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Journal of Finance forthcoming

Abstract

We provide evidence that firms fail to properly adjust for risk in their valuation of investment projects, and that this behavior leads to value-destroying investment decisions. If managers tend to use a single discount rate within firms, we expect conglomerates to underinvest in relatively safe divisions, and to overinvest in risky ones. We measure division relative risk as the difference between the division market beta and a firm-wide beta. We establish a robust and significant positive relationship between division-level investment and division relative risk. Then, we measure the value loss due to this behavior in the context of acquisitions. When the bidder's beta is lower than that of the target, announcement returns are lower by 0.8% of the bidder's equity value.

*Krüger is with the Université de Genève and the Geneva Finance Research Institute, Landier is with the Toulouse School of Economics, and Thesmar is with HEC Paris and CEPR. The authors greatly appreciate comments and suggestions from Malcolm Baker, Andor György, Owen Lamont, Oliver Spalt, Masahiro Watanabe, Jeff Wurgler and seminar participants at AFA, CEPR, EFA, EFMA and NBER meetings, HBS, Mannheim University, Geneva University, and HEC Lausanne. The authors also thank three referees, the Editor (Cambell Harvey), and an Associate Editor for their constructive suggestions. Krüger thanks Genève Place Financière for financial support. Landier aknowledges financial support from a Scor Chair at the JJ Laffont foundation and from the European Research Council under the European Communitys Seventh Framework Programme (FP7/2007-2013) Grant Agreement no. 312503 SolSys. Thesmar thanks the HEC Foundation for financial support.

In this paper, we provide evidence that firms fail to properly adjust for risk in their valuation of investment projects, and that such behavior leads to value-destroying investment decisions. According to the standard textbook formula, the value of an investment project depends on both its expected cash flows and its discount rate, which is a measure of risk. In practice, however, survey evidence shows that most firms use only one single discount rate to value all of their projects (Bierman (1993), Graham and Harvey (2001)), a behavior that we label the "WACC fallacy". The WACC fallacy is a failure to account for project-specific risk, which is particularly damaging when the firm has to decide between heterogeneous projects. The value of riskier projects will be overestimated, while that of safer ones will be underestimated.

Thus, we expect the WACC fallacy to have real effects: in relatively complex firms, investment will be biased against safe projects, and this should lead to the destruction of value as capital is not optimally used. The economic magnitude of this bias is potentially large. For example, suppose that a firm invests in a project that pays a dollar in perpetuity. If it takes a discount rate of 10%, the present value of the project is $10. By contrast, a rate of 8% would imply a present value of $12.5. Hence, underestimating the discount rate by only 2 percentage points leads to overestimating its present value by 25%. The present paper is a first attempt to document and measure the distortions induced by the WACC fallacy by relying entirely on field data. To implement our empirical tests, we focus on two types of projects: Investment within conglomerates and Mergers and Acquisitions.

First, we use business segment data to investigate if diversified firms rely on a firm-wide discount rate. To do so, we examine whether diversified companies are inclined to invest less in their low beta division than in their high-beta divisions, controlling for standard determinants of investment, such as growth opportunities. The intuition is the following: A company using a single firm-wide discount rate would tend to overestimate the value 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[1], they must have a tendency to overestimate the value of projects that are riskier than the firm's typical project and vice versa. This, in turn, should lead to overinvestment (resp. underinvestment) in divisions that have a beta above (resp. below) the beta of the firm's representative project.

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 this finding as evidence that some firms do in fact discount investment projects from non-core divisions by relying on a discount rate closer to 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 more costly (e.g., the non-core 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 discount rate. To do this, we focus on diversifying acquisitions, a particular class of investment 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 uses its own WACC to value the target, it tends to overvalue it, thus announcement returns should be relatively poorer, reflecting relatively lower shareholder value creation. We find that such behavior leads to a relative loss of about 0.8% of the bidder's market capitalization. On average, this corresponds to about 8% of the deal value, or $16m per deal. This finding is robust to the inclusion of different control variables and to different specifications.

Following Stein (1996), our approach is connected with the idea that CAPM betas capture some dimension of fundamental risk. On the positive side, our investment regressions show that, irrespective of whether the CAPM holds or not, managers *do* use

CAPM betas but fail to adjust them across projects. Most corporate finance textbooks recommend the use of CAPM betas to compute discount rates, but require that managers use the project's beta. Our investment regressions show that investment in non-core divisions depends strongly on core betas. Hence, managers do use a CAPM beta to make capital budgeting decisions, even if it is the wrong one (core instead of non-core). On the normative side, our M&A results suggest that using the wrong beta to value the NPV of an acquisition is actually value-destroying. This may come as a surprise given that the CAPM fails at predicting stock returns. As shown in Stein (1996), however, this empirical failure is not inconsistent with the normative prescriptions of textbooks. Indeed, CAPM based capital budgeting is value-creating if CAPM betas contain at least some information on fundamental risk relevant for long-term investors. Our M&A results suggest that they do.

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 discount rates. 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, Harvey, and Puri (2013). This more recent contribution shows that the net present value rule is the dominant way for allocating capital across different divisions. The same reasoning does, however, also apply to firms using an IRR criterion: if the minimum IRR required for projects is similar across all the firm's projects, there will be overinvestment in risky projects. Thus, whether firms base decisions on NPV or IRR, the use of a single rate leads to a similarly biased investment policy.

Secondly, our paper contributes to the growing behavioral corporate finance literature. Baker, Ruback, and Wurgler (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. This study 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, overconfidence or preference for skewness can have distorting effects on managerial expectations about the future and investment decisions (see Malmendier and Tate (2005, 2008), Landier and Thesmar (2009), Gervais, Heaton, and Odean (2011), and Schneider and Spalt (2014)). By contrast, far less attention has been paid to whether and how bounded rationality and resulting "rules of thumbs" 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 value effects on important corporate policies such as corporate investment and acquisitions. We find several pieces of evidence consistent 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 fallacy is less pronounced in larger non-core 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 (2014)).

Finally, our paper is also related to the extensive literature on the functioning of internal capital markets. Lamont (1997) and Shin and Stulz (1998) provide evidence that internal capital markets exist and reallocate cash flows across different divisions, while Berger and Ofek (1995) and Lamont and Polk (2002) link investment in conglomerates to value destruction. To better characterize internal capital markets, a series of papers show in different settings that investment within conglomerates is less sensitive to growth opportunities, which suggests misallocation of funds (see Rajan, Servaes, and Zingales (2000), Gertner, Powers, and Scharfstein (2002), Ahn and Denis (2004) or Ozbas and Scharfstein (2010)). In contrast to this view, however, Maksimovic and Phillips (2002) show that investment patterns within conglomerates are related to differences in productivity across divisions, consistent with optimality. Within this debate, our paper points at a new "dark side" of internal capital markets: They may be inefficient because of the tendency to use a single discount rate, which leads to misallocation. As a result, we show that investment does not just depend on market-to-book or cash flows (as suggested in the literature), but also strongly on division-level industry *betas*. Our M&A section also shows that such misallocation can be costly.

The rest of the paper is organized as follows: Section I 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 value impact evidence on diversifying mergers and acquisitions. Finally, Section IV concludes.

I. The Data

A. 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 from 1987 to 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). Within each firm, we then aggregate capital expenditures, sales, and total assets 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 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 ownership from Compustat Execucomp. Such information is available only from 1992 to 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. Out of approximately 135,000 firm-year observations, about 120,000 observations correspond to stand-alones (i.e., firms operating in a single FF48 industry) and about 15,000 observations (or approximately 750 firms a year) operate in more than one industry (on average, 2.56 industries). We provide summary statistics for conglomerates and stand-alones in Internet Appendix Table D.I. On average, conglomerates are quite focused: About 73% of total sales are realized in the largest division. Unsurprisingly, stand-alones grow faster, are smaller and younger than conglomerates; conglomerates have lower market-to-book ratios (1.5 vs 1.8 for stand-alones).

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 I we report division-level summary statistics for non-core divisions only. One of the FF48 industry categories is not-defined (FF48=48, "Almost Nothing"). Because our tests rely on measures of industry risk, we exclude divisions belonging to the category "Almost Nothing." 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.

[Table I about here.]

The definition of most of the division-level variables is straightforward and detailed in Section B of the Internet Appendix. We impute a Tobin's q for each division. Since divisions do not have a market price, we compute the median market-to-book ratio of all stand-alones that are operating in the same year, in the same FF48 industry. 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 label $Q_{DIV,t}$ its own imputed Tobin's q, and $Q_{CORE,t}$ the Tobin's q of its core division. As we report in Table I, non-core and core divisions have on average very similar Tobin's q's.

B. Mergers and Acquisition Data

Our second series of tests relies on two samples of mergers and acquisitions. The samples are 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. 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 drop all transaction announcements in which the value of the target represents less than 1% 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.

We then construct two samples of acquisitions, on which we will conduct our tests. First, we identify a sample of 6,366 *diversifying* acquisitions. To do this, we first identify the bidder's and target's core activities through the SDC variables *Acquiror_Primary_SIC_Code* and *Target_Primary_SIC_Code*, which we match to their corresponding FF48 industry categories. We then retain all deals in which a bidder gains control of a public or non-public target belonging to a different FF48 industry. Secondly, we build a sample of 627 transactions, in which both bidder and target are publicly listed. Both firms may belong to the same industry. Daily stock returns of the bidder are downloaded from CRSP for an event window surrounding the announcement date of the deal. Finally, we obtain balance sheet data for all bidders and publicly listed targets from the Compustat North America database.

[Table II about here.]

Summary statistics for the two deal samples are summarized in Table II. Panel A is dedicated to diversifying transactions. The typical diversifying transaction involves a small non-public target. The average value of the target is slightly less than \$200m, 12% of the diversifying transactions involve listed targets, and only 3% correspond to tender offers. We also report the average Tobin's q of the bidder and the target, calculated as the median market-to-book of stand-alones belonging to the same industries as the bidder and target respectively. The difference is, on average across transactions, close to zero. In Panel B of Table II, we report summary statistics for our sample of transactions in which both the bidder and the target are publicly listed. The average bidder is relatively big (\$11,000m) in this sample. We also report the difference between firm-level Tobin's q's of the bidder and the target, and consistent with prior research (see, for instance, Rhodes-Kropf, Robinson, and Viswanathan (2005)), find bidders to have significantly higher Tobin's q's than their targets.

C. Calculating the Cost of Capital

C.1. Industry-level Betas

For both series of tests, we need to construct annual industry-level measures of the unlevered cost of capital, which we will merge with the 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:

$$\beta_{j,t}^{A} = \frac{E_{j,t-1}}{E_{j,t-1} + D_{j,t-1}} \times \beta_{j,t}^{E}, \quad (1)$$

where $E_{j,t-1}$ is the total market value of equity within the FF48 industry j at the beginning of year t, and $D_{j,t-1}$ is the total book value of debt (see the Internet Appendix for definitions of debt and equity values). The variable $\beta_{j,t}^{E}$ is the estimated equity beta of industry j in year t, which is estimated using a 60 month rolling return window ending in the last month of year $t-1$. In turn, $\beta_{j,t}^{A}$ is the beta of assets invested in industry j in year t. We report average asset and equity betas by FF48 industries in Table D.II of the Internet Appendix. Since we are using industry returns to estimate these betas, we indifferently refer to them as "industry betas" or "value-weighted betas". We can do this because industry returns are value-weighted average firm returns.

We also consider an alternative industry-level cost of capital based on averaging firm-level equity betas unlevered at the firm-level. To calculate this alternative industry beta, we first estimate firm-level equity betas $\beta_{i,t}^{E}$ using rolling windows of 60 months. We then unlever the estimated firm-level equity beta using firm $i's$ capital structure. The alternative industry cost of capital is then calculated as the equally weighted industry average for each FF48 industry:

$$\beta_{EW,j,t}^{A} = 1/N_{j,t} \sum_{i=1}^{N_{j,t}} \frac{E_{i,t-1}}{E_{i,t-1} + D_{i,t-1}} \times \beta_{i,t}^{E}, \quad (2)$$

where $N_{j,t}$ denotes the number of firms in FF48 industry j in year t, $E_{i,t-1}$ firm $i's$ market value of equity at the beginning of year t, $D_{i,t-1}$ its book value of debt and $\beta_{i,t}^{E}$ its firm-specific equity beta estimated using rolling windows of 60 months ending in the last month prior to year t.

C.2. Division- and Firm-Level Betas

We then merge the information on industry cost of capital with the division-level data. For each non-core division j in our sample, we denote as $\beta_{DIV,t}^{A}$ its industry-level asset beta.

For a non-core division, the WACC fallacy consists of using some firm-wide beta other than the division's own $\beta^A_{DIV,t}$. We use a variety of alternative measures of the firm-wide beta in tests which are reported in the Internet Appendix. However, our main specification uses $\beta^A_{CORE,t}$, which is the industry-level asset beta of the core-division of the conglomerate to which the non-core division belongs. The implicit assumption here is that the non-core division uses the beta of the core. An obvious alternative is to calculate a firm-wide average beta, which we call $\beta^A_{AVERAGE,t}$. To calculate this average beta, we use the asset betas resulting from the FF48 industry portfolios and weight each divisional industry beta by the ratio of the division's to total firm wide book assets. Here, the behavioral assumption is that non-core divisions use some firm-level average of betas, instead of their own. Analysis using this alternative beta definition is reported in the Internet Appendix. Descriptive statistics Table I provides information on the non-core and related core betas. Non-core divisions have on average the same asset beta (0.56) as their related core divisions (0.55), so that the "beta spread", that is 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 -0.21 at the 25th percentile to +0.22 at the 75th percentile.

In robustness checks, we use equally-weighted industry betas ($\beta^A_{EW,j,t}$), instead of value-weighted industry betas ($\beta^A_{j,t}$), to calculate the beta of the non-core division, that of its related core, and the firm-wide average beta. Summary statistics from Table I confirm that value- or equal-weighting does not change the numbers very much. Division level asset betas calculated using asset betas at the firm ($\beta^A_{EW,j,t}$) or industry level ($\beta^A_{j,t}$) are quite similar on average. Equal weighting seems to generate a slightly smaller dispersion, however.

In our M&A analysis, we use two sets of betas. First, in the *diversifying* acquisition sample, we use the industry beta of the acquirer and the industry beta of the target. To shorten exposition, we focus on value-weighted industry betas. Industry level asset betas of the bidder and the target are denoted by $\beta^A_{IND,BIDDER,t}$ and $\beta^A_{IND,TARGET,t}$. Secondly, in the sample where target and bidder are both publicly listed, we can directly compute the equity betas of the two firms, and then unlever these betas with the firms' capital structures. We label firm specific asset betas as $\beta^A_{i,BIDDER,t}$ respectively $\beta^A_{i,TARGET,t}$. Since firm-level betas can change as a result of M&A (see Hackbarth and Morellec (2008)), we ensure that there is a gap of at least six month between the merger announcement and the end of the estimation period used to calculate the firm-level betas of the bidder and the target. Table II has descriptive statistics on bidder and target betas. In contrast to industry level Tobin's q, which tends to be similar between bidders and targets, industry level asset betas tend to be significantly smaller for bidders (0.57) than for targets (0.62) (see Panel A). The firm-level betas that we use in the second acquisition sample are, however, not significantly different from one another (see Panel B).

D. Calculating the Extent of Vertical Relatedness between Industries

For each non-core division, we also seek to measure the extent to which it is vertically related to its core. To do this, we ask whether the non-core division's industry is a large supplier or client of the core division's industry. We first download the benchmark Input-Output Accounts for the years 1987, 1992, 1997, and 2002 from the Bureau of Economic Analysis (BEA).[2] 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 $V_{ij} = 1/2(v_{ij} + v_{ji})$. The variable $V_{i,j}$ measures the extent to which the non-core division and the core division exchange inputs. In Table I we show summary 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.

II. Investment Distortions Within Diversified Firms

A. Empirical Strategy

Our test of investment distortions rests on the idea that investment should be an increasing function of the difference between the "adequate" and the "wrong" cost of capital. Let us explain why. Assume a division has a risk measured by the CAPM beta β^{div}, but belongs to a conglomerate which uses the "reference" measure of risk β^{ref}. The WACC fallacy occurs when managers value the projects of the division using a cost of capital based on β^{ref} instead of β^{div}. When, for instance, $\beta^{ref} > \beta^{div}$, a given project's cash flows will be discounted with a rate that is higher than it should be. Investment will be lower than optimal. On the contrary, when $\beta^{ref} < \beta^{div}$, the NPV of a given project will look higher than it really is and the division will overinvest. It follows that investment should be increasing in $\beta^{div} - \beta^{ref}$, which we label the "beta spread". If, however, the firm uses the correct cost of capital in each division, then division investment will not be affected by β^{ref} and in this case, the beta spread should have no impact (we formalize this insight in a simple investment model provided in the Internet Appendix).

To implement such a test, we need to measure the true beta β^{div} and the reference beta β^{ref}. For the division, the true beta is given by $\beta^{div} = \beta^{A}_{DIV,t-1}$, which is defined in the previous section. It is essentially the value-weighted average of unlevered betas of stand-alone firms belonging to the same industry as the division. In most of our specifications, the reference beta is $\beta^{ref} = \beta^{A}_{CORE,t-1}$, which is the industry beta of the largest division (the "core"). The interpretation of this proxy is that managers use the risk measure of the most frequent project, which is likely to belong to the largest division.

Obviously, this approach forces us to restrict the econometric analysis to divisions that are "non-core".

In robustness checks, we use as an alternative $\beta^{ref} = \beta^{A}_{AVERAGE,t-1}$, which is the asset-weighted average of industry betas of all divisions in the conglomerate. The interpretation of this alternative measure is that managers use some firm-wide discount rate that takes into account the diversity of the firm's activities. All our results go through with this alternative measure (we only present some in the paper), but we use $\beta^{A}_{CORE,t-1}$ as our preferred specification for two reasons. First, when we include the two measures in the RHS of the regression, $\beta^{A}_{CORE,t-1}$ wins the horse race, suggesting that firms actually tend to use a discount rate related to their core activity. Secondly, $\beta^{A}_{CORE,t-1}$ is a good proxy for $\beta^{A}_{AVERAGE,t-1}$, because the core division accounts on average for 73% of total sales and 68% of total assets. As a result, the correlation between the two is about 0.85.

B. Baseline Results

We first provide graphical evidence in Figure 1 that non-core division investment 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 compute average non-core division investment. In total, we use the three measures of non-core division investment that have been the most commonly used in the conglomerate literature. First, following Shin and Stulz (1998), we rely on raw investment, which is non-core division capital expenditures divided by lagged non-core division assets. Secondly, we use industry adjusted investment which we calculate as a non-core division's raw investment net of the median raw investment of all standalone firms operating in the non-core division's FF48 industry in that year (see Lamont (1997)). Finally, following Rajan, Servaes, and Zingales (2000), we also use industry-firm adjusted investment, which subtracts from each non-core division's industry adjusted investment the firm's weighted average industry adjusted investment. The weights used in calculating the average are division to total (book) assets. All three measures are formally defined in the Internet Appendix. Figure 1 shows a monotonic relationship between all three investment measures and the spread: It seems that non-core divisions with relatively high beta spread (beta bigger than the core-division's) tend to invest more than their comparables, whereas non-core divisions with a low spread invest less.

[Figure 1 about here]

We then report multivariate regression results in Table III, in order to control more extensively for observable determinants of investment. The dependent variable in these regressions is raw investment. Standard errors are clustered at the firm-level. Column (1) establishes the basic fact by showing that non-core division raw investment depends positively on the spread between the non-core and the core division's industry betas: The larger the spread, the higher raw investment in the respective non-core division. This is precisely what would be expected if companies discount high (low) risk projects using too low (high) discount rates.

[Table III about here.]

In column (2), we add the main determinants of corporate investment, and show that the univariate coefficient is unchanged. We control extensively for the investment opportunities at the division and firm-level, by including both the core and the non-core division industry-level Tobin's q's as well as firm-level Tobin q in order to address the concern that asset betas may simply correlate with variations in investment opportunities that are captured by Tobin's q's. Since it might also be that the beta spread is simply a proxy for the diversity of a firm's investment opportunities, which has been shown in earlier work to distort investment behavior (Rajan, Servaes, and Zingales (2000)), we also control for such unobservable differences in investment opportunities by including as an additional control the within-firm standard deviation of industry-level Tobin's q's normalized by firm wide Tobin's q. Intuitively, and consistent with existing evidence, we find non-core division investment to decrease with the firm's diversity in investment opportunities. We also control for size and cash flow at the firm and division-level, as well as for the age of the company. Our last control is a measure of *Firm Focus*: The ratio of core division sales to total firm wide sales. This control is intended to capture the fact that diversified firms may be overinvesting because of less efficient internal capital markets. After including these controls, the coefficient estimate for the spread decreases marginally but remains highly statistically significant (with a t-statistic going down from 8.7 to 6.2).

In column (3) we replace the spread by its two separate components $\beta^A_{CORE,t-1}$ and $\beta^A_{DIV,t-1}$. The results show a negative sign for the coefficient estimate for $\beta^A_{CORE,t-1}$ and a positive sign for $\beta^A_{DIV,t-1}$. This suggests that whenever the company has a low risk core activity (low $\beta^A_{CORE,t-1}$), 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 $\beta^A_{CORE,t-1}$ is significant provides 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 sizable. Assume $\beta^A_{DIV,t-1} - \beta^A_{CORE,t-1} = 0.35$, which is about one sample standard deviation. This means the gap in discount rates between the division and its core is approximately 1.4% (assuming a 4% equity risk premium). Given our estimates, we would expect the non-core division's investment rate to be 0.6 (0.018*0.35) percentage points higher. This is a non-negligible effect, equivalent to about 10% of the average raw investment rate in our sample. Interestingly, the absolute values of the coefficients for $\beta^A_{DIV,t-1}$ and $\beta^A_{CORE,t-1}$ are of similar magnitude. This finding is consistent with our WACC fallacy hypothesis, since both variables play exact opposite roles in the discount rate's misvaluation. Coherent with this idea, it turns out that we cannot reject the null hypothesis that the sum of both coefficients is equal to zero. Note that the interpretation of our results does not depend crucially on firms relying on the NPV criterion. A manager who relies on the IRR criterion would be subject to the same fallacy. With the NPV rule, it occurs when the manager uses the same rate to discount the cash flows of all projects – whatever the project risk is. With the IRR criterion, it occurs when the managers use a single hurdle rate for all projects whatever their risks.

We then test a logical implication of the WACC fallacy: The documented investment distortion should be larger if the project's sales growth is higher. 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 $\frac{C}{WACC-g}$. This formula implies that the valuation mistake made by not choosing the right WACC is bigger when g is larger.[3] Hence, we expect the impact of beta spread on investment to be bigger when the division belongs to a fast growing industry.

We test this in Table III, column (4). We code an indicator variable for each tercile of lagged industry sales growth *(Low, Med, and High Ind Sales Growth)* and interact these dummies with the spread in asset betas. The results show that investment appears to be higher for medium and high growth divisions. The difference is large too: While for divisions in the bottom tercile of industry growth, the coefficient is equal to 0.011, it is equal to 0.022 in the top tercile. The estimated effect is therefore twice as large. This underlines the idea that the beta spread sensitivity is in fact increasing in lagged industry sales growth.

We finally check that it is managers themselves, and not financial markets, who are subject to the WACC fallacy.[4] Imagine that managers are perfectly rational, but markets irrationally use the core division's discount rate to value investment projects in the entire firm. In this case, managers might try to take advantage of the market's misperception, by raising abnormally cheap capital to invest in high beta non-core divisions. If this mechanism was the driving force behind our results, one should observe higher investment sensitivity to beta spread when a firm is relying on external rather than internal capital. In order to test this, we follow Baker, Stein, and Wurgler (2003) and calculate the firm's external finance activity as the sum of contemporaneous debt and equity issues normalized by lagged assets. In column (5), we then interact the spread sensitivity of non-core division investment with tercile dummies based on the measure of external financing activity. The results show that the WACC fallacy does not depend on the use of new external finance. This conclusion holds irrespective of whether new equity, new debt or the sum of both is used as a measure of external finance activity. We also find no relation between the magnitude of the beta spread sensitivity and financial constraints measured as in Kaplan and Zingales (1997).

C. Robustness Checks

We perform various robustness checks, which we detail in Section D of the Internet Appendix. First, we exclude the financial sector from the sample, and re-run our investment regressions. The reason is that some accounting variables, such as capital expenditures, may be unreliable for the financial sector. We find that our results go through when we exclude these firms. We prefer, however, to keep them in our main specifications as there are good reasons to believe that even the banking sector can be subject to the WACC fallacy.

In a second series of tests, we check that our results hold for various definitions of betas. We show that, in a horse race, the beta of the core division captures more variation than the firm-wide average beta. Even though it is ultimately difficult to distinguish the effects of the firm-wide average beta from the core beta (both are highly correlated), the fact that the core beta "wins" in a horse race suggest that this is the right place to look at. We also show that betas based on equally-weighted industry returns also work in our investment regression, although they are a bit noisier. Finally, we check that our results hold if we use, instead of the beta of the core division's industry, the firm's asset beta as directly estimated from stock returns.

Finally, we use various approaches to control for non-core-division-level industry shocks: Industry adjustment, inclusion of industry $\times$ year fixed effects, and firm fixed-effects. In all these alternative specifications, our results go through.

D. Discussion

In this section, we discuss potential interpretations of our investment results.

D.1. Controlling for Division Relatedness

A potential 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. While we do not have an instrument to directly address the endogeneity of conglomerate formation, we run several tests to rule out this alternative explanation.

First, in Table IV, column (1), we control for contemporaneous investment of the core division. If non-core division investment is related to the core division's beta because of vertical integration and the core division's beta is simply a proxy for firm-wide investment decisions, then directly including core-division investment should strongly weaken the effect of the beta. While contemporaneous core investment is strongly correlated with non-core investment, including contemporaneous core investment leaves the coefficient estimate of the beta spread unchanged.

[Table IV about here.]

An alternative way of addressing this concern is to follow Ozbas and Scharfstein (2010) and construct a measure of vertical integration between each non-core division and its core. This measure is based on the input-output matrix from the BEA, which tells us how much a given industry is a supplier and a customer of each other's industries. Using these data, we measure whether a division and its core are vertically integrated. We then interact tercile dummies of this vertical relatedness measure with the beta spread to see if the extent of vertical integration between the core and non-core affects the relation estimated in Table III.

We do not find that our effect is related to the degree of vertical integration between the non-core and its core division. We report the estimates using various specifications in Table IV. In column (2), we add the interaction terms between beta spread and the dummies. It appears that the measured impact of the beta spread on investment does not depend on the extent to which the non-core division is related to 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.

D.2. Evidence of Bounded Rationality

We argue that distortions in investment decisions arise due to managers inappropriately taking the wrong discount rate. We expect though, that if the costs of not using project-specific discount rates are too high, managers will choose to become more sophisticated and use different WACCs. The cost of switching to more sophisticated behavior might be both cognitive (it actually takes time to understand why using a firm-wide discount rate is inappropriate) and organizational (an internal process has to be put in place to decide which discount rate is appropriate for each project). This "bounded rationality view" makes predictions as to which firms are more likely to be subject to the WACC fallacy: The relationship uncovered in Table III should weaken when the benefits of taking the right WACC are large.

[Table V about here.]

We now test the "bounded rationality view". We do so by interacting the beta spread with measures of the net benefit of adopting differentiated WACCs across divisions. Bounded rationality predicts that investment policy should be *less* sensitive to the beta spread when the net benefit of using division specific discount rates is high. We report the results of this investigation in Table V using four different measures of the net benefit of taking 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 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 to 1991, 1992 to 1996, 1997 to 2001, and 2002 to 2007) with beta spread. The interaction terms indicate that the investment distortion has been strongest between 1987 and 1996. The evidence that the strength of the fallacy decreases over time is consistent with the view that managers have become more sophisticated. Note that an alternative explanation to that of increased financial sophistication of decision makers could be the decrease of the equity premium, multiplicatively reducing the impact of the spread variable.[5] Consistently, however, with the idea that expertise reduces the scope for biases, Custodio and Metzger (2014) find in a recent paper that the WACC fallacy is less pronounced in firms run by CEOs who have more financial expertise.

In columns (2)–(3), we use cross-sectional proxies of the 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; investment in these divisions is therefore less likely to be subject to the WACC fallacy. 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 *(Low, Med, and High Relative*

Importance) and interact the dummies with the beta spread. We report the regression results in column (2): Investment in more important divisions *(High Relative Importance)* is less sensitive to the beta spread, suggesting that investment in relatively large divisions is less prone to the WACC fallacy. 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 ($SD(\beta^A_{i,t-1})$). 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 terciles. Column (3) shows that division investment in firms with highly diverse costs of capital (*High* ($SD(\beta^A_{i,t-1})$)) 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 is running. This would be consistent with Baker, Ruback, and Wurgler (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%). We show, in column (4), that the impact of beta spread on division investment is substantially lower for firms whose CEO owns 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. Notice, however, that this result may receive an alternative interpretation. Assume that high ownership CEOs are less diversified: These executive would seek to reduce company risk by underinvesting in risky divisions. This would, also, generate a weaker relation between investment and the beta spread for this category of CEOs.

D.3. Does The WACC Fallacy Lead to Over- or Underinvestment?

A last possibility is that the WACC fallacy emerges from the strategic behavior of large core divisions that seek to maximize their investment capacity.[6] When the core division has a relatively high cost of capital, it imposes its own beta on the non-core divisions in order to reduce their investment, so as to redirect capital to its own needs. When, on the contrary, the core division operates in a safe industry, a single discount rate ceases to be optimal from its view point, as it would lead the non-core divisions to over-invest, and therefore dry up internal capital markets. To prevent internal cash flows from flowing excessively to the high-risk divisions, the core division imposes a division-specific cost of capital. Under this interpretation of our results, the WACC fallacy is a self-serving tool for powerful core divisions that seek to maximize their access to internal cash flows. A key prediction is that it should be asymmetric: non-core division investment should be more sensitive to negative values of the beta spread (i.e., when the beta of the core is high compared to the beta of the division).

We thus check whether the relationship between investment and the beta spread uncovered in Table III is aymmetric. We split the beta spread into a negative and a positive part, and then regress non-core division investment on these two parts. We find that the negative part of the beta spread is strongly significant, while the positive part is not significant (see Internet Appendix Table D.V). Both coefficients have the same order of magnitude, so it is not possible to reject the null hypothesis that the sensitivity of investment to spread is not the same for positive or negative spreads. What is true however, is that the relationship is more precisely estimated for negative spreads, lending some credence to the "power theory" of the WACC fallacy.

III. Efficiency Effects

In this section, we examine the efficiency costs of the WACC fallacy. If one believes that the WACC criterion is appropriate, one should expect value destruction from using it wrongly. Note that the WACC criterion may be useful even if the CAPM fails at explaining the cross-section of returns because, as reported by Stein (1996), "beta - if calculated properly - may continue to be a reasonable measure of the fundamental economic risk of an asset, even if it has little or no predictive power for stock returns."

A. Empirical Strategy

Our test uses M&As as experiments to measure the value impact of the WACC fallacy. The intuition for this test is the following. Assume that the risk of the bidder is given by $\beta^{A}_{BIDDER,t-1}$, while the risk of the target is given by $\beta^{A}_{TARGET,t-1}$. By definition, if the bidder is prone to the WACC fallacy, it will wrongly use its own beta, instead of the target's beta, to value the target's cash flows. Hence, if $\beta^{A}_{TARGET,t-1} > \beta^{A}_{BIDDER,t-1}$, the bidder overpays (apply a low cost of capital to risky cash flows). Announcement returns should therefore be, all things equal, lower on average. Similarly, if $\beta^{A}_{TARGET,t-1} < \beta^{A}_{BIDDER,t-1}$, the bidder underpays (applies a high cost of capital to relatively safe cash flows). In this case, announcement returns should be higher. Hence, on average, acquirer announcement returns should be larger if the bidder has a higher beta than the target. This is what we test.

M&As offer a good setting to test for the value impact of the WACC fallacy. First, acquisitions come in large numbers and tend to be large enough so that their impact on the market value of the acquirer is detectable. Second, the adequate cost of capital of the investment project can be computed: in the case of acquiring non-publicly listed targets, the target's industry cost of capital can be used as a proxy, while the target's firm-level cost of capital serves as a natural estimate if the target is publicly listed. Third, mergers and acquisitions can give rise to behavior consistent with the WACC fallacy: This is because targets and bidders can differ in terms of asset risk, which gives scope to applying wrong discount rates. Fourth, we have a reasonable estimate of the NPV for such investment projects, namely, the stock price reaction of the acquirer upon acquisition announcement. Under the assumption that markets are not systematically biased in their reaction, the announcement returns provide an estimate of the NPV created by the project. The important assumption here is not that the market is perfectly efficient but that, whatever biases the market has, these biases are a priori orthogonal to the WACC fallacy of the bidder: When a bidder is overestimating the value of a target because the bidder is used to discount at a low discount rate, we just assume that there is no reason to assume the market to be biased in the same direction.

In practice, the procedure to compute $\beta^A_{TARGET,t-1}$ differs according to whether the target is publicly listed or not. To address this, we split the sample into two parts: a sample of diversifying acquisitions involving public and non-public targets as well as a sample of acquisitions in which both bidder and target are publicly listed. A diversifying transaction is defined as a deal in which a public bidder seeks control of an asset (public or non-public) belonging to a different FF48 industry. Note, that the second sample includes deals in which the bidder and the target belong to the same industry. This is, because we rely on firm-level cost of capital when analyzing these deals. Firm-level cost of capital can potentially be different even though bidder and target belong to the same industry, implying that intra-industry deals can also be subject to the WACC fallacy.

B. *Value Loss in Asset Acquisitions*

We start by providing some graphical evidence. In the left picture of Figure 2, we plot the average cumulative abnormal returns of bidders around the announcement of diversifying asset acquisitions conditional on whether the bidder's industry WACC ($\beta^A_{IND,BIDDER,t-1}$) is lower or higher than that of the target ($\beta^A_{IND,TARGET,t-1}$). Bidder and target WACCs are calculated at the industry level, because the sample involves a substantial number of non-publicly listed targets. 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 subsets of diversifying deals, we observe that announcement returns are positive: This is consistent with Fuller, Netter, and Stegemoller (2002) or Bradley and Sundaram (2006), who find that announcement returns for acquirers of non-public firms (the vast majority of the deals in this sample) are positive and statistically significant (see also Betton, Eckbo, and Thorburn (2008)). More importantly to us, the left picture of Figure 2 suggests that the market welcomes bids less favorably when the bidder's industry-beta is lower than that of the target. This confirms our hypothesis that low beta bidders tend to overbid for high beta targets.

[Figure 2 about here]

Turning to deals in which we can directly calculate the firm-level cost of capital of both the bidder and the target, we obtain similar results: Consistent with the WACC fallacy, the right picture of Figure 2 shows strong evidence that public-public deals, which involve a bidder with a lower cost of capital than the target turn out to be more value destroying than deals in which the bidder's firm-level asset beta is higher than that of the target. The difference is statistically significant at the 1% level.

In order to formally test whether bidder announcement returns differ in a statistically significant way conditional on whether the bidder has a lower or a higher cost of capital than the target, we regress 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 this regressions are reported in Table VI.

[Table VI about here.]

Columns (1)–(3) focus on the sample of deals in which the target belongs to an industry different from that of the bidder. In columns (4)–(6), we examine deals in which both target and bidder are publicly listed. In all specifications, we include year dummies to capture the potential impact of merger waves on announcement returns and also 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 return correlation of deals that are announced on the same day, standard errors are clustered by announcement dates. Column (1) of Table VI establishes the main result by showing that bidder seven day cumulative abnormal returns are significantly lower for transactions where the bidder has a lower industry beta than the target. The coefficient estimate for the dummy variable is equal to 0.0085 (t-statistic of 2.56). This suggests that when the bidder has a lower beta than the target, 0.85% of acquirer value is lost compared to other bids of similar size (target size is the only control in column (1)). Given that the average equity value of the bidder is about $2bn, this estimate translates into an estimated excess payment of about $16m, or 8% of the average target value ($200m). In column (2) we add additional explanatory variables to control for the possibility that the beta spread dummy might be correlated with other known determinants of bidder announcement returns. Most importantly, we control for differences in industry-level Tobin's q's between the acquirer and the target. The coefficient estimate is largely unaffected by the additional controls. In the regressions of columns (1) and (2) we rely on a categorical variable indicating whether the beta spread is positive or not. To some extent, this does not use all of the variation in the beta difference and the value effect should be monotonic in the beta spread. To test whether the effect we document is indeed monotonic, we now code three dummy variables indicating the terciles of the beta spread. Using terciles of the spread instead of the binary variable used in (1) and (2) also allows to further control for unobservable deal characteristics (e.g., factors that would be correlated with firms in growing industries buying assets that belong to more stagnant industries). The regression in column (3) turns out to show a monotonic effect with the strongest impact in the third tercile of the spread.

To buttress our results even further, we now turn to the multivariate regression analysis of deals involving publicly listed targets. In analyzing deals involving public targets, we can use firm-level instead of industry level cost of capital. While it is natural to use industry level cost of capital in the previous analysis, mainly due to the large number of small and non-publicly listed targets for which an industry cost of capital is more appropriate, it is natural to look at firm specific asset betas in public-public transactions. In column (4), we rerun the firm-level equivalent of the specification used in column (1) by relying on a dummy variable indicating whether the asset beta of the bidder exceeds that of the target. The coefficient estimate is positive and significant (t-statistic: 2.68): Deals in which high firm-level beta bidders buy low firm-level beta targets generate significantly higher wealth for shareholders. The estimate appears to be slightly noisier, potentially due to the lower number of deals. However, the economic magnitude of the effect increases substantially. Given that the average bidder's market value in the sample of public-public transactions is about $10b, the excess payment due to applying the wrong discount rate is about $170m or about 9% of the average target size ($1,800m). Interestingly, the order of magnitude of the value loss in terms of the average deal value is quite similar for both samples: 8% for diversifying deals and 9% for the public-public transactions. Including additional controls makes the effect, if anything, stronger both in statistical and economical terms (see column (5)). Finally, we establish the same monotonic relationship in the sample of public-public transactions (see column (6)).

C. Possible Alternative Interpretations

One possible concern is that a high beta acquirer may increase value by purchasing a low beta target, because the resulting entity would be less volatile (lower financial or operating leverage) than the acquirer as a standalone entity. This kind of financial synergy could explain why relatively high beta bidders generate higher positive announcement returns. To address this issue, we control for the financial leverage of the bidder prior to the deal. Controling for financial leverage does not affect the coefficient on the beta difference dummy and hardly affects its statistical significance. These regressios are reported in Table D.VI of the Internet Appendix.

Another concern is that after a diversifying acquisition, the resulting entity may be subject to the WACC fallacy that we document. Since bidder and target belong to different industries, the merged entity will be a conglomerate with a core division (former bidder) and a non-core division (former target) with a different beta. If the new entity uses a single discount rate, investment will not be optimal: The resulting value destruction may affect the announcement return we are looking at. First, notice that this effect is a priori symmetric, it happens whether the bidder has a larger, or smaller, beta. So if the WACC fallacy is symmetric in the beta spread, it does not bias our results in an obvious way. Second, the asymmetry documented in subsection D.3. of Section II suggests that our M&A results are, if anything, underestimated. If most of the WACC fallacy comes from high beta core divisions (bidders), then the announcement return should be *more negative* when the bidder has a higher beta: We find the opposite in Table VI.

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: They might also be organizational, as the use of multiple discount rates within a firm might require the creation of a specific internal process to decide the discount rate appropriate for each project.

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Figures

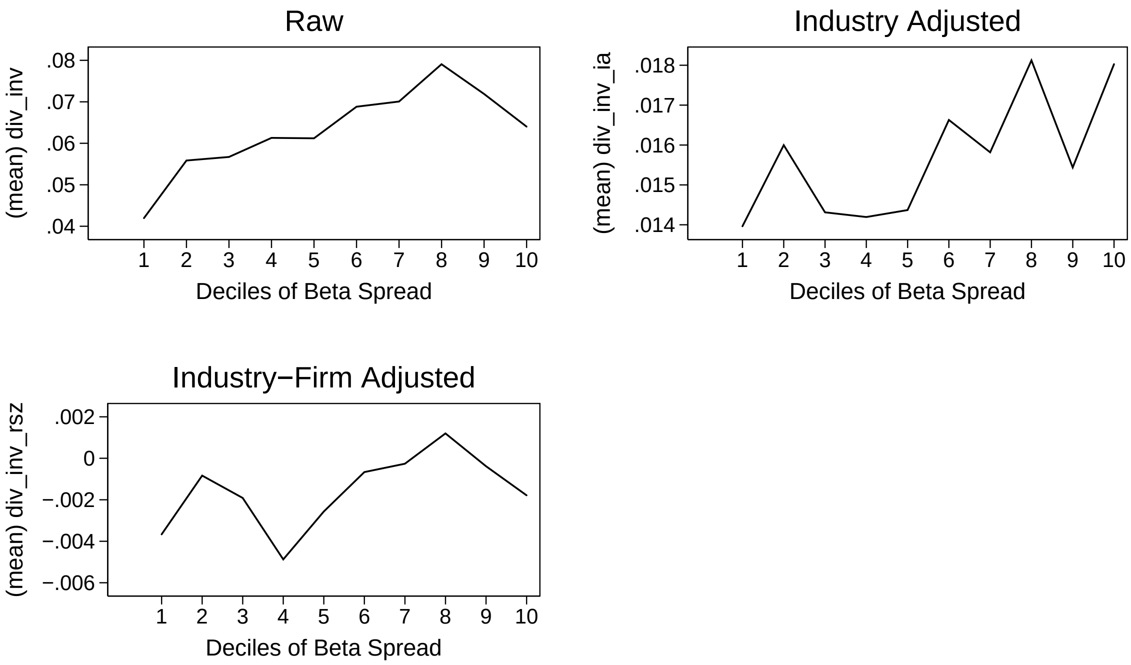

Figure 1. Mean Non-Core Investment By Deciles of Beta Spread. This figure shows average non-core division investment by deciles of $\beta^A_{DIV,t-1} - \beta^A_{CORE,t-1}$, which is the spread between the industry-level asset beta of the non-core and that of the core division. We consider three different measures of investment, namely *Raw*, *Industry Adjusted* and *Industry-Firm Adjusted Investment. Raw Investment* is non-core division capital expenditures divided by lagged non-core division assets. *Industry Adjusted Investment* is calculated as a non-core division's *Raw Investment* net of the median raw investment of all standalone firms operating in the non-core division's FF48 industry in that year. Finally, *Industry-Firm Adjusted Investment* subtracts from each non-core division's *Industry Adjusted Investment* the firm's division asset weighted average *Industry Adjusted Investment.*

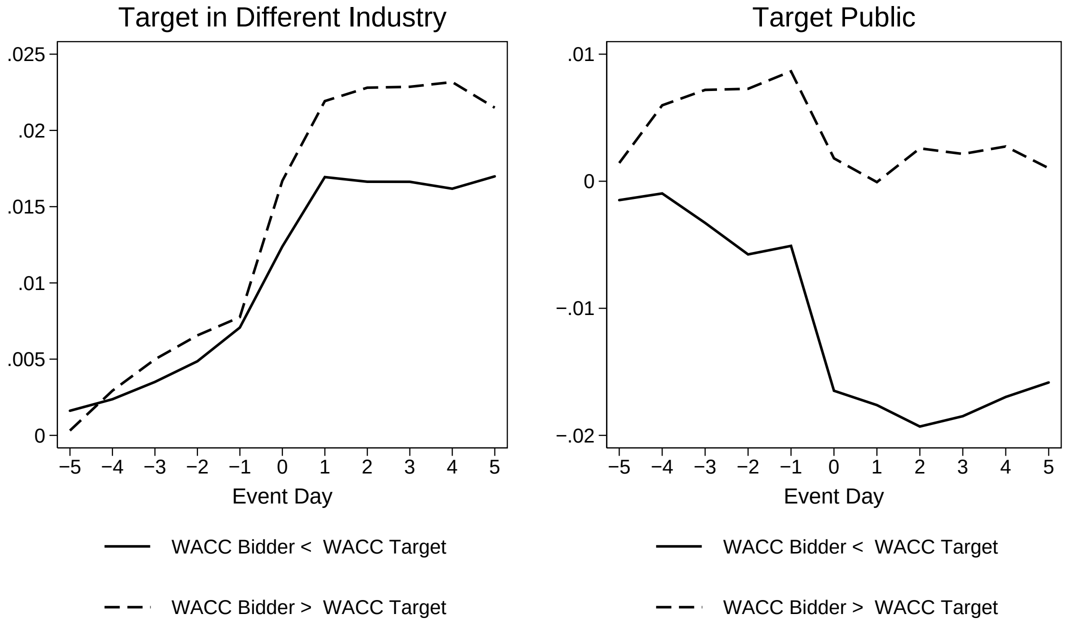

Figure 2. Bidder Average Cumulative Abnormal Returns. Average cumulative abnormal returns of the bidder around the announcement of asset acquisitions conditional on whether the WACC of the bidder exceeds that of the target. Abnormal returns are market adjusted and calculated as the difference between the acquiring firm's daily stock return and the CRSP Value Weighted Market Return on the respective event day. The left picture is restricted to diversifying acquisitions in which the acquiring firm's FF48 industry differs from that of the target. This sample consists of public and non-public targets. Bidder and target WACCs are calculated at the industry level. The right picture is restricted to transactions in which both target and bidder are publicly listed. Bidder and target WACCs are calculated at the firm-level.

Tables

Table I

Non-Core Division-Level Summary 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. Variables are defined in the Internet Appendix, except for betas, which are defined in the text (see Section I). All variables are trimmed by removing observations for which the value of a variable deviates from the median by more than five times the interquartile range.

	Mean	Median	SD	P25	P75	N
Raw Investment$_{t+1}$	0.063	0.040	0.074	0.013	0.084	21529
Industry Adjusted Investment$_{t+1}$	0.016	0.000	0.061	-0.019	0.036	21188
Industry-Firm Adjusted Investment$_{t+1}$	-0.002	-0.003	0.051	-0.028	0.021	20237
Raw Investment Core Division$_t$	0.069	0.050	0.082	0.025	0.088	21190
$\beta^A_{DIV,t-1}$	0.565	0.549	0.299	0.365	0.715	21529
$\beta^A_{CORE,t-1}$	0.562	0.544	0.269	0.393	0.694	21529
$\beta^A_{DIV,t-1} - \beta^A_{CORE,t-1}$	0.002	0.001	0.360	-0.216	0.218	21529
$\beta^A_{EW,DIV,t-1}$	0.568	0.548	0.235	0.434	0.659	21500
$\beta^A_{EW,CORE,t-1}$	0.557	0.540	0.231	0.438	0.646	21495
$\beta^A_{EW,DIV,t-1} - \beta^A_{EW,CORE,t-1}$	0.011	0.005	0.284	-0.137	0.156	21481
$Q_{DIV,t}$	1.396	1.306	0.376	1.135	1.571	21516
$Q_{CORE,t}$	1.389	1.306	0.362	1.137	1.559	21491
Divison Size$_t$	4.108	4.322	2.556	2.465	5.920	20960
Divison Cash Flow$_t$	0.135	0.131	0.201	0.044	0.225	18754
Ind Sales Growth$_t$	0.107	0.113	0.083	0.053	0.156	21529
$V_{DIV,t}$	0.042	0.028	0.044	0.009	0.057	21450
Relative Importance$_t$	0.320	0.247	0.270	0.090	0.497	20960

Table II

Summary Statistics of Deal, Bidder and Target Characteristics

This table shows summary statistics of deal, bidder, and target characteristics for the M&A samples used in the study. Panel A shows summary statistics for a sample of diversifying transactions. A diversifying transaction is a completed merger or acquisition in which the bidder has successfully gained control of a target belonging to a different FF48 industry. Targets are either publicly listed or non-public. $\beta^A_{IND,BIDDER,t-1}$ and $\beta^A_{IND,TARGET,t-1}$ are the industry level asset betas of the bidder and the target calculated using rolling windows of FF48 industry returns. $(\beta^A_{IND,BIDDER,t-1} - \beta^A_{IND,TARGET,t-1} > 0)$ is a dummy variable indicating whether the difference in industry level costs of capital exceeds zero. $Q_{IND,BIDDER,t-1}$ and $Q_{IND,TARGET,t-1}$ are the median FF48 industry Tobin's q's of the bidder and the target. $V_{TARGET,t}$ is the value of the deal. $E_{BIDDER,t-1}$ is the market value of the bidder's equity. *Target Public?* is a dummy variable indicating whether the target is public. *Tender Offer?* Indicates whether the transaction is a tender offer, while *All Cash?* and *All Equity?* are dummy variable measuring whether the acquirer paid using only cash or only equity. Panel B shows summary statistics for a sample of transactions in which the target is publicly listed. $\beta_{i,BIDDER,t-1}$ and $\beta^A_{i,TARGET,t-1}$ are the bidder's and target's firm-specific asset betas, which are estimated using rolling return windows of 60 months. $Q_{i,BIDDER,t-1}$ and $Q_{i,TARGET,t-1}$ are firm-level Tobin's q's of the bidder and the target. For further information on variables, see Section C of the Internet Appendix, except for betas, which are defined in the text (see Section I).

Panel A: Target in Different Industry

	Mean	Median	SD	P25	P75	N
$(\beta^A_{IND,BIDDER,t-1} - \beta^A_{IND,TARGET,t-1} > 0)$	0.410	0.000	0.492	0.000	1.000	6366
$(Q_{BIDDER,t-1} - Q_{TARGET,t-1} > 0)$	0.485	0.000	0.500	0.000	1.000	6366
$\beta^A_{IND,BIDDER,t-1}$	0.576	0.511	0.404	0.196	0.867	6366
$\beta^A_{IND,TARGET,t-1}$	0.628	0.582	0.352	0.363	0.889	6366
$\beta^A_{IND,BIDDER,t-1} - \beta^A_{IND,TARGET,t-1}$	-0.052	-0.054	0.401	-0.247	0.145	6366
$Q_{IND,BIDDER,t-1}$	1.461	1.327	0.380	1.189	1.669	6366
$Q_{IND,TARGET,t-1}$	1.464	1.344	0.378	1.178	1.685	6366
$Q_{IND,BIDDER,t-1} - Q_{IND,TARGET,t-1}$	-0.004	-0.014	0.399	-0.172	0.167	6366
$V_{TARGET,t}$	189.273	30.000	1077.693	10.000	104.669	6366
$E_{BIDDER,t-1}$	2010.123	349.350	8342.122	105.765	1137.870	6366
$V_{TARGET,t}/E_{BIDDER,t-1}$	0.349	0.090	5.077	0.037	0.235	6366
Target Public?	0.128	0.000	0.334	0.000	0.000	6366
Tender Offer?	0.028	0.000	0.165	0.000	0.000	6366
All Equity?	0.137	0.000	0.344	0.000	0.000	6366
All Cash?	0.303	0.000	0.460	0.000	1.000	6366

Panel B: Target Public

	Mean	Median	SD	P25	P75	N
$(\beta_{i,BIDDER,t-1} - \beta_{i,TARGET,t-1} > 0)$	0.539	1.000	0.499	0.000	1.000	627
$(Q_{i,BIDDER,t-1} - Q_{i,TARGET,t-1} > 0)$	0.655	1.000	0.476	0.000	1.000	609
$\beta^A_{i,BIDDER,t-1}$	0.734	0.598	0.581	0.332	0.962	627
$\beta^A_{i,TARGET,t-1}$	0.742	0.550	0.723	0.248	1.045	627
$\beta^A_{i,BIDDER,t-1} - \beta^A_{i,TARGET,t-1}$	-0.008	0.039	0.679	-0.271	0.341	627
$Q_{i,BIDDER,t-1}$	1.935	1.600	1.038	1.210	2.328	614
$Q_{i,TARGET,t-1}$	1.710	1.370	0.984	1.077	2.029	620
$Q_{i,BIDDER,t-1} - Q_{i,TARGET,t-1}$	0.241	0.190	1.144	-0.205	0.725	609
$log(V_{TARGET,t})$	5.953	5.952	1.843	4.617	7.339	627
$V_{TARGET,t}$	1881.478	384.350	5711.204	101.202	1539.424	627
$E_{BIDDER,t-1}$	11356.186	2346.994	29758.030	559.155	7625.509	627
$V_{TARGET,t}/E_{BIDDER,t-1}$	0.444	0.205	0.678	0.072	0.544	627
Target Public?	0.994	1.000	0.080	1.000	1.000	627
Tender Offer?	0.260	0.000	0.439	0.000	1.000	627
All Equity?	0.231	0.000	0.422	0.000	0.000	627
All Cash?	0.410	0.000	0.492	0.000	1.000	627

Table III

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 is *Raw Investment*, that is division-level capital expenditures in period $t+1$ scaled by division assets in period t. $\beta^A_{DIV,t-1}$ is the industry-level asset beta of the non-core division. $\beta^A_{CORE,t-1}$ is the industry-level asset beta of the core-division (i.e., the division with the highest sales). *Ind Sales Growth* is the average sales growth observed in the non-core division's FF48 industry between t and $t-1$. *Med* and *High Ind Sales Growth* indicate the second and third tercile of industry level sales growth. *External Finance* measures the firm's contemporaneous equity and debt issues scaled by lagged assets. *Med* and *High External Finance* indicate the second and third tercile of contemporaneous external finance. $Q_{DIV,t}$ 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 belonging to the same FF48 industry. *Divison Cash Flow* is the division's cash flow. *Division Size* is the logarithm of division sales. $Q_{FIRM,t}$ is the firm-specific Tobin's q. $SD(Q_{i,t})/Q_{FIRM,t}$ is the standard deviation of a firm's division-level Tobin's q's scaled by the overall Tobin's q of the firm. *Firm Cash Flow* is the firm's cash flow scaled by total assets 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. All regressions include year fixed effects. t-statistics in parentheses. Standard errors clustered at the firm-level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

	(1)	(2)	(3)	(4)	(5)
$\beta^A_{DIV,t-1} - \beta^A_{CORE,t-1}$	0.020***	0.018***		0.011***	0.017***
	(8.71)	(6.23)		(2.85)	(5.23)
$\beta^A_{DIV,t-1}$			0.016***		
			(4.13)		
$\beta^A_{CORE,t-1}$			-0.021***		
			(-5.30)		
Med Ind Sales Growth$_{t-1}$				-0.002	
				(-1.14)	
High Ind Sales Growth$_{t-1}$				0.001	
				(0.34)	
Med Ind Sales Growth$_{t-1}$ $\times$ $(\beta^A_{DIV,t-1} - \beta^A_{CORE,t-1})$				0.013***	
				(2.94)	
High Ind Sales Growth$_{t-1}$ $\times$ $(\beta^A_{DIV,t-1} - \beta^A_{CORE,t-1})$				0.011**	
				(2.17)	
Med External Finance$_{t+1}$					0.010***
					(6.39)
High External Finance$_{t+1}$					0.019***
					(10.43)
Med External Finance$_{t+1}$ $\times$ $(\beta^A_{DIV,t-1} - \beta^A_{CORE,t-1})$					0.002
					(0.57)
High External Finance$_{t+1}$ $\times$ $(\beta^A_{DIV,t-1} - \beta^A_{CORE,t-1})$					0.001
					(0.14)
$Q_{DIV,t}$		0.004	0.005*	0.003	0.003
		(1.47)	(1.82)	(1.20)	(1.19)
$Q_{CORE,t}$		-0.005*	-0.004	-0.005*	-0.005
		(-1.80)	(-1.42)	(-1.68)	(-1.57)
Divison Cash Flow$_t$		0.037***	0.037***	0.038***	0.038***
		(6.77)	(6.73)	(6.78)	(6.67)
Divison Size$_t$		0.001	0.001	0.001	0.001
		(0.63)	(0.78)	(0.74)	(0.99)
$Q_{FIRM,t}$		0.005***	0.005***	0.005***	0.004**
		(3.14)	(3.09)	(3.14)	(2.48)
$SD(Q_{i,t})/Q_{FIRM,t}$		-0.010	-0.011*	-0.011*	-0.009
		(-1.60)	(-1.69)	(-1.72)	(-1.39)
Firm Cash Flow$_t$		0.074***	0.074***	0.074***	0.071***
		(6.99)	(7.00)	(6.99)	(6.47)
Firm Size$_t$		0.001	0.000	0.001	0.000
		(0.75)	(0.54)	(0.70)	(0.28)
Firm Age$_t$		-0.003*	-0.003*	-0.003*	-0.002
		(-1.83)	(-1.85)	(-1.86)	(-1.32)
Firm Focus$_t$		0.006	0.006	0.006	0.006
		(0.99)	(0.94)	(0.99)	(0.93)
Observations	21532	15118	15118	15118	14706
R^2	0.021	0.053	0.053	0.054	0.063

Table IV

Alternative Interpretation: Synergies Between Core and Non-Core Divisions

The specifications in this table account for the extent of vertical integration between the non-core and core division. The dependent variable is *Raw Investment*, that is division-level capital expenditures in period $t+1$ scaled by division assets in period t. $V_{DIV,t}$ 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's industry. Fan and Lang (2000) interpret this measure as a proxy for the scope of 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. *Med* and *High* $V_{DIV,t}$ are dummy variables indicating whether $V_{DIV,t}$ falls in the second or third tercile. All specifications include the previously used firm- and division-level control variables (see Table III) and year fixed effects. t-statistics in parentheses. Standard errors clustered at the firm-level. * $p < 0.10$, ** $p < 0.05$,*** $p < 0.01$

	(1)	(2)	(3)	(4)
$\beta^A_{DIV,t-1} - \beta^A_{CORE,t-1}$	0.0189***	0.0202***	0.0196***	0.0182***
	(6.51)	(4.16)	(3.99)	(3.70)
Raw Investment Core Division$_{t+1}$	0.1306***			
	(8.53)			
Med $V_{DIV,t} \times (\beta^A_{DIV,t-1} - \beta^A_{CORE,t-1})$		-0.0095	-0.0075	-0.0050
		(-1.50)	(-1.15)	(-0.76)
High $V_{DIV,t} \times (\beta^A_{DIV,t-1} - \beta^A_{CORE,t-1})$		-0.0007	-0.0022	-0.0000
		(-0.10)	(-0.30)	(-0.01)
$Q_{DIV,t}$	0.0048*	0.0044	0.0051*	0.0090**
	(1.73)	(1.55)	(1.78)	(2.37)
Med $V_{DIV,t} \times Q_{DIV,t}$				-0.0076
				(-1.31)
High $V_{DIV,t} \times Q_{DIV,t}$				-0.0053
				(-0.82)
$Q_{CORE,t}$	-0.0050*	-0.0049	-0.0072*	-0.0085**
	(-1.70)	(-1.59)	(-1.82)	(-2.15)
Med $V_{DIV,t} \times Q_{CORE,t}$			0.0117**	0.0141***
			(2.29)	(2.62)
High $V_{DIV,t} \times Q_{CORE,t}$			-0.0041	-0.0022
			(-0.67)	(-0.34)
Med $V_{DIV,t}$		0.0072***	-0.0088	-0.0016
		(3.33)	(-1.19)	(-0.17)
High $V_{DIV,t}$		0.0106***	0.0163*	0.0210*
		(4.31)	(1.78)	(1.90)
Observations	14531	15077	15077	15077
R^2	0.066	0.057	0.058	0.058

Table V

Evidence of Bounded Rationality

The dependent variable is *Raw Investment*, that is division-level capital expenditures in period $t+1$ scaled by division assets in period t. Column (1) includes interaction terms between dummy variables for the three distinct sub-periods (1992–1996), (1997–2001), and (2002–2007) and $\beta^A_{DIV,t-1} - \beta^A_{CORE,t-1}$. *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. *Med* and *High Relative Importance* are dummy variables equaling one whenever the relative importance of the divisions falls into the second respectively third tercile. $SD(\beta^A_{j,t-1})$ is the within-firm standard deviation of divisional asset betas in a given year, which is calculated for the asset betas of both the core and the non-core divisions. *Med* and *High* $SD(\beta^A_{i,t-1})$ 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%. Although coefficient estimates are not reported in this table, all specifications also control for the previously used firm- and division-level control variables (see Table III). All regressions include year fixed effects. t-statistics in parentheses. Standard errors clustered at the firm-level. * $p < 0.10$, ** $p < 0.05$,*** $p < 0.01$

	(1)	(2)	(3)	(4)
$\beta^A_{DIV,t-1} - \beta^A_{CORE,t-1}$	0.040***	0.024***	0.044***	0.020
	(6.54)	(5.25)	(4.02)	(1.11)
(1992-1996)	-0.005			
	(-0.41)			
(1997-2001)	-0.022*			
	(-1.76)			
(2002-2007)	-0.021*			
	(-1.66)			
(1992-1996) × ($\beta^A_{DIV,t-1} - \beta^A_{CORE,t-1}$)	-0.013**			
	(-2.20)			
(1997-2001) × ($\beta^A_{DIV,t-1} - \beta^A_{CORE,t-1}$)	-0.024***			
	(-3.18)			
(2002-2007) × ($\beta^A_{DIV,t-1} - \beta^A_{CORE,t-1}$)	-0.035***			
	(-5.02)			
Med Relative Importance$_t$		0.004		
		(1.28)		
High Relative Importance$_t$		0.010**		
		(2.43)		
Med Relative Importance$_t$ × ($\beta^A_{DIV,t-1} - \beta^A_{CORE,t-1}$)		-0.006		
		(-1.00)		
High Relative Importance$_t$ × ($\beta^A_{DIV,t-1} - \beta^A_{CORE,t-1}$)		-0.013**		
		(-2.20)		
Med $SD(\beta^A_{i,t-1})$			-0.002	
			(-0.89)	
High $SD(\beta^A_{i,t-1})$			-0.007***	
			(-3.17)	
Med $SD(\beta^A_{i,t-1})$ × ($\beta^A_{DIV,t-1} - \beta^A_{CORE,t-1}$)			-0.017	
			(-1.50)	
High $SD(\beta^A_{i,t-1})$ × ($\beta^A_{DIV,t-1} - \beta^A_{CORE,t-1}$)			-0.030***	
			(-2.68)	
High CEO Share Ownership$_t$				-0.000
				(-0.09)
High CEO Share Ownership$_t$ × ($\beta^A_{DIV,t-1} - \beta^A_{CORE,t-1}$)				-0.024***
				(-2.79)
log(Market Cap)$_t$				0.005
				(1.40)
log(Market Cap)$_t$ × ($\beta^A_{DIV,t-1} - \beta^A_{CORE,t-1}$)				-0.001
				(-0.34)
Observations	15118	15117	15117	4183
R^2	0.056	0.055	0.056	0.058

Table VI

Bidder Cumulative Abnormal Returns as a Function of Beta Spreads

This table shows cross-sectional regressions in which seven day cumulative abnormal returns of bidders around announcements of asset acquisitions are regressed on measures of the bidder's and the target's costs of capital. The regressions in columns (1)–(3) are restricted to transactions in which the bidder buys a target belonging to a different FF48 industry ("diversifying transactions"). This sample involves both publicly and non-publicly listed targets. The regressions in columns (4)–(6) are restricted to a sample of transactions in which both the bidder and the target are publicly listed. This sample involves both intra-industry and diversifying transactions. $(\beta^A_{IND,BIDDER,t-1} - \beta^A_{IND,TARGET,t-1} > 0)$ is a dummy variable indicating whether the industry level cost of capital of the bidder exceeds that of the target. *Med* and *High* indicate the second and third tercile of the respective variable. $(\beta^A_{i,BIDDER,t-1} - \beta^A_{i,TARGET,t-1} > 0)$ indicates if the difference between the firm-level asset betas of the bidder and the target exceeds zero. 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. All regressions include year dummies and standard errors are clustered by announcement dates. All other variables are defined in the Internet Appendix, except for betas, which are defined in the text (see Section I). t-statistics in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

	Target in Different Industry			Target Public		
	(1)	(2)	(3)	(4)	(5)	(6)
$(\beta^A_{IND,BIDDER,t-1} - \beta^A_{IND,TARGET,t-1} > 0)$	0.0085**	0.0082**				
	(2.56)	(2.43)				
Med $\beta^A_{IND,BIDDER,t-1} - \beta^A_{IND,TARGET,t-1}$			-0.0029			
			(-0.74)			
High $\beta^A_{IND,BIDDER,t-1} - \beta^A_{IND,TARGET,t-1}$			0.0081**			
			(2.07)			
$(\beta_{i,BIDDER,t-1} - \beta_{i,TARGET,t-1} > 0)$				0.0204***	0.0234***	
				(2.68)	(3.22)	
Med $\beta^A_{i,BIDDER,t-1} - \beta^A_{i,TARGET,t-1}$						0.0233***
						(2.72)
High $\beta^A_{i,BIDDER,t-1} - \beta^A_{i,TARGET,t-1}$						0.0373***
						(4.25)
$log(V_{TARGET,t})$	-0.0032***	-0.0023**	-0.0023**	-0.0120***	-0.0118***	-0.0120***
	(-3.31)	(-2.20)	(-2.25)	(-4.19)	(-2.82)	(-2.87)
$V_{TARGET,t}/E_{BIDDER,t-1}$		0.0020	0.0020		0.0034	0.0040
		(1.54)	(1.53)		(0.29)	(0.34)
$(Q_{BIDDER,t-1} - Q_{TARGET,t-1} > 0)$		-0.0014				
		(-0.41)				
$(Q_{i,BIDDER,t-1} - Q_{i,TARGET,t-1} > 0)$					-0.0103	
					(-1.37)	
$Q_{IND,BIDDER,t-1} - Q_{IND,TARGET,t-1}$			0.0008			
			(0.17)			
$Q_{i,BIDDER,t-1} - Q_{i,TARGET,t-1}$						-0.0054*
						(-1.71)
Target Public?		-0.0254***	-0.0246***			
		(-4.39)	(-4.24)			
Tender Offer?		0.0101	0.0095		0.0009	0.0011
		(1.14)	(1.07)		(0.09)	(0.12)
All Equity?		0.0169**	0.0172***		-0.0248**	-0.0238**
		(2.55)	(2.59)		(-2.43)	(-2.37)
All Cash?		0.0035	0.0036		0.0161*	0.0167*
		(1.14)	(1.18)		(1.81)	(1.86)
Observations	6366	6366	6366	627	609	609
R^2	0.011	0.023	0.023	0.080	0.107	0.120

Notes

[1]Survey evidence of CEOs and CFOs presented in Graham, Harvey, and Puri (2013) suggests that the NPV ranking is the predominant principle governing capital budgeting decisions.

[2]See: http:www.bea.gov/industry/io_benchmark.htm

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

[4]We thank Malcolm Baker and Jeff Wurgler for suggesting this test.

[5]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.

[6]We thank our AFA discussant, Oliver Spalt, for suggesting this interpretation.

Internet Appendix for "The WACC Fallacy"

PHILIPP KRÜGER, AUGUSTIN LANDIER, and DAVID THESMAR*

A Definition of Firm-level Variables

Firm Cash Flow is the sum of income before extraordinary items (item IB_t) and depreciation and amortization (item DP_t) scaled by total assets (item AT_t).

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

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 $CAPX_{t+1}$) scaled by total firm assets (item AT_t).

Leverage is long term debt (item $DLTT_t$) scaled by total assets (item AT_t).

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 Divisions* is equal to 1 in standalone firms.

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

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 $SALE_t$). It is by definition equal to 1 for standalone firms.

$Q_{FIRM,t}$ is the firm's Market to Book ratio. Market value of assets is calculated as the book value of assets (item AT_t) plus the market value of common equity at fiscal year end (item $CSHO_t$ × item $PRCC\_F_t$) minus the book value of common equity (item CEQ_t) and balance sheet deferred taxes (item $TXDB_t$).

* "Citation format: KRÜGER, LANDIER, AND THESMAR, [2014], Internet Appendix to The WACC Fallacy: The Real Effects of Using a Unique Discount Rate, Journal of Finance [DOI STRING]. Please note: Wiley-Blackwell is not responsible for the content or functionality of any supporting information supplied by the authors. Any queries (other than missing material) should be directed to the authors of the article.

$SD(Q_{i,t})/Q_{FIRM,t}$ 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 section of the Internet Appendix. By definition, it is equal to zero for standalone firms.

log(Market Cap) is natural log of the market value of firm equity. It is defined as the number of shares outstanding (item $CSHO_t$) times the price of each share (item $PRCC\_F_t$).

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

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

External Finance is the sum of the change in equity issues ($\Delta CEQ + \Delta TXDB - \Delta RE$) and the change in debt issues ($\Delta CEQ - \Delta TXDB$) scaled by total assets in period t, where Δ denotes the forward difference operator (both from period t to $t+1$).

$SD(\beta^A_{j,t})$ is the within-firm standard deviation of divisional asset betas in a given year, which is calculated for the asset betas of both the core and the non-core divisions. By definition, it is equal to zero for standalone firms.

CEO Share Ownership is item $shrown\_excl\_opts\_pct_t$ from the Compustat Execucomp Database.

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. 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*. According to the Compustat manual, both variables have the same definition, namely "Segment Primary SIC Code" but are retrieved from two different historical files. We match this 4 digit SIC code to the corresponding FF48 industry. We use an extract of the Compustat Segment files downloaded from WRDS in September 2010.

Raw Investment is division-level capital expenditures normalized by total division assets at the previous fiscal year end, that is $\frac{CAPX_{i,t+1}}{ASSETS_{i,t}}$.

Industry Adjusted Investment is $\frac{CAPX_{i,t+1}}{ASSETS_{i,t}} - \frac{CAPX^{SA}_{i,t+1}}{ASSETS^{SA}_{i,t}}$, where $\frac{CAPX^{SA}_{i,t+1}}{ASSETS^{SA}_{i,t}}$ is the median investment of standalone firms belonging to the division's FF48 industry in that year.

Industry-Firm Adjusted Investment is *Industry Adjusted* investment less the weighted average industry adjusted investment across all divisions of the firm. Formally, that is $\frac{CAPX_{i,t+1}}{ASSETS_{i,t}} - \frac{CAPX^{SA}_{i,t+1}}{ASSETS^{SA}_{i,t}} - \sum_{i=1}^{N} w_i \times \left(\frac{CAPX_{i,t+1}}{ASSETS_{i,t}} - \frac{CAPX^{SA}_{i,t+1}}{ASSETS^{SA}_{i,t}} \right)$, where $w_{i,t}$ is the ratio of division to total firm assets.

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

Division Cash Flow is the sum of division-level Operating Profit and Depreciation and Amortization scaled by division assets.

$Q_{DIV,t}$ 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 the previous section 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 flows of goods and services between the industries of the non-core and core division. See subsection D. of Section I in the paper for details.

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.

Ind Sales Growth is the mean sales growth between $t-1$ and t in a given FF48 industry.

C Definition of M&A Related Variables

($\beta^A_{IND,BIDDER,t} - \beta^A_{IND,TARGET,t} > 0$) indicates whether the difference between the bidder's and the target's industry level asset betas is positive. See Section I of the paper for details on how the asset betas are constructed.

($\beta^A_{i,BIDDER,t} - \beta^A_{i,TARGET,t} > 0$) indicates whether the difference between the bidder's and the target's firm-level asset betas is positive. See Section I of the paper for details on how the asset betas are constructed.

$V_{TARGET,t}$ is the value of the transaction as disclosed by SDC (in Million US-$).

$Q_{IND,BIDDER,t}$ and $Q_{IND,TARGET,t}$ are the estimated industry level Tobin's q of the bidder and the target respectively. To compute industry-level Tobin's q, we calculate, each year, the median q of standalone firms that belong to the same FF48 industry as the firm. For the definition of Tobin's q, see the previous sections.

($Q_{IND,BIDDER,t} - Q_{IND,TARGET,t} > 0$) is a dummy variable indicating whether the difference between the bidder's and the target's industry level Tobin's q's is positive.

$Q_{i,BIDDER,t}$ and $Q_{i,TARGET,t}$ are the estimated firm-level Tobin's q of firm i, where i indexes either the target or the bidder. Firm-level Tobin's q are calculated as the firms' Market to Book ratios. Market value of assets is calculated as the book value of assets (item AT_t) plus the market value of common equity at fiscal year end (item $CSHO_t \times$ item $PRCC\_F_t$) minus the book value of common equity (item CEQ_t) and balance sheet deferred taxes (item $TXDB_t$).

($Q_{i,BIDDER,t} - Q_{i,TARGET,t} > 0$) is a dummy variable indicating whether the difference between the bidder's and the target's firm-level Tobin's q's is positive.

$E_{BIDDER,t-1}$ is the fiscal year end equity market value of the bidder in the year prior to the bid announcement (in Million US-$), which is calculated as (item $CSHO_{t-1}$) times share price at fiscal year end (item $PRCC\_F_{t-1}$).

Target Public? is a dummy variable indicating whether the target is a public company.

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.

All Equity? takes on the value of one whenever the target's shareholders are entirely compensated with shares.

D Appendix Tables

A. Additional Descriptive Tables

Table D.I simply reports firm-level statistics for conglomerates and stand-alone firms. It allows to appraise the differences between focused firms and conglomerates, whose non-core divisions we will be studying in our paper. Variable names are self-explanatory, but the exact definition is given in Internet Appendix A. Table D.II reports time series averages of our estimates of unlevered betas by industry.

B. Main Specification Without Finance

Table D.III reports the main findings of Table III, after excluding finance, insurance, and real estate industries. Investment and investment opportunities in these industries are not likely to be 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 III, excluding all non-core divisions-year observations that belong to a core division from the Banking and Insurance (FF48 industries 44 and 45). We report these new estimates in Table D.III. They are, if anything, stronger, consistent with the notion that accounting data are noisier in these industries.

C. Alternative Beta Definitions

In Table D.IV, we explore the sensitivity of our investment results to various definitions of the beta. First, one natural question is whether non-core divisions use the beta of their core division, or some firm-wide average beta. Both are a priori sensible hypotheses. To test one against the other, we regress investment on the beta of the division ($\beta^A_{DIV,t-1}$), as well as both the beta of the core ($\beta^A_{CORE,t-1}$) and the firm-wide average beta ($\beta^A_{AVERAGE,t-1}$). We also add all the controls from Table III, column (2). As shown in Table D.IV, column (2), all of the statistical significance is picked up by $\beta^A_{DIV,t-1}$ and $\beta^A_{CORE,t-1}$. The coefficient on $\beta^A_{AVERAGE,t-1}$ is small and insignificant. This "horse race" suggests that the beta of the core division is more likely to serve as a benchmark in firms subject to the WACC fallacy.

Second, in constructing $\beta^A_{DIV,t-1}$, $\beta^A_{CORE,t-1}$, and $\beta^A_{AVERAGE,t-1}$, we rely on estimated industry-level equity betas which are unlevered at the industry-level. However, an alternative would be to use industry-averages based on firm-level equity betas unlevered at the firm-level instead. First note that calculating value weighted industry averages based on these firm-level betas (where total firm values serve as weights) is exactly equivalent to the approach we choose (i.e., unlevering industry betas with industry leverage). A true alternative would be, however, to calculate equally weighted industry averages based on firm-level equity betas unlevered at the firm-level. In this case, the two approaches are not equivalent. Using this second approach to measure the core and non-core betas, we find comparable point estimates in investment regressions (Table D.IV, column (3)). Statistical significance for these estimates drops a bit, which is consistent with the notion that equally-weighted industry averages of betas are noisier. This is because firm-level betas tend to be notoriously imprecise for small firms. As a result, we have a preference for our baseline approach, which overweights larger firms in computing the betas.

Last, we also investigate the possibility that the non-core division might be using the beta of the firm, as directly calculated from its own stock returns. This is an alternative to using the beta of the core's industry ($\beta^A_{CORE,t-1}$) or the average beta across divisions ($\beta^A_{AVERAGE,t-1}$). We explore this alternative in Table D.IV, columns (4)–(8). We find that it is a valid alternative, as long as the beta of the firm is precisely estimated. Firm-level betas are notoriously noisier than industry betas, since industry returns smooth out a big part of idiosyncratic volatility: this measurement error problem slightly pollutes our tests. We show this using three different techniques. First, we estimate a beta with rolling windows of 60 monthly returns, and the firm's capital structure to unlever it. Using this beta, we find that our investment regression works much better for firms whose asset beta is stable over time, that is firms for which the standard error for the firm-specific equity beta is low (see column (5)). Second, we find that these regressions also work better when we remove observations corresponding to extreme values of asset betas (below 0 or above +2, see column (6)). Third, we find much stronger estimate when we move to weekly betas, which allows us to increase the number of observation to calculate the firm-level beta (104, or even 260 weeks, instead of just 60 months: See columns (7) and (8)).

D. Controlling for Industry Shocks

In Table D.V, we perform various robustness checks of our investment regressions to account for industry shocks. It might be the case that non-core divisions belonging to certain industries invest more for reasons that are specific to their industries and not due to biases in the capital budgeting process. In order to address this concern, we use several alternative approaches, and report the results in Table D.V.

We first follow Lamont (1997) and use industry adjusted investment as our dependent variable. Industry adjusted investment is calculated as the difference between raw investment of the non-core division and the median raw investment for standalone firms operating in the same FF48 industry in that specific year. We show the result in Table D.V, column (1). The coefficient is somewhat attenuated but remains significant. Note, though, that even though the coefficient is smaller, the economic magnitude is not smaller than in our main specification. Indeed, mean industry adjusted investment is substantially lower than mean raw investment. While average raw investment is 0.063 for non-core divisions, industry adjusted investment averages at 0.016 (see Table I). Hence, for a one standard deviation increase in the beta spread, division investment in excess of the average standalone raw investment changes by about 0.00175 (0.005*0.35) percentage points, translating into a sizeable distortion of about 11% of average industry adjusted investment. Note that this approach is quite demanding as most of our identification is based on industry-year variation (we use industry betas).

A second approach consists of directly adding industry $\times$ year fixed effects in the regression. As shown in Table D.V, column (2), the coefficient is stronger and more significant than with the Lamont adjustment. In column (4), we just control for industry fixed effects, and find similar results.

We also implement an alternative measure of industry adjustment proposed by Rajan, Servaes, and Zingales (2000). A potential concern is that standard industry adjustment procedures may be flawed because, compared to standalone firms in the same industry, some diversified firms may overinvest in all of their divisions. If this is the case, industry adjusted division investment would be higher in these firms, but such overinvestment would be incorrectly treated as being division specific. In order to correct for the potential firm-wide overinvestment of conglomerates, Rajan, Servaes, and Zingales (2000) propose to further subtract from the division's industry adjusted investment rate the industry adjusted investment rate averaged across all divisions of the firm. We run our main specification using this second alternative investment measure. The results are reported in Table D.V, column (3): the parameter estimate remains statistically and economically significant.

Fourth, we control for firm-level unobservable heterogeneity. This approach achieves results similar to the Rajan, Servaes, and Zingales (2000) industry-firm adjustment: It control for firm-level policies, except that it only deals with those policies that are fixed over time. We report the result in Table D.V, column (5), and find that our results hold up to this robustness check.

Table D.I

Firm-level Summary Statistics

This table reports summary statistics of the employed firm-level variables. Variables based on data from Compustat and CRSP are observed for the period of 1987–2007. CEO related variables from Compustat Execucomp are observed from 1992–2007 only. All variables are defined in Section A of the Internet Appendix, except for betas, which are defined in the text (see Section I of the paper). Standalone Firms have their activities concentrated in a single FF48 industry, whereas Conglomerate Firms are diversified across at least two different FF48 sectors. All variables are trimmed by removing observations for which the value of a variable deviates from the median by more than five times the interquartile range.

	Standalone Firms					
	Mean	Median	SD	P25	P75	N
Firm Cash Flow$_t$	0.029	0.064	0.169	-0.014	0.121	106461
Firm Size$_t$	4.305	4.283	2.455	2.637	5.947	120714
Firm Age$_t$	2.136	2.197	0.888	1.609	2.773	120541
Firm Investment$_{t+1}$	0.065	0.038	0.078	0.013	0.086	102520
Leverage$_t$	0.188	0.091	0.239	0.000	0.301	119633
Sales$_t$	3.946	4.110	2.653	2.352	5.757	120770
Sales Growth$_t$	0.126	0.086	0.366	-0.041	0.263	104181
$Q_{FIRM,t}$	1.881	1.417	1.273	1.037	2.268	92422
$\beta^A_{AVERAGE,t-1}$	0.639	0.614	0.343	0.408	0.870	114488
$\beta^A_{i,t-1}$	0.722	0.565	0.694	0.248	1.025	38449
log(Market Cap)$_t$	4.301	4.265	2.343	2.689	5.898	100569
CEO Share Ownership	5.521	1.716	8.961	0.550	6.330	8397
External Finance$_{t+1}$	0.146	0.055	0.325	-0.020	0.219	92299
	Conglomerate Firms					
	Mean	Median	SD	P25	P75	N
Firm Cash Flow$_t$	0.061	0.075	0.106	0.036	0.113	14680
Firm Size$_t$	5.960	6.047	2.438	4.192	7.737	15024
Firm Age$_t$	2.825	3.045	0.888	2.197	3.555	15020
Firm Investment$_{t+1}$	0.059	0.046	0.054	0.024	0.078	14756
Leverage$_t$	0.227	0.198	0.199	0.071	0.326	14987
Number of Divisions$_t$	2.564	2.000	0.873	2.000	3.000	15024
Sales$_t$	5.868	6.082	2.423	4.248	7.603	15024
Sales Growth$_t$	0.100	0.071	0.257	-0.017	0.176	14308
Firm Focus$_t$	0.732	0.740	0.173	0.592	0.883	14930
$Q_{FIRM,t}$	1.499	1.234	0.854	1.011	1.667	12723
$SD(Q_{i,t})/Q_{FIRM,t}$	0.175	0.129	0.161	0.063	0.233	12633
$\beta^A_{AVERAGE,t-1}$	0.560	0.554	0.239	0.409	0.685	15024
$\beta^A_{i,t-1}$	0.525	0.467	0.430	0.233	0.734	8944
log(Market Cap)$_t$	5.527	5.571	2.513	3.678	7.379	13575
CEO Share Ownership	5.552	1.500	9.891	0.500	5.360	1633
$SD(\beta^A_{i,t-1})$	0.210	0.176	0.164	0.095	0.279	15024
External Finance$_{t+1}$	0.070	0.027	0.234	-0.030	0.114	13637

Table D.II

Weighted Average Cost of Capital (Industry Level)

This table shows time series averages of the yearly industry level equity beta $\beta^E_{j,t}$, industry level leverage $E_{j,t-1}/(D_{j,t-1}+E_{j,t-1})$, and the industry level asset beta $\beta^A_{j,t}$, where j indexes FF48 industries. Yearly industry level debt ($D_{j,t}$) and equity ($E_{j,t}$) are the aggregate debt and aggregate market value of equity observed in the respective FF48 industry in a given year. Time series averages are calculated over the sample period 1987–2007 as $\beta^E_j = (1/T)\sum_{t=1}^{T}\beta^E_{j,t}$, $\beta^A_j = (1/T)\sum_{t=1}^{T}\beta^A_{j,t}$ and $(E/(D+E))_j = (1/T)\sum_{t=1}^{T}(E_{j,t-1}/(D_{j,t-1}+E_{j,t-1}))$. Yearly industry level equity betas ($\beta^E_{j,t}$) 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.

FF48	Industry	Description	β^E_j	$(\frac{E}{D+E})_j$	β^A_j
1	Agric	Agriculture	0.79	0.61	0.48
2	Food	Food Products	0.69	0.65	0.44
3	Soda	Candy & Soda	0.78	0.52	0.42
4	Beer	Beer & Liquor	0.59	0.77	0.45
5	Smoke	Tobacco Products	0.87	0.60	0.52
6	Toys	Recreation	1.42	0.53	0.77
7	Fun	Entertainment	1.16	0.63	0.73
8	Books	Printing and Publishing	0.95	0.64	0.60
9	Hshld	Consumer Goods	0.94	0.67	0.60
10	Clths	Apparel	1.07	0.69	0.75
11	Hlth	Healthcare	1.03	0.57	0.58
12	MedEq	Medical Equipment	0.91	0.80	0.72
13	Drugs	Pharmaceutical Products	0.80	0.84	0.68
14	Chems	Chemicals	0.95	0.56	0.53
15	Rubbr	Rubber and Plastic Products	1.13	0.57	0.68
16	Txtls	Textiles	0.99	0.48	0.47
17	BldMt	Construction Materials	1.03	0.58	0.59
18	Cnstr	Construction	1.24	0.39	0.51
19	Steel	Steel Works Etc	1.15	0.53	0.59
20	FabPr	Fabricated Products	0.99	0.52	0.54
21	Mach	Machinery	1.20	0.57	0.66
22	ElcEq	Electrical Equipment	1.26	0.49	0.61
23	Autos	Automobiles and Trucks	1.07	0.29	0.32
24	Aero	Aircraft	0.97	0.51	0.49
25	Ships	Shipbuilding, Railroad Equipment	0.84	0.55	0.44
26	Guns	Defense	0.80	0.50	0.38
27	Gold	Precious Metals	0.53	0.81	0.42
28	Mines	Non-Metallic and Industrial Metal Mining	0.98	0.71	0.70
29	Coal	Coal	0.92	0.50	0.47
30	Oil	Petroleum and Natural Gas	0.67	0.64	0.42
31	Util	Utilities	0.44	0.41	0.19
32	Telcm	Communication	1.02	0.59	0.62
33	PerSv	Personal Services	1.02	0.60	0.61
34	BusSv	Business Services	1.42	0.72	1.05
35	Comps	Computers	1.27	0.65	0.85
36	Chips	Electronic Equipment	1.56	0.68	1.14
37	LabEq	Measuring and Control Equipment	1.53	0.74	1.13
38	Paper	Business Supplies	0.98	0.53	0.51
39	Boxes	Shipping Containers	0.79	0.45	0.36
40	Trans	Transportation	1.03	0.47	0.48
41	Whlsl	Wholesale	1.01	0.42	0.39
42	Rtail	Retail	1.06	0.61	0.63
43	Meals	Restaraunts, Hotels, Motels	1.01	0.64	0.65
44	Banks	Banking	1.09	0.09	0.10
45	Insur	Insurance	0.86	0.17	0.16
46	RlEst	Real Estate	0.82	0.35	0.26
47	Fin	Trading	0.99	0.14	0.16

Table D.III

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

	(1)	(2)	(3)
$\beta^A_{DIV,t-1} - \beta^A_{CORE,t-1}$	0.0209***	0.0185***	
	(9.13)	(6.45)	
$\beta^A_{DIV,t-1}$			0.0148***
			(3.94)
$\beta^A_{CORE,t-1}$			-0.0230***
			(-5.77)
$Q_{DIV,t}$		0.0037	0.0056*
		(1.31)	(1.87)
$Q_{CORE,t}$		-0.0065**	-0.0048
		(-2.13)	(-1.58)
$Q_{FIRM,t}$		0.0055***	0.0054***
		(3.31)	(3.23)
$SD(Q_{i,t})/Q_{FIRM,t}$		-0.0092	-0.0102
		(-1.43)	(-1.58)
Firm Cash Flow$_t$		0.0710***	0.0711***
		(6.73)	(6.74)
Divison Size$_t$		0.0003	0.0005
		(0.38)	(0.58)
Divison Cash Flow$_t$		0.0388***	0.0385***
		(6.86)	(6.82)
Firm Size$_t$		0.0010	0.0007
		(1.14)	(0.85)
Firm Age$_t$		-0.0025*	-0.0026*
		(-1.85)	(-1.88)
Firm Focus$_t$		0.0064	0.0058
		(0.99)	(0.91)
Observations	20750	14791	14791
R^2	0.023	0.055	0.055

Table D.IV

Non-Core Division-Level Investment Regressions: Alternative Spread Definitions

In column (1), $\beta^A_{AVERAGE,t-1}$ is the division asset weighted average asset beta calculated using monthly industry returns returns. In column (2), we run a horse race between the division asset weighted average asset beta and the beta of the core division. In column (3), $\beta^A_{EW,DIV,t-1}$ and $\beta^A_{EW,CORE,t-1}$ are equally weighted industry average asset betas obtained from firm-level equity betas unlevered at the firm-level (using monthly return data). In column (4), $\beta^A_{i,t-1}$ denotes the firm specific asset beta obtained from relying on monthly data and using rolling windows of 60 months. In column (5), firm specific asset betas using monthly stock returns are interacted with terciles (*Med, High*) of the standard error of the firm specific equity beta estimate $SE(\beta^E_{i,t-1})$. In column (6), we restrict the regressions to observations for which the firm specfic asset beta $\beta^A_{i,t-1}$ falls in the interval of $[0,2]$. In column (7), we use the firm specific asset beta relying on weekly data and rolling windows of 104 weeks. In column (8), we extend the rolling windows to 260 weeks. All regressions control for the usual control variables (see Table III in the paper) and year dummies. t-statistics in parentheses. Standard errors clustered at the firm-level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\beta^A_{DIV,t-1} - \beta^A_{AVERAGE,t-1}$	0.022***							
	(5.61)							
$\beta^A_{DIV,t-1}$		0.017***						
		(3.68)						
$\beta^A_{CORE,t-1}$		-0.018***						
		(-2.59)						
$\beta^A_{AVERAGE,t-1}$		-0.004						
		(-0.47)						
$\beta^A_{EW,DIV,t-1} - \beta^A_{EW,CORE,t-1}$			0.011***					
			(2.94)					
$\beta^A_{DIV,t-1} - \beta^A_{i,t-1}$				0.004*	0.021***	0.007**		
				(1.70)	(3.73)	(2.31)		
Med $SE(\beta^E_{i,t-1})$					0.001			
					(0.58)			
High $SE(\beta^E_{i,t-1})$					0.001			
					(0.14)			
Med $SE(\beta^E_{i,t-1}) \times (\beta^A_{DIV,t-1} - \beta^A_{i,t-1})$					-0.022***			
					(-3.64)			
High $SE(\beta^E_{i,t-1}) \times (\beta^A_{DIV,t-1} - \beta^A_{i,t-1})$					-0.020***			
					(-3.05)			
$\beta^A_{DIV,t-1} - \beta^A_{i,t-1}$							0.006**	
							(2.37)	
$\beta^A_{DIV,t-1} - \beta^A_{i,t-1}$								0.009***
								(2.64)
Observations	15315	15118	15080	10947	10947	10590	10888	10940
R^2	0.052	0.053	0.048	0.053	0.056	0.056	0.054	0.054

Table D.V

Non-Core Division-Level Investment Regressions: Robustness Checks

In column (1), we use *Industry Adjusted Investment* as the dependent variable. In column (2), we use *Raw Investment* as the dependent variable and include Division Industry*Year Fixed Effects. In column (3), *Industry-Firm Adjusted Investment* serves as dependent variable. In column (4), we include division industry fixed effects. In column (5), we include firm fixed effects. In column (6), we examine the asymmetry of the beta spread and use the positive and negative component of the spread as independent variables. All regressions control for the usual control variables (see Table III in the paper). t-statistics in parentheses. Standard errors clustered at the firm-level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

	(1)	(2)	(3)	(4)	(5)	(6)
$\beta^A_{DIV,t-1} - \beta^A_{CORE,t-1}$	0.005**	0.010**	0.006***	0.007**	0.014***	
	(2.36)	(2.52)	(2.83)	(2.36)	(3.76)	
$min(\beta^A_{DIV,t-1} - \beta^A_{CORE,t-1}, 0)$						0.019***
						(3.11)
$max(\beta^A_{DIV,t-1} - \beta^A_{CORE,t-1}, 0)$						0.010
						(1.46)
Observations	14878	15118	14256	15118	15118	15118
R^2	0.037	0.173	0.017	0.131	0.413	0.413
Year Fixed Effects	Yes	No	Yes	Yes	Yes	Yes
Division Industry*Year Fixed Effects	No	Yes	No	No	No	No
Division Industry Fixed Effects	No	No	No	Yes	No	No
Firm Fixed Effects	No	No	No	No	Yes	No

Table D.VI

Bidder Cumulative Abnormal Returns as a Function of Beta Spreads (Robustness)

This table shows cross-sectional regressions in which seven day cumulative abnormal returns of bidders around announcements of asset acquisitions are regressed on measures of the bidder's and the target's costs of capital, several control variables, and a the bidder's *Leverage*. *Leverage* is defined as the sum of a firm's total debt (i.e., total long term debt and debt in current liabilities) scaled by the sum of a firm's debt and equity. The regressions in columns (1)–(2) are restricted to transactions in which the bidder buys a target belonging to a different FF48 industry ("diversifying transactions"). This sample involves both publicly and non-publicly listed targets. The regressions in columns (3)–(4) are restricted to a sample of transactions in which both the bidder and the target are publicly listed. This sample involves both intra-industry and diversifying transactions. $(\beta^A_{IND,BIDDER,t} - \beta^A_{IND,TARGET,t} > 0)$ is a dummy variable indicating whether the industry level cost of capital of the bidder exceeds that of the target. *Med* and *High* indicate the second and third tercile of the respective variable. $(\beta^A_{i,BIDDER,t} - \beta^A_{i,TARGET,t} > 0)$ indicates if the difference between the firm-level asset betas of the bidder and the target exceeds zero. 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. All regressions include year dummies and standard errors are clustered by announcement dates. All other variables are defined in the Internet Appendix, except for betas, which are defined in the paper (see Section I). *t*-statistics in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

	Target in Different Industry		Target Public	
	(1)	(2)	(3)	(4)
$(\beta^A_{IND,BIDDER,t-1} - \beta^A_{IND,TARGET,t-1} > 0)$	0.0088**			
	(2.48)			
Med $\beta^A_{IND,BIDDER,t-1} - \beta^A_{IND,TARGET,t-1}$		-0.0017		
		(-0.43)		
High $\beta^A_{IND,BIDDER,t-1} - \beta^A_{IND,TARGET,t-1}$		0.0087**		
		(2.16)		
$(\beta_{i,BIDDER,t-1} - \beta_{i,TARGET,t-1} > 0)$			0.0236***	
			(3.24)	
Med $\beta^A_{i,BIDDER,t-1} - \beta^A_{i,TARGET,t-1}$				0.0234***
				(2.72)
High $\beta^A_{i,BIDDER,t-1} - \beta^A_{i,TARGET,t-1}$				0.0387***
				(4.32)
$log(V_{TARGET,t})$	-0.0021**	-0.0021**	-0.0122***	-0.0125***
	(-1.96)	(-2.00)	(-2.90)	(-2.97)
$Leverage_{BIDDER,t-1}$	-0.0023	-0.0024	0.0186	0.0223
	(-0.33)	(-0.33)	(1.31)	(1.54)
$V_{TARGET,t}/E_{BIDDER,t-1}$	0.0020	0.0020	0.0027	0.0031
	(1.54)	(1.54)	(0.23)	(0.27)
$(Q_{BIDDER,t-1} - Q_{TARGET,t-1} > 0)$	-0.0006			
	(-0.17)			
$(Q_{i,BIDDER,t-1} - Q_{i,TARGET,t-1} > 0)$			-0.0092	
			(-1.22)	
$Q_{IND,BIDDER,t-1} - Q_{IND,TARGET,t-1}$		0.0010		
		(0.22)		
$Q_{i,BIDDER,t} - Q_{i,TARGET,t}$				-0.0048
				(-1.53)
Target Public?	-0.0250***	-0.0243***		
	(-4.23)	(-4.10)		
Tender Offer?	0.0095	0.0089	0.0018	0.0024
	(1.07)	(1.00)	(0.19)	(0.25)
All Equity?	0.0165**	0.0167**	-0.0233**	-0.0220**
	(2.50)	(2.53)	(-2.29)	(-2.20)
All Cash?	0.0034	0.0035	0.0159*	0.0166*
	(1.10)	(1.13)	(1.79)	(1.84)
Observations	6315	6315	607	607
R^2	0.022	0.022	0.109	0.124

E Theory

This section derives our main empirical specification from a simple investment model. Consider a population of companies (or divisions) i, each in an industry $j(i)$. There are two periods $1, 2$. The risk-free rate is r.

At time 1, companies have a legacy amount of capital booked at market value, normalized to 0 for simplicity. They have the possibility to invest k_i in a project that yields the following expected cash-flow at time 2:

$$\theta_j(1 + \epsilon_i + \eta_j)k_i \tag{1}$$

where θ_j is *expected* productivity in sector j. The two shocks ϵ_i (idiosyncratic) and η_j (industry-specific) have zero mean. They are revealed at time 1 before the firm (or division) decides on its investment level k_i.

The final cash-flow is risky and its systematic risk is captured by the industry beta: β_j, which is a characteristic of the industry.

There are convex adjustment costs $\gamma k_i^2/2$ to installing capital k_i at time 1.

A. The Rational Firm

Firm i solves the following program:

$$\max_{k_i} \frac{\theta_j(1 + \epsilon_i + \eta_j)k_i}{1 + r + \beta_j(r_M - r)} - k_i - \gamma k_i^2/2. \tag{2}$$

Thus, the expected investment of firm i in sector j is:

$$k_i = \frac{1}{\gamma}\left(\frac{\theta_j(1 + \epsilon_i + \eta_j)}{1 + r + \beta_j(r_M - r)} - 1\right) \tag{3}$$

The total value of the firm (debt plus equity) at $t = 1$ after investment is:

$$V_i = \frac{\theta_j(1 + \epsilon_i + \eta_j)}{1 + r + \beta_j(r_M - r)} k_i \tag{4}$$

Thus, the market-to book (or Tobin's q) at $t = 1$ is:

$$q_{i,j} = \frac{V_i}{k_i} = \frac{\theta_j(1 + \epsilon_i + \eta_j)}{1 + r + \beta_j(r_M - r)} \tag{5}$$

Taking expectation over idiosyncratic shocks, we get the industry-level market-to book (which is the measure that we use in our division-level regressions):

$$q_j = \frac{\theta_j(1 + \eta_j)}{1 + r + \beta_j(r_M - r)} \tag{6}$$

Thus

$$k_i = \frac{1}{\gamma}(q_{i,j} - 1) = \frac{1}{\gamma}\left(\frac{1 + \epsilon_i + \eta_j}{1 + \eta_j} q_j - 1\right) \tag{7}$$

In particular, this equation implies that, once controlling for q_j, there is no correlation between k_i and β_j as shocks ϵ_i and η_j are orthogonal to β_j.

Note that the expected investment in sector j is:

$$\overline{k}_j = \frac{1}{\gamma}(q_j - 1) \tag{8}$$

This is the average investment of non-biased firms (divisions).

B. Firm Subject to the WACC fallacy

Division i (in industry j) mistakenly uses β_{j0} (the beta of the core division) to discount and thus solves the following program:

$$\max_{k_i} \frac{\theta_j(1+\epsilon_i+\eta_j)k_i}{1+r+\beta_{j0}(r_M - r)} - k_i - \gamma k_i^2/2. \tag{9}$$

Thus, the expected investment of firm i in sector j is:

$$k_i = \frac{1}{\gamma}\left(\frac{1+r+\beta_j(r_M - r)}{1+r+\beta_{j0}(r_M - r)}\frac{\theta_j(1+\epsilon_i+\eta_j)}{1+r+\beta_j(r_M - r)} - 1\right) \tag{10}$$

Taking the expectation over idiosyncratic shocks and approximating

$$\frac{1+r+\beta_j(r_M - r)}{1+r+\beta_{j0}(r_M - r)} \sim 1 + (r_M - r)(\beta_j - \beta_{j0}), \tag{11}$$

we get expected investment of division i:

$$Ek_i = \frac{1}{\gamma}((1+(r_M - r)(\beta_j - \beta_{j0}))q_j - 1) \tag{12}$$

or, equivalently:

$$Ek_i = \frac{(r_M - r)q_j}{\gamma}(\beta_j - \beta_{j0}) + \frac{1}{\gamma}(q_j - 1) \tag{13}$$

which positively links the division-level investment with the "beta spread" $\beta_j - \beta_{j_0}$. We find such a relationship in the data.

Under the null hypothesis that firms are rational, we have seen previously that $Ek_i = \overline{k}_j = \frac{1}{\gamma}(q_j - 1)$. Hence, under the null hypothesis that the WACC fallacy does not exist, the coefficient on $(\beta_j - \beta_{j_0})$ in division-level investment regressions should be zero.

C. Empirical Implementation and Endogeneity Concerns

Under the null hypothesis that firms are not subject to the WACC fallacy, once controlling for q_j or q_i, there should be no link between Ek_i and β_j.

However, a valid concern with this approach is that a link between Ek_i and (β_j, β_{j_0}) might be driven by mismeasurement problems. We investigate this further in what follows:

- **What if "official industries" are different from "real industries"?** Assume the division's true industry is in fact the core industry of the firm, j_0. Then, controlling for either the core industry's q_{j_0} (or equivalently the core division investment k_{i_0}) eliminates any spurious link between k_i and β_j. Indeed, assuming no WACC fallacy and the division's industry being j_0:

$$Ek_i = \frac{1}{\gamma}(q_{j_0} - 1) \tag{14}$$

- **What if industry-level Tobin's q is poorly measured?** In that case, one might be concerned that β_j might be a proxy for the real $q_{i,j}$. In unreported regressions, we show, using stand-alone divisions, that investment is not correlated with beta. Hence, the data does not display any mechanical link between investment and beta that might explain the sign of the coefficient we find on the beta spread.