) a regression with both the average firm beta and the beta of the core division. In this specification, the average beta of the firm is no longer significant. The documented investment distortion thus seems to be driven by the use of the core-division's discount rate rather than the use of an average firm-wide WACC, even though both hypotheses may ultimately be hard to distinguish rigorously.

[Table VI about here.]

In column (3), we seek to directly address the concern that the beta spread may capture differences in investment opportunities between the division and the core, that is not fully controlled for by the Tobin's $q$'s. We do so by including the gap between the division-level's and the firm's overall Tobin's $q$. It leaves the estimated effect of beta spread unaffected. In the same spirit, the beta spread may simply capture a measure of diversity of a firm's investment opportunities, which has been shown in earlier work to distort investment behavior (Rajan et al. (2000)). In column (4), we therefore include as additional control the within-firm standard deviation of industry-level Tobin's $q$'s normalized by firm wide $q$. As found by Rajan et al. (2000), the more diverse the firm's investment opportunities, the lower non-core division investment on average. Yet, the inclusion of the diversity control and the gap between the division and the firm's Tobin's $q$ does not affect our conclusions.

In column (5), we control for firm-wide investment policy through including the core division's investment rate. This control variable also leaves the coefficient estimates for both $\beta^A_{CORE,t}$ and $\beta^A_{DIV,t}$ unchanged.

In column (6), we are looking at the sources of identification. To do this, we include division industry-year fixed-effects. In this regression, the identification is purely based on the comparison between divisions in the same industry, depending on whether they are affiliated with low or high beta core divisions. The estimated effect of $\beta^A_{CORE,t}$ is divided by two but remains statistically significant at the 5% significance level. Hence, the estimate of $\beta^A_{CORE,t}$ is identified both on the within industry, across conglomerates variation, and on investment variability across industries. Finally, we control for firm fixed effects (see column (7)). After controlling for firm fixed effects, we still find evidence of an investment bias toward riskier non-core divisions (significant coefficient for $\beta^A_{DIV,t}$). By contrast, $\beta^A_{CORE,t}$ is no longer significant.

One last concern with our results is that we may be capturing the impact of upstream integration. Assume, for instance, that a firm produces toys and owns trucks to transport them. It therefore has two activities: transportation (non-core) and toy-production (core). If the cost of capital in the toy industry goes down, the firm may expand its production capacity, for instance to cater to investor sentiment (for this to hold, note that the beta must be capturing investment determinants not already controlled for in our regressions). To ship the additional production, it will also invest in new trucks. In this setting, investment in a non-core division (trucks) responds to changes in the WACC of the core division (toys), for reasons that have little to do with the

WACC fallacy.

[Table VII about here.]

To address this concern, we construct a measure of vertical integration between each non-core division and its core, and interact this measures with the beta spread to see if it affects the relation estimated in Table V. For each FF48 industry, we calculate (1) the fraction of this industry's output that is sold to each (downstream) FF48 industry and (2) the fraction of this industry's input that comes from each (upstream) industry. For each industry pair $(i, j)$, $V_{ij}$ is equal to the mean of these two numbers, and therefore measures the extent to which these two industries are integrated both upstream and downstream. For each non-core division, we split the measure of relatedness with the core into three tercile dummies, and interact them with the beta spread. We report the estimates using various specifications in Table VII. In column (1), we report the baseline result without interaction. In column (2), we add the interaction terms between beta spread and the dummies. It appears that the measured impact of beta spread on investment does not depend on the extent to which the non-core division is related with its core. In columns (3) and (4), we interact the two measures of growth opportunities with the relatedness dummies. The overall diagnosis remains: our estimated effect of beta spread on investment is not driven by non-core divisions that are vertically related to the core activity.

## II.3 Evidence of bounded rationality

Taking the wrong cost of capital destroys present value, because it biases the firm's investment decisions away from value maximization. On the other hand, computing the adequate cost of capital, making it vary across projects, making sure that division managers do not manipulate it to defend low NPV projects, is also costly. Sometimes, it may therefore be optimal to keep a single WACC for the entire organization. But if the costs of doing so are too high, we expect firms to use different WACCs. This "bounded rationality view" makes predictions as to which firms are "WACC fallacious" and which firms are not: the relationship uncovered in Table V should disappear when the benefits of taking the right WACC are large.

[Table VIII about here.]

In this Section, we test the "bounded rationality view". We do this by interacting beta spread with measures of the net benefit of adopting differentiated WACCs. Bounded rationality predicts that investment policy should be *less* sensitive to beta spread when this net benefit is high (i.e. when firms find it optimal to unbias themselves). We report the results of this investigation in Table VIII using four different measures of net benefit to take the right WACC. In column (1), we first hypothesize that financial knowledge of corporate decision makers in charge of making capital budgeting decisions has improved over time. Higher financial sophistication of managers due to MBA style education could thus have improved the quality of capital allocation decisions within conglomerate firms, making the cognitive cost of taking the right WACC decrease over time. We therefore expect the sensitivity of investment to beta spread to decrease over time, and test this by interacting four period dummies (1987-1991, 1992-1996, 1997-2001, 2002-2007) with beta spread. The analysis by sub-period indicates that the investment distortion has been strongest between 1987 and 1996.[5]

In columns (2)–(4), we use cross-sectional proxies of net benefit of financial sophistication. In column (2), we use the *Relative Importance* of a non-core division. The idea is that, when the non-core division is large with respect to the core, valuation mistakes have larger consequences; these divisions are therefore less likely to be "WACC fallacious". We calculate this measure by scaling non-core division sales by the sales of the core division. Values close to one indicate that the non-core division in question is almost as important as the core-division within the conglomerate. By contrast, values close to zero indicate that the non-core division is negligible vis à vis the core division. We then split this measure into terciles and interact it with the beta spread. We report the regression results in column (2): investment in large divisions is less sensitive to beta spread, suggesting that investment in relatively large divisions is less "WACC fallacious". In column (3), the measure of net benefit is diversity of costs of capital, defined at the firm level as the within-firm standard deviation of (core and non-core) division asset betas. Again, the intuition is that taking a single WACC to evaluate investment projects leads to larger mistakes if costs of capital are very different within the organization. As before, we split our measure of diversity into

[5]Interestingly, the change in business segment reporting standards initiated by the FASB issuance of SFAS 131 in June 1997 does not seem to have an impact on our results, since our coefficients remain statistically significant also in sub-periods following the change in regulation.

terciles. Column (3) shows that division investment in firms with highly diverse costs of capital is significantly less sensitive to the beta spread. These firms therefore seem to find it optimal to use different WACCs. Last, we explore in column (4) the role of CEO ownership: here the intuition is that CEOs with more "skin in the game" will find it more profitable to avoid value destroying investment decisions and will opt for financial sophistication in the organization she's running. This is consistent with Baker et al. (2007), who note that in order for irrational managers to have an impact on corporate policies, corporate governance should be somewhat limited. Because of the limited availability of this variable, we only split CEO ownership into two dummies (above and below 1%, the sample median). We show, in column (4), that the impact of beta spread on division investment is divided by three for firms whose CEO has a relatively larger stake. Such evidence is also in line with evidence in Ozbas and Scharfstein (2010), who find that inefficient investment in conglomerates decreases with management equity ownership.

# III Efficiency effects

In this section, we examine the efficiency costs of using the "wrong" cost of capital. Doing this is difficult in the context of conglomerate investment, since we would need to compare firm values in the cross-section. A more powerful test, which we implement here, consists of looking at market reaction to large investment projects, whose cost of capital we can measure. To do this, we study *diversifying* mergers and acquisitions. For our purpose, these investment projects have four advantages. First, they are easy to observe: large standard datasets report the exact date, the size, industry and the amount invested in these projects. Second, the cost of capital of the acquisition can be computed (using the target's industry cost of capital) and is, for diversifying acquisitions, different from the cost of capital of the acquirer, which may give rise to "WACC fallacious" behavior. Third, we have a reasonable estimate of their NPV, namely, the stock price reaction of the acquirer upon acquisition announcement. Under the assumption that markets are efficient, the announcement returns provides an estimate of the NPV created by the project. Last, these projects tend to be large enough so that their impact on the market value of the acquirer is detectable in a credible way.

## III.1 WACC fallacious acquisitions

We first check that acquisitions are subject to the same WACC fallacy as non-core division investment. From Table III, Panel B, we see that, across all deals in our sample, the beta spread is on average -0.05: targets have, on average, a higher asset beta than bidders. The difference is statistically significant at 1%. This is consistent with bidders using their own discount rate to value targets: this leads to overvaluation from the bidder's side, which makes the deal more likely to succeed. From Table III, Panel B, we also observe that this phenomenon is more pronounced when the target is private than when it is public. This is consistent with the "bounded rationality" hypothesis defended in the previous section: when the target is publicly listed, information about its true value is cheaper to come by (the market quotes a price). As a result, it is easier to make the right estimate.

## III.2 Value loss in diversifying asset acquisitions

The fallacy of using inadequate discount rates is expected to have implications for bidder abnormal returns around the announcement of diversifying acquisitions. Whenever bidders use too high a discount rate, they are more likely to undervalue their targets and therefore more likely to propose an offer price for the target's assets below fair value. Shareholders of the bidder should thus perceive a bid from a high beta bidder for a low beta target as relatively better news, since it reduces the likelihood of overpaying for the target. Conversely, a low industry-level beta bidder should have a tendency to overvalue high beta assets. Hence, the bid announcement from a low industry-level asset beta company for a high beta industry asset should be perceived as bad news by stock markets because the bidder is paying too much. We thus expect bidder abnormal returns around transactions to be significantly higher whenever the bidder's WACC is higher than that of the target.

[Figure 2 about here]

In Figure 2, we plot the mean cumulative abnormal returns of bidders around the announcement of diversifying asset acquisitions conditional on whether the bidder's WACC is lower or higher than that of the target. Abnormal returns are calculated as market adjusted returns on the respective event day. We use the CRSP Value Weighted Index as the market benchmark. For both categories of deals, we first see that announcement returns are positive: this is consistent with Bradley and Sundaram (2006) who find that announcement returns for acquirers of private firms (the vast majority of the deals in our sample) are positive and statistically significant (see also Betton et al. (2008)). More importantly to us, evidence from Figure 2 suggests that the market welcomes bids involving low beta bidders and high beta targets less favorably than bids with high beta bidders and low beta targets. This confirms our hypothesis that low beta bidder tend to overbid for high beta targets.

In order to formally test whether this difference is statistically significant, we regress both the abnormal return on the announcement day (AR(0)), as well as the seven day cumulative abnormal return surrounding the announcement (CAR(3,3)) on a dummy variable indicating whether the bidder's WACC exceeds that of the target. The results from regressions in which the abnormal return serves as the dependent variable are reported in table IX. Table X reports the regression results for the cumulative abnormal return (CAR(-3,3)). In all specifications, we also include year dummies to capture the potential impact of merger waves on announcement returns and control for the size of the transaction, which we calculate as the natural log of the deal value as disclosed by SDC. In order to control for deals that are announced on the same day, standard errors are clustered by announcement dates. In unreported regressions we cluster standard errors by week, month and year, which does not affect our results.

[Table IX and Table X about here.]

Column (1) of table IX establishes the main result by showing that bidder abnormal returns on the announcement day of transactions involving low beta bidders and high beta targets are significantly lower than transactions involving high industry-level beta bidders and low industry-level beta targets. The coefficient estimate for the dummy variable is equal to 0.00416 (t-stat of 2.95). This suggests that when the bidder has a lower beta than the target, 0.4% of acquirer value is lost compared to other bids of similar size (target size is the only control in column (1)). Given that bidders have equity value of about $2bn on average, this estimate translates into an estimated excess payment of about $8m, or 4% of the average target value.

To control for observable differences in transactions, that could be correlated with our main variable, we then include known determinants of acquirer's announcement returns. In column (2), we seek to control for the fact that some overvalued acquirers may seek to create value by purchasing undervalued targets. The announcement of such a transaction may be interpreted by the market as a signal of overvaluation which would reduce the acquirer stock price. This control is not statistically significant and does not affect our estimate. In column (3), we control for the fact that the acquisition of private targets leads to larger announcement returns (Bradley and Sundaram (2006)): consistently with this, the "Target Private" dummy comes out positive and significant, but our estimate remains unchanged. The relative size of the target (inserted in column (5)) is also significant and positive, but has no impact on our estimate. All in all, some observable controls are statistically significant, but our estimate resists well.

Findings of table IX are confirmed by results reported in table X, which looks at cumulative returns 7 days around the announcement date (CAR(3,3)). These estimates are larger: The coefficient estimate for the dummy variable capturing differences in the cost of capital between the target and the bidder is now equal, across specifications to about 0.7% of the acquirer's value. This is in line with the idea that announcements take several days to be impounded into prices. For the average acquirer, whose market capitalization is about $2bn, this suggests a value loss of about $14m, or 7% of the value of the average target (whose average value is approximately $200m).

# IV Conclusion

Survey evidence suggests that many firms use a firm-wide discount rate to evaluate projects (Graham and Harvey (2001)). The prevalence of this "WACC fallacy" implies that firms tend to bias investment upward for divisions that have a higher industry beta than the firm's core division. This paper provides a direct test of this prediction using segment-level accounting data. We find a robust positive relationship between division-level investment and the spread between its industry beta and the beta of the firm's core division. Using unrelated data on mergers and acquisitions, we also find that the acquirer's stock-price reaction to the announcement of an acquisition is lower when the target has a higher beta than the acquirer. The prevalence of the "WACC fallacy" among corporations seems consistent with managerial bounded rationality. It is actually not so simple to explain to a non-finance executive why it is logically flawed for a firm to discount a risky project using its own cost of capital. The costs associated with using multiple discount rates might, however, not be purely cognitive or computational: They might also be organizational, as the use of multiple discount rates might increase the scope for politicking and gaming of the capital budgeting process in a hierarchy, in the spirit of Rajan et al. (2000); Scharfstein and Stein (2000).

# References

Baker, M., Ruback, R., and Wurgler, J. (2007). Behavioral Corporate Finance. *Handbook of corporate finance: Empirical corporate finance*, 1:145–86.

Berger, P. and Ofek, E. (1995). Diversification's effect on firm value. *Journal of Financial Economics*, 37(1):39–65.

Bertrand, M. and Schoar, A. (2003). Managing with Style: The Effect of Managers on Firm Policies. *Quarterly Journal of Economics*, 118(4):1169–1208.

Betton, S., Eckbo, B., and Thorburn, K. (2008). Corporate Takeovers. *Handbook of Corporate Finance: Empirical Corporate Finance*, 2(15):291–430.

Bierman, J. H. (1993). Capital budgeting in 1992: a survey. *Financial Management*, 22(3):24.

Bradley, M. and Sundaram, A. (2006). Acquisition and performance: A reassessment of the evidence. Working Paper, Fuqua School of Business, Duke University.

Brealey, R., Myers, S., and Allen, F. (2005). *Principles of Corporate Finance, McGraw-Hill, New York*. McGraw-Hill, New-York, NY.

Fama, E. and French, K. (1997). Industry costs of equity. *Journal of Financial Economics*, 43(2):153–193.

Fan, J. and Lang, L. (2000). The Measurement of Relatedness: An Application to Corporate Diversification. *Journal of Business*, 73(4):629–660.

Gabaix, X. (2010). A Sparsity-Based Model of Bounded Rationality. Working Paper, Stern School of Business, New York University.

Gompers, P., Ishii, J., and Metrick, A. (2003). Corporate Governance and Equity Prices. *Quarterly Journal of Economics*, 118(1):107–155.

Gordon, M. and Shapiro, E. (1956). Capital Equipment Analysis: The Required Rate of Profit. *Management Science*, 3(1):102–110.

Graham, J. and Harvey, C. (2001). The theory and practice of corporate finance: evidence from the field. *Journal of Financial Economics*, 60(2-3):187–243.

Graham, J., Harvey, C., and Puri, M. (2010). Capital Allocation and Delegation of Decision-Making Authority within Firms. Working Paper, Fuqua School of Business, Duke University.

Grinblatt, M. and Titman, S. (2002). *Financial Markets and Corporate Strategy.* McGraw-Hill, New-York, NY.

Kaplan, S. and Zingales, L. (1997). Do Investment-Cash Flow Sensitivities Provide Useful Measures of Financing Constraints? *Quarterly Journal of Economics*, 112(1):169–215.

Lamont, O. (1997). Cash Flow and Investment: Evidence from Internal Capital Markets. *Journal of Finance*, 52(1):83–109.

Landier, A. and Thesmar, D. (2009). Financial Contracting with Optimistic Entrepreneurs. *Review of Financial Studies*, 22(1):117.

Malmendier, U. and Tate, G. (2005). CEO Overconfidence and Corporate Investment. *The Journal of Finance*, 60(6):2661–2700.

Malmendier, U. and Tate, G. (2008). Who makes acquisitions? CEO overconfidence and the market's reaction. *Journal of Financial Economics*, 89(1):20–43.

Modigliani, F. and Miller, M. (1958). The Cost of Capital, Corporation Finance and the Theory of Investment. *The American Economic Review*, 48(3):261–297.

Montgomery, C. and Wernerfelt, B. (1988). Diversification, Ricardian rents, and Tobin's q. *The RAND Journal of Economics*, 19(4):623–632.

Morck, R., Shleifer, A., and Vishny, R. (1990). Do Managerial Objectives Drive Bad Acquisitions? *Journal of Finance*, 45(1):31–48.

Ozbas, O. and Scharfstein, D. (2010). Evidence on the Dark Side of Internal Capital Markets. *Review of Financial Studies*, 23(2):581.

Poterba, J. and Summers, L. (1995). A CEO survey of US companies' time horizons and hurdle rates. *Sloan Management Review*, 37(1):43.

Rajan, R., Servaes, H., and Zingales, L. (2000). The Cost of Diversity: The Diversification Discount and Inefficient Investment. *The Journal of Finance*, 55(1):35–80.

Scharfstein, D. and Stein, J. (2000). The Dark Side of Internal Capital Markets: Divisional Rent-Seeking and Inefficient Investment. *The Journal of Finance*, 55(6):2537–2564.

Shin, H. and Stulz, R. (1998). Are Internal Capital Markets Efficient? *Quarterly Journal of Economics*, 113(2):531–552.

# Figures

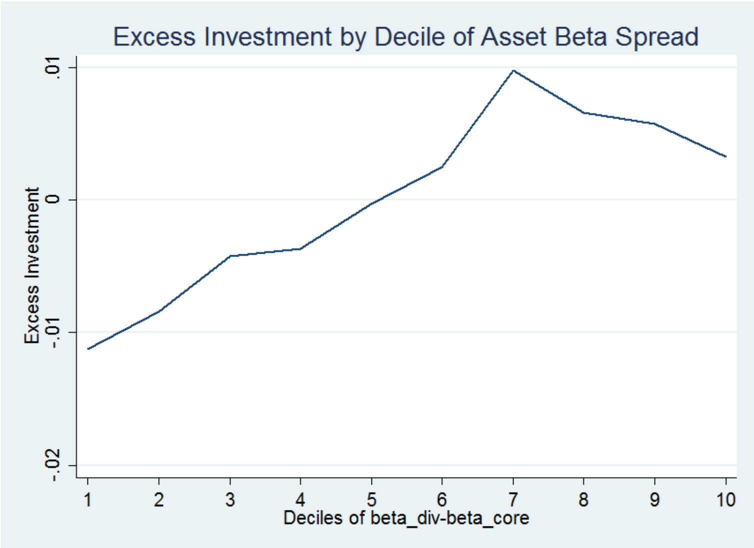


**Figure 1. Monotonicity of Excess Investment.** We fit an Investment equation for all standalone firms. The specification we chose is $Inv_{i,t+1} = f(Q_{it}^{IND}, size_{it}, cashflow_{it}) + \epsilon_{it}$. In the case of standalone firms, investment, Tobin's $q$, size and cash flows are equal at the firm and the division level $i$ and $j$. $Q_{i,t}^{IND}$ is the industry level Tobin's $q$ of the standalone firm, $size_{it}$ the natural logarithm of the firm's assets, and $cashflow_{it}$ the firm wide cash flow. We use the estimated coefficients in order to predict the investment rate for all non-core divisions of conglomerates. In predicting the non-core division investment $\hat{Inv}_{j,t+1}$, we use the firm wide $cashflow_{it}$, the natural log of the division's assets $size_{jt}$ as well as the industry level Tobin's $q$ of the industry the non-core division belongs to, i.e. $Q_{jt}^{IND}$. Excess investment for non-core divisions is the difference between observed and predicted investment, that is $\hat{\epsilon}_{jt} = Inv_{jt} - \hat{Inv}_{jt}$. The graph plots the average predicted excess investment $\hat{\epsilon}_{jt}$ by deciles of $\beta_{DIV}^{A} - \beta_{CORE}^{A}$.

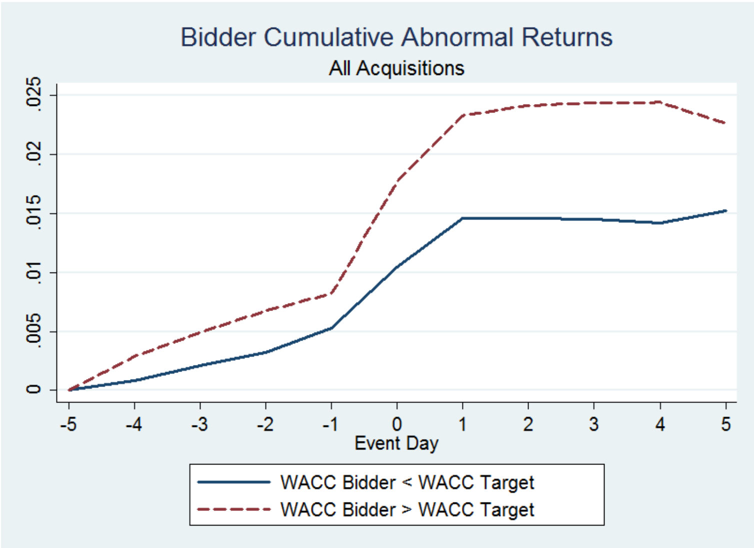


**Figure 2. Bidder Cumulative Abnormal Returns (All Acquisitions).** Mean cumulative abnormal returns of the bidder around the announcement of an asset acquisition conditional on whether the WACC of the bidder exceeds that of the target. Only diversifying acquisitions in which the acquiring firm's Fama and French (1997) industry differs from that of the target are considered. Abnormal returns are market adjusted and calculated as the difference between the acquiring firm's daily stock return and the CRSP Value Weighted Market Return on the respective event day. All transactions between 1988 and 2007 fulfilling the sample construction conditions are considered (N=6,206).

# Tables

**Table I**

**Firm-Level Descriptive Statistics**

This table reports descriptive statistics of the employed firm-level variables. Variables based on data from Compustat and CRSP are observed for the period of 1987 to 2007. CEO related variables from Compustat Execucomp are observed from 1992 to 2007 only. All variables are defined in the Appendix, except for betas, which are defined in the text (see section I.3). Standalone firms are firms with activities concentrated in a single FF48 industry, whereas Conglomerate Firms are diversified across at least two different FF48 sectors. All variables are winsorized at the first and 99th percentile.

| | **Standalone Firms** | | | | | |
|---|---|---|---|---|---|---|
| | Mean | Median | SD | P25 | P75 | N |
| Firm Cash Flow$_t$ | 0.03 | 0.06 | 0.17 | -0.01 | 0.12 | 107784 |
| Firm Size$_t$ | 4.30 | 4.28 | 2.46 | 2.63 | 5.94 | 122120 |
| Firm Age$_t$ | 2.04 | 2.08 | 0.98 | 1.39 | 2.77 | 119087 |
| Firm Investment$_t$ | 0.06 | 0.04 | 0.07 | 0.01 | 0.08 | 118351 |
| Leverage$_t$ | 0.19 | 0.09 | 0.24 | 0.00 | 0.30 | 121023 |
| Sales$_t$ | 3.94 | 4.10 | 2.66 | 2.35 | 5.75 | 122178 |
| Sales Growth$_t$ | 0.13 | 0.09 | 0.37 | -0.04 | 0.26 | 105336 |
| $Q_{FIRM,t}$ | 1.88 | 1.42 | 1.27 | 1.04 | 2.27 | 93558 |
| $\beta^A_{AVERAGE,t}$ | 0.65 | 0.62 | 0.34 | 0.41 | 0.85 | 106541 |
| CEO Share Ownership | 5.20 | 1.58 | 8.59 | 0.52 | 5.70 | 11463 |
| | **Conglomerate Firms** | | | | | |
| | Mean | Median | SD | P25 | P75 | N |
| Firm Cash Flow$_t$ | 0.06 | 0.07 | 0.10 | 0.04 | 0.11 | 16185 |
| Firm Size$_t$ | 5.93 | 6.01 | 2.44 | 4.14 | 7.73 | 16543 |
| Firm Age$_t$ | 2.79 | 3.04 | 0.93 | 2.20 | 3.53 | 16442 |
| Firm Investment$_t$ | 0.06 | 0.05 | 0.05 | 0.03 | 0.07 | 16252 |
| Leverage$_t$ | 0.23 | 0.20 | 0.20 | 0.07 | 0.33 | 16502 |
| Number of Divisions$_t$ | 2.56 | 2.00 | 0.87 | 2.00 | 3.00 | 16543 |
| Sales$_t$ | 5.84 | 6.04 | 2.41 | 4.20 | 7.57 | 16543 |
| Sales Growth$_t$ | 0.10 | 0.07 | 0.26 | -0.02 | 0.18 | 15749 |
| Firm Focus$_t$ | 0.73 | 0.74 | 0.17 | 0.59 | 0.88 | 16460 |
| $Q_{FIRM,t}$ | 1.49 | 1.22 | 0.84 | 1.01 | 1.65 | 14033 |
| $SD(Q_{DIV,t})/Q_{FIRM,t}$ | 0.23 | 0.18 | 0.19 | 0.09 | 0.32 | 13994 |
| $\beta^A_{AVERAGE,t}$ | 0.56 | 0.55 | 0.24 | 0.41 | 0.69 | 15831 |
| CEO Share Ownership | 5.71 | 1.60 | 9.94 | 0.54 | 5.80 | 1633 |

**Table II**

## Non-Core Division-Level Descriptive Statistics

This table reports summary statistics of variables at the non-core division-level for the sample period of 1987–2007. Non-core divisions are divisions that do not have the highest sales within the Conglomerate firm. Divisions are defined by grouping together segments operating in the same Fama and French (1997) industry category. All variables are winsorized at the first and 99th percentile and are defined in the Appendix.

| | Mean | Median | SD | P25 | P75 | N |
|---|---|---|---|---|---|---|
| Capx/Assets | 0.06 | 0.04 | 0.07 | 0.01 | 0.09 | 23871 |
| Divison Size$_t$ | 4.07 | 4.26 | 2.54 | 2.44 | 5.87 | 23269 |
| $Q_{DIV,t}$ | 1.72 | 1.63 | 0.42 | 1.43 | 1.93 | 23858 |
| $Q_{CORE,t}$ | 1.68 | 1.61 | 0.42 | 1.41 | 1.92 | 23831 |
| $Q_{DIV,t} - Q_{CORE,t}$ | 0.03 | 0.03 | 0.51 | -0.27 | 0.33 | 23818 |
| $Q_{DIV,t} - Q_{FIRM,t}$ | 0.26 | 0.38 | 0.84 | 0.02 | 0.70 | 20163 |
| $\beta^E_{DIV,t}$ | 1.08 | 1.09 | 0.28 | 0.92 | 1.25 | 23871 |
| $\beta^E_{CORE,t}$ | 1.04 | 1.08 | 0.31 | 0.88 | 1.23 | 23871 |
| $\beta^A_{DIV,t}$ | 0.56 | 0.54 | 0.29 | 0.36 | 0.72 | 23871 |
| $\beta^A_{CORE,t}$ | 0.55 | 0.53 | 0.27 | 0.37 | 0.69 | 23871 |
| $\beta^A_{DIV,t} - \beta^A_{CORE,t}$ | 0.01 | 0.01 | 0.35 | -0.21 | 0.22 | 23871 |
| Investment Core Division$_t$ | 0.07 | 0.05 | 0.09 | 0.02 | 0.09 | 18715 |
| Divison Sales Growth$_t$ | 0.46 | 0.06 | 13.29 | -0.06 | 0.20 | 17786 |
| Divison Industry-Level Sales Growth$_t$ | 0.10 | 0.11 | 0.09 | 0.05 | 0.15 | 23871 |
| $V_{DIV,t}$ | 0.04 | 0.03 | 0.04 | 0.01 | 0.06 | 23871 |
| Relative Importance$_t$ | 0.31 | 0.24 | 0.27 | 0.09 | 0.49 | 23871 |

**Table III**

## Descriptive Statistics of Deal, Bidder and Target Characteristics

This table shows descriptive statistics of deal, bidder and target characteristics for our sample of 6,206 diversifying transactions. A diversifying transaction is a completed merger or acquisition in which the bidder has successfully sought control of a target not belonging to its own FF48 industry. $(\beta^A_{BIDDER} - \beta^A_{TARGET} > 0)$ indicates whether the difference between the bidder's and the target's asset betas is positive. $(Q_{BIDDER} - Q_{TARGET} > 0)$ is a dummy variable indicating whether the difference between the bidder's and the target's industry level Tobin's $q$'s is positive. $V_{TARGET}$ is the value of the transaction as disclosed by SDC (in Million US-\$). $E_{BIDDER}$ is the fiscal year end equity market value of the bidder in the year prior to the bid announcement (in Million US-\$). *Target private?* is a dummy variable indicating whether the target is a private company and *Tender Offer?* indicates whether the bidder sought control through the process of a tender offer. *All Cash?* is a dummy variable that takes on the value one when the consideration was entirely paid in cash whereas *All Equity?* takes on the value of one whenever the target's shareholders are entirely compensated with shares. *Multi-Division Acquirer?* takes on the value of one when the bidder's business activities are diversified across at least two multiple FF48 industry categories. *Hostile* and *Challenging Bid?* are two dummy variables indicating whether the bid's nature is hostile and whether there has been a challenging bid. $\beta^A_i$ is the industry level asset beta and $Q_i$ the industry-level Tobin's $q$.

Panel A: Deal Characteristics

| | **All Deals (N=6206)** | **Public Targets (N=656)** | **Private Targets (N=5500)** |
|---|---|---|---|
| $(\beta^A_{BIDDER} - \beta^A_{TARGET} > 0)$ | 0.41 | 0.46 | 0.40 |
| | (0.49) | (0.50) | (0.49) |
| $(Q_{BIDDER} - Q_{TARGET} > 0)$ | 0.54 | 0.48 | 0.55 |
| | (0.50) | (0.50) | (0.50) |
| $V_{TARGET}$ | 186.13 | 799.42 | 113.64 |
| | (1074.87) | (2977.51) | (442.42) |
| $E_{BIDDER}$ | 1917.26 | 5668.03 | 1473.92 |
| | (7718.58) | (14493.86) | (6321.64) |
| $V_{TARGET}/E_{BIDDER}$ | 0.41 | 0.39 | 0.42 |
| | (7.77) | (0.71) | (8.21) |
| Target private? | 0.89 | 0.00 | 1.00 |
| | (0.31) | (.) | (.) |
| Tender Offer? | 0.03 | 0.23 | 0.00 |
| | (0.17) | (0.42) | (.) |
| All Cash? | 0.31 | 0.41 | 0.30 |
| | (0.46) | (0.49) | (0.46) |
| All Equity? | 0.12 | 0.27 | 0.11 |
| | (0.33) | (0.44) | (0.31) |
| Multi-Division Acquirer? | 0.31 | 0.48 | 0.28 |
| | (0.46) | (0.50) | (0.45) |
| Hostile Bid? | 0.00 | 0.02 | 0.00 |
| | (0.05) | (0.12) | (0.02) |
| Challenging Bid? | 0.01 | 0.06 | 0.00 |
| | (0.09) | (0.24) | (0.04) |

Panel B: Bidder and Target Characteristics

| | **All Deals (N=6206)** | | | **Public Targets (N=656)** | | | **Private Targets (N=5500)** | | |
|---|---|---|---|---|---|---|---|---|---|
| | Bidder | Target | Diff | Bidder | Target | Diff | Bidder | Target | Diff |
| $\beta^A_i$ | 0.59 | 0.64 | -0.05*** | 0.68 | 0.70 | -0.02* | 0.58 | 0.63 | -0.05*** |
| | (0.40) | (0.34) | (0.40) | (0.36) | (0.33) | (0.39) | (0.40) | (0.34) | (0.40) |
| $Q_i$ | 1.87 | 1.86 | 0.01 | 1.89 | 1.91 | -0.03 | 1.87 | 1.86 | 0.01** |
| | (0.45) | (0.46) | (0.49) | (0.49) | (0.51) | (0.52) | (0.44) | (0.46) | (0.49) |

Standard deviations in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

**Table IV**

## Diversifying Transactions Sample by Calendar Year

This table shows the temporal distribution of the sample of diversifying mergers and acquisitions. Yearly means and standard deviations of the nominal deal value (In Million US-$) are calculated by relying on the deal value as disclosed by SDC.

| | # of Acquisitions | Mean Value (Million US-$) | SD |
|---|---|---|---|
| 1988 | 98 | 218.52 | 614.30 |
| 1989 | 133 | 195.57 | 666.76 |
| 1990 | 121 | 78.94 | 317.95 |
| 1991 | 109 | 47.72 | 83.77 |
| 1992 | 162 | 51.73 | 121.32 |
| 1993 | 234 | 56.36 | 152.75 |
| 1994 | 316 | 81.10 | 295.22 |
| 1995 | 332 | 153.09 | 1121.65 |
| 1996 | 467 | 126.55 | 609.68 |
| 1997 | 679 | 122.92 | 410.24 |
| 1998 | 740 | 138.86 | 526.48 |
| 1999 | 428 | 264.66 | 1231.43 |
| 2000 | 350 | 371.23 | 1772.37 |
| 2001 | 222 | 181.40 | 422.21 |
| 2002 | 255 | 142.14 | 453.85 |
| 2003 | 267 | 168.51 | 534.73 |
| 2004 | 279 | 193.12 | 424.56 |
| 2005 | 364 | 401.60 | 2941.85 |
| 2006 | 367 | 310.91 | 1532.03 |
| 2007 | 283 | 249.94 | 581.31 |
| Total | 6206 | 186.13 | 1074.87 |

**Table V**

## Non-Core Division-Level Investment Regressions

Using business segment data from Compustat (1987–2007), we construct industry-level divisions by aggregating segment data by Fama and French (1997) industries. A division is defined as the bundle of a firm's segments operating in the same FF48 industry. The regressions are run on divisions which do not have the highest sales in the conglomerate (non-core divisions). The dependent variable *Capx/Assets* is division-level capital expenditures in period $t+1$ scaled by division assets in period $t$. $\beta^A_{CORE,t}$ is the industry-level asset beta of the core-division (i.e. the division with the highest sales). $\beta^A_{DIV,t}$ is the industry-level asset beta of the non-core division. $Q_{DIV,t}$ is the division's industry-level Tobin's $q$. $Q_{CORE,t}$ is the industry-level Tobin's $q$ of the division with the highest sales in the conglomerate. Both are calculated for a sample of standalone firms from the same industry. *Firm Cash Flow* is the firm's cash flow scaled by total assets. *Division Size* is the logarithm of division sales and *Firm Size* is the log of total assets. *Firm Age* is the logarithm of the current year plus one minus the year in which the firm first appeared in the Compustat North America database. *Firm Focus* is the ratio of the firm's core division sales to total sales. Sales growth is the average sales growth observed in a FF48 industry. *Medium* and *High Sales Growth* indicate whether lagged industry level sales growth of the non-core division falls in the second, or third tercile of lagged industry level sales growth.

| | (1) Capx/Assets | (2) Capx/Assets | (3) Capx/Assets | (4) Capx/Assets | (5) Capx/Assets | (6) Capx/Assets |
|---|---|---|---|---|---|---|
| $\beta^A_{DIV,t} - \beta^A_{CORE,t}$ | 0.0181*** | 0.0163*** | 0.0155*** | 0.0155*** | | 0.0120*** |
| | (8.13) | (6.85) | (6.56) | (6.41) | | (3.74) |
| $\beta^A_{CORE,t}$ | | | | | -0.0140*** | |
| | | | | | (-4.22) | |
| $\beta^A_{DIV,t}$ | | | | | 0.0167*** | |
| | | | | | (5.22) | |
| Medium Sales Growth $\times$ ($\beta^A_{DIV,t} - \beta^A_{CORE,t}$) | | | | | | 0.0024 |
| | | | | | | (0.61) |
| High Sales Growth $\times$ ($\beta^A_{DIV,t} - \beta^A_{CORE,t}$) | | | | | | 0.0088** |
| | | | | | | (2.18) |
| $Q_{DIV,t}$ | | 0.0051** | 0.0048** | 0.0048** | 0.0043* | 0.0045** |
| | | (2.46) | (2.30) | (2.28) | (1.96) | (2.14) |
| $Q_{CORE,t}$ | | -0.0016 | -0.0030 | -0.0029 | -0.0034 | -0.0028 |
| | | (-0.76) | (-1.42) | (-1.36) | (-1.56) | (-1.32) |
| Firm Cash Flow$_t$ | | 0.0914*** | 0.0918*** | 0.0892*** | 0.0893*** | 0.0893*** |
| | | (12.05) | (11.33) | (10.98) | (10.99) | (10.99) |
| Divison Size$_t$ | | | 0.0016*** | 0.0021*** | 0.0020*** | 0.0021*** |
| | | | (2.63) | (3.16) | (3.08) | (3.16) |
| Firm Size$_t$ | | | -0.0007 | -0.0009 | -0.0008 | -0.0008 |
| | | | (-1.00) | (-1.26) | (-1.14) | (-1.23) |
| Firm Age$_t$ | | | -0.0015 | -0.0015 | -0.0015 | -0.0015 |
| | | | (-1.54) | (-1.51) | (-1.51) | (-1.51) |
| Firm Focus$_t$ | | | | 0.0087 | 0.0088* | 0.0088* |
| | | | | (1.63) | (1.65) | (1.65) |
| Observations | 23874 | 23400 | 22729 | 22362 | 22362 | 22362 |
| $R^2$ | 0.019 | 0.034 | 0.035 | 0.036 | 0.036 | 0.036 |

All regressions include year fixed effects.
$t$ statistics in parentheses. Standard errors clustered at the firm level.
$^*$ $p < 0.10$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$

**Table VI**

## Non-Core Division-Level Investment Regressions: Robustness Checks

This table shows robustness checks on the main specification of non-core division-level investment regressions used in the previous tables. $\beta^A_{CORE,t}$ is the industry-level asset beta of the core-division (i.e. the division with largest sales). $\beta^A_{DIV,t}$ is the industry-level asset beta of the non-core division. $\beta^A_{AVERAGE,t}$ is a firm wide average beta and is calculated as the weighted average of division-level asset betas, where the weights correspond to the ratio of division-level to total firm assets. $Q_{DIV,t}$ and $Q_{CORE,t}$ are the industry level Tobin's $q$ of the non-core and core divisions respectively. $Q_{DIV,t} - Q_{FIRM,t}$ is the gap between the industry-level Tobin's $q$ of the division and the firm-wide Tobin's $q$. $SD(Q_{DIV,t})/Q_{FIRM,t}$ is the standard deviation of a firm's division-level Tobin's $q$'s (core and non-core divisions) in a given year scaled by the overall Tobin's $q$ of the firm. *Investment Core Division* is calculated as Capx of the core division in period $t+1$ scaled by the core division's assets in period $t$. All other variables are as previously defined.

| | (1) Capx/Assets | (2) Capx/Assets | (3) Capx/Assets | (4) Capx/Assets | (5) Capx/Assets | (6) Capx/Assets | (7) Capx/Assets |
|---|---|---|---|---|---|---|---|
| $\beta^A_{CORE,t}$ | | -0.0193*** | -0.0145*** | -0.0163*** | -0.0150*** | -0.0079** | 0.0016 |
| | | (-3.43) | (-4.11) | (-4.63) | (-4.54) | (-2.41) | (0.34) |
| $\beta^A_{AVERAGE,t}$ | -0.0129*** | 0.0075 | | | | | |
| | (-2.85) | (0.99) | | | | | |
| $\beta^A_{DIV,t}$ | 0.0209*** | 0.0168*** | 0.0158*** | 0.0161*** | 0.0174*** | | 0.0173*** |
| | (6.07) | (4.53) | (4.55) | (4.67) | (5.44) | | (4.19) |
| $Q_{DIV,t} - Q_{FIRM,t}$ | | | -0.0076*** | | | | |
| | | | (-5.60) | | | | |
| $SD(Q_{DIV,t})/Q_{FIRM,t}$ | | | | -0.0146*** | | | |
| | | | | (-3.33) | | | |
| Investment Core Division$_t$ | | | | 0.0887*** | 0.0897*** | 0.0803*** | 0.0063 |
| | | | | (6.51) | (6.76) | (6.76) | (0.58) |
| $Q_{DIV,t}$ | 0.0042* | 0.0041* | 0.0099*** | 0.0058** | 0.0048** | | 0.0077*** |
| | (1.89) | (1.87) | (3.69) | (2.43) | (2.17) | | (2.79) |
| $Q_{CORE,t}$ | -0.0045** | -0.0026 | -0.0071*** | -0.0036 | -0.0040* | -0.0029 | -0.0001 |
| | (-2.07) | (-1.21) | (-2.89) | (-1.51) | (-1.85) | (-1.36) | (-0.04) |
| Firm Cash Flow$_t$ | 0.0937*** | 0.0929*** | 0.0860*** | 0.0814*** | 0.0815*** | 0.0755*** | 0.0727*** |
| | (12.18) | (12.10) | (9.89) | (9.42) | (10.36) | (9.71) | (7.48) |
| Divison Size$_t$ | | | 0.0018** | 0.0020*** | 0.0023*** | 0.0021*** | 0.0028*** |
| | | | (2.47) | (2.72) | (3.51) | (3.08) | (3.02) |
| Firm Size$_t$ | | | -0.0005 | -0.0007 | -0.0010 | -0.0007 | -0.0085*** |
| | | | (-0.60) | (-0.88) | (-1.47) | (-0.97) | (-4.17) |
| Firm Focus$_t$ | -0.0003 | -0.0003 | 0.0066 | 0.0060 | 0.0073 | 0.0081* | 0.0268*** |
| | (-0.06) | (-0.06) | (1.14) | (1.08) | (1.41) | (1.71) | (3.60) |
| Firm Age$_t$ | -0.0008 | -0.0007 | -0.0022* | -0.0021* | -0.0013 | -0.0011 | 0.0013 |
| | (-0.85) | (-0.78) | (-1.84) | (-1.75) | (-1.31) | (-1.13) | (0.44) |
| Observations | 22916 | 22916 | 18999 | 18738 | 22079 | 22090 | 22079 |
| $R^2$ | 0.034 | 0.035 | 0.043 | 0.047 | 0.044 | 0.151 | 0.379 |
| Year Fixed Effects | YES | YES | YES | YES | YES | NO | YES |
| Division Industry*Year Fixed Effects | NO | NO | NO | NO | NO | YES | NO |
| Firm Fixed Effects | NO | NO | NO | NO | NO | NO | YES |

$t$ statistics in parentheses. Standard errors clustered at the firm level.
$^{*}$ $p < 0.10$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$

**Table VII**

## Vertical Integration of Non-Core and Core Division

$V_{DIV,t}$ measures the extent to which the industry of the non-core division and the industry of the core division exchange production inputs. It is the average of (i) the fraction of the non-core division's industry output that is sold to the industry of the core division and (ii) the fraction of the non-core division's industry inputs that comes from the core division. Fan and Lang (2000) interpret this measure as a proxy for the opportunity for vertical integration between two industries. High values of $V_{DIV,t}$ indicate that both industries exchange significant amounts of inputs while low values indicate vertical unrelatedness. *Medium* and *High* $V_{DIV,t}$ are dummy variables indicating whether $V_{DIV,t}$ falls in the second or third tercile.

| | (1)<br>Capx/Assets | (2)<br>Capx/Assets | (3)<br>Capx/Assets | (4)<br>Capx/Assets |
|---|---|---|---|---|
| $\beta^A_{DIV,t} - \beta^A_{CORE,t}$ | 0.0155*** | 0.0158*** | 0.0140*** | 0.0131*** |
| | (6.39) | (3.86) | (3.54) | (3.26) |
| Medium $V_{DIV,t} \times (\beta^A_{DIV,t} - \beta^A_{CORE,t})$ | | -0.0082 | -0.0066 | -0.0033 |
| | | (-1.57) | (-1.28) | (-0.63) |
| High $V_{DIV,t} \times (\beta^A_{DIV,t} - \beta^A_{CORE,t})$ | | 0.0060 | 0.0078 | 0.0065 |
| | | (1.06) | (1.39) | (1.05) |
| $Q_{CORE,t}$ | -0.0027 | -0.0024 | -0.0051** | -0.0067** |
| | (-1.23) | (-1.12) | (-2.27) | (-2.44) |
| Medium $V_{DIV,t} \times Q_{CORE,t}$ | | | 0.0036*** | 0.0088** |
| | | | (3.29) | (2.42) |
| High $V_{DIV,t} \times Q_{CORE,t}$ | | | 0.0047*** | 0.0037 |
| | | | (4.16) | (0.94) |
| $Q_{DIV,t}$ | 0.0050** | 0.0046** | 0.0046** | 0.0061** |
| | (2.36) | (2.13) | (2.17) | (2.13) |
| Medium $V_{DIV,t} \times Q_{DIV,t}$ | | | | -0.0054 |
| | | | | (-1.47) |
| High $V_{DIV,t} \times Q_{DIV,t}$ | | | | 0.0010 |
| | | | | (0.24) |
| Firm Cash Flow$_t$ | 0.0894*** | 0.0895*** | 0.0898*** | 0.0898*** |
| | (10.95) | (10.96) | (11.01) | (10.99) |
| Divison Size$_t$ | 0.0021*** | 0.0021*** | 0.0019*** | 0.0020*** |
| | (3.15) | (3.13) | (2.90) | (2.92) |
| Firm Size$_t$ | -0.0009 | -0.0009 | -0.0006 | -0.0006 |
| | (-1.25) | (-1.24) | (-0.84) | (-0.85) |
| Firm Age$_t$ | -0.0015 | -0.0014 | -0.0013 | -0.0013 |
| | (-1.46) | (-1.42) | (-1.29) | (-1.29) |
| Firm Focus$_t$ | 0.0086 | 0.0085 | 0.0072 | 0.0071 |
| | (1.61) | (1.59) | (1.35) | (1.35) |
| Observations | 22285 | 22285 | 22285 | 22285 |
| $R^2$ | 0.036 | 0.037 | 0.039 | 0.039 |

$t$ statistics in parentheses. Standard errors clustered at the firm level.
$^{*}$ $p < 0.10$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$

**Table VIII**

## Evidence Consistent with Bounded Rationality

Column (1) includes interaction terms between dummy variables for the three distinct sub-periods (1992-1996), (1997–2001) and (2002–2007) of the sample period as well as $\beta^A_{DIV,t} - \beta^A_{CORE,t}$. *Relative Importance* is a measure of a division's organizational importance. It is calculated as non-core-division sales scaled by the core division's sales. *Medium* and *High Relative Importance* are dummy variables equaling one whenever the observed relative importance of the divisions falls into the second respectively third tercile. Non-core divisions included in the third tercile exhibit high organizational importance within the conglomerate firm in the sense of having sales almost as high as the core division. *Diversity of* $\beta^A_{i,t}$ is the within-firm standard deviation of divisional asset betas in a given year. The standard deviation is calculated for all divisions, i.e. core and non-core divisions. *Medium* and *High Diversity of* $\beta^A_{i,t}$ are dummy variables indicating whether the within-firm standard deviation of asset betas falls into the second or third tercile. *High CEO Ownership* is a dummy variable indicating whether CEO equity ownership exceeds 1%. All other variables are as previously defined.

| | (1)<br>Capx/Assets | (2)<br>Capx/Assets | (3)<br>Capx/Assets | (4)<br>Capx/Assets |
|---|---|---|---|---|
| $\beta^A_{DIV,t} - \beta^A_{CORE,t}$ | 0.0264*** | 0.0185*** | 0.0302*** | 0.0321** |
| | (5.47) | (4.73) | (3.24) | (1.96) |
| (1992-1996) × ($\beta^A_{DIV,t} - \beta^A_{CORE,t}$) | -0.0037 | | | |
| | (-0.68) | | | |
| (1997-2001) × ($\beta^A_{DIV,t} - \beta^A_{CORE,t}$) | -0.0110* | | | |
| | (-1.82) | | | |
| (2002-2007) × ($\beta^A_{DIV,t} - \beta^A_{CORE,t}$) | -0.0193*** | | | |
| | (-3.41) | | | |
| Medium Relative Importance × ($\beta^A_{DIV,t} - \beta^A_{CORE,t}$) | | 0.0002 | | |
| | | (0.05) | | |
| High Relative Importance × ($\beta^A_{DIV,t} - \beta^A_{CORE,t}$) | | -0.0097** | | |
| | | (-1.97) | | |
| Medium Diversity of $\beta^A_{i,t}$ × ($\beta^A_{DIV,t} - \beta^A_{CORE,t}$) | | | -0.0018 | |
| | | | (-0.19) | |
| High Diversity of $\beta^A_{i,t}$ × ($\beta^A_{DIV,t} - \beta^A_{CORE,t}$) | | | -0.0184** | |
| | | | (-1.97) | |
| High Ownership × ($\beta^A_{DIV,t} - \beta^A_{CORE,t}$) | | | | -0.0217*** |
| | | | | (-2.67) |
| $log(MarketCap)$ × ($\beta^A_{DIV,t} - \beta^A_{CORE,t}$) | | | | -0.0021 |
| | | | | (-1.15) |
| $Q_{DIV,t}$ | 0.0040* | 0.0046** | 0.0047** | 0.0000 |
| | (1.85) | (2.17) | (2.22) | (0.01) |
| $Q_{CORE,t}$ | -0.0020 | -0.0028 | -0.0027 | -0.0039 |
| | (-0.90) | (-1.31) | (-1.25) | (-1.02) |
| Firm Cash Flow$_t$ | 0.0896*** | 0.0897*** | 0.0893*** | 0.0953*** |
| | (11.03) | (11.05) | (10.99) | (3.99) |
| Divison Size$_t$ | 0.0020*** | 0.0021*** | 0.0021*** | 0.0013 |
| | (3.09) | (3.15) | (3.17) | (0.80) |
| Firm Size$_t$ | -0.0009 | -0.0009 | -0.0009 | -0.0040*** |
| | (-1.27) | (-1.28) | (-1.28) | (-2.78) |
| Firm Age$_t$ | -0.0015 | -0.0015 | -0.0015 | 0.0013 |
| | (-1.53) | (-1.55) | (-1.55) | (0.48) |
| Firm Focus$_t$ | 0.0087 | 0.0084 | 0.0087 | 0.0031 |
| | (1.63) | (1.57) | (1.62) | (0.31) |
| Observations | 22362 | 22361 | 22362 | 5496 |
| $R^2$ | 0.037 | 0.036 | 0.037 | 0.037 |

All regressions include year fixed effects.
$t$ statistics in parentheses. Standard errors clustered at the firm level.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

## Table IX

## Bidder Abnormal Returns as a Function of the Spread in Industry-Level Asset Betas

This table shows cross-sectional regressions in which the bidder's abnormal return on the announcement day of a *diversifying* merger or acquisition is regressed on bidder, target and deal characteristics as well as measures of the target's and the bidder's cost of capital. Diversifying acquisitions are defined as transactions in which a bidder buys an asset belonging to an industry different from the bidder's industry. Industries are defined according to the 48 categories proposed by Fama and French (1997). Abnormal returns are market adjusted and calculated as the difference between the acquiring firm's daily stock return and the return on the CRSP Value Weighted Market Index. $\beta^A_{BIDDER}$ is the industry-level asset beta of the bidder in the year prior to the announcement of the acquisition. $\beta^A_{TARGET}$ is the industry-level asset beta of the target in the year preceding the transaction. $(\beta^A_{BIDDER} - \beta^A_{TARGET} > 0)$ is a dummy variable taking on a value of one when the difference between bidder and target industry-level asset betas is positive. $Q_{BIDDER}$ is the average industry-level market to book ratio of the bidder in the year preceding the transaction. $Q_{TARGET}$ is the average industry-level market to book ratio of the target. $(Q_{BIDDER} - Q_{TARGET} > 0)$ indicates whether the industry of the bidder offers better investment opportunities than the target's industry. *Target Private?* is a dummy variable indicating whether the target firm is a private company. *Tender Offer?* indicates whether the transaction is realized by means of a tender offer. $V_{TARGET}/E_{BIDDER}$ is the ratio of the transaction value and the equity market capitalization of the bidder at the end of the fiscal year prior to the acquisition announcement. *All Cash?* indicates whether the total value of consideration has been paid for entirely with cash, whereas *All Equity?* indicates whether only common stock has been used to pay for the acquisition. *Multi-division Acquirer?* is a dummy variable indicating whether the company's activities are diversified across more than one of the 48 Fama and French industries before the acquisition. *Hostile Bid?* is a dummy variable that takes on the value of one if the bid is hostile. *Challenging Bid?* is a dummy variable that equals one if a third party launched an offer for the target while the original bid was pending. All specifications are estimated on a sample of 6,206 deals between 1988 and 2007 fulfilling the sample construction criteria. All regressions include year dummies and standard errors are clustered by announcement dates.

| | (1) AR(0) | (2) AR(0) | (3) AR(0) | (4) AR(0) | (5) AR(0) | (6) AR(0) | (7) AR(0) | (8) AR(0) |
|---|---|---|---|---|---|---|---|---|
| $(\beta^A_{BIDDER} - \beta^A_{TARGET} > 0)$ | 0.00439*** | 0.00458*** | 0.00479*** | 0.00479*** | 0.00477*** | 0.00467*** | 0.00404*** | 0.00404*** |
| | (2.75) | (2.95) | (3.08) | (3.07) | (3.06) | (3.09) | (2.68) | (2.68) |
| $log(V_{TARGET})$ | -0.00239*** | -0.00239*** | -0.00199*** | -0.00199*** | -0.00210*** | -0.00211*** | -0.00227*** | -0.00228*** |
| | (-4.24) | (-4.24) | (-3.31) | (-3.28) | (-3.50) | (-3.46) | (-3.48) | (-3.49) |
| $(Q_{BIDDER} - Q_{TARGET} > 0)$ | | -0.000895 | -0.00107 | -0.00107 | -0.00118 | -0.00113 | -0.000594 | -0.000604 |
| | | (-0.62) | (-0.74) | (-0.74) | (-0.82) | (-0.78) | (-0.38) | (-0.39) |
| Target private? | | | 0.00668*** | 0.00668*** | 0.00647*** | 0.00688*** | 0.00725*** | 0.00724*** |
| | | | (2.86) | (2.82) | (2.73) | (2.82) | (2.96) | (2.93) |
| Tender Offer? | | | | 0.0000150 | 0.000132 | 0.000773 | 0.000372 | 0.000170 |
| | | | | (0.00) | (0.03) | (0.19) | (0.09) | (0.04) |
| $V_{TARGET}/E_{BIDDER}$ | | | | | 0.000492 | 0.000490 | 0.000493 | 0.000493 |
| | | | | | (1.32) | (1.32) | (1.32) | (1.32) |
| All Cash? | | | | | | -0.000263 | -0.000627 | -0.000621 |
| | | | | | | (-0.19) | (-0.45) | (-0.44) |
| All Equity? | | | | | | 0.00218 | 0.00238 | 0.00238 |
| | | | | | | (0.60) | (0.64) | (0.64) |
| Multi-Division Acquirer? | | | | | | | 0.00440** | 0.00439** |
| | | | | | | | (2.04) | (2.04) |
| Hostile Bid? | | | | | | | | 0.00369 |
| | | | | | | | | (0.36) |
| Challenging Bid? | | | | | | | | -0.0000904 |
| | | | | | | | | (-0.01) |
| Observations | 6206 | 6206 | 6206 | 6206 | 6206 | 6206 | 6206 | 6206 |
| Adjusted $R^2$ | 0.007 | 0.007 | 0.008 | 0.008 | 0.013 | 0.012 | 0.013 | 0.013 |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

$t$ statistics in parentheses
$^{*}$ $p < 0.10$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$

## Table X

## Bidder Cumulative Abnormal Returns as a Function of the Spread in Industry-Level Asset Betas

This table shows cross-sectional regressions in which seven day cumulative abnormal returns of bidders around announcements of *diversifying* mergers and acquisitions are regressed on bidder, target and deal characteristics as well as measures of the target's and the bidder's cost of capital. Diversifying acquisitions are defined as transactions in which a bidder buys an asset belonging to an industry different from the bidder's industry. Industries are defined according to the 48 categories proposed by Fama and French (1997). Abnormal returns are market adjusted and calculated as the difference between the acquiring firm's daily stock return and the return on the CRSP Value Weighted Market Index. $\beta^A_{BIDDER}$ is the industry-level asset beta of the bidder in the year prior to the announcement of the acquisition. $\beta^A_{TARGET}$ is the industry-level asset beta of the target in the year preceding the transaction. $(\beta^A_{BIDDER} - \beta^A_{TARGET} > 0)$ is a dummy variable taking on a value of one when the difference between bidder and target industry-level asset betas is positive. $V_{TARGET}$ is the deal value as disclosed by SDC. $Q_{BIDDER}$ is the average industry-level market to book ratio of the bidder in the year preceding the transaction. $Q_{TARGET}$ is the average industry-level market to book ratio of the target. $(Q_{BIDDER} - Q_{TARGET} > 0)$ indicates whether the industry of the bidder offers better investment opportunities than the target's industry. *Target Private?* is a dummy variable indicating whether the target firm is a private company. *Tender Offer?* indicates whether the transaction is realized by means of a tender offer. $V_{TARGET}/E_{BIDDER}$ is the ratio of the transaction value and the equity market capitalization of the bidder at the end of the fiscal year prior to the acquisition announcement. *All Cash?* indicates whether the total value of consideration has been paid for entirely with cash, whereas *All Equity?* indicates whether only common stock has been used to pay for the acquisition. *Multi-division Acquirer?* is a dummy variable indicating whether the company's activities are diversified across more than one of the 48 Fama and French industries before the acquisition. *Hostile Bid?* is a dummy variable that takes on the value of one if the bid is hostile. *Challenging Bid?* is a dummy variable that equals one if a third party launched an offer for the target while the original bid was pending. All specifications are estimated on a sample of 6,206 deals between 1988 and 2007 fulfilling the sample construction criteria. All regressions include year dummies and standard errors are clustered by announcement dates.

| | (1)<br>CAR(3,3) | (2)<br>CAR(3,3) | (3)<br>CAR(3,3) | (4)<br>CAR(3,3) | (5)<br>CAR(3,3) | (6)<br>CAR(3,3) | (7)<br>CAR(3,3) | (8)<br>CAR(3,3) |
|---|---|---|---|---|---|---|---|---|
| $(\beta^A_{BIDDER} - \beta^A_{TARGET} > 0)$ | 0.00818** | 0.00948*** | 0.00976*** | 0.00986*** | 0.00979*** | 0.00871*** | 0.00843** | 0.00837** |
| | (2.39) | (2.77) | (2.86) | (2.88) | (2.86) | (2.60) | (2.45) | (2.42) |
| $log(V_{TARGET})$ | -0.00279*** | -0.00280*** | -0.00227** | -0.00218** | -0.00236** | -0.00253** | -0.00260** | -0.00261** |
| | (-2.84) | (-2.85) | (-2.16) | (-2.08) | (-2.25) | (-2.40) | (-2.41) | (-2.42) |
| $(Q_{BIDDER} - Q_{TARGET} > 0)$ | | -0.00600* | -0.00624* | -0.00629* | -0.00645* | -0.00589* | -0.00565* | -0.00562* |
| | | (-1.82) | (-1.88) | (-1.90) | (-1.94) | (-1.78) | (-1.65) | (-1.65) |
| Target private? | | | 0.00901 | 0.00691 | 0.00667 | 0.00989 | 0.0101 | 0.00975 |
| | | | (1.57) | (1.09) | (1.06) | (1.55) | (1.57) | (1.50) |
| Tender Offer? | | | | -0.0104 | -0.0101 | -0.00736 | -0.00754 | -0.00710 |
| | | | | (-1.20) | (-1.17) | (-0.84) | (-0.86) | (-0.75) |
| $V_{TARGET}/E_{BIDDER}$ | | | | | 0.000861 | 0.000845 | 0.000847 | 0.000847 |
| | | | | | (1.39) | (1.39) | (1.40) | (1.40) |
| All Cash? | | | | | | 0.00223 | 0.00207 | 0.00206 |
| | | | | | | (0.70) | (0.65) | (0.64) |
| All Equity? | | | | | | 0.0173** | 0.0174** | 0.0174** |
| | | | | | | (2.40) | (2.42) | (2.41) |
| Multi-Division Acquirer? | | | | | | | 0.00196 | 0.00197 |
| | | | | | | | (0.52) | (0.52) |
| Hostile Bid? | | | | | | | | 0.0128 |
| | | | | | | | | (0.89) |
| Challenging Bid? | | | | | | | | -0.0105 |
| | | | | | | | | (-0.39) |
| Observations | 6206 | 6206 | 6206 | 6206 | 6206 | 6206 | 6206 | 6206 |
| Adjusted $R^2$ | 0.008 | 0.008 | 0.009 | 0.009 | 0.012 | 0.013 | 0.013 | 0.013 |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

$t$ statistics in parentheses.
$^{*}$ $p < 0.10$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$

# Appendix

## A Definition of firm-level variables

*Firm Cash Flow* is the sum of income before extraordinary items (item $IB$) and depreciation and amortization (item $DP$) scaled by total assets (item $AT$).

*Firm Size* is the natural logarithm of the firm's total assets (item $AT$).

*Firm Age* is the logarithm of the current year plus one minus the year in which the firm first appeared in the Compustat North America database.

*Firm Investment* is total firm wide capital expenditures (item $CAPX$) scaled by total firm assets (item $AT$).

*Leverage* is long term debt (item $DLTT$) scaled by total assets (item $AT$).

*Number of Divisions* is obtained by grouping business segments by 2-digit Fama and French (1997) industries and counting the number of different industries in which a firm operates in a given year. By definition, the Number of Division is equal to 1 in standalones.

*Sales* is the natural logarithm of total firm sales (item $SALE$).

*Sales Growth* is the firm's total sales growth between periods $t-1$ and $t$.

*Firm Focus* is sales of the division with the highest level of sales (core division) divided by total firm wide sales (item $SALE$). It is by definition equal to 1 for standalones.

$Q_{FIRM,t}$ is the firm's Market to Book ratio. Market value of assets is calculated as the book value of assets (item $AT$) plus the market value of common equity at fiscal year end (item $CSHO$ $\times$ item $PRCC\_F$) minus the book value of common equity (item $CEQ$) and balance sheet deferred taxes (item $TXDB$).

$SD(Q_{DIV,t})/Q_{FIRM,t}$ is the standard deviation of a firm's division-level Tobin's $q$'s scaled by the firm wide Tobin's $q$. We define division-level Tobin's $q$ in the next appendix.

$E_{FIRM,t}$ is the market value of firm equity. It is defined as the number of shares outstanding (item $CSHO$) times the price of each share (item $PRCC\_F$).

$D_{FIRM,t}$ is the book value of debt, measured as book assets (item $AT$) minus common equity (item $CEQ$) and deferred taxes ($TXDB$).

# B Definition of division-level variables

All division-level accounting information (assets, capx, sales) comes from the Compustat Segment files, aggregated at the 2-digit (FF48) Fama-French industry level.

*Capx/Assets* is division-level capital expenditures normalized by total division assets at the previous fiscal year end.

*Division Size* is the natural logarithm of division-level sales.

$Q_{DIV,t}$ is the estimated Tobin's $q$ of the division. To compute it, we calculate, each year, the median q of standalone firms that belong to the same FF48 industry as the division. See above for the definition of $q$ at the firm level.

$Q_{CORE,t}$ is the Tobin's $q$ of the core division of the firm to which a given division belongs. For core divisions, $Q_{DIV,t} = Q_{CORE,t}$

$V_{DIV,t}$ measures the extent of commodity flows between the non-core and the core division.

*Relative Importance* is the ratio between the sales of the non-core and the core division. It is a proxy for the organizational importance of the non-core division.

**Table A.I**

## Weighted Average Cost of Capital (Industry Level)

This table shows time series averages of the yearly industry level equity beta $\beta^E_{i,t}$, industry level leverage $E_{i,t}/(D_{i,t}+E_{i,t})$ and the industry level asset beta $\beta^A_{i,t}$. Time series averages are calculated over the sample period 1987–2007 as $\beta^E = (1/T)\sum_{t=1}^{T}\beta^E_{i,t}$, $\beta^A = (1/T)\sum_{t=1}^{T}\beta^A_{i,t}$ and $E/(D+E) = \sum_{t=1}^{T}(E_{i,t}/(D_{i,t}+E_{i,t}))$. Yearly industry level equity betas ($\beta^E_{i,t}$) are obtained by regressing monthly returns of value-weighted portfolios comprised of companies belonging to the same FF48 industry on the CRSP Value Weighted Index for moving-windows of 60 months. Yearly industry level debt ($D_{i,t}$) and equity ($E_{i,t}$) are the average leverage and average market value of equity observed in the respective FF48 industry in a given year.

| FF48 | Industry | Description | $\beta^E$ | $\frac{E}{D+E}$ | $\beta^A$ |
|---|---|---|---|---|---|
| 1 | Agric | Agriculture | 0.77 | 0.68 | 0.53 |
| 2 | Food | Food Products | 0.64 | 0.61 | 0.38 |
| 3 | Soda | Candy & Soda | 0.76 | 0.50 | 0.38 |
| 4 | Beer | Beer & Liquor | 0.60 | 0.76 | 0.44 |
| 5 | Smoke | Tobacco Products | 0.77 | 0.58 | 0.44 |
| 6 | Toys | Recreation | 1.48 | 0.56 | 0.82 |
| 7 | Fun | Entertainment | 1.14 | 0.60 | 0.69 |
| 8 | Books | Printing and Publishing | 0.91 | 0.62 | 0.56 |
| 9 | Hshld | Consumer Goods | 0.90 | 0.66 | 0.58 |
| 10 | Clths | Apparel | 1.04 | 0.68 | 0.70 |
| 11 | Hlth | Healthcare | 0.92 | 0.55 | 0.49 |
| 12 | MedEq | Medical Equipment | 0.90 | 0.79 | 0.70 |
| 13 | Drugs | Pharmaceutical Products | 0.84 | 0.84 | 0.71 |
| 14 | Chems | Chemicals | 0.93 | 0.54 | 0.49 |
| 15 | Rubbr | Rubber and Plastic Products | 1.10 | 0.54 | 0.61 |
| 16 | Txtls | Textiles | 0.93 | 0.45 | 0.42 |
| 17 | BldMt | Construction Materials | 0.97 | 0.57 | 0.55 |
| 18 | Cnstr | Construction | 1.19 | 0.40 | 0.48 |
| 19 | Steel | Steel Works Etc | 1.16 | 0.49 | 0.57 |
| 20 | FabPr | Fabricated Products | 0.96 | 0.50 | 0.49 |
| 21 | Mach | Machinery | 1.20 | 0.55 | 0.66 |
| 22 | ElcEq | Electrical Equipment | 1.28 | 0.49 | 0.63 |
| 23 | Autos | Automobiles and Trucks | 1.05 | 0.30 | 0.31 |
| 24 | Aero | Aircraft | 0.95 | 0.53 | 0.50 |
| 25 | Ships | Shipbuilding, Railroad Equipment | 0.79 | 0.48 | 0.34 |
| 26 | Guns | Defense | 0.68 | 0.50 | 0.32 |
| 27 | Gold | Precious Metals | 0.55 | 0.83 | 0.44 |
| 28 | Mines | Non-Metallic and Industrial Metal Mining | 0.93 | 0.69 | 0.65 |
| 29 | Coal | Coal | 0.84 | 0.46 | 0.40 |
| 30 | Oil | Petroleum and Natural Gas | 0.64 | 0.63 | 0.40 |
| 31 | Util | Utilities | 0.42 | 0.38 | 0.16 |
| 32 | Telcm | Communication | 1.02 | 0.54 | 0.55 |
| 33 | PerSv | Personal Services | 1.03 | 0.62 | 0.63 |
| 34 | BusSv | Business Services | 1.40 | 0.70 | 0.99 |
| 35 | Comps | Computers | 1.29 | 0.64 | 0.86 |
| 36 | Chips | Electronic Equipment | 1.55 | 0.69 | 1.10 |
| 37 | LabEq | Measuring and Control Equipment | 1.53 | 0.74 | 1.16 |
| 38 | Paper | Business Supplies | 0.92 | 0.52 | 0.47 |
| 39 | Boxes | Shipping Containers | 0.77 | 0.43 | 0.33 |
| 40 | Trans | Transportation | 1.01 | 0.38 | 0.38 |
| 41 | Whlsl | Wholesale | 0.98 | 0.41 | 0.39 |
| 42 | Rtail | Retail | 1.05 | 0.63 | 0.64 |
| 43 | Meals | Restaraunts, Hotels, Motels | 0.97 | 0.62 | 0.60 |
| 44 | Banks | Banking | 1.04 | 0.19 | 0.19 |
| 45 | Insur | Insurance | 0.82 | 0.17 | 0.14 |
| 46 | RlEst | Real Estate | 0.77 | 0.34 | 0.24 |
| 47 | Fin | Trading | 0.98 | 0.15 | 0.14 |
| 48 | Other | Almost Nothing | 1.04 | 0.53 | 0.57 |

**Table A.II**

## Non-Core Division-Level Investment Regressions (Excluding Banking and Insurance)

In this table, we exclude non-core division-year observations belonging to a conglomerate with a core division in the banking or insurance sector (i.e. FF48 industries 44 and 45). All variables are as defined in table V.

| | (1) Capx/Assets | (2) Capx/Assets | (3) Capx/Assets | (4) Capx/Assets | (5) Capx/Assets |
|---|---|---|---|---|---|
| $\beta^A_{DIV,t} - \beta^A_{CORE,t}$ | 0.0190*** | 0.0171*** | 0.0162*** | 0.0160*** | |
| | (8.46) | (7.13) | (6.81) | (6.62) | |
| $\beta^A_{CORE,t}$ | | | | | -0.0170*** |
| | | | | | (-5.06) |
| $\beta^A_{DIV,t}$ | | | | | 0.0152*** |
| | | | | | (4.74) |
| $Q_{DIV,t}$ | | 0.0043** | 0.0040* | 0.0040* | 0.0043* |
| | | (2.01) | (1.92) | (1.90) | (1.95) |
| $Q_{CORE,t}$ | | -0.0023 | -0.0035 | -0.0034 | -0.0031 |
| | | (-1.05) | (-1.63) | (-1.58) | (-1.41) |
| Firm Cash Flow$_t$ | | 0.0894*** | 0.0889*** | 0.0869*** | 0.0868*** |
| | | (11.73) | (10.92) | (10.62) | (10.61) |
| Divison Size$_t$ | | | 0.0012* | 0.0017** | 0.0018*** |
| | | | (1.89) | (2.56) | (2.60) |
| Firm Size$_t$ | | | 0.0000 | -0.0003 | -0.0003 |
| | | | (0.03) | (-0.43) | (-0.49) |
| Firm Age$_t$ | | | -0.0018* | -0.0018* | -0.0018* |
| | | | (-1.82) | (-1.83) | (-1.83) |
| Firm Focus$_t$ | | | | 0.0092* | 0.0091* |
| | | | | (1.70) | (1.69) |
| Observations | 23073 | 22736 | 22083 | 21782 | 21782 |
| $R^2$ | 0.021 | 0.035 | 0.036 | 0.037 | 0.037 |

All regressions include year fixed effects.
$t$ statistics in parentheses. Standard errors clustered at the firm level.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$