Project Development with Delegated Bargaining:
The Role of Elevated Hurdle Rates

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Abstract

During project development, costs are endogenously determined through delegated bargaining with counterparties. In surveys, nearly 80% of CFOs report using an elevated hurdle rate, the implications of which we explore in a delegated bargaining model. We show that elevated hurdle rates can convey a bargaining advantage that exceeds the opportunity cost of forgone projects, whether hurdle rate buffers arise for strategic or non-strategic reasons. Using CFO survey data, we find buffer use is negatively related to the cost of capital and ex ante bargaining power, consistent with the model, and that realized returns exhibit "beat the hurdle rate benchmark" behavior.

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"If I set a higher hurdle rate, my people go out and get better deals on contracts they negotiate."

CFO of NYSE listed energy firm.

1. Introduction

Project *development* is distinct from project *evaluation.* By the latter we mean the capital budgeting steps prescribed by textbooks, while the former is broader and involves interactions with trading partners, including the procurement of inputs. In this paper, we explore the special role of discount rates in project development, and in particular, the common practice of requiring that expected returns for projects exceed a hurdle rate that is greater than the risk-appropriate weighted-average cost of capital (WACC). We show that, because of the process through which projects are cultivated, adding a buffer to discount rates often preserves and improves firm value.

Two ideas are central. First, every project that a firm accepts is an acquisition that changes the boundary of the firm. Each one needs to be developed. Therefore, up-front investment costs are not exogenous, contrary to standard assumptions. They are the *endogenous* result of a collection of bargaining outcomes between a firm's managers and outsiders who do business with the firm. If sufficient gains through trade exist, investment in positive NPV projects creates a joint surplus, over which the firm and its trading partners negotiate. While we study this feature of project development within the context of elevated hurdle rates, this insight of bargaining within capital budgeting seems worthy of attention broadly.

For example, suppose that building a new plant requires land (which is part of up front investment costs C_0). This cost is not exogenous. The price at which the land sells will depend on what it will eventually be used for (the value created by future cash flows) and the relative bargaining power between the firm's managers and the owners of the property.

Second, employees accept their CFO's instructions about hurdle rates as given without

questioning or verifying them.[1] This common organizational structure within firms gives rise to a delegated bargaining situation, in which top executives can alter the firm's observable preferences to outsiders, and project managers act as delegates.[2] As such, when a hurdle rate is high, project managers presume that their walkaway value is higher and that the firm has better outside options. This can result in harder bargaining by delegates and the firm obtaining a greater share of the surplus during negotiations as projects are developed.

Based on these ideas, we pose a theoretical model of delegated bargaining, characterize the optimal hurdle rate buffer in several settings, and test the novel empirical implications that arise from the analysis. One key result is that inflated hurdle rates may persist and preserve firm value because they are part of an equilibrium trade-off between the gains to trade from higher bargaining power and losses that arise when forfeiting moderately positive NPV projects.

Hurdle rate buffers are extremely common. Our survey evidence shows that 78% of companies set hurdle rates above their cost of capital, and among these firms the average buffer is 6.6%.[3] The surveys also indicate why (Figure 1): because of perceived or real financial constraints (Graham, 2022), idiosyncratic risk (Décaire, 2024), uncertainty about the true cost of capital (Bessembinder and Décaire, 2021), agency problems within the firm (Harris et al., 1982; Harris and Raviv, 1996, 1998; Chen and Jiang, 2004), managerial time constraints (Jagannathan et al., 2016), or for real options effects (McDonald, 2000).[4]

But based on textbook tutelage, capital budgeting with inflated hurdle rates at such high magnitudes should ultimately destroy substantial value ("leave money on the table") as firms bypass material positive NPV projects.[5] If so, why wouldn't innovation in contracting,

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[1]Evidence based on CFO interviews from Graham (2022) illustrates that the hurdle rate is considered "sacred" at firms, thus providing a clear benchmark to facilitate decisions by mid-level employees.

[2]See Schelling (1956), Crawford and Varian (1979), Sobel (1981), Jones (1989), Fershtman et al. (1991), Burtraw (1993), and Segendorff (1998).

[3]Jagannathan et al. (2016), Gormsen and Huber (2022), and Graham (2022) provide similar estimates.

[4]For reasons to be explained below, we refer to these collectively as "non-strategic" explanations of the hurdle rate buffer.

[5]The magnitudes in our surveys imply that firms impose a negative bias of 5.7% for one-year cash flows and a 45% decrease for perpetual cash flows. Among firms that use a hurdle rate buffer, the average hurdle

governance, hiring, or organizational structure arise to claw back lost firm value? And why wouldn't the market for corporate control, discipline from earnings reporting, or stock market pressure correct this behavior? Based on our analysis, we show that inflated hurdle rates can persist because they preserve firm value based on their role during project development.

In our model of delegated bargaining, parties enjoy a greater share of the surplus when their required rate of return is reported to be higher. This is in the spirit of Rubinstein (1982), but distinct. Rubinstein bargaining uses a higher discount rate to model less patience, so a party would be vulnerable to waiting to make a deal: a higher discount rate is associated with a lower split of the surplus (Rubinstein and Wolinsky, 1985). In our model, the opposite occurs because the value of the outside option is based on the opportunity cost of capital. When a party is required to earn a higher return, their perceived walkaway value increases and they earn more surplus if a deal is on the table.

So, in the model, while projects with moderate NPV may be bypassed when using an inflated hurdle rate, overall this can still create value due to the bargaining advantage the firm enjoys when negotiating the projects that the firm does undertake. This arises both when the CFO uses a buffer strategically or non-strategically (e.g., based on the explanations in Figure 1), and when a trading partner uses a buffer as well. This helps explain why hurdle rate buffers are so widely used and persistent.

Using data from six CFO surveys, we establish new stylized facts about hurdle rates and test the model's predictions about buffer use. One interesting new empirical fact is that the distribution of ex post return on investment capital (ROIC, which we estimate using Compustat) aligns with the ex ante hurdle rates that CFOs provide in our surveys. Interestingly, a portion of the mass of the ROIC distribution is shifted from just below the hurdle rate to just above the hurdle rate, consistent with firms working to "meet or beat" the hurdle rate benchmark. These facts corroborate the validity of the hurdle rates that CFOs

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rate and WACC are 14.73% and 8.15%, respectively. Each dollar of perpetual cash flow is worth $6.79 in present value under the hurdle rate, and $12.27 under the cost of capital. This represents a decrease in value of 45% attributable to the buffer.

provide to us via surveys; and more broadly, they indicate that buffered-up hurdle rates are a focal point of corporate action. We additionally show that realized ROIC is typically several percentage points greater than WACC, indicating that hurdle rate buffers play a deeper role than simply offsetting optimistic cash flow projections provided by managers. These findings motivate our theoretical modeling of the effects of elevated hurdle rates

We use the survey data to empirically explore the primary implications from the model, on both the extensive and intensive margins. Our first prediction is that hurdle rate buffer use should be decreasing in a firm's cost of capital. This turns out to be a robust finding in the data. And absent our model, it is not what we would have expected ex ante based on prior work. For example, if managers use a larger buffer to compensate for idiosyncratic risk (Décaire, 2024), we would have expected there to be, on average, a positive association between the cost of capital and the buffer, because idiosyncratic risk is empirically correlated with systematic risk. Also, prior explanations based on financial or managerial constraints would also generally predict either no relation between the buffer and cost of capital (because managerial time constraints are likely independent of the cost of capital) or a positive relation (because financial constraints are more likely to bind for high cost of capital firms). Thus, both our prediction and empirical findings appear to be novel.

Second, we use firm-level data on supplier-customer relationships (e.g., FactSet Revere) to construct measures of bargaining power in negotiations and show that buffer use is negatively related to a firm's ex ante bargaining advantage over its trading partners. This is consistent with the model's implication that firms that already have strong bargaining power have less incentive to use buffered-up hurdle rates to further enhance bargaining power; this too is a novel prediction. Empirically, we confirm this relation using 1) supplier concentration measures (Autor et al., 2020), 2) measures of the concentration of a firm's customer base (Patatoukas, 2012), and 3) relative supplier-customer price markups. Moreover, as one would expect, these results are strongest among asset classes most likely subject to negotiation: the relations above are strongest for firms that rely on assets that are not readily redeployable.

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Lastly, while our model is motivated by bargaining in capital budgeting decisions, we show that its key prediction also holds true in an M&A setting: acquiring firms that negotiate relative to a hurdle rate that is greater than the target's cost of capital typically pay less in the acquisition and experience stronger market reactions upon deal announcement. This evidence is consistent with a hurdle rate buffer conveying a bargaining advantage for bidders.

It is important to emphasize that the purpose of this paper is not to propose a "7th explanation" for the use of hurdle rate buffers or to run a horse race among all the explanations. Rather, we seek to explore the effects that elevated hurdle rates have on project development and why buffers appear to persist over time, whether buffers arise for bargaining power (strategic) reasons or because of traditional (non-strategic) reasons.[6] As such, our rationale for the persistence of buffers co-exists with and complements the reasons already described in the literature, which we describe in Section 2.[7] Nonetheless, as we show, our model and empirical evidence provide new and different implications than those predicted by traditional explanations for buffers.

The rest of the paper is organized as follows. In the next section, we describe the contributions of our paper in the context of the existing literature. In Section 3, we describe the survey and other data that we use, and establish a number of stylized facts about hurdle rate buffers. In Section 4, we analyze delegated bargaining theoretically and characterize the empirical implications about IRR buffers that arise from the model. The proofs are contained in the appendix. In Section 5, we develop a set of hypotheses and test the model using data from six CFO surveys and archival data. Section 6 concludes.

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[6]If buffers were value-destroying, we would expect them to have disappeared.

[7]We repeat this point for emphasis: Even if firms do not "strategically" choose a high hurdle rate to aid negotiations, but instead the hurdle rate is high for traditional "non-strategic" reasons, the key point of our paper still holds: a high hurdle rate aids bargaining. Thus, our message does not compete with nor reject traditional rationales; rather, our argument complements traditional hurdle rate buffer rationales by offering an explanation for how large, long-lasting buffers might continue to exist.

2. Literature Review

The discrepancy between hurdle rates and WACC has been appreciated for decades. Starting with Poterba and Summers (1995), the authors surveyed CEO's from Fortune 1000 companies and showed that hurdle rates often exceed both the equityholders' average rates of return and the cost of debt. Many of the firms in their study were in manufacturing, where long-term capital budgeting is commonplace. Unlike our study, though, they did not ask their subjects whether a different WACC was also computed and not used for project development. While the authors did not compute a specific IRR buffer as we do, their findings suggest that the hurdle rates used were indeed inflated.

Since that time, many explanations have been proposed for the use of elevated hurdle rates. Harris and Raviv (1996) provide a theory of internal capital allocation in which there is decentralized information about projects and agency problems within the firm. The goal of headquarters is to manage the tendency for a division to over-invest in new projects. This may arise because divisional managers can employ less effort if more capital is invested (Harris et al., 1982), or because managers are either optimistic or have private benefits when projects are undertaken. Harris and Raviv (1996) posit that a mixture of capital constraints and oversight can help ameliorate these frictions.

Bernardo et al. (2001) investigate these issues in the context of contracting and show that only high-quality projects get funded, and that managers of these receive greater incentive compensation. This stems from information asymmetries between CFOs (headquarters) and divisional managers. Chen and Jiang (2004) show that asymmetric information is not necessary to cause use of higher hurdle rates. They show that use of an IRR buffer solves an agency problem in which the divisional manager is required to exert costly, non-contractible effort to collect information. In both cases, headquarters must commit to the allocation and compensation schemes. Chen and Jiang (2004) surmise this could arise from the rigidity of the capital budgeting process. The analysis that we provide in our theoretical model supports this claim – and furthermore shows that such commitment that arises when the

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CFO (headquarters) dictates the elevated hurdle rate and project managers take it as given without verification can lead to bargaining benefits and higher overall valuations.

More recently, other explanations have been offered for the pervasive use of IRR buffers. Jagannathan et al. (2016) posit that IRR buffers arise because of real (or perceived) managerial constraints. They demonstrate this to be the case using survey data. They also quantify the wedge between the hurdle rate and the firm's WACC. Their magnitudes are consistent with the results from our surveys, which is reassuring. Further, our more recent surveys confirm that elevated hurdle rates remain important for managers. However, as we describe above, one still wonders why firms would leave value on the table if they could access labor markets and hire or train more managers. Our paper addresses this issue directly, both theoretically and empirically.

Décaire (2024) shows that firms use an IRR buffer when they face higher idiosyncratic risk. Bessembinder and Décaire (2021) show that uncertainty about discount rates (systematic risk) causes an upward bias in estimated NPVs, leading to higher corporate investment; such a bias should cause firms to adjust their hurdle rates. These predictions are also considered in our model. We also show that they are present in the data, confirming these studies as well as predictions from our model; we control for these forces when investigating the other implications of our model.

Relatedly, a recent literature has studied the real effects of managers using imprecise or over-simplified discount rates. Krüger et al. (2015) analyze the practice of using a single firm-wide discount rate (see Graham and Harvey, 2001) and show that companies value high-risk projects using discount rates that are too low and vice versa; this leads to over-investment (under-investment) in relatively risky (safe) projects. They further show that this practice leads to lost value – in the context of acquisitions, when the bidder's beta is lower than the target's beta, announcement returns are significantly lower. Dessaint et al. (2021) study a different mechanism – managers and the market may arrive at different acquisition valuations if managers (over-)rely on CAPM-estimated discount rates. This stems

from the well documented observation that the empirical security market line is too "flat" relative to CAPM-implied estimates. They show that managers who rely on the CAPM tend to overvalue low-beta targets and undervalue high-beta targets relative to the market.[8] Together, these papers highlight additional real consequences of the use of imprecise WACC in corporate finance, which we incorporate into our model and empirical analysis.

Our paper is also related to Gormsen and Huber (2022), who document time-varying wedges between discount rates and the cost of capital disclosed in earnings calls. Despite our having much different data sources, the magnitude of the hurdle rate buffers are similar between our paper and theirs. Gormsen and Huber (2022) also show that the hurdle rate wedges are negatively related to investment, providing new evidence on the real effects of inflated discount rates.

A key contribution of our paper relative to the prior work on the buffer is that we show that a buffer can actually be value-enhancing. McDonald (2000) posits a very different mechanism that relates buffer use to increases in value. In that paper, a buffer serves as a heuristic that approximates solving a real options problem. Managers have the option to wait to start projects and thus choose when to optimally exercise an American option. If the option is sufficiently in the money, they do not wait; this is akin to the project return exceeding a high hurdle rate. Even if buffers are used in this manner, our model suggests that large buffers have the added benefit of impacting the bargaining surplus the project will achieve.

As discussed briefly above, our paper adds to the extant bargaining literature. The model explored in Rubinstein (1982) and Rubinstein and Wolinsky (1985) is sequential in which two parties take turns making take-it-or-leave-it offers. Bargaining takes place over time, as long as an agreement has not been reached. Each party has a discount rate, which proxies for their eagerness to get to a negotiated deal faster. The solution involves an

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[8]Our analysis of the relation between hurdle rate buffers and acquisition premia in Section 5.2.5 also relates to Dessaint et al. (2021). We show that hurdle rate buffers are negatively related to acquisition premia paid by bidders and positively related to bidder abnormal returns post-announcement. Our tests confirm that the use of hurdle rate buffers conveys a bargaining advantage in M&A, another example of the real effects of capital budgeting and project development practices.

equilibrium split whereby a higher discount rate yields lower surplus. Our model yields the opposite intuition: having a higher discount rate increases a party's (perceived) walkaway value because the outside option is more valuable.

The organizational structure in our model gives rise to decentralization in which the CFO reports the hurdle rate and the manager develops projects. This is in the spirit of Schelling (1956), Crawford and Varian (1979), and Sobel (1981) who explore how advantage can be gained by distorting the impression or beliefs of a counterparty during negotiation. Explicitly, this can be done via delegation in which a party commits to using a representative without the ability to renegotiate suboptimal outcomes (Jones, 1989; Fershtman et al., 1991; Burtraw, 1993; Segendorff, 1998). The structure of our theoretical construct shares this feature, which we use to model typical organizational behavior.

Finally, our paper adds to the rent-seeking and innovation literature. In much of our analysis, we use a surplus share that resembles a classic Tullock contest function (Tullock, 1980), where the fraction of the project surplus the firm receives is an increasing function of its hurdle rate. We show that the Tullock function we use may arise from a stochastic productivity model (Jia, 2008) or from standard Nash bargaining. But, it is a natural construct in project development as it has been used often in the rent-seeking literature to represent the proportion of the market each party enjoys when new projects or markets arise (Hirshleifer, 1989). Tullock contest functions are commonly used to characterize R&D races (D'Aspremont and Jacquemin, 1988; Chung, 1996; Andrei and Carlin, 2022). What differentiates our work is that the Tullock contest function arises from delegated bargaining and is a function of the purported cost of capital for each firm. Additionally, the purported hurdle rate also creates spillovers for each firm, in that positive NPV projects may be discarded. We thus add to prior work in the rent-seeking literature that considers spillovers where the size of the pie in contests either increases with effort (D'Aspremont and Jacquemin, 1988; Chung, 1996) or shrinks (Alexeev and Leitzel, 1996).

3. Data Description and the Hurdle Rate Buffer

In this section, we describe our data sources, discuss the reasons that firms set their hurdle rate above their cost of capital, and describe variation in the hurdle rate buffer across observable dimensions. We discuss the main variables covered by our CFO surveys in Section 3.1, discuss the origins of the buffer in Section 3.2 and relate ex ante hurdle rates to ex post returns in Section 3.2.3. Table A.1 provides variable definitions and Appendix C.1 provides more detail on the CFO Survey.

3.1. CFO Survey Data

Our primary data source comes from six CFO surveys conducted by Duke University. These surveys have been conducted quarterly for decades; the most recent surveys conducted jointly with the Federal Reserve Banks of Richmond and Atlanta. At several points in time, the survey asked CFOs directly for both their hurdle rate and their weighted average cost of capital.

One advantage of gathering data via surveys is that we obtain information directly from each firm's primary financial decision-maker. Another advantage is that we are able to gather data via questions that precisely define hurdle rates and other variables versus having to infer or approximate the variables. We ascertain the firms' weighted average cost of capital by asking CFOs "what do you estimate is your firm's overall weighted average cost of capital (WACC)?" To obtain data on hurdle rates, we ask "what is your firm's hurdle rate (the rate of return that an investment must beat in order to be adopted)?" Similar questions appeared in each of the six CFO surveys that we analyze and the consistent wording of these questions gives us confidence that our measures capture what we intend.[9] For sample inclusion, we require that the CFO supply a value for their WACC and hurdle rate. From there, we compute the hurdle rate buffer as the difference between the hurdle rate and WACC.[10]

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[9]The surveys are 2011q1, 2012q2, 2017q2, 2017q3, 2019q1 and 2022q2. Appendix C.1 provides detail on the data collection process and the questions posed to CFOs concerning their hurdle rate and cost of capital.

[10]In our terminology, we use the extensive margin to refer to the use of a positive buffer (i.e., an indicator

Figure 2 summarizes key characteristics of the survey firms. Panel A shows that firms in our sample are distributed across several industries and that manufacturing firms comprise the largest portion of the sample. Panel B conveys that the sample includes large firms (revenue greater than $1 billion), as well as smaller firms. Panel C shows that our sample is comprised of both private and public firms. Panel D shows that our sample is relatively evenly distributed across six different surveys that asked CFOs about their hurdle rates.

Table 1 Panel A displays summary statistics of variables related to the hurdle rate and cost of capital. The average hurdle rate in our sample is 13.88% and the average WACC is 8.77%, giving rise to an average buffer of just over 5%. Nearly 78% of companies use a hurdle rate buffer. Among the firms that have a non-zero buffer, the average buffer is 6.6%. The size of the buffer is consistent with other research (Jagannathan et al., 2016; Graham, 2022; Gormsen and Huber, 2022).

3.2. Exploratory Analysis of the Hurdle Rate Buffer

In this section, we establish stylized facts about why firms use buffers and the cross-sectional and time series variation in the intensive and extensive margins of the buffer. We also explore the connection between ex ante hurdle rates and realized company returns.

3.2.1. Why Do CFOs Set Hurdle Rates Above the Cost of Capital?

Various frictions may lead a company to set its hurdle rate above the cost of capital. Companies may use a buffer to ration capital, so that they choose just the highest expected return projects of a given class. This may arise due to constraints on funding, managerial time, non-managerial labor availability, or production capacity (Jagannathan et al., 2016; Graham, 2022). A second set of forces may lead CFOs to set a hurdle rate equal to their

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taking one (zero) if the firm's hurdle rate is greater than (equal to) WACC. We use intensive margin to refer to the difference between the hurdle rate and WACC. Much of our analysis of the intensive margin is for the full sample (including firms that have buffer = 0), which is the same sample used for the extensive margin analysis and therefore enhances comparability; in unreported results, we show that the intensive analysis is robust to using a Tobit specification (to account for zero-inflation in our intensive margin variable). Our intensive analysis is also robust to deleting buffer = 0 firms and examining only firms that have a positive buffer (e.g., see Panel B of Table 2). Table A.1 displays variable definitions.

perceived cost of capital plus a "fudge factor," which serves to offset complications from idiosyncratic risk or difficulties in estimating the true cost of capital (Décaire, 2024; Bessembinder and Décaire, 2021), because of agency issues or adverse selection problems within the firm, or because of behavioral forces that lead managers to use overly-optimistic cash flow forecasts as they pitch their projects to upper management (Harris et al., 1982; Harris and Raviv, 1996, 1998; Chen and Jiang, 2004). Third, using a buffer may approximate decision-making that accounts for real options motivations (McDonald, 2000).

To explore these possibilities, on three of the CFO surveys we asked CFOs "Why do you set your hurdle rate above WACC?", allowing respondents to choose among a list of reasons representing the forces mentioned above (or to write in other explanations).[11] The available choices varied somewhat between surveys but always included choices related to five of the traditional explanations mentioned above: (i) financing constraints (ii) managerial/resource constraints (iii) project prioritization (iv) idiosyncratic risk/uncertainty and (v) over-optimism/agency. We classify CFO responses concerning why their hurdle rate exceeds WACC under these five qualitative groupings, in order to ascertain the relative importance of each in explaining the buffer.

Figure 1 presents the proportion of CFOs that selected reasons that fall within each of the five categorizations of why companies use hurdle rate buffers. Table A.2 describes how we group responses across each survey. Panel A of Figure 1 displays the importance of each category across the three surveys. There is reasonable support for each of the five categories. For example, 60% of respondents indicate that they implement a buffer due to project prioritization and more than half indicate that risk or uncertainty in estimating the cost of capital or unmeasured risks lead to buffers. Panel B displays the importance of each reason by survey year. The importance of financing and resource constraints dipped in 2019 when the economy was in a relatively strong position (relative to 2011, where the after-effects of the 2008 crisis were still present; and relative to 2022, with a tight labor market and rising

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[11]The three surveys were conducted in 2011q1, 2019q1 and 2022q2.

borrowing costs). To emphasize a point made earlier, whether the CFO increases the hurdle rate buffer for one of the "non-strategic" reasons reflected in Figure 1, or to gain strategic negotiating advantage, the bargaining implications derived in our model still hold.

Panel C displays the results conditional on firm size (large firms being those with revenue weakly greater than $1 billion). Financing and resource constraints are relatively more important for small firms. Interestingly, idiosyncratic project risk or uncertainty about WACC or discount rate or other unmeasured risks are more important for large firms. This may be because large firms are more likely to have numerous diverse projects, with different idiosyncratic risk, and are more likely to use equity markets or issue debt, potentially adding complexity to estimating the cost of capital and the return required by investors.

Taken together, the information in Figure 1 helps us create empirical proxies to measure these buffer explanations, both to explore these explanations directly and to control for these reasons when we explore empirical predictions from the model. Section 5 discusses specific variables used to measure buffer explanations, as well as the other non-CFO survey variables that we use in our main empirical analysis.

3.2.2. Variation in Hurdle Rate Buffers Across Firms, Time, and Geography

Surveys back to the 1980s show that firms' hurdle rates are on-average relatively stable across time – suggesting that buffers also retain this consistency, or are even growing through time (Graham, 2022; Sharpe and Suarez, 2021; Jagannathan et al., 2016; Poterba and Summers, 1995). To ascertain the degree of variation in the buffer in our dataset, Figure 3 investigates the cross-sectional and time series properties of the hurdle rate and related variables. Panel A displays industry average hurdle rates, costs of capital, and buffers. The black error-caps on each bar display the within-group inter-quartile range.[12] It is noteworthy that there is substantial variation *within* each industry, which is consistent with our model in which a firm's position within its industry affects its incentives to use hurdle rate buffers.

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[12]For example, the average buffer in Mining/Construction is approximately 6%, and the inter-quartile range is 0% to roughly 9%.

Also clear is that the buffer is not just an artifact of fixed differences across industries, which will play an important role in our empirical analysis. Leveraging our data's fine industry classifications, Table A.3 displays average hurdle rate, cost of capital, and the intensive and extensive margins of the buffer across NAICS-2 and CFO survey industries.[13]

Panel B shows that the size of the average buffer is relatively stable across survey years. Panel C shows that there is a clear difference in the size of the buffer for small versus large firms. For firms with less than $1 billion in sales revenue, the average buffer is 5.8%, whereas for firms with revenue above $1 billion, it is 3.8%. Though not shown in the figure, among firms with a non-zero buffer, the average buffer for small/large firms is 6.9%/5.3%.

Panel D shows that the buffer is remarkably similar across regions of the world, despite variation in the hurdle rate and the cost of capital (see also Gormsen and Huber, 2022). We separately examine the properties of the extensive margin of the buffer in Figure A.1. The extensive margin patterns in the appendix figure are very similar to the just-discussed intensive margin results shown in Figure 3.

3.2.3. Ex Ante Hurdle Rates versus Realized Returns

Companies use hurdle rates as a benchmark against which expected returns of projects are compared. To the extent that realized and expected returns align, we would therefore expect hurdle rates to influence the distribution of realized project returns. In particular, as we explain in the next two paragraphs, we expect to observe excess mass in the ROIC distribution directly above the benchmark hurdle rate. We do not observe project-level returns in our data; however, for public firms in Compustat that appear in our surveys, we can calculate the return on invested capital (ROIC) as a measure of realized returns, which is an aggregation of the firm's return on all its projects.

The spirit of our model, and the data, suggest that hurdle rates are chosen to be greater than the true cost of capital. Thus, in project development, even with a bargaining advan-

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[13]We use company names and the Infogroup dataset to match survey firms to their NAICS codes. Survey industry codes are supplied by the CFO directly and roughly equate to one-digit SIC codes.

tage, managers of marginal projects (those with expected returns close to or just below the hurdle rate) might need to stretch to surpass the elevated hurdle. Managers are incentivized to push a little harder to get these marginal projects over the line. This could occur via the specific mechanism in our paper (bargaining hard over project inputs), though it could also result from another aspect of project development.

A direct empirical consequence of the just described evaluation-development link would be bunching of ROIC just above the hurdle rate; that is, a shift in a portion of the ROIC distribution from just below to just above the hurdle rate. Empirically, we search for this discontinuity in the distribution using a simple application of manipulation testing, often used in the context of regression discontinuity designs (McCrary, 2008; Cattaneo et al., 2018). In our application, we are interested in determining formally whether there is evidence of a discontinuity in the density of ROIC at the hurdle rate. To implement this test, we define the variable $Excess\ ROIC = ROIC - Hurdle$, which measures the firm's ROIC earned in excess of its hurdle rate. We are interested in testing for the existence of a discontinuity in excess ROIC at zero.

Figure 4 displays the density of excess ROIC centered at zero. The light blue and orange bars display observed frequencies of excess ROIC in 0.5 percentage point bins. The frequency of observations just above zero (realized ROIC just greater than the hurdle rate) is much larger than that directly below. For example, about 9% of relevant observations are in the +0.5% bin, whereas about 3.5% are in the −0.5% bin.[14] The shaded area and lines overlaid on the histograms display the result from the methodology described in Cattaneo et al. (2018) – estimating the density of excess ROIC via local polynomial density estimation. The

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[14]As stated in the caption of Figure 4, we linearly interpolate between observed hurdle rates for Compustat firms in our sample. For example, if the hurdle rate is 10% in 2012q2 and 11% in 2012q4, we assume a hurdle rate of 10.5% in 2012q3. Given the stickiness of hurdle rates as shown in Graham (2022), we feel that this assumption is reasonable. We confirm the primary findings of our analysis in Figure 4 by alternatively using "stair-step" interpolation, where we keep the hurdle rate constant between consecutive observation until data from a future survey reveals a change in the hurdle. For the same example just given, we would assume that the firm's hurdle rate remained at 10% in 2012q3. Results are very similar.

figures reveals a distinct discontinuity in excess ROIC at zero.[15]

The findings in Figure 4 provide evidence consistent with companies choosing projects to beat their hurdle rates. The bunching just above the hurdle rate is consistent with the spirit of our model. Moreover, if companies are choosing projects based on hurdle rates, rather than the cost of capital, one would not expect to find ROICs bunched just above the WACC. This is exactly what we find in Figure A.3, where we undertake a similar exercise to Figure 4, testing instead for discontinuity in the density of ROIC at firms' costs of capital. We find no statistical or visual evidence of bunching in ROIC directly above WACC, suggesting that firms target their hurdle rates, as opposed to WACC.[16]

One take-away from these figures is explicit confirmation, for the first time in the literature to our knowledge, of the importance of hurdle rates (more so than the cost of capital) in project development, as well as "beat-the-benchmark" bunching just above the hurdle rate.[17] These findings also help validate the quality of the hurdle rate data gathered via the CFO surveys – and indicate that elevated hurdle rates play a greater role than simply offsetting inflated cash flow projections. These implications motivate our focus on the hurdle rate in our model, as explored in the next section.

The evidence in this section confirms three empirical features of hurdle rate buffers. First, firms use buffers for a variety of reasons, often to ration project choice because of con-

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[15]We follow the data-driven bandwidth selection methodology to estimate the density, and set the order of the local polynomial to 3. Inference using this methodology can be sensitive to researcher-chosen parameters, in particular the order of the local polynomial and the size of the bandwidth for local estimation. In Table A.4, we vary these parameters and show that the implications of Figure 4 are quite robust to parameter choices, though the effects attenuate as the size of the bandwidth increases.

[16]In appendix Figure A.3, we use the same sample of firms as in Figure 4. In nearly all of our analyses, we require the respondent to supply both a hurdle rate and a WACC. However, for Figure 4 we maximize our sample size to include firms that only supply their hurdle rate. For this expanded sample, because CFOs do not always provide a WACC number along with their hurdle rate, in Figure A.3 only we estimate WACC using Compustat data and the CAPM (see Appendix C.1). We do this to facilitate comparison between the role of the hurdle rate vs. the role of WACC in determining the distribution of ROIC, as depicted in the two figures.

[17]Burgstahler and Dichev (1997) find beat-the-benchmark behavior for earnings per share targets, a highly visible external benchmark. Our finding shows similar behavior for the hurdle rate benchmark, a number which is internal to the firm and not generally known publicly, suggesting strong beat-the-benchmark corporate incentives.

straints, or to counteract frictions in the firm's organizational structure or capital budgeting process (Figure 1). Second, while average buffers are relatively constant across observable dimensions, there is considerable variation, confirming that the buffer is not an artifact of differences in financial practice across, e.g., industries (Figure 3). Third, the hurdle rate matters for realized returns, which is consistent with hurdle-based project evaluation influencing outcomes in project development (Figure 4). These three points motivate and discipline the model in Section 4 and subsequent empirical analyses in Section 5.

4. The Model

4.1. Preliminaries

Consider an unlevered firm F that employs a CFO who is tasked with calculating a hurdle rate for its activities. We assume that she uses an asset pricing model that computes the cost of capital $W_F = 1 + r_{wacc}^F$. The CFO reports a hurdle rate H_F to other employees in the firm, which is taken at face value and is not verified. As such, the CFO has discretion to report the real $H_F = W_F$, or she may use an IRR buffer and report a higher gross hurdle rate $H_F = \tau_F$ to others in the firm.

Reasons for reporting $\tau_F > W_F$ may be strategic or non-strategic. We refer to an IRR buffer as strategic if a positive buffer is chosen by the CFO to take advantage of the delegated-bargaining organizational structure of the firm (to be described shortly). Alternatively, IRR buffers may exist for non-strategic reasons that may be the result of compensating for a lack of precision in estimating W_F, conservatism, or managerial and financial constraints.

Employees within the firm who identify and manage projects are called *delegates*. For any given project, we begin by considering that it is necessary for the firm to acquire one asset from an outside business partner (e.g., land, a building, or equipment). If the delegate fails to secure the necessary asset, the entire project becomes infeasible. In Section 4.2.2, we generalize this to consider N outside entities/assets.

The outside business partner, O, also has a CFO and a delegate who represent its inter-

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ests. The business partner also has a required rate of return. In the same way, though, the delegate for the outside business partner is either endowed with their true cost of capital $H_O = W_O = 1 + r^O_{wacc}$ or a gross hurdle rate that includes an IRR buffer $H_O = \tau_O$.

The projects that the primary firm has access to are heterogeneous. Assume that the gross returns from these investment opportunities are distributed according to a continuously-differentiable cumulative distribution function $F(R)$ with associated density function $f(R)$ on the support $[1, \bar{R}]$. We assume that $F(\bar{R}) = 1$ and that $F(R)$ is weakly concave over $[1, \bar{R}]$, which admits common distributions such as the uniform, exponential, and truncated-normal.[18] Assume that both delegates and CFO's have full information about this distribution. Also, to abstract away from other agency or adverse selection problems, assume that the return from any project that is ultimately accepted is ex post verifiable.

When assets are acquired, both delegates report their respective hurdle rates to each other, and a fraction θ of the surplus is allocated to firm F, with $(1 - \theta)$ going to firm O. Assume that the split is a continuously differentiable function $\theta(H_F, H_O)$ on $[0, 1]$, such that $\theta'(H_F) > 0$, $\theta''(H_F) \leq 0$, and $\theta'(H_O) < 0$.

To motivate this modeling choice, consider the following result from standard Nash bargaining, where bargaining maximizes

$$\max_{s} \ (s_F - d_F)^\alpha (s_O - d_O)^\beta, \tag{1}$$

$s \equiv \{s_F, s_O\}$ is the surplus allocated to each party, and $d \equiv \{d_F, d_O\}$ is each party's disagreement payoff.

Lemma 1. *For any feasible R, suppose that $s = \{\theta R - H_F, (1 - \theta)R - H_O\}$, $d = \{0, 0\}$, and*

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[18]The normal distribution is concave for realizations that are greater than its mean. This is natural here. For example, suppose a firm faces potential projects with a mean gross return of 1, they would be unlikely to accept any project with a return less than 1. So, analyzing the portion of a normal distribution strictly above $\mu = 1$ is plausible.

$\alpha = \beta = 1$. *Then,*

$$\theta = \frac{1}{2} + \frac{H_F - H_O}{2R}. \tag{2}$$

In Lemma 1, firms receive their portion of R minus their opportunity cost. If the two managers walk away, they believe that they can invest their capital in an alternative at their hurdle rate, earning zero NPV. The solution in (2) shows that the split of the surplus depends on each firm's purported hurdle rate - the firm with a higher hurdle rate effectively has more bargaining power. The two parties split the surplus, with a greater proportion going to the party with the higher walkaway value: θ is increasing in H_F and decreasing in H_O.

The use of discount rates in θ is in the spirit of Rubinstein bargaining, but distinct. Because Rubinstein bargaining is sequential, the party with less patience (higher discount rate) earns a lower split of the surplus. Here, the opposite occurs since the perceived value of the outside option is based on the hurdle rate. When a delegate is required to earn a higher return, their perceived walkaway value increases, and they earn more surplus if a deal is feasible.

Both the firm and its trading partner can increase their respective bargaining power by reporting a higher hurdle rate. In the equilibria that we derive below, this may make it attractive for both parties to use IRR buffers. As we will see however, the offsetting cost will be that positive NPV projects are lost because of the exaggeration of reported hurdle rates.

In the following subsections, we present four different versions of the model linking hurdle rates (and buffers) to project outcomes via this bargaining mechanism. We illustrate how this effect holds whether buffers are used by a single firm strategically, by both firms competitively, or by a single firm for reasons unrelated to bargaining, either due to imprecise estimation of the WACC or due to operational or financial constraints. In all versions of the model, the hurdle rate buffer affects bargaining outcomes and firm value.

4.2. Strategic Use of IRR Buffers

4.2.1. Single-firm IRR Buffer

It is instructive to start by assuming that the outside business partner does not use an IRR buffer strategically. Without loss of generality, we set $H_O = W_O$.[19]

If firm F does not use an IRR buffer, its split of the total surplus is given by θ_N so that firm value is computed as

$$V_N = \int_{\underline{R}}^{\bar{R}} \theta_N dF(R) = \theta_N[1 - F(\underline{R})], \tag{3}$$

where $\underline{R} \equiv W_F + W_O$. As such, $\underline{R}$ measures the minimum project return so that both parties can receive sufficient surplus to participate.

Now consider that a hurdle rate buffer may be used strategically by the firm when the outsider does not. The firm solves

$$\max_{\tau_F \geq W_F} \quad V_B = \int_{\underline{R}'}^{\bar{R}} \theta_B dF(R), \tag{4}$$

where $\tau_F = H_F$ is the buffered (gross) hurdle rate and $\theta_B > \theta_N$ is the resulting split.

We restrict $\tau_F \geq W_F$ because it is a dominated strategy to choose a lower cost of capital than W_F; in that case the firm would reduce its bargaining power and accept negative NPV projects. So, when a positive IRR buffer is used, $\underline{R}' \equiv \tau_F + W_O$, which is larger than $\underline{R}$. The lower limit of the integral increases because some positive NPV projects are rejected and the firm's delegate walks away.

So, the CFO faces a trade-off. Using a higher buffer increases the split of the surplus from θ_N to θ_B, but raises the minimum acceptable project from $\underline{R}$ to $\underline{R}'$: bargaining power increases, but positive NPV projects are discarded.

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[19]A value $H_O > W_O$ that is set exogenously or used for non-strategic reasons does not qualitatively change the results that follow.

Proposition 1. *When the firm uses a positive IRR buffer and the outsider does not, there exists a unique optimal buffered hurdle rate τ^* that solves*

$$\frac{\frac{\partial \theta_B(\tau^*)}{\partial \tau}}{\theta_B(\tau^*)} = \frac{f(\underline{R}')}{1 - F(\underline{R}')}, \tag{5}$$

and the resulting value to the firm is given by

$$V_B^* = \frac{\partial \theta_B(\tau^*)}{\partial \tau} \frac{[1 - F(\underline{R}')]^2}{f(\underline{R}')}. \tag{6}$$

The change in value resulting from use of the buffered hurdle rate is strictly positive if

$$\frac{\partial \theta_B(\tau^*)}{\partial \tau} \frac{[1 - F(\underline{R}')]^2}{f(\underline{R}')} > \theta_N[1 - F(\underline{R})]. \tag{7}$$

According to Proposition 1, the optimal buffered hurdle rate solves (5), where the right-hand side can be considered a hazard rate and the left-hand side is a reverse hazard rate. The intuition is that at the optimum, the marginal benefit of increasing the hurdle rate to raise bargaining power equals the cost of losing an incremental project. Also, (7) characterizes when a buffered hurdle rate is optimal: 1) when the marginal benefit to raising bargaining power is higher; 2) the exclusion of marginal positive NPV projects is not too costly; 3) when the firm's starting bargaining power is low; and 4) the range of feasible projects under no buffers is smaller.

While the results in Proposition 1 are general, we can further characterize the results with some simplifications. Let us first assume that project gross returns are uniformly distributed on $[1, \bar{R}]$. Further, let us consider that the θ split results from a Tullock contest function (Tullock, 1980)

$$\theta = \frac{H_F}{H_F + H_O}, \tag{8}$$

with the interpretation from (Hirshleifer, 1989) that each party gains a share of the return

from the project. Given this

$$\theta_N = \frac{W_F}{W_F + W_O} \qquad \theta_B = \frac{\tau_F}{\tau_F + W_O}. \qquad (9)$$

Use of a Tullock contest function is natural here as they are commonly used to characterize the gains from innovation in the rent seeking literature (D'Aspremont and Jacquemin, 1988; Chung, 1996; Baye and Hoppe, 2003; Andrei and Carlin, 2022).[20] In Appendix B, we show that the Tullock function in (8) can arise from both a stochastic productivity model (Jia, 2008) and from Nash bargaining (Lemma B.1).

Proposition 2. *When the firm uses a positive IRR buffer and the outsider does not, the optimal buffered hurdle rate is given by*

$$\tau_F^* = \sqrt{\bar{R} W_O} - W_O, \qquad (10)$$

and the resulting value to the firm is given by

$$V_B^* = \bar{V} + W_O - 2\sqrt{\bar{R} W_O}. \qquad (11)$$

The change in value resulting from use of the buffered hurdle rate is strictly positive, that is,

$$\Delta V = V_B^* - V_N = \frac{W_O \bar{R}}{W_F + W_O} + (W_F + W_O) - 2\sqrt{\bar{R} W_O} > 0. \qquad (12)$$

ΔV *is increasing in* $\bar{R}$ *and decreasing in* W_F.

As in the general case, the CFO faces a trade-off. Using a higher buffer increases the split of the surplus from θ_N to θ_B, but raises the minimum acceptable project from $\underline{R}$ to $\underline{R}'$: Bargaining power increases, but positive NPV projects are discarded.

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[20]Chowdhury and Sheremeta (2011) generalize Tullock contest functions to consider linear combinations of effort complementarities in duopoly contests. See also D'Aspremont and Jacquemin (1988), Chung (1996), and Alexeev and Leitzel (1996).

We can use (10) to determine a condition that characterizes when a positive buffer is used (extensive margin), that is when $\tau_F > W_F$. A positive buffer is used if

$$(1 - \theta_N)\bar{R} > W_F + W_O. \tag{13}$$

The firm is more likely to use the buffer when its starting bargaining power (i.e., their initial split of the surplus, θ_N) is lower, its own cost of capital (W_F) is lower, and when there are more high potential project values ($\bar{R}$). The upper bound of the project values $\bar{R}$ can also be considered a proxy for the uncertainty faced by managers, since the variance of the distribution increases with $\bar{R}$. If (13) is not satisfied, then the CFO reports the hurdle rate as equal to the true WACC.

As a specific example, Figure 5 displays the value implications from the model. We calibrate parameters so the optimal hurdle rate buffer $b^* = 5.11\%$, the unconditional average value in the CFO Survey data. On the right y-axis, we plot the change in value implied by a standard capital budgeting model, where we only consider the value lost from foregoing positive NPV projects. At b^*, the implied "traditional" change in value is about -4.4%. On the left y-axis, we incorporate the value benefit from bargaining and plot the model-implied percentage increase in firm value from using a hurdle rate buffer.[21] This equals $+0.11\%$. While this may seem small, it does imply that firm value is preserved even with a large buffer. The difference in value creation between traditional assumptions and the bargaining model is quantitatively large at 4.5 percentage points.

Also according to Proposition 2, if an IRR buffer is used, the intensive margin implications are that buffers are more attractive for high potential project values and less attractive when there is a higher cost of capital. The relationship is more subtle between ΔV and W_O. This stems from a non-monotonic relationship between the use of the IRR buffer (τ_F^*) and W_O.

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[21]The difference between the two axes is the bargaining split. On the left y-axis, θ_B is allowed to change with b, so $V_B = \theta_B \bar{V} - (W_F + b)$ and the bargaining split increases with b. On the right, we hold the surplus split fixed, so $\tilde{V}_B = \theta_N \bar{V} - (W_F + b)$, with θ_N displayed in (9).

Taking the following derivative

$$\frac{\partial \tau^*}{\partial W_O} = \frac{\bar{R}}{2\sqrt{\bar{R}W_O}} - 1$$

demonstrates that the relationship is positive only if $\bar{R} > 2\underline{R}'$. When the surplus gained from a larger share of projects is greater than the value lost from forgoing positive NPV projects, the firm's IRR buffer is increasing in W_O. Otherwise, if $\bar{R} < 2\underline{R}'$, the cost of lost positive NPV projects dominates and the buffer is smaller.

4.2.2. Competitive IRR Buffers

Now consider that each player $i \in \{F, O\}$ chooses an IRR buffer to maximize

$$\max_{\tau_F} \quad V_F = \int_{\underline{R}''}^{\bar{R}} \theta dR$$

and

$$\max_{\tau_O} \quad V_O = \int_{\underline{R}''}^{\bar{R}} (1 - \theta) dR,$$

conditional on their counterparty acting optimally as well. Now, the lower limit of integration is defined as $\underline{R}'' = \tau_F + \tau_O$, which is the purported minimum project value that can meet both parties' required returns under the buffered IRR hurdle rates.

Proposition 3. *There exists a unique symmetric Nash equilibrium in pure strategies in which the optimal buffered hurdle rates are given by*

$$\tau_F^* = \frac{\bar{R}}{4} \qquad \tau_O^* = \frac{\bar{R}}{4} \tag{14}$$

and the value for each firm is

$$V_F^* = V_O^* = \frac{\bar{R}}{4}. \tag{15}$$

Compared to the case in which hurdle rate buffers are infeasible, the deadweight loss is

$$Loss = \frac{\bar{R}}{2} - (W_F + W_O). \tag{16}$$

According to Proposition 3, hurdle rate buffers are used by both firms. This arises based on the best-response functions, which are derived in (B.21) and (B.22) in the appendix. If one firm uses an equilibrium buffer, it is suboptimal for their counterparty to truthfully use their true cost of capital. Additionally, (B.21) and (B.22) are violated for any other set of symmetric strategies $\tau_F^* = \tau_O^* = \frac{\bar{R}}{n}$ for $n \neq 4$. This assures uniqueness of the symmetric equilibrium.

While there is an equilibrium deadweight loss, this is not necessarily a Prisoner's dilemma. Let us compare each party's value when both use an IRR buffer to the case where neither (are allowed to) do so.

$$\Delta V_F = \bar{R} \left(\frac{1}{2} - \theta_N \right) - (\tau_F - W_F) \tag{17}$$

$$\Delta V_O = \bar{R} \left(\theta_N - \frac{1}{2} \right) - (\tau_O - W_O). \tag{18}$$

The first term in both expressions is the change in value due to a gain or loss in bargaining power. By inspection, it is clear that one party gains and one loses. The second term is negative for both parties and represents the loss of otherwise feasible positive NPV projects. So, one party unequivocally loses value, but the other may gain based on the underlying parameters. From (17), firm F is net positive with hurdle rate buffers if

$$\frac{\bar{R}}{4} - \theta_N \bar{R} + W_F > 0 \qquad \Leftrightarrow \qquad \frac{\bar{R}}{4\theta_N} - (\bar{R} - \underline{R}) > 0.$$

This is more likely to be the case if the firm starts with low bargaining power when IRR

buffers are not used (feasible). The corresponding condition for the outsider is

$$\frac{\bar{R}}{4} - (1 - \theta_N)\bar{R} + W_O > 0 \qquad \Leftrightarrow \qquad \frac{\bar{R}}{4(1 - \theta_N)} - (\bar{R} - \underline{R}) > 0.$$

We conclude this section by considering that n parties take part in the investment, and each may act strategically. The primary firm is indexed as $i = 1$, and remainder are in $\{2, \ldots, n\}$. We assume that each party's share of the project is

$$\theta_i = \frac{H_i}{\sum_{j \in N} H_j}, \tag{19}$$

where $N \equiv \{1, \ldots, n\}$. As such, θ_i is a higher-dimensional Tullock contest function.

Proposition 4. *There exists a unique symmetric Nash equilibrium in which the optimal buffered hurdle rates are given by*

$$\tau^* = \frac{(n-1)\bar{R}}{n^2} \tag{20}$$

and the value for each counterparty is

$$V^* = \frac{\bar{R}}{n^2}. \tag{21}$$

The structure of the equilibrium in Proposition 4 resembles that of Proposition 3, except that we now have a comparative static on the number of counterparties at the bargaining table: the equilibrium IRR buffer is strictly decreasing in n.

4.3. Non-Strategic Use of IRR Buffers

In this section, we show that the model's main results continue to hold when the model considers non-strategic reasons as the source of IRR buffers. Because buffer use is non-strategic by construction, we assume in what follows that the primary firm may use a buffer, but we fix the behavior of their trading partner (i.e., $H_O = W_O$).

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4.3.1. Imprecise Estimation of WACC

According to Bessembinder and Décaire (2021) and Krüger et al. (2015), managers may face the inability to precisely estimate W_F. This may be the result of model uncertainty or inherent estimation error. To account for this, or to be conservative, CFOs may use a buffer, which we denote by b.

With a buffer $H_F = W_F + b$, the Nash Bargaining split is

$$\theta_B = \frac{H_F}{H_F + W_O} \tag{22}$$

and the value of the firm can be calculated as

$$V_B = \frac{W_F \bar{R} + b\bar{R}}{W_F + b + W_O} - (W_F + b). \tag{23}$$

Proposition 5. *When the CFO uses a buffered hurdle rate, $H_F = W_F + b$ to adjust for imprecision in estimating W_F, the value of the firm increases if*

$$V_B > V_N \quad \Leftrightarrow \quad \frac{\bar{R}W_O - (W_F + W_O)^2}{(W_F + W_O)} > b. \tag{24}$$

According to Proposition 5, if the buffer b is sufficiently low, firm value rises because the bargaining benefit outweighs the loss incurred by discarding marginal positive NPV projects. It is instructive to write the inequality in (24) as

$$V_B > V_N \quad \Leftrightarrow \quad (\bar{R} - \underline{R}^N) - \theta_N \bar{R} > b, \tag{25}$$

where $\underline{R}^N$ is the lower bound of feasible projects when no IRR buffer is used. This expression indicates that, because the range of projects $(\bar{R} - \underline{R}^N)$ can be considered a measure of uncertainty, according to (25) firm value rises when the CFO faces more risk and uses a

reasonable buffer to account for lack of precision in her estimate of W_F. Last, according to (25), if the firm already enjoys sufficient bargaining power without a buffer (θ_N is large), it is less likely that using a buffer adds value. In this case, foregoing positive NPV projects is too costly.

Overall, Proposition 5 illustrates that the bargaining channel can mitigate some or all of the cost of forgoing positive NPV projects, even when the buffer is not set with bargaining in mind. Therefore, even if a CFO uses a buffer to address uncertainty regarding their WACC estimation, the bargaining advantage conveyed by that buffer may preserve or even improve firm value. The same intuition will arise when we consider financial and managerial constraints next.

4.3.2. Financial and Managerial Constraints

Now, we consider that the CFO chooses a hurdle rate $H_F > W_F$ to accommodate an exogenous constraint that is based on time or financial resources. Suppose that the firm only has financial resources to initiate the fraction f of the potential projects such that $0 < f \leq 1$. Likewise, it can only consider a fraction m of the projects due to managerial constraints such that $0 < m \leq 1$. Define $k \equiv min\{f, m\}$. Given this, the value of the firm with a buffer is

$$V_B = \int_{\underline{R}^H}^{\bar{R}} \theta_H dR,$$

where the share of the surplus the firm receives is

$$\theta_H = \frac{H_F}{H_F + W_O}.$$

Proposition 6. *When only k fraction of projects can be considered because of constraints, the CFO sets a buffered hurdle rate*

$$H_F = (1 - k)(\bar{R} - W_O) + kW_F. \tag{26}$$

It follows that $H_F > \tau_F^*$ iff

$$k < \frac{\bar{R} - \underline{R}'}{\bar{R} - \underline{R}}, \tag{27}$$

where $\underline{R}'$ and $\underline{R}$ are defined as in Section 4.2.1. Finally,

$$V_B > V_N \quad \Leftrightarrow \quad (\theta_H - \theta_N) > (1 - k)(1 - \frac{W_F + W_O}{\bar{R}}). \tag{28}$$

The results in Proposition 6 are straightforward. First, the hurdle rate is a decreasing function of k. By construction, the less constrained the firm is (higher k), the less of an IRR buffer it needs to use. Second, (27) tells us that if the firm is sufficiently constrained, it will set a hurdle rate above what is optimal under the strategic considerations in Section 4.2.1, which is suboptimal. However, the use of the IRR buffer due to constraints increases firm value if (28) holds. This will arise when the gain in bargaining power is higher, the firm is less constrained, and the range of projects is larger. The latter finding is similar to the risk/variance result that we derived in Proposition 5.

5. Model Predictions and Empirical Evidence

In this section, we test empirical predictions from the models described in Section 4. Our tests focus on three primary underlying characteristics of firms and projects: the cost of capital, bargaining power, and asset specificity. We explore predictions about the use of a buffer of any magnitude (extensive margin) and the size of the buffer conditional on use (the intensive margin). We also explore the effects of buffers in an M&A setting.

5.1. The Firm's Cost of Capital and Buffer Use

The first hypothesis that we investigate is that buffer use decreases in the firm's cost of capital, both on the extensive and intensive margin. The intuition is straightforward based on the model. All else equal, a firm that has a higher cost of capital already has a bargaining advantage through the hurdle rate channel. While the use of a buffer may

convey an additional incremental advantage, it comes at an unattractive cost of rejecting good projects.[22]

The prediction that buffer use and size is negatively related to the cost of capital distinguishes our theory from other buffer explanations that do not consider the impact of the cost of capital on bargaining. For example, if managers use a higher buffer to compensate for idiosyncratic risk (Décaire, 2024), we would expect there to be, on average, a positive association between the cost of capital and the buffer – because empirically idiosyncratic risk is positively correlated with systematic risk. Prior explanations based on financial or managerial constraints would also generally predict either no relation (since managerial time constraints are likely independent of the cost of capital) or a positive relation (since financial constraints are more likely to bind for high cost of capital firms).

We present tests of the relation between cost of capital and the buffer in Table 2. Panel A explores tests related to the extensive margin and Panel B explores the intensive margin. For the extensive margin, we estimate both linear probability models (columns 1-4) and logit models (columns 5-7), where the dependent variable is an indicator equal to one if the firm uses a buffer, and zero otherwise. For the intensive margin (Panel B), the dependent variable is the difference between the reported hurdle rate and the WACC. We estimate this model for all firms (columns 1-4) and for the subsample of firms that use a buffer (columns 5-8). The main variable of interest is the firm's reported cost of capital.

Overall, the results show that both the probability of using a buffer and the size of the buffer itself are strongly negatively related to the cost of capital.[23] These negative relations support a primary prediction of our model. A one percentage point increase in the cost of capital predicts a 2.5 to 3 percentage point (pp) drop in the probability of using the buffer,

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[22]To see the extensive margin effect in the model, note that Equation (13) is less likely to hold as W_F increases. For the intensive margin, if we write $\tau^* = W_F + b$, by definition, for any optimal hurdle rate τ^* the buffer is decreasing as W_F increases. Therefore, in our empirical specification we will control for the industry beta for each firm, which affects the WACC. The model makes the same prediction on the extensive margin for the non-strategic case where a buffer is given exogenously (Proposition 5).

[23]These negative relations with cost of capital are very robust, and exist in every specification in the paper.

and roughly a 0.3 pp reduction in size of the buffer.[24]

In both panels of Table 2 we include specifications that control for firm and industry characteristics. In particular, prior work shows that estimation error or uncertainty about WACC and/or discount rates affects corporate investment (Krüger et al., 2015; Bessembinder and Décaire, 2021). While not directly related to our bargaining model, this would affect hurdle rate buffers in our data if CFOs include a fudge factor in their discount rates to offset this uncertainty. We use the volatility of the CAPM beta within the CFO survey firm's NAICS-4 industry the quarter previous to the survey quarter to proxy for this uncertainty (Bessembinder and Décaire, 2021).[25] We also include controls for firms size, public/private status, and controls related to the CFO's optimism about their own firm and the U.S. economy. We also include a variety of fixed effects in columns 3 and 4. Detailed definitions of all variables are included in Table A.1.

Our proxy for idiosyncratic project risk, sales volatility, is strongly related to the intensive margin of the buffer, but is not significant on the extensive margin. This suggests that, after controlling for estimation uncertainty in WACC, even for firms that estimate their cost of capital very well, idiosyncratic project risk leads to larger buffers (consistent with prior work).

Large firms are both less likely to use a positive buffer and have smaller-sized buffers, reinforcing the findings from Figure 3, Panel C. Public firms are slightly more likely to use a positive buffer, but show no difference in the size of the buffer. Whether or not a firm has a credit rating has no effect on either margin. To the extent that having a credit rating is a reasonable measure of financing constraint (Faulkender and Petersen, 2005), we do not find evidence in our sample that the ability to access public debt markets is a primary

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[24]If we condition on firms that set their hurdle rate above WACC, the effect of a one pp increase in the cost of capital leads to about a 0.18 pp drop in the buffer, as in columns 5-8 of Table 2, Panel B.

[25]When this measure is high, firms within an industry vary substantially in the level of return investors require in order to bear the firm's underlying risk. Even for firms not publicly traded, this measure proxies for the required rate of return demanded by investors if the business activities and underlying cash flow risk of private and public firms within an industry are similar.

determinant of the buffer.

The CFO survey asks CFOs to rate their level of optimism about their own firm's prospects and the US economy more generally.[26] Columns 4 and 7 of Panel A and columns 4 and 8 of Panel B include these variables in our baseline regressions. We find that own-firm optimism is positively related to buffer use and the size of the buffer, even after controlling for US economy optimism. This suggests that CFOs choose a larger buffer at least in part to offset optimism in other aspects of project development. We note that in contrast, if firm-optimism is correlated with higher confidence of project success and this were the dominant effect, we would expect to find a negative relation between optimism and the buffer.

Overall, these results indicate that the negative correlation between cost of capital and buffer use is robust to the inclusion of the control variables and is noteworthy with respect to several existing explanations of why firms set hurdle rates above WACC (as presented in Figure 1). According to these explanations, if uncertainty about a firm's true WACC or project-specific idiosyncratic risk are large, then we would expect the cost of capital and the buffer to be *positively* correlated: as the required return increases, so too would these two sources of uncertainty; therefore, managers would build in a *larger* buffer as the cost of capital increases. Our prediction and finding are thus unique relative to the existing literature.

Based on estimates from Table 2, Figure 6 illustrates the negative relation between the cost of capital and the buffer. Panel A displays predicted probabilities that a firm uses a positive buffer for different costs of capital. Going from a cost of capital of 5% to 15%, the probability that a company uses a buffer drops from about 87% to 60%. Panel B displays a binned scatter plot of the size of a firm's (intensive margin) buffer and its cost of capital. A strong negative relation between the two variables is apparent. We note that the relations shown in the figure are net of both size and industry fixed effects (as well as the other controls included in the underlying regressions). While the model makes predictions about

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[26]The question asks CFOs to rate their level of optimism on a 0-100 scale, with 0 being the least optimistic. The mean firm-level (US) optimism is 68.7 (63.1), with a standard deviation of about 18 (16).

the size and likelihood of the buffer across industries, it also predicts that the negative relation between the buffer and the cost of capital should exist for all types of firms that strategically set buffers.[27]

Table 2 shows that the use and size of the buffer are strongly negatively related to the cost of capital. This is a key prediction of our model – all else equal, two firms with different costs of capital will have different incentives to use a buffer. Implicit in this prediction is the assumption that two firms can face the same distribution of project returns, but have different costs of capital. This assumption is consistent with a CAPM determined cost of capital as long as not all project volatility is systematic. Nonetheless, it is important empirically to ensure our results are not driven by systematic differences in the risk of projects.

With this in mind, we conduct additional tests of the relation between the buffer and WACC, controlling for firms' estimated betas. To do this, we rely on the publicly traded firms that appear in the CFO survey; for which we can directly estimate their CAPM betas (see Table 3). The analysis shows that the negative buffer-WACC relationship continues to hold, as before. The table also provides further reassurance that our survey data are sound – survey-provided discount rates are positively related to the firm's externally estimated beta (consistent with Jagannathan et al., 2016).

5.2. Bargaining Power in Negotiations and Buffer Use

Our second model prediction relates to a systematic relation between the buffer and a firm's bargaining power. A buffer creates value for a firm only if it improves the split of project surplus sufficiently such that this outweighs what is given up by accepting fewer projects. Firms that would get a sufficiently high split of project surplus without a buffer might not find this tradeoff worthwhile. For example, in the simple single-firm version of the model, inspection of (13) shows that the likelihood that a buffer creates value is decreasing

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[27]Figure A.4 estimates the relation between the buffer and WACC for high, medium and low WACC firms and shows that the negative relation exists within each subset. This makes a mechanical explanation less likely.

in θ_N, a measure of ex-ante bargaining power.

Consistent with the model, we predict a negative relation between the size and use of the buffer and a firm's ex ante bargaining power when negotiating with customers and suppliers. This prediction is novel and not in the traditional buffer literature, as there is no immediate analogous prediction related to bargaining power from buffer explanations based on idiosyncratic risk, financial constraints, or managerial constraints. To test this prediction empirically, we use three measures of relative bargaining power: the firms' supplier concentration, the firms' customer concentration, and a measure of the firms' markups relative to their suppliers' markups. We also consider asset specificity, as we explore whether the empirical relations (concerning relative bargaining power) predicted by the model are strongest for asset types most likely subject to bargaining.

5.2.1. Supplier Concentration

We first quantify the relative bargaining power of a given company by measuring the industry-sales concentration of its suppliers. If a company's suppliers in a given industry are concentrated, all else equal we expect the company to have less bargaining power relative to suppliers, and vice versa. Using the FactSet Revere database on customer-supplier relationships, we define supplier concentration as the average of a firm's suppliers' industry-level sales concentration (the Herfindahl–Hirschman Index (HHI) of sales in a supplier's industry, as in Autor et al., 2020). Intuitively, this measure captures how easy it is for a firm to find an alternative supplier: if a firm's suppliers come from concentrated industries, (all else equal) this will reduce the likelihood of finding a replacement trading partner. This measure is bounded between zero and one, where a higher value indicates a supplier with higher bargaining power. Therefore, we test whether there is a positive relation between supplier concentration and buffer use.[28]

Table 4 shows our results. Supplier concentration is robustly and positively related to

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[28]We match our bargaining power measures to the CFO survey data by survey year and NAICS-3 industry classifications, based on the industries reported by CFOs.

buffer use, both at the extensive and intensive margins. At the extensive margin, a one standard deviation increase in supplier concentration is associated with a 3-4% increase in the probability of using a buffer. At the intensive margin, a one standard deviation increase in supplier concentration is associated with a buffer that is approximately 50bps higher, which is roughly a 10% increase relative to the average buffer size. The results are robust to controls for volatility of sales and beta, as well as survey and characteristic fixed effects. Overall, these results suggest that firms with lower bargaining power (i.e., higher supplier concentration) are more likely to use a buffer and have larger buffers when used.

5.2.2. Customer Concentration

While the previous analysis takes the model literally and examines the bargaining power of a firm relative to its suppliers, predictions of the model should hold for a firm's other trading partners as well. For example, the model could be re-posed from the outsider's standpoint (as dealing with a buyer), which would yield similar incentives and comparative statics. So, if a particular firm's customers have a high degree of (relative) bargaining power, the model would predict that the firm would use a buffer to capture surplus.

To investigate this, we quantify the bargaining power of a firm by measuring it relative to the bargaining power of its customers. We proxy for this based on the level of concentration of the firm's downstream sales, which is distinct from our previous supplier concentration measure of upstream purchases. Disclosure regulation allows us to directly measure whether a firm relies on a few large customers to generate revenues; all else equal, a firm with a concentrated customer base will hold little bargaining power over its customers.

We use data from the Compustat Segments file to measure firm-level customer sales concentration, which pulls data from company filings about firms' large customers. Specifically, we calculate the HHI of each firm's sales to its corporate customers (Patatoukas, 2012). To match to our survey data, we take quarter × NAICS-3 averages of this measure and match to each firm in the survey by its industry.

The measure is also bounded between zero and one, but the interpretation differs from

the expected relation with respect to supplier concentration. When the customer variable is closer to zero, the sales of firms in an industry are spread more evenly across a larger number of corporate customers, indicating more bargaining power for the firm *relative* to its customers. Likewise, given that this is a customer-based measure of concentration, when this measure approaches one, the seller firm has less bargaining power, all else equal, because the seller is more reliant on fewer customers to generate revenue.

In Table 5, we relate this measure to survey firms' buffers. Columns 1-3 analyze the extensive margin and columns 4-6 analyze the intensive margin. We find no direct relation between customer concentration and the extensive margin of the buffer.[29] In terms of the intensive margin, columns 4-6 show that a one-standard deviation increase in customer concentration leads to about a 0.3 pp increase in the buffer, consistent with the model's prediction. For context, our results predict that moving from the 10th to 90th percentile of customer concentration would increase the size of the buffer by about 0.9 pp.

5.2.3. Supplier Relative Markup

We also explore an alternative proxy for bargaining power based on the markup of the firm relative to the markup charged by their suppliers. Markups are often used to proxy for market power (e.g., De Loecker et al., 2020). However, high absolute markups do not necessarily imply that the firm has bargaining power relative to its suppliers.[30] Therefore, we examine the relation between relative markups and buffer usage, where relative markups are the average ratio of supplier firms' markups to the firm's own markup over its customers. Higher supplier relative markup means less bargaining power for the firm, and we therefore predict a positive relation with both buffer use and buffer size.[31]

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[29]In Section 5.2.4, we show that the relation between bargaining power and the buffer is conditional on the types of assets a firm uses in operations. Figure A.5 Panel B shows that customer concentration relates positively for firms with low redeployability and high tangibility, as predicted by the model.

[30]In Table A.6, we show results based purely on firm markup levels within the subset of B2B firms (where markups are more likely to represent relative bargaining power with customers.) We find qualitatively similar results.

[31]Similar to our supplier concentration measure, we use FactSet Revere to construct the average markup of a firm's suppliers and take the ratio to the firm's markup. We match NAICS-3 averages to our survey

The results from this analysis are presented in Table 6. As with the first two proxies for bargaining power, we observe a negative relation between ex ante bargaining power and buffer usage (and thus a positive estimated coefficient). When suppliers' relative markups are higher, the probability that a buffer is used is higher and the size of the buffer is larger. Specifically, at the extensive margin, a one standard deviation increase in supplier concentration is associated with about a 3% increase in the probability of using a buffer. At the intensive margin, a one standard deviation increase in supplier concentration is associated with a buffer that is 40-50bps higher, a roughly 10% increase relative to the average buffer size. These results are similar in magnitude to the other measures of bargaining power, and robust to controls for volatility of sales and beta, and survey and characteristic fixed effects.

5.2.4. Bargaining Power and Asset Specificity

We examine the interaction between bargaining power and the specificity of a firm's assets. Implicit in our model is the assumption that project inputs are from markets that are not perfectly competitive. That is, there is some ability to bargain over the project in the first place. For example, if all of a project's inputs were commodities available in liquid markets, there would be no advantage to bargaining and using a buffer would merely cut off a set of good projects. We therefore extend our analysis of buffer use and bargaining by conditioning on asset type, given that bargaining is more likely for certain types assets. To do this, we test the relation between bargaining power and buffer use, conditional on two measures of asset specificity: tangibility and redeployability. The simple idea is that the more specific is the asset base, the more scope there is for bargaining.

We present the asset specificity analyses in Figures 7 and 8. In Figure 7, we see that the effect of bargaining on the buffer is stronger when asset tangibility is higher, as predicted. For example, Panel A shows that the effect of a one standard deviation change in supplier concentration on the buffer is roughly double for industries with 75% tangibility relative to

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firms based on their industry and the survey year.

industries with 25% tangibility. Figure 8 displays the results for asset redeployability (as in Kim and Kung, 2017). Redeployability ranges from 0 to 1: less redeployable assets are more specific-to-use (and more likely to be subject to bargaining); we thus predict the conditional bargaining-buffer relation to follow the opposite pattern to tangibility, as the figure shows. Figure A.5 in the appendix shows similar patterns for the extensive margin of the buffer.

5.2.5. Buffer use and Acquisition Premia

Bargaining power is a fundamental determinant of M&A outcomes (e.g., Ahern, 2012), making M&A a natural setting for evaluating the predictions of bargaining power models. While our model is motivated by bargaining inherent in project development, the underlying economic mechanisms could also play a role in merger outcomes. As long as firms can credibly commit to a hurdle rate above the target cost of capital in negotiations, we expect the hurdle rate buffer to influence bargaining outcomes in M&A transactions. The key prediction of our model is that firms with a buffer capture more project surplus, all else equal, with an implication in this setting that bidders extract more surplus in acquisition negotiations when they use a positive hurde rate buffer.

It is worth emphasizing that for our model's predictions to hold in an M&A setting, it is important that the bidder can credibly commit to a hurdle rate above the target's cost of capital in negotiation. This could occur if the CFO delegates acquisition negotiations to an employee or if the CFO negotiates herself and is committed to walking away if the target price exceeds what would allow the bidder to earn its hurdle rate in expectation. If the bidder does not treat the hurdle rate as a walkaway value in a negotiation, this would work against our finding an empirical relation between acquisition premia and buffers.

We test this prediction using data on takeover transactions from Refinitiv's SDC Platinum M&A database. While the true discount rate used in M&A is unobserved, Dessaint et al. (2021) show that for deals with available fairness opinion data, the discount rate used in the

fairness opinions map closely to a true discount rate.[32] For our test, we focus on public-to-public transactions, so that we can estimate the WACC of the target firm, which allows us to define an implied buffer used in the M&A deal. Following Dessaint et al. (2021), we define the average discount rate as the average between the maximum and minimum discount rate used in the fairness opinion. We define the implied buffer as the difference between the average discount rate and the target's WACC. Appendix C.2 shows that the average implied buffer for our sample is about 4.7% percentage points, similar to our survey data.

In Table 7, we present results from regressing bidder M&A bargaining outcomes on the implied hurdle rate buffer. Because our predictions rest on being able to commit to a hurdle rate above the target's cost of capital, we control for the target's predicted WACC in the tests. We find a statistically significant negative relation between the use of a buffer and the equity premium paid to the target (columns 1-2). In other words, firms that use a buffer pay less in an acquisition.

We also find that the buffer is positively related to the bidder's cumulative abnormal return (columns 3-4). This novel evidence suggests that the market positively appraises the bidder's bargaining outcome from the deal when the bidder uses a larger hurdle rate buffer in negotiations.[33] The estimates in column 6 predict that, relative to not using a buffer (i.e., bargaining at the target's cost of capital), a buffer of 5 percentage points would increase the bidder's CAR by 1.26 percentage points. Overall, the results are consistent with the view that higher hurdle rates convey a bargaining advantage in M&A transactions.

6. Conclusion

Project development differs from standard textbook capital budgeting guidance. We explore these differences based on two central observations about real-world capital allocation. First, input costs are not exogenous as commonly assumed, but rather are the result of

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[32]Appendix C.2 details the M&A sample construction and provides summary statistics for the main variables.
[33]Table A.8 in the appendix displays robustness for the bidder CAR results in Table 7 in which we vary both the model and time window used in CAR estimation.

negotiation between a firm and its trading partners. Second, headquarters tells mid-level managers the hurdle rate they must use for project evaluation, which the managers accept without question. As is well known, and confirmed by our survey data over the past dozen years, CFOs typically inflate the hurdle rate with a buffer of 5 or 6 percentage points above the cost of capital. Highlighting the importance of inflated hurdle rates, we provide new, direct empirical evidence that hurdle rates are a focal point of corporate investment decisions and that companies exhibit "beat the benchmark" behavior relative to the hurdle rate.

We build a model to explore the implications of these realistic features of project development. The model highlights a trade-off that occurs from using an inflated hurdle rate: passing up projects with moderately positive net present value versus earning a higher share in negotiations from the smaller set of projects. We explore these issues in several settings, including where firms set inflated hurdle rates (i) for non-bargaining reasons, (ii) strategically to gain bargaining power, and (iii) where firms and their trading partners both use hurdle rates for bargaining. In the model, the inflated hurdle rates reflect firms' relative bargaining power, their relative investment in the project, and the value of the underlying projects.

In equilibrium, using an inflated hurdle rate can preserve or even create value, thus offering an explanation for the wide-spread and long-standing use of inflated hurdle rates. Importantly, the implications of our model hold whether companies strategically choose inflated hurdle rates to aid negotiation or whether hurdle rates are inflated for other "non-strategic" reasons posited by the literature. Moreover, even when a counterparty is using an inflated hurdle rate for strategic reasons, a firm will find it optimal to use a hurdle rate buffer.

We test two primary predictions of the model using data that span 2011 to 2022 and our empirical findings generally support the model's predictions. We find that hurdle rate buffers are negatively correlated with the cost of capital and are negatively correlated with the firm's ex ante relative bargaining power. These two predictions are novel and opposite from what one would expect based on existing hurdle rate buffer models. We also provide two additional novel empirical findings that are worthy of more research: i) companies exhibit

beat-the-hurdle-rate-benchmark behavior, and ii) using hurdle rate buffers is associated with improved outcomes for firms making acquisitions.

Our paper explores a new, fundamental insight that input costs and selling prices are endogenous in capital budgeting decisions, contrary to the commonly accepted view. While we examine the effects of bargaining in the context of elevated hurdle rates, the implications are broader and ripe for more research.

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Figure 1: Reasons that Companies Set Hurdle Rates Above the Cost of Capital

This figure displays qualitative reasons why firms set their hurdle rates above WACC (i.e., use a hurdle rate buffer). Results are taken from three editions of the Duke CFO survey (2011q1, 2019q1, 2022q2) which asked CFOs "Why do you set your hurdle rate above WACC?" Possible answers vary by survey, so we group them into five distinct reasons. Table A.2 displays these groupings and provides further detail on how the question was asked on each survey. "Rationing" refers to cases when managers prioritize projects, for example due to limited capital resources. "Fudge Factor" refers to cases when managers add a (positive) buffer to their discount rate to account for, e.g., idiosyncratic risk of specific projects (Brealey and Myers, 1996; Décaire, 2024). Panel A displays the percentage of CFOs that fall within each category, Panels B and C displays the results split by survey year and size (revenue above/below $1 billion).
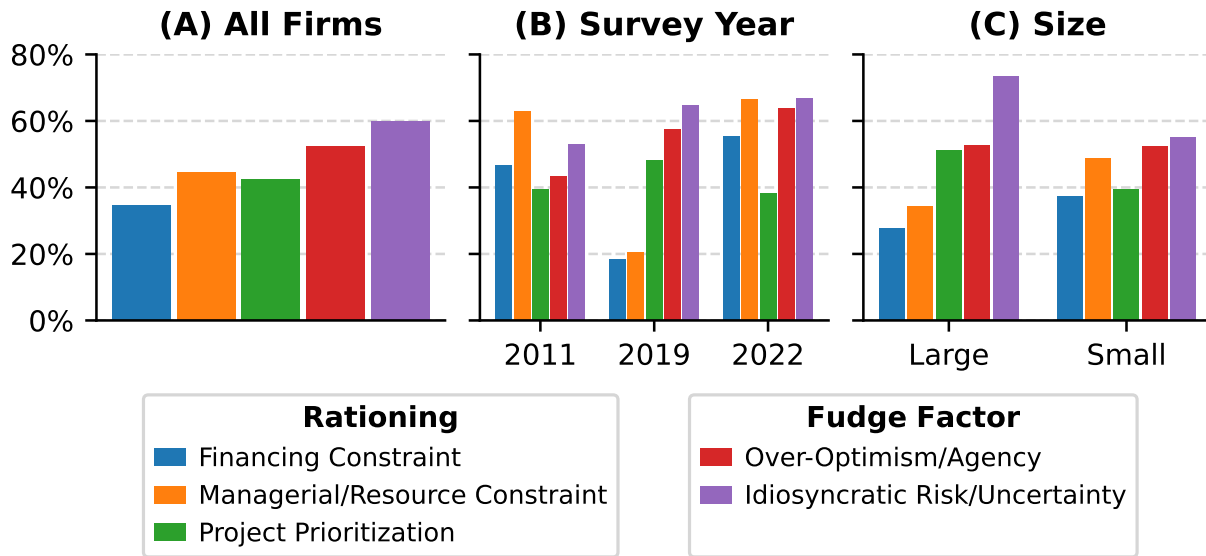
Figure 2: Sample Demographics

This figure displays demographic information for all CFOs that provide both a hurdle rate and cost of capital (WACC) in the Duke CFO Survey.
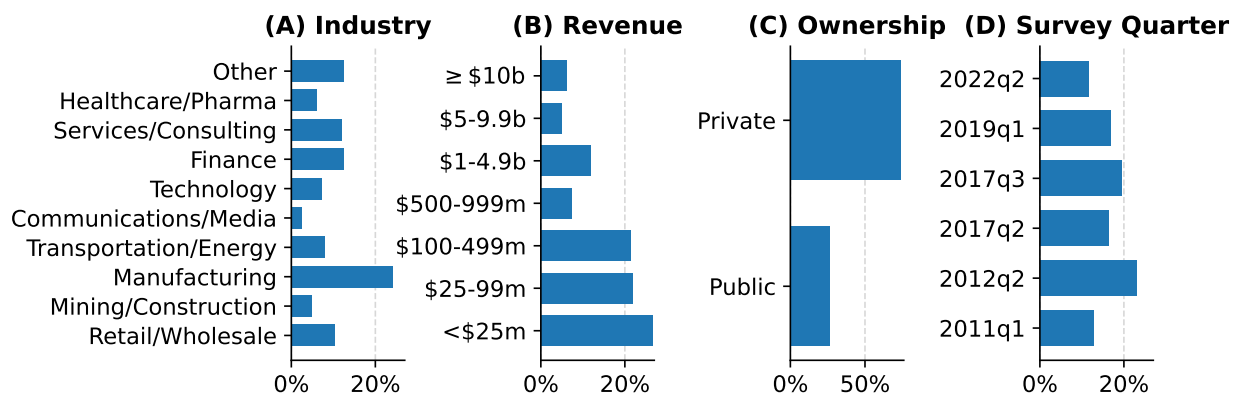
Figure 3: Time Series and Cross-Sectional Variation in Hurdle Rates and the Cost of Capital

This figure displays the within-group average and interquartile range (IQR) of CFO survey company hurdle rates, WACCs and hurdle rate buffers across several observable characteristics. For example, Panel A displays the statistics across CFO survey industries; the average buffer for firms in Mining/Construction is about 6%, and the 25th and 75th percentiles within-group are roughly 0% and 9%, respectively.
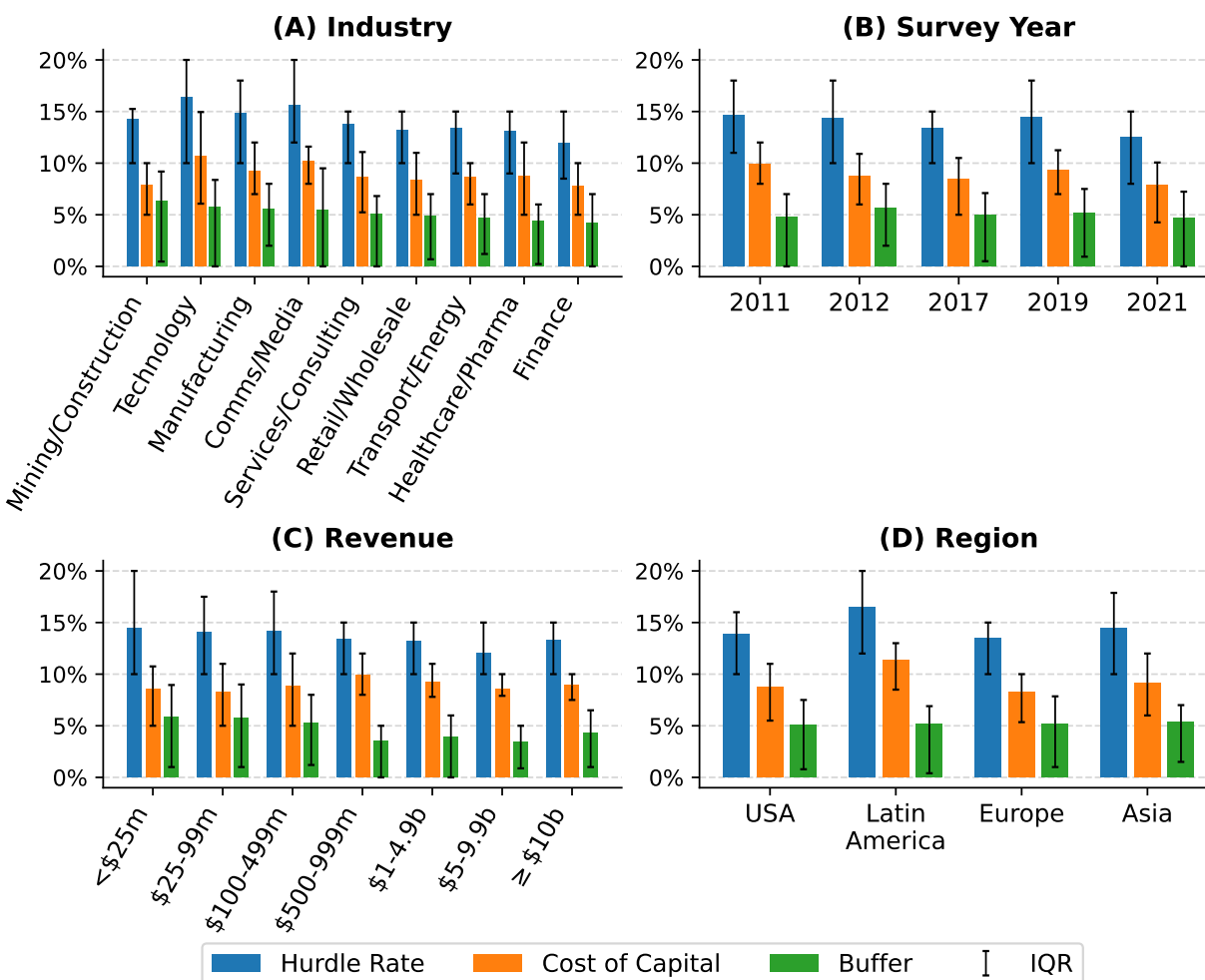
Figure 4: Density Manipulation in Excess ROIC at the Hurdle Rate

This figure displays the results of testing for density manipulation of return on invested capital (ROIC) around the hurdle rate, following the methodology described in Cattaneo et al. (2018). The sample is CFO survey firms that also appear in Compustat quarterly, for which we observe a hurdle rate. We first linearly interpolate firms' hurdle rates between two consecutive appearances in Compustat. For example, if a firm's hurdle rate in 2012q2 were 10%, and in 2012q4 it were 11%, we would assume that the value of the hurdle rate in 2012q3 were 10.5%. Given stickiness in hurdle rates (as in, e.g., Graham, 2022), this assumption seems reasonable. ROIC is defined as $ROIC_{i,t} = EBIT_{i,t}(1 - tax_{i,t})/ICAPT_{i,t-1}$, where $ICAPT$ is the firm's invested capital (i.e., the sum of long-term book debt and equity). We take trailing four-quarter sums of $EBIT(1 - tax)$, and divide by $ICAPT$ from the previous fiscal year. Next, we define our variable of interest, "Excess ROIC," as a firm's ROIC above its hurdle rate, i.e. for firm i in quarter t,

$$Excess\ ROIC_{i,t} = ROIC_{i,t} - Hurdle_{i,t}$$

We focus on observations of Excess ROIC with an absolute value less than 25%. The sample is 470 observations. We are interested in testing for density manipulation of Excess ROIC at 0. The blue and orange bars display observed frequencies of Excess ROIC in 0.5% bins ranging from -10% to $+10\%$ (though the densities estimated use the full range of observations). The blue and orange lines (and shaded areas) display the estimated local-polynomial densities as described in Cattaneo et al. (2018). To estimate the densities, we set the order of the local polynomial (and the order of the bias-corrected density estimator) equal to 3. The bandwidths for the local polynomial estimator are chosen via the "data-driven" methodology described in Section 2.5 of Cattaneo et al. (2018), and are $\{h_-, h_+\} = \{7.449\%, 6.199\%\}$. The shaded areas display 90% confidence intervals. Table A.4 displays robustness where we vary the size of the bandwidth and the order of the polynomials. The figure displays a discontinuity of the ROIC density at the hurdle rate, with some mass of the ROIC density shifting from just below to just above the hurdle rate.
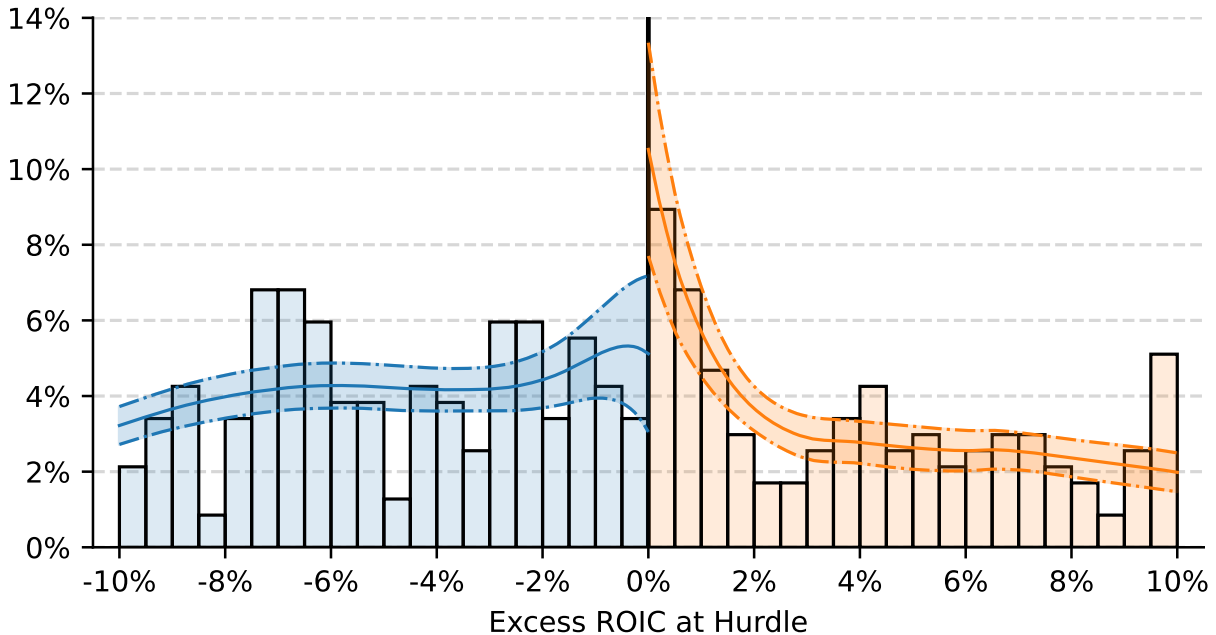
Figure 5: Implications for Firm Value from the Delegated Bargaining Model

This figure plots the model-implied change in firm value from using a hurdle rate buffer and the change in firm value from using a buffer as implied by a standard capital budgeting model. Using Proposition 2, we calibrate our model such that $r_F^{WACC} = 8.77\%$ and $r_O^{WACC} = 13.88\%$, the mean and 90th percentile WACC in the CFO Survey data. We choose remaining parameters such that the optimal hurdle rate buffer $b^* = 5.11\%$, which is the average buffer in our sample (given r_F^{WACC} and r_O^{WACC}, $\underline{R} = 2.226$ and we set $\bar{R} = 4.555$, about $2 \times \underline{R}$) Under these parameters, the percentage increase in firm value from the no-buffer case to the optimal buffered hurdle rate, $V_B^*/V_N - 1 \approx 0.11\%$, and is displayed in blue relative to the left y-axis. Displayed on the right y-axis is the percentage change in value if we were to ignore the benefits from bargaining (and only consider the value lost from forgoing positive NPV projects), which is roughly -4.4%. Thus, the difference in value implications once we consider the effects of bargaining is about 4.5 percentage points.
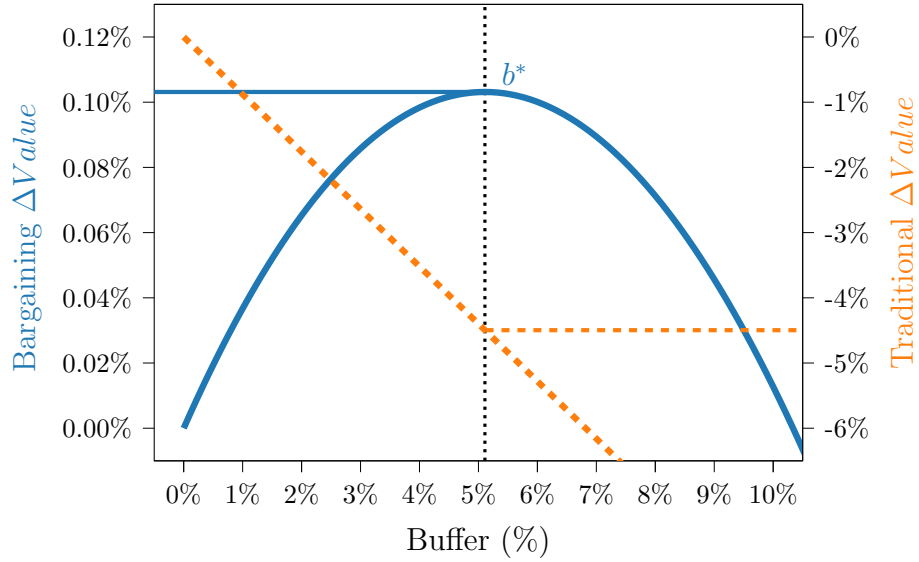
Figure 6: The Relation Between the Cost of Capital and Hurdle Rate Buffers

This figure displays the effect of a firm's cost of capital on the extensive and intensive margins of the buffer. Panel A displays estimated probabilities that a firm uses a buffer for different costs of capital (estimated using column 6 of Table 2, Panel A). Each navy point on the plot displays the estimated probability of a positive buffer, given that level of cost of capital. For example, for a cost of capital of 5%, $\Pr[Hurdle > WACC] \approx$ 87%, and this probability decreases with WACC. The gray shaded areas are 95% confidence intervals. Panel B displays a binned scatter plot with 100 bins of a firm's (intensive margin) buffer and the cost of capital (estimated using column 4 of Table 2, Panel B), again showing a negative relation with WACC.
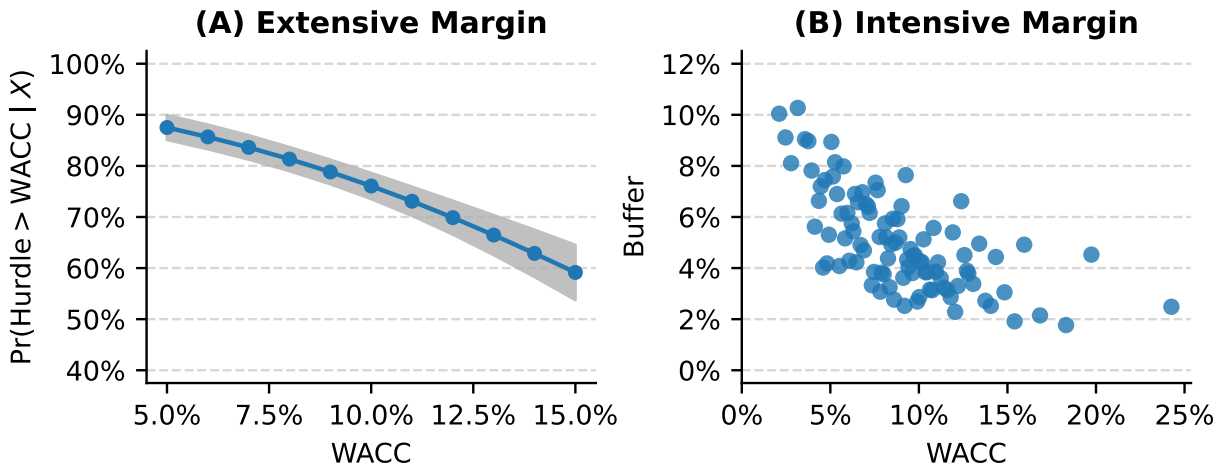
Figure 7: The Relation Between the Buffer and Bargaining Power by Asset Tangibility

This figure displays how the relations between the buffer and our measures of bargaining power vary across the degree of industry-level asset tangibility. Firms are more likely to bargain over more-tangible assets, so the relation between the buffer and bargaining power should be stronger in high-tangibility industries. For reach bargaining power measure BP, we first estimate a regression of the buffer (intensive margin) on an interaction between BP and the industry-level tangibility $tang$:

$$B_{j,i,t} = \delta_1 + \beta_1 BP_{i,t} + \beta_2 tang_{i,t} + \beta_3 \left(BP \times tang\right)_{i,t} + \gamma_{j,i,t} \cdot X_{j,i,t} + \varepsilon_{j,i,t}$$

We then plot the predicted effect of a one-standard deviation increase in bargaining power BP on the buffer, conditional on a level of tangibility. That is, given a level of $tang$ τ, each point on the plot displays $\beta_1 + \beta_3 \times \tau$. In each plot, we also display the main effect from the regression, when tangibility is at the mean. Controls are the firm's WACC, sales volatility and beta volatility; fixed effects are survey-quarter and size. Standard errors are clustered by survey industry $\times$ survey quarter. The results reveal that the effect of bargaining power on the buffer is stronger in high-tangibility industries. Figure A.5 in the appendix displays the same for the extensive margin. Table A.7 Panel A displays the regressions used to estimate each figure (columns 4-6 map to this figure, columns 1-3 map to Figure A.5).
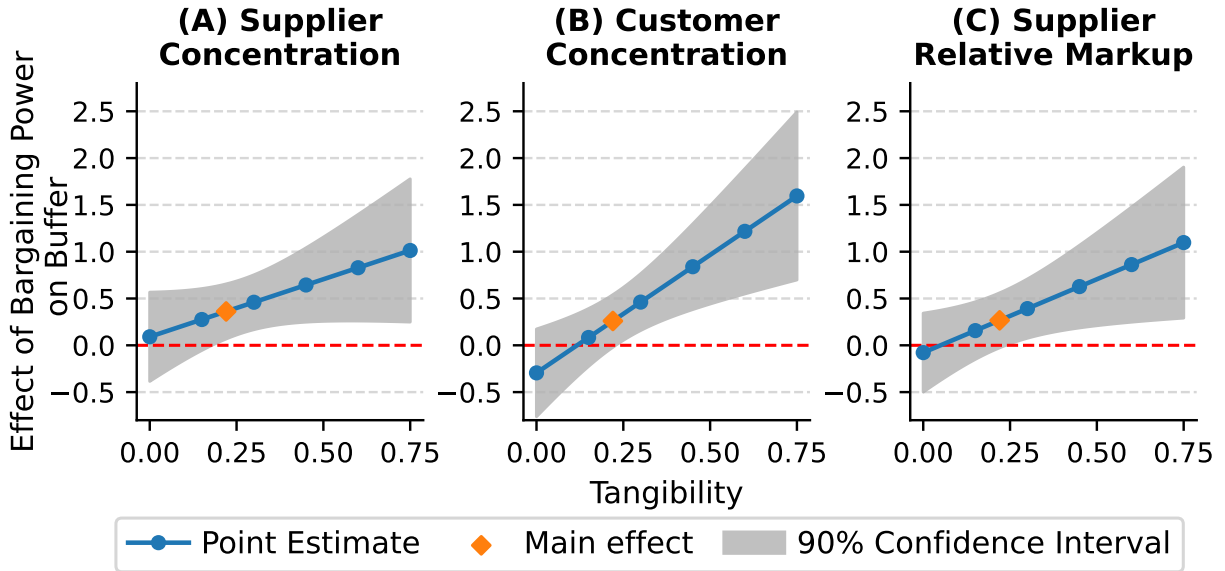
Figure 8: The Relation Between the Intensive Margin of the Buffer and Bargaining Power by Asset Redeployability (Kim and Kung, 2017)

This figure displays how the relations between the buffer and our measures of bargaining power vary across the degree of industry-level asset redeployability. The regression specification to estimate each figure panel is the same as described in Figure 7. See Table A.7 Panel B for the regression results used to estimate each panel (columns 4-6).
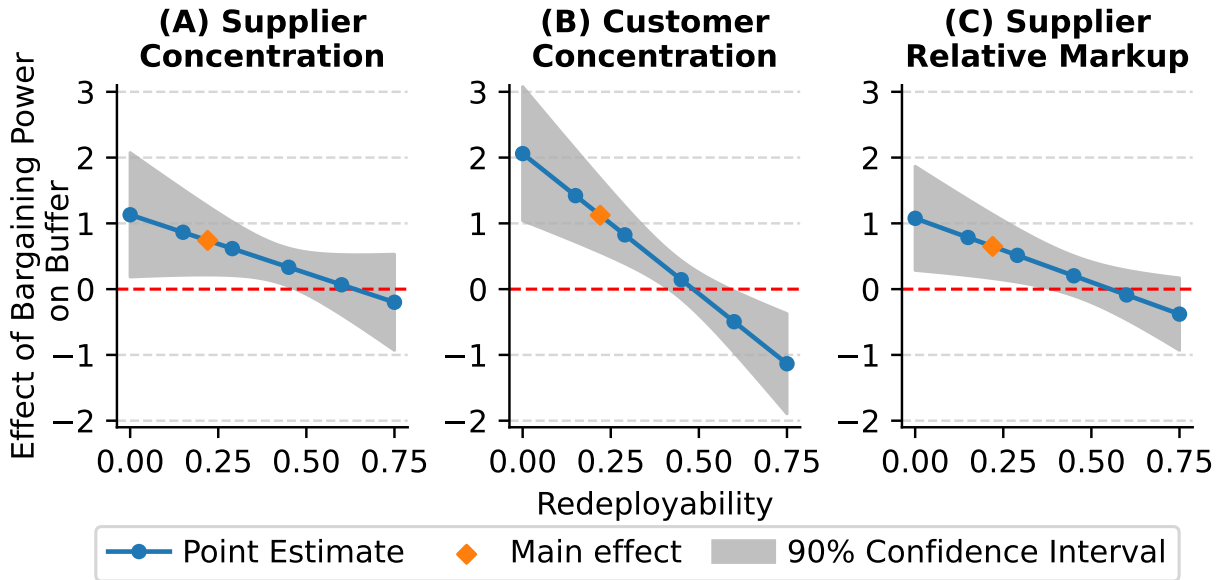
Table 1: Summary Statistics

This table displays the number of observations, averages, standard deviations, and quartiles of key empirical variables. Panel A displays statistics for variables related to the hurdle rate and the cost of capital. Panel B displays summary statistics for the industry-level variables we explore in Section 5. Summary statistics for markup variables are displayed only for firms in non-consumer-facing industries. Detailed variable definitions are available in Table A.1.

	N	Mean	Std Dev	25%	50%	75%
Panel A: CFO Survey Variables						
Hurdle Rate	1,232	13.879	5.977	10	12.750	16
Cost of Capital	1,232	8.769	4.211	5.500	8.800	11
Buffer (Extensive Margin)	1,232	0.777				
Buffer (Intensive margin)	1,232	5.111	5.376	0.787	4	7.500
Buffer | Buffer > 0	957	6.579	5.248	3	5	9.500
Panel B: Industry-Level Variables						
Beta Volatility	1,232	0.686	0.234	0.535	0.687	0.834
Sales Volatility	1,232	0.120	0.053	0.088	0.120	0.154
Supplier Concentration	1,066	0.246	0.066	0.204	0.249	0.282
Customer Concentration	1,066	0.305	0.191	0.136	0.333	0.428
Supplier Relative Markup	1,066	-0.066	0.080	-0.089	-0.071	-0.022
Asset Tangibility	1,232	0.231	0.159	0.120	0.194	0.297
Asset Redeployability	1,232	0.440	0.128	0.346	0.476	0.516

Table 2: Determinants of the Extensive and Intensive Margins of the Hurdle Rate Buffer

This table explores the determinants of the extensive and intensive margins of the hurdle rate buffer. In Panel A, we focus on the extensive margin (i.e., the dependent variable is the binary variable Uses Buffer {0,1}). The first four columns display linear probability models (OLS) and columns 5-7 display logistic regressions. In Panel B, we focus on the intensive margin. The variables Beta Volatility, Sales Volatility, Firm-Level Optimism and US Economy Optimism are standardized to mean zero, unit variance. All variables are defined in detail in Table A.1. In columns 4 and 7 of Panel A and columns 4 and 8 of Panel B, the number of observations drops because we do not have optimism forecasts from every respondent. Standard errors are clustered at survey industry × survey quarter and displayed in parentheses below the coefficient. The R^2 in columns 5-7 of Panel A is the pseudo-R^2 from the logistic regression. ***, **, * denote significance at 1%, 5%, 10%.

Panel A: Extensive Margin of Buffer

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Linear Probability Model				Logit		
Cost of Capital	-0.027***	-0.028***	-0.029***	-0.029***	-0.025***	-0.026***	-0.028***
	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)
Beta Volatility		0.031***	0.031***	0.013		0.031***	0.015
		(0.011)	(0.011)	(0.011)		(0.011)	(0.011)
Sales Volatility		0.010	0.009	0.015		0.010	0.015
		(0.015)	(0.015)	(0.016)		(0.016)	(0.016)
Large Firm		-0.077**				-0.085**	-0.067
		(0.036)				(0.039)	(0.044)
Public Firm		0.079*				0.065*	0.045
		(0.044)				(0.038)	(0.038)
Has Credit Rating		-0.012				-0.016	-0.061**
		(0.029)				(0.030)	(0.029)
Firm-Level Optimism				0.033*			0.033*
				(0.018)			(0.018)
US Economy Optimism				-0.001			-0.015
				(0.018)			(0.018)
Observations	1,232	1,232	1,232	947	1,232	1,232	947
R-squared	0.075	0.086	0.122	0.129	0.068	0.080	0.105
Survey Quarter FE			Yes	Yes			
Size FE			Yes	Yes			
Ownership FE			Yes	Yes			
Credit Rating FE			Yes	Yes			

Panel B: Intensive Margin of Buffer

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		All	CFOs			Buffer	> 0	
Cost of Capital	-0.307***	-0.311***	-0.314***	-0.319***	-0.194***	-0.181***	-0.180***	-0.166**
	(0.045)	(0.045)	(0.045)	(0.058)	(0.054)	(0.055)	(0.057)	(0.069)
Beta Volatility		0.432***	0.431***	0.325*		0.295*	0.289*	0.307
		(0.148)	(0.145)	(0.175)		(0.165)	(0.166)	(0.196)
Sales Volatility		0.395**	0.375**	0.561***		0.438***	0.420***	0.580***
		(0.163)	(0.167)	(0.173)		(0.151)	(0.155)	(0.171)
Large Firm		-1.246***				-1.033**		
		(0.391)				(0.448)		
Public Firm		-0.040				-0.610		
		(0.462)				(0.521)		
Has Credit Rating		-0.142				-0.077		
		(0.292)				(0.373)		
Firm-Level Optimism				0.520**				0.436*
				(0.210)				(0.235)
US Economy Optimism				-0.371				-0.476
				(0.267)				(0.313)
Observations	1,232	1,232	1,232	947	957	957	957	750
R-squared	0.058	0.083	0.099	0.120	0.021	0.048	0.064	0.083
Survey Quarter FE			Yes	Yes			Yes	Yes
Size FE			Yes	Yes			Yes	Yes
Ownership FE			Yes	Yes			Yes	Yes
Credit Rating FE			Yes	Yes			Yes	Yes

Table 3: The Buffer, the Cost of Capital and Beta for Publicly Listed Companies.

This table explores how the firm's cost of capital affects the use and size of the buffer for publicly traded firms that appear in the CFO survey. In each specification, we control for the firm's estimated CAPM beta, in order to hold constant how the firm's underlying cash flow risk simultaneously affects the buffer and the cost of capital (via its effect on beta). Firm Beta is the firm's estimated CAPM beta; Beta Volatility and Sales Volatility are the industry level measures as shown in Table A.1; all three variables are standardized to mean zero, unit variance. Standard errors are clustered at survey industry $\times$ survey quarter and displayed in parentheses below the coefficient. ***, **, * denote significance at 1%, 5%, 10%.

| | (1) | (2) | (3) | (4) | (5) | (6) |
	Extensive Margin			Intensive Margin		
Cost of Capital	-0.032***	-0.032***	-0.034***	-0.432**	-0.439**	-0.532***
	(0.010)	(0.010)	(0.009)	(0.202)	(0.197)	(0.191)
Firm Beta	0.078***	0.077***	0.067**	1.001***	0.967***	1.252***
	(0.027)	(0.027)	(0.027)	(0.342)	(0.331)	(0.330)
Beta Volatility		0.012	0.005		0.422	0.334
		(0.020)	(0.019)		(0.278)	(0.274)
Sales Volatility		0.030	0.037		0.599**	0.499*
		(0.030)	(0.032)		(0.256)	(0.286)
Observations	186	186	186	186	186	186
R-squared	0.057	0.064	0.133	0.085	0.113	0.188
Survey Quarter FE			Yes			Yes
Size FE			Yes			Yes
Ownership FE			Yes			Yes
Credit Rating FE			Yes			Yes

Table 4: The Buffer and Supplier Concentration

This table explores how the bargaining power of a firm over its suppliers affects the buffer. If a company's suppliers come from concentrated industries, all else equal the company has less bargaining power; and vice versa. Our measure of supplier bargaining power is supplier concentration: the average of a firm's suppliers' industry-level sales concentration (Autor et al., 2020). We use Revere data on customer-supplier relationships to identify a firm's major suppliers. We aggregate to NAICS-3 by year level and match to our CFO survey data by their industries. Columns 1-3 focus on the extensive margin; columns 4-6 focus on the intensive margin. The variables Supplier Concentration, Beta Volatility and Sales Volatility are standardized to mean zero, unit variance. All variables are defined in detail in Table A.1. Table A.5 provides robustness where we use different measures of industry-level concentration. Standard errors are clustered at survey industry $\times$ survey quarter and displayed in parentheses below the coefficient. ***, **, * denote significance at 1%, 5%, 10%.

	(1)	(2)	(3)	(4)	(5)	(6)
		Extensive Margin			Intensive Margin	
Supplier Concentration	0.038***	0.034**	0.030**	0.473***	0.426***	0.505***
	(0.014)	(0.014)	(0.013)	(0.143)	(0.132)	(0.139)
Cost of Capital	-0.027***	-0.027***	-0.028***	-0.312***	-0.320***	-0.315***
	(0.003)	(0.003)	(0.003)	(0.046)	(0.046)	(0.047)
Beta Volatility		0.027**	0.029**		0.478***	0.454***
		(0.012)	(0.013)		(0.168)	(0.169)
Sales Volatility		0.012	0.012		0.451***	0.396**
		(0.016)	(0.016)		(0.149)	(0.156)
Observations	1,066	1,066	1,066	1,066	1,066	1,066
R-squared	0.086	0.091	0.121	0.070	0.084	0.112
Survey Quarter FE			Yes			Yes
Size FE			Yes			Yes
Ownership FE			Yes			Yes
Credit Rating FE			Yes			Yes

Table 5: The Buffer and Customer Concentration

This table explores how the bargaining power of a firm's customers affects the buffer. If a company's customers are concentrated, all else equal the company has less bargaining power; and vice versa. Our measure of customer bargaining power is customer concentration: the HHI of a firm's sales to corporate customers (Patatoukas, 2012). We aggregate to NAICS-3 by year level and match to our CFO survey data by their industries. Columns 1-3 focus on the extensive margin; columns 4-6 focus on the intensive margin. The variables Customer Concentration, Beta Volatility and Sales Volatility are standardized to mean zero, unit variance. All variables are defined in detail in Table A.1. Standard errors are clustered at survey industry × survey quarter and displayed in parentheses below the coefficient. ***, **, * denote significance at 1%, 5%, 10%.

	(1)	(2)	(3)	(4)	(5)	(6)
	Extensive Margin			Intensive Margin		
Customer Concentration	0.009	0.004	0.006	0.461***	0.333***	0.352**
	(0.015)	(0.014)	(0.015)	(0.148)	(0.124)	(0.134)
Cost of Capital	-0.027***	-0.027***	-0.028***	-0.316***	-0.322***	-0.317***
	(0.003)	(0.003)	(0.003)	(0.047)	(0.047)	(0.047)
Sales Volatility		0.009	0.010		0.366**	0.313**
		(0.016)	(0.016)		(0.146)	(0.154)
Beta Volatility		0.032**	0.033**		0.512***	0.500***
		(0.012)	(0.013)		(0.164)	(0.164)
Observations	1,066	1,066	1,066	1,066	1,066	1,066
R-squared	0.078	0.084	0.117	0.069	0.081	0.107
Survey Quarter FE			Yes			Yes
Size FE			Yes			Yes
Ownership FE			Yes			Yes
Credit Rating FE			Yes			Yes

Table 6: The Buffer and the Relative Markup of Suppliers

This table explores how the relative bargaining power of a firm's suppliers affects the buffer. To measure the relative bargaining power of suppliers, we use the average ratio of supplier firms' markups to the firm's own markup over its customers. We use Revere data on customer-supplier relationships to identify a firm's major suppliers, and we use the "accounting" markup from Baqaee and Farhi (2020) as a proxy for the firm's bargaining power. For a given firm i, the Supplier Relative Markup is the simple average of the ratio of each supplier's markup to the firm's own markup over its customer. We aggregate to NAICS-3 by year level and match to our CFO survey data by their industries. Columns 1-3 focus on the extensive margin; columns 4-6 focus on the intensive margin. The variables Supplier Relative Markup, Beta Volatility and Sales Volatility are standardized to mean zero, unit variance. All variables are defined in detail in Table A.1. Standard errors are clustered at survey industry × survey quarter and displayed in parentheses below the coefficient. ***, **, * denote significance at 1%, 5%, 10%.

	(1)	(2)	(3)	(4)	(5)	(6)
		Extensive Margin			Intensive Margin	
Supplier Relative Markup	0.034**	0.028*	0.028*	0.532***	0.388**	0.367**
	(0.017)	(0.016)	(0.014)	(0.157)	(0.157)	(0.163)
Cost of Capital	-0.028***	-0.028***	-0.028***	-0.324***	-0.327***	-0.322***
	(0.003)	(0.003)	(0.003)	(0.046)	(0.047)	(0.047)
Beta Volatility		0.027**	0.029**		0.475***	0.467***
		(0.012)	(0.013)		(0.167)	(0.167)
Sales Volatility		0.005	0.007		0.365**	0.322**
		(0.015)	(0.015)		(0.148)	(0.158)
Observations	1,066	1,066	1,066	1,066	1,066	1,066
R-squared	0.084	0.088	0.121	0.072	0.083	0.108
Survey Quarter FE			Yes			Yes
Size FE			Yes			Yes
Ownership FE			Yes			Yes
Credit Rating FE			Yes			Yes

Table 7: The Real Effects of Using a Hurdle Rate Buffer: Evidence from M&A Deals

This table presents analysis of the relation between a bidder's use of a buffer and bidder bargaining outcomes in M&A deals. The sample is public-to-public M&A deals with maximum and minimum discount rates used in fairness opinions on proposed deals. Following Dessaint et al. (2021), we compute the average of the maximum and minimum discount rate used in the fairness opinion. The variable Implied Buffer is the difference between the fairness opinion average discount rate and the target's predicted WACC (constructed using the average asset beta from a firm's 3-digit SIC $\times$ year, see Dessaint et al., 2021). Premium is the percentage premium of the bid-implied equity value over the target's market capitalization in the year prior to the bid. Bidder CAR is the bidder's cumulative abnormal return relative to the 4-factor model over the 11 days around deal announcement ($t \in [-5, 5]$). Year FE refers to the year the deal was announced. Bidder/target Industry FE refers to the bidder/target Fama-French 49 industry code. Bidder/target controls are log market capitalization in the year prior to bid, market-to-book, return on assets, leverage, and cash/assets. Deal controls are relative size (deal value to bidder market cap), toehold (percent owned by bidder before bid), and indicators for deal type (cash, stock, mixed), hostile, same industry, tender offer and poison (See Dessaint et al. (2021) for variable definitions of controls). Detailed variable definitions are in Table A.1. Standard errors are clustered by 3-digit target SIC industry and displayed below the coefficient. ***, **, * denote significance at 1%, 5%, 10%.

| | (1) | (2) | (3) | (4) |
	Premium		Bidder CAR	
Implied Buffer	-1.453***	-1.211***	0.279**	0.253**
	(0.451)	(0.413)	(0.113)	(0.118)
Predicted Target WACC	-0.994	-0.812	-0.205	-0.235
	(0.965)	(0.864)	(0.313)	(0.322)
Observations	736	736	736	736
R-squared	0.401	0.458	0.182	0.199
Year FE	Yes	Yes	Yes	Yes
Bidder/Target Industry FE	Yes	Yes	Yes	Yes
Bidder/Target Controls	Yes	Yes	Yes	Yes
Deal Controls		Yes		Yes

A. Appendix Figures and Tables

Figure A.1: Time Series and Cross-Sectional Differences in the Extensive Margin of the Buffer

This figure displays the proportion of firms that use a positive buffer (i.e., their hurdle rate exceeds their cost of capital) across several observable characteristics of the CFO survey sample.
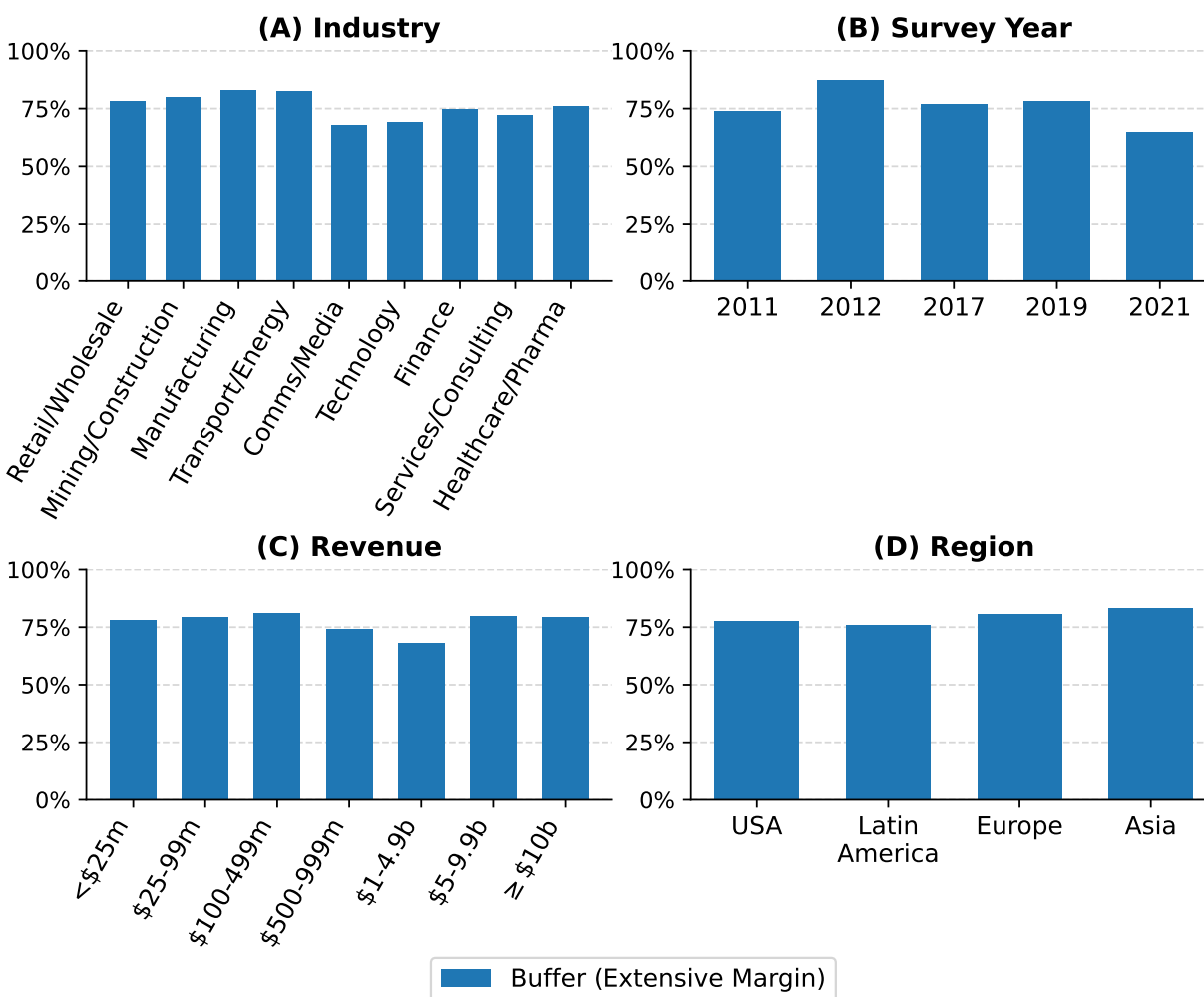
Figure A.2: Cross-Correlations of Main Variables

This figure shows the pair-wise correlations among the main variables. Dark blue indicates strong positive correlations, and dark red indicates strong negative correlations. Detailed variable definitions are available in Table A.1.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Hurdle Rate (1)	1										
WACC (2)	0.49	1									
Buffer (Extensive Margin) (3)	0.27	-0.27	1								
Buffer (Intensive Margin) (4)	0.73	-0.24	0.51	1							
Sales Volatility (5)	0.1	0.04	0.02	0.08	1						
Beta Volatility (6)	0.09	0.04	0.04	0.07	0.02	1					
target_hhi_sale_ind (7)	0.1	0.03	0.09	0.09	-0.02	0.15	1				
Customer Concentration (8)	0.1	0.06	0.03	0.07	0.2	0.1	0.33	1			
log_diff (9)	0.11	0.08	0.04	0.06	0.21	0.09	0.03	0.25	1		
Asset Tangibility (10)	0.05	0.01	0.07	0.05	-0.19	0.04	0.3	0.06	0.24	1	
Asset Redeployability (11)	-0.08	-0.05	-0.05	-0.05	0.04	-0.01	-0.28	-0.23	-0.34	-0.63	1

Figure A.3: Density Manipulation in Excess ROIC relative to WACC

This figure displays robustness for Figure 4. In particular, we test for density manipulation of ROIC around the cost of capital, as opposed to the hurdle rate. The sample is the same as in Figure 4. We define $Excess\ ROIC_{i,t}^{WACC} = ROIC_{i,t} - WACC_{i,t}$ as excess ROIC relative to the firm's cost of capital (as opposed to the hurdle rate as in Figure 4). We implement the same test and look for excess bunching in ROIC directly above the firm's WACC; we do not find a discontinuity in the density at WACC (the test returns a t-statistic of -1.013).
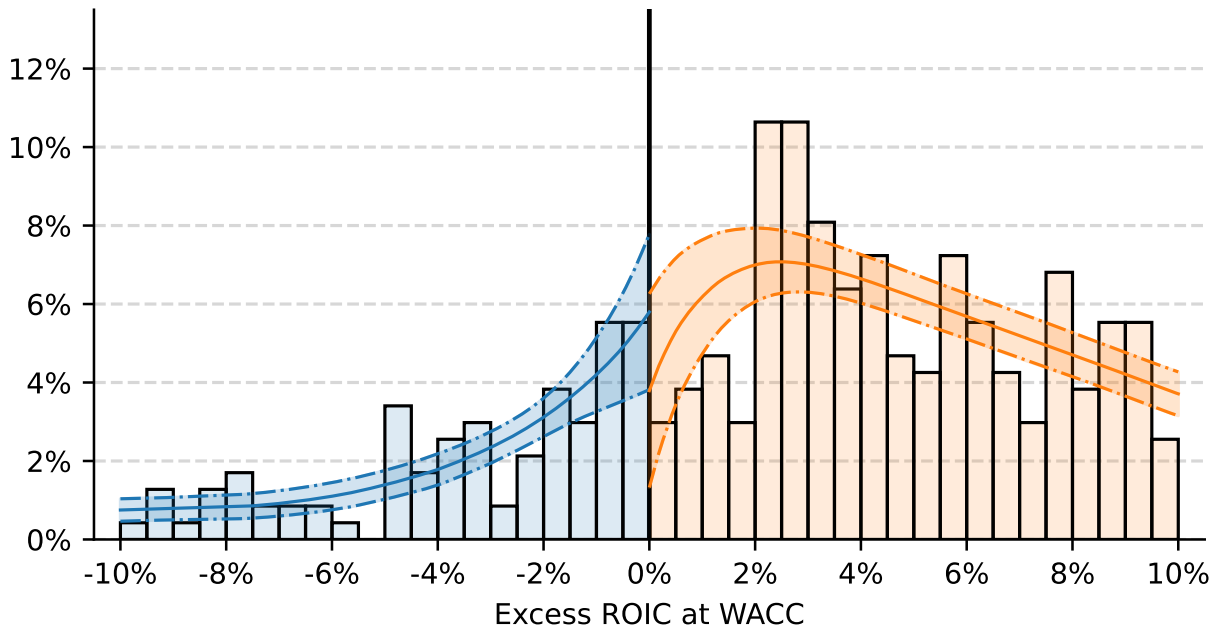
Figure A.4: Negative Relation Between Buffer and Cost of Capital Across Different WACC/Risk Groups

This figure displays how the relation between the cost of capital and the buffer varies across different levels of the cost of capital. We first estimate a regression of the buffer (extensive and intensive margins) on an interaction between WACC and a categorical variable that groups survey firms by the level of their WACC (along with the non-interactive variables):

$$B_{i,t} = \delta_1 + \beta_1 WACC_{i,t} + \sum_{k=2}^{4} \left(\beta_k WACC_{i,t} \times WACC \text{ Group}_k + \delta_k WACC \text{ Group}_k \right) + \gamma_{i,t} \cdot X_{i,t} + \varepsilon_{i,t}$$

where i indexes firm and t survey-quarter. The four groups are (1) $\leq 5\%$, (2) $(5\%, 10\%]$, (3) $(10\%, 15\%]$ and (4) $> 15\%$. We then display effect of WACC on the buffer for each group. For example, for firms with WACC $\leq 5\%$, the figure displays the baseline effect from the regression (β_1); the other three groups display the group-specific slope coefficient ($\beta_1 + \beta_{k|k \in \{2,3,4\}}$). In each plot, we display the overall effect for comparison (labeled "All"), which is estimated from a similar regression without interactions. Controls in this regression are sales volatility and beta volatility; fixed effects are survey-quarter and size. Standard errors are clustered by survey industry $\times$ survey quarter. The results reveal a significant negative relation between the hurdle rate buffer and WACC for each subgroup.

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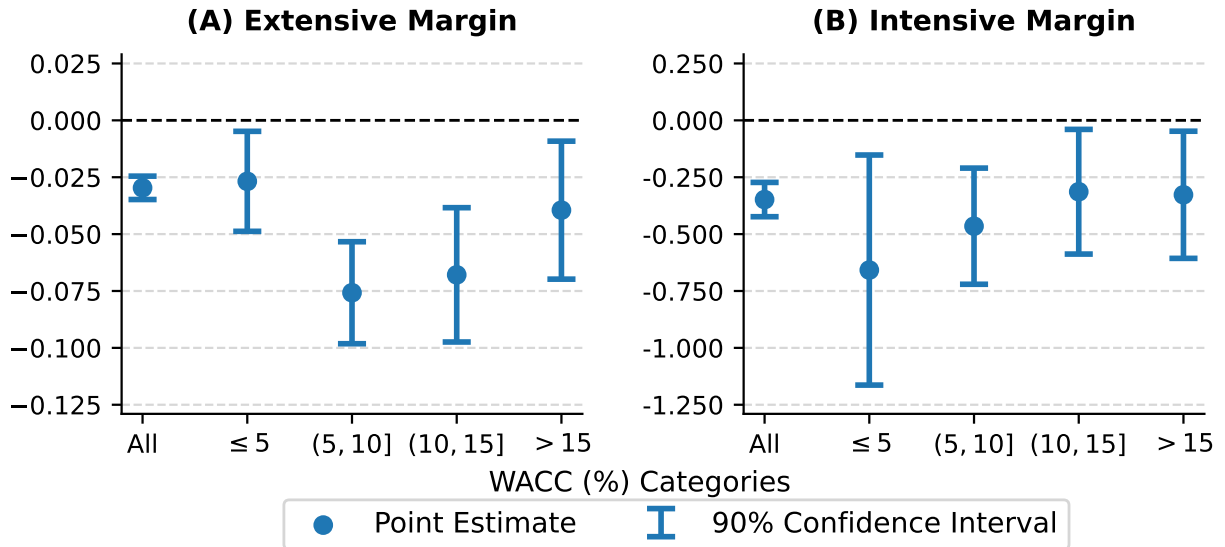Figure A.5: The Relation Between the Extensive Margin of the Buffer and Bargaining Power by Asset Tangibility and Redeployability

This figure is robustness for Figures 7 and 8, and displays the equivalent result for the extensive margin of the buffer. See Table A.7 Panel A and B for the regressions used to estimate each figure panel (columns 1-3 of each table panel).

Panel A: Asset Tangibility
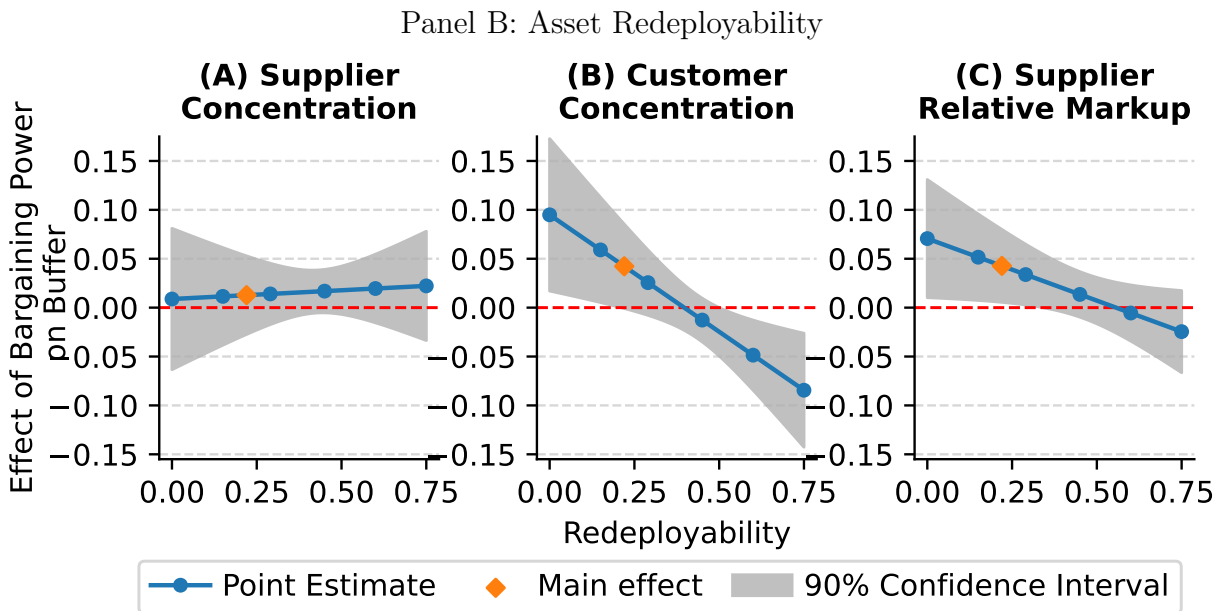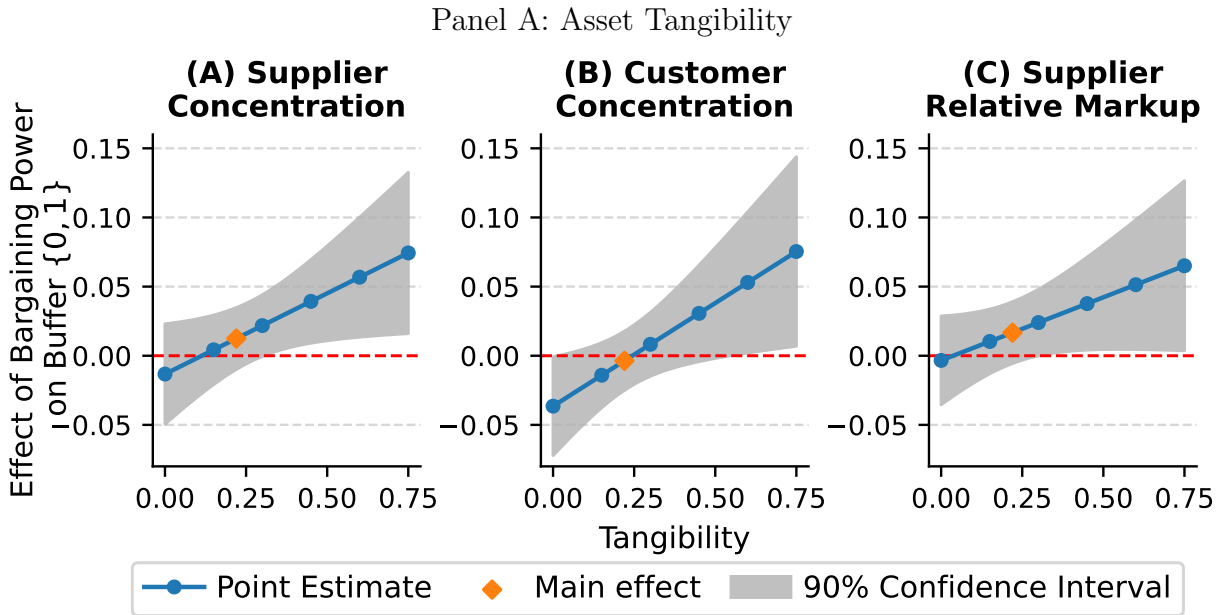

Panel B: Asset Redeployability

Table A.1: Empirical Variable Definitions

This table gives definitions, details on construction and sources for each empirical variable used in the paper. Appendix C.1 contains additional details on the survey data and other data sources.

Variable	Description	Source
Hurdle Rate	The minimum rate of return required to pursue a project.	CFO Survey
Cost of Capital/WACC	The firm's weighted average cost of capital.	CFO Survey
Buffer (Extensive Margin)	Indicator variable taking a value of one if the firm's hurdle rate exceeds its cost of capital; i.e., the extensive margin of the buffer.	CFO Survey
Buffer (Intensive Margin)	The difference between hurdle and WACC, i.e. the intensive margin of the buffer.	CFO Survey
Buffer | Buffer > 0	The intensive margin of the buffer for firms that use a positive buffer. This differs from the definition above as it excludes Buffer $= 0$ observations.	CFO Survey
Survey Industry	Industry of firm, as supplied by respondent to the CFO survey, roughly equivalent to 1-digit SIC. The 10 categories are Retail/Wholesale Trade, Mining/Construction, Manufacturing, Transportation/Energy, Communications/Media, Technology, Finance, Servces/Consulting, Healthcare/Pharma, Other.	CFO Survey
Has Credit Rating	Indicator variable equal to one if the firm states it has a credit rating (and zero for all other firms)	CFO Survey
Size	Categorical variable tracking firm size by revenue. Categories are $< \$25m$, $\$25-99m$, $\$100-499m$, $\$500-900m$, $\$1-4.9b$, $\$5-9.9b$ and $\geq \$10b$. Often included as a fixed effect in analysis.	CFO Survey
Large Firm	Indicator variable equal to one if the firm's sales revenue is weakly greater than $1 billion.	CFO Survey
Public Firm	Indicator variable equal to one if the firm is publicly traded.	CFO Survey
Firm-Level (US) Optimism	Answer to the question: "Rate your optimism about your firm (or in a separate question, the US economy) on a scale from 0-100, with 0 being the least optimistic and 100 being the most optimistic."	CFO Survey
Return on Invested Capital	ROIC is $EBIT_t \times (1 - tax_t)/ICAPT_{t-1}$ where $ICAPT$ is Invested Capital. Invested Capital is the sum of long-term debt (total) and common equity (total). We take trailing four-quarter sums of $EBIT(1 - tax)$, and divide by the invested capital from the end of the previous fiscal year to derive our final measure.	Compustat
Sales Volatility	We adapt methodology in Décaire (2024) to estimate a measure of industry idiosyncratic sales volatility. We estimate $sales/(lagged\ assets)_{i,j,t,q} = \alpha_j + \alpha_t + \alpha_q + \varepsilon_{i,j,t,q}$ for firm i, industry j, calendar quarter t and $q \in \{1,2,3,4\}$. We take residuals $\varepsilon_{i,j,t,q}$ as a quarterly firm-level measure of idiosyncratic risk. To net out short-run, firm-specific shocks, we take trailing 2-year averages of firm idiosyncratic risk as our final firm-level measure. The final measure is the standard deviation of the firm-level measure for firms in a given NAICS-4 industry and calendar quarter.	Compustat
Beta Volatility	Standard deviation of the CAPM beta within a quarter and 4-digit NAICS industry.	Compustat & CRSP

| Supplier Concentration | Average of firms' suppliers' industry concentrations within a year and NAICS-3 industry. For a given customer firm i in Revere, we take the average of their j suppliers' industry-level sales concentration as the measure of supplier (industry) concentration. Industry-level sales concentration is taken from publicly available 2017 Census data on the HHI of sales at the NAICS-4 industry level. Results are similar using simple averages to aggregate to the firm-level, or by weighting by supplier size (sales). To match to the CFO survey data, we take NAICS-3 $\times$ year averages of Supplier Concentration. We limit to firms in non-consumer-facing industries as our bargaining analysis pertains to B2B firms. | Revere & U.S. Census Bureau (2017) |

| Customer Concentration | Average of firms' corporate customer sales HHI within a year and NAICS-3 industry. For firm i and customer firm(s) j, $HHI_i^{sales} = \sum_j \left(\frac{sales_{i,j}}{sales_i} \right)^2$. To measure HHI, we use the Compustat Segments Customers file (which itself is created using SEC filings), focusing on corporate customers. See, e.g., Patatoukas (2012), for more details. We limit to firms in non-consumer-facing industries as our bargaining analysis pertains to B2B firms. | Compustat & SEC filings |

| Relative Markup | Average of firms' supplier-to-own relative markup (see accounting markup below) within a year and NAICS-3 industry. For a given customer firm i in Revere, we take the average of the ratio of j firm's markup to firm i markup ($rel\ markup_i = |J_i|^{-1} \sum_j \frac{markup_j}{markup_i}$) as a measure of firm-level (relative) bargaining power over suppliers. To match to the CFO survey data, we take NAICS-3 $\times$ year averages of Relative Markup. We limit to firms in non-consumer-facing industries as our bargaining analysis pertains to B2B firms. | Revere & Compustat |

| Markup | We follow the "accounting markup" from Baqaee and Farhi (2020) (BF). At the firm-level, we measure profits as operating income after depreciation (OIBPD-DP). The firm-level markup is μ_i comes from the following relation: $profits_i = \left(1 - \mu_i^{-1} \right) sales_i$. To net out the effects of year-specific shocks, we take four-year trailing averages of μ_i within-firm. Following BF, we take NAICS-3 by year averages of μ_i as our industry measure. See Appendix C.2.1 of BF details, and Baqaee and Farhi (2019) for details on replication. | Compustat |

| Consumer-Facing | Indicator variable taking a value of one if a firm is in GICS sectors 25 or 30 ("Consumer Discretionary" or "Consumer Staples"). | GICS |

| Asset Tangibility | We calculate firm-level tangibility as the ratio of property, plant and equipment to total fixed assets (PPENT/AT). Because there is very little time variation in tangibility (a regression of firm tangibility on NAICS-4 fixed effects produces an R^2 of 0.62, adding year fixed effects produces an R^2 of 0.635), we take simple NAICS-4 averages of firm-level tangibility for our industry measure. | Compustat |

| Asset Redeployability | See Kim and Kung (2017). Asset redeployability (at the asset level) is the proportion of industries that use a given asset. Industry-level asset redeployability is the value-weighted average of redeployability based on how important assets are to an industry. We use the publicly available data from Kim and Kung (2017) and match to our survey firms at the NAICS-2 level. | Kim and Kung (2017), BEA |

| Average Discount Rate | Average between the maximum and minimum discount rate used in fairness opinions on M&A deals. | SDC |

Predicted Target WACC	Target's WACC, with r_A estimated using the average CAPM asset beta in the target firm's 3-digit SIC industry the year before deal announcement and r_D estimated as the firm's average cost of debt and average tax rate. See Dessaint et al. (2021).	SDC, CRSP & Compustat
Premium	Percentage premium of the bid-implied equity value (EV) of the target to the target's market capitalization (MV) in the year prior to the bid. If EV is missing, then EV is the deal value divided by the percentage of equity acquired in the deal (for uncompleted deals, the percentage of equity sought). Final measure is $\log(EV/MV)$.	SDC, CRSP & Compustat
Bidder CAR	Bidder's cumulative abnormal return relative to the four-factor model in the 11 trading days around deal announcement ($t \in [-5, 5]$). We use a 252 trading day window to estimate the expected return (requiring a minimum of 100 trading days to estimate), and include a 60 trading day gap between the end of the estimation window and the start of the event window.	SDC & CRSP

Table A.2: Reason Aggregation for Figure 1

This table displays how we produce Figure 1. The possible responses that CFOs can give for the reason(s) that they set their hurdle above WACC vary by survey. We categorize possible reasons into five qualitative groupings.

Panel A: 2011

Financing Constraint	1.	Shortage of funding
Managerial/Resource Constraint	1. 2. 3.	Shortage of employees Shortage of management time and expertise Shortage of production capacity
Project Prioritization	1.	We do not pursue some positive net present value projects because we think others will earn even higher returns
Over-Optimism/Agency	1. 2.	Some projects only appear to be attractive due to optimistic projections but may not be successful Project might reduce earnings per share
Idiosyncratic Risk/Uncertainty	1. 2.	There is too much uncertainty about some projects The risk of the project is too high

Panel B: 2019

Financing Constraint	1.	Because we face funding constraints
Managerial/Resource Constraint	1.	Because we have scarcity of managerial time/expertise
Project Prioritization	1.	So that we choose only the best available projects
Over-Optimism/Agency	1. 2.	So that we choose projects that are profitable To provide a buffer in case the project underperforms
Idiosyncratic Risk/Uncertainty	1. 2. 3.	To account for riskiness of the projects being evaluated To account for costs not captured by WACC To provide a margin of error in calculations and assumptions

Panel C: 2022

Financing Constraint	1.	Our firm cannot fund all profitable projects
Managerial/Resource Constraint	1. 2.	Scarcity of non-management labor Scarcity of management times
Project Prioritization	1. 2.	To limit the total number of projects we take on Saves resources in order to preserve the option to invest in future projects that might earn higher return
Over-Optimism/Agency	1. 2.	Helps offset possible over-optimism in project evaluation Builds in a buffer, to reduce the odds we will have to cancel a project that we have already started should a negative surprise occur
Idiosyncratic Risk/Uncertainty	1. 2.	Provides a margin of error in calculations and assumptions Accounts for project-specific risks not reflected in WACC

Table A.3: Hurdle Rates, Costs of Capital and Buffers by Industry

This table displays industry-level averages of hurdle rates, costs of capital and the intensive and extensive margins of the buffer. Panel A sorts by NAICS-2 industries, Panel B sorts by survey industries (i.e., the industry the CFO stated on the survey), which approximately align with one-digit SIC codes. The final column of both panels displays the average buffer conditional on using a positive buffer. See Table A.1 for detailed definitions.

Panel A: NAICS-2 Averages

Code	Description	Percent of Sample	Hurdle	WACC	Buffer Intensive Margin	Buffer Extensive Margin	Buffer | Buffer > 0
11	Agri, Forestry, Fish	0.32	11.875	9.250	2.625	0.750	3.500
21	Mining, Oil/Gas	2.03	18.020	10.140	7.880	0.960	8.208
22	Utilities	0.97	8.892	7.075	1.817	0.667	2.725
23	Construction	5.19	13.575	8.322	5.253	0.734	7.153
31-33	Manufacturing	21.59	14.616	9.197	5.418	0.805	6.735
41-42	Wholesale Trade	7.22	13.553	8.576	4.977	0.775	6.419
44-45	Retail Trade	5.11	14.374	8.910	5.465	0.778	7.026
48-49	Transportation/Warehouse	1.95	13.562	9.017	4.546	0.833	5.455
51	Information	4.38	15.398	9.645	5.753	0.778	7.397
52	Finance/Insurance	9.42	11.693	7.723	3.970	0.733	5.418
53	Real Estate	3.9	12.964	8.383	4.580	0.729	6.281
54	Professional/Scientific Services	9.66	15.708	9.936	5.771	0.756	7.631
55	Management of Companies	0.73	10.267	6.839	3.428	0.556	6.170
56	Admin/Waste Management	2.76	15.294	8.751	6.543	0.824	7.945
61	Educational Services	1.38	8.444	6.368	2.076	0.529	3.922
62	Healthcare	3.98	11.849	7.658	4.191	0.837	5.009
71	Arts/Entertainment	0.49	11.383	9.550	1.833	0.667	2.750
72	Accommodation/Food	1.46	16.744	9.386	7.358	0.833	8.830
81,91-92	Other Services, Public Admin	2.68	11.955	6.564	5.391	0.848	6.354
Unknown	Unknown	14.77	13.848	8.903	4.945	0.775	6.383

Panel B: Survey Industry Averages

Industry	Percent of Sample	Hurdle	WACC	Buffer Intensive Margin	Buffer Extensive Margin	Buffer | Buffer > 0
Mining/Construction	4.87	14.212	7.894	6.317	0.800	7.897
Technology	7.31	16.394	10.638	5.756	0.689	8.356
Manufacturing	24.11	14.803	9.276	5.527	0.828	6.673
Communications/Media	2.52	15.581	10.165	5.416	0.677	7.995
Services/Consulting	12.01	13.764	8.664	5.100	0.723	7.055
Retail/Wholesale	10.39	13.170	8.320	4.851	0.781	6.209
Transportation/Energy	7.87	13.349	8.654	4.696	0.825	5.694
Healthcare/Pharma	6.09	13.128	8.763	4.365	0.760	5.744
Finance	12.42	11.958	7.790	4.168	0.745	5.594
Other	12.42	13.459	8.274	5.185	0.797	6.503

Table A.4: Excess ROIC Density Manipulation Test Robustness

This table displays robustness the results of the density manipulation test described in Figure 4. We alter both order of the local polynomial estimator, as well as the bandwidth for the local estimation. For each polynomial order p, the bias-corrected density estimator is set to be $q = p + 1$, which is the default setting. In each column, we display the difference in the estimated density immediately above and immediately below the cutoff. In the notation of Cattaneo et al. (2018), we display $\hat{f}_{+,p}(h) - \hat{f}_{-,p}(h)$, where $\hat{f}_{\pm,p}(h)$ is derived via local polynomial density estimation. Below the estimated difference in density, we display standard errors. Column 1 displays the results when the bandwidths for estimation are chosen via the data-driven methodology in Section 2.5 of Cattaneo et al. (2018). In column 1, the chosen bandwidths $\{h_-, h_+\}$ are displayed below the standard error. In columns 2-5, we fix the bandwidth to be equal on both sides. ***, **, * denote significance at 1%, 5%, 10%.

		(1)	(2)	(3)	(4)	(5)
				Bandwidth		
		Data-Driven	2.5	5	7.5	10
		0.057***	0.083***	0.030*	0.004	0.002
	1	(0.021)	(0.027)	(0.017)	(0.012)	(0.010)
		$\{4.422, 3.432\}$				
		0.051**	0.108**	0.097***	0.036*	0.012
Polynomial Order	2	(0.023)	(0.048)	(0.028)	(0.021)	(0.017)
		$\{7.926, 6.038\}$				
		0.125***	0.136*	0.118***	0.113***	0.046*
	3	(0.034)	(0.077)	(0.041)	(0.030)	(0.025)
		$\{7.449, 6.199\}$				

Table A.5: The Buffer and Concentration of Supplier Industries (Alternative Measures)

This table display robustness tests for Table 4, in which we use alternative measures of industry-level sales concentration to construct the measure of supplier concentration (Autor et al., 2020). We use the same FactSet Revere data to aggregate supplier (industry) concentration to the firm-level, and we again aggregate to NAICS-3 by year level and match to our CFO survey data by their industries. Columns 1-4 (5-8) display results using the percentage of sales accounted for by the top four, eight, 20 and 50 firms in an industry as supplier industry concentration, respectively. Columns 1-4 focus on the extensive margin; columns 5-8 focus on the intensive margin. All displayed variables standardized to mean zero, unit variance, and the controls are the same as Table 4. Standard errors are clustered at survey industry × survey quarter and displayed in parentheses below the coefficient. ***, **, * denote significance at 1%, 5%, 10%.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
	Extensive Margin				Intensive Margin			
Supplier Top 4 Sale Share	0.015				0.643***			
	(0.015)				(0.158)			
Supplier Top 8 Sale Share		0.022				0.651***		
		(0.015)				(0.161)		
Supplier Top 20 Sale Share			0.023				0.554***	
			(0.016)				(0.175)	
Supplier Top 50 Sale Share				0.020				0.444**
				(0.016)				(0.189)
Observations	1,066	1,066	1,066	1,066	1,066	1,066	1,066	1,066
R-squared	0.118	0.118	0.119	0.118	0.112	0.113	0.111	0.108
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Survey Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Size FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ownership FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Credit Rating FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table A.6: The Buffer and Price Markups in B2B Industries

This table explores how a firm's level bargaining power affects the buffer. The proxy for a firm's bargaining power in this table is the price markup of firms operating in non-consumer-facing industries, i.e., firms whose operations are predominantly (business-to-business) B2B. Higher price markups on a firm's customers would be a direct consequence of bargaining power, all else equal. Our measure of price markup is the "accounting" markup from Baqaee and Farhi (2020), which we aggregate to NAICS-3 by year level and match to our CFO survey data by their industries. Because our model makes no prediction on the relation between the buffer and markup for consumer-facing firms, we remove consumer-facing industries from the analysis. Specifically, we follow Gofman et al. (2020) and define an industry as consumer-facing if it falls in GICS sector "Consumer Discretionary" or "Consumer Staples" (GICS codes 25 and 30, respectively); 166 of our 1232 observations are firms operating in consumer-facing industries. Columns 1-3 focus on the extensive margin; columns 4-6 focus on the intensive margin. The variables Markup, Beta Volatility and Sales Volatility are standardized to mean zero, unit variance. All variables are defined in detail in Table A.1. Standard errors are clustered at the survey industry $\times$ survey quarter and displayed in parentheses below the coefficient. ***, **, * denote significance at 1%, 5%, 10%.

	(1)	(2)	(3)	(4)	(5)	(6)
	Extensive Margin			Intensive Margin		
Markup	-0.031***	-0.024**	-0.026*	-0.698***	-0.527***	-0.559***
	(0.011)	(0.011)	(0.013)	(0.148)	(0.162)	(0.163)
Cost of Capital	-0.027***	-0.028***	-0.028***	-0.326***	-0.328***	-0.324***
	(0.003)	(0.003)	(0.003)	(0.047)	(0.047)	(0.047)
Sales Volatility		0.003	0.004		0.284*	0.222
		(0.015)	(0.015)		(0.145)	(0.153)
Beta Volatility		0.027**	0.028**		0.426**	0.408**
		(0.013)	(0.013)		(0.167)	(0.165)
Observations	1,066	1,066	1,066	1,066	1,066	1,066
R-squared	0.083	0.087	0.120	0.079	0.086	0.113
Survey Quarter FE			Yes			Yes
Size FE			Yes			Yes
Ownership FE			Yes			Yes
Credit Rating FE			Yes			Yes

Table A.7: The Relation Between the Buffer and Bargaining by Asset Specificity

This table displays the regressions used to estimate Figures 7, 8 and A.5. In each column, we interact the measure of bargaining power BP with the measure of specificity (tangibility in Panel A, redeployability in Panel B). Each measure of bargaining power is standardized to mean-zero unit variance. Tangibility and redeployability are both $\in [0,1]$, and not standardized. Thus, the coefficient on the main effect of each bargaining power is interpreted as the effect of a one-standard deviation increase in bargaining power for a firm in a zero-tangibility (redeployability) industry. All variables are defined in detail in Table A.1. Standard errors are clustered at survey industry $\times$ survey quarter and displayed in parentheses below the coefficient. ***, **, * denote significance at 1%, 5%, 10%.

Panel A: Bargaining Power by Asset Tangibility						
	(1)	(2)	(3)	(4)	(5)	(6)
		Extensive Margin			Intensive Margin	
Supplier Concentration	-0.013			0.091		
	(0.022)			(0.289)		
Supplier Concentration $\times$ Tangibility	0.117*			1.229		
	(0.067)			(0.882)		
Customer Concentration		-0.036*			-0.295	
		(0.022)			(0.284)	
Customer Concentration $\times$ Tangibility		0.149**			2.520**	
		(0.076)			(0.995)	
Supplier Relative Markup			-0.003			-0.078
			(0.020)			(0.256)
Supplier Relative Markup $\times$ Tangibility			0.091			1.567*
			(0.065)			(0.854)
Tangibility	0.152*	0.271***	0.224***	0.990	2.565**	2.183**
	(0.089)	(0.080)	(0.082)	(1.166)	(1.047)	(1.081)
Observations	1,066	1,066	1,066	1,066	1,066	1,066
R-squared	0.129	0.128	0.128	0.115	0.117	0.113
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Survey Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Size FE	Yes	Yes	Yes	Yes	Yes	Yes
Ownership FE	Yes	Yes	Yes	Yes	Yes	Yes
Credit Rating FE	Yes	Yes	Yes	Yes	Yes	Yes

Panel B: Bargaining Power by Asset Redeployability

	(1)	(2)	(3)	(4)	(5)	(6)
		Extensive Margin			Intensive Margin	
Supplier Concentration	0.009			1.131**		
	(0.044)			(0.574)		
Supplier Concentration × Redeploy	0.018			-1.774		
	(0.097)			(1.274)		
Customer Concentration		0.095**			2.060***	
		(0.047)			(0.619)	
Customer Concentration × Redeploy		-0.239**			-4.259***	
		(0.104)			(1.362)	
Supplier Relative Markup			0.071*			1.077**
			(0.037)			(0.481)
Supplier Relative Markup × Redeploy			-0.127*			-1.942**
			(0.073)			(0.963)
Redeployability	-0.266***	-0.409***	-0.325***	-2.741**	-4.655***	-4.021***
	(0.101)	(0.104)	(0.107)	(1.325)	(1.366)	(1.403)
Observations	1,066	1,066	1,066	1,066	1,066	1,066
R-squared	0.127	0.131	0.129	0.117	0.121	0.116
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Survey Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Size FE	Yes	Yes	Yes	Yes	Yes	Yes
Ownership FE	Yes	Yes	Yes	Yes	Yes	Yes
Credit Rating FE	Yes	Yes	Yes	Yes	Yes	Yes

Table A.8: Bidder Cumulative Abnormal Return Robustness for Table 7

This table displays robustness for our M&A analysis where we vary the estimation method for the bidder's cumulative abnormal returns. In Panel A, we vary the model to estimate the bidder's cumulative abnormal returns. In Panel B, we vary the window over which we estimate the bidder's cumulative abnormal returns. In Panel A, we use the estimation window $t \in [-5, 5]$ to estimate abnormal returns, which matches the estimation window in Table 7. Market-Adjusted refers to the abnormal return in excess of the CRSP value-weighted portfolio (including dividends). In Panel B, we use the 4-factor model to estimate abnormal returns, which matches the model in Table 7.

Panel A: Alternative Cumulative Abnormal Return Models

	(1)	(2)	(3)	(4)	(5)	(6)
	3-Factor		CAPM		Market-Adjusted	
Implied Buffer	0.278**	0.252**	0.286**	0.264**	0.256**	0.244**
	(0.114)	(0.119)	(0.116)	(0.120)	(0.117)	(0.121)
Predicted Target WACC	-0.294	-0.323	-0.264	-0.285	-0.211	-0.223
	(0.304)	(0.314)	(0.287)	(0.300)	(0.279)	(0.295)
Observations	736	736	736	736	736	736
R-squared	0.187	0.205	0.189	0.205	0.172	0.186
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Bidder/Target Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Bidder/Target Controls	Yes	Yes	Yes	Yes	Yes	Yes
Deal Controls		Yes		Yes		Yes

Panel B: Alternative Estimation Window

	(1)	(2)	(3)	(4)	(5)	(6)
	$[-3, 3]$		$[-2, 2]$		$[-1, 1]$	
Implied Buffer	0.218**	0.197*	0.235**	0.229**	0.207**	0.214**
	(0.108)	(0.105)	(0.100)	(0.094)	(0.086)	(0.083)
Predicted Target WACC	-0.277	-0.291	-0.188	-0.184	-0.137	-0.130
	(0.281)	(0.291)	(0.240)	(0.244)	(0.240)	(0.248)
Observations	736	736	735	735	735	735
R-squared	0.201	0.214	0.226	0.238	0.223	0.240
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Bidder/Target Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Bidder/Target Controls	Yes	Yes	Yes	Yes	Yes	Yes
Deal Controls		Yes		Yes		Yes

B. Proofs

Proof of Lemma 1

If $s = \{\theta R - H_F, (1-\theta)R - H_O\}$, $d = \{0,0\}$, and $\alpha = \beta = 1$, then (1) becomes

$$\max_{\theta} \quad \left(\theta R - H_F\right)\left((1-\theta)R - H_O\right). \tag{B.1}$$

Expansion yields

$$\theta(1-\theta)R^2 - \theta R H_O - (1-\theta)R H_F + H_F H_O.$$

Taking first-order conditions,

$$(1 - 2\theta)R^2 + R H_F - R H_O = 0.$$

Solving for the Nash split yields

$$\theta = \frac{1}{2} + \frac{H_F - H_O}{2R}.$$

∎

Proof of Proposition 1

Integrating (4) over all incentive compatible gross returns ($\underline{R}'$ to $\bar{R}$) yields

$$V_B = \theta_B[1 - F(\underline{R}')].$$

Taking the derivative with respect to τ yields

$$\frac{\partial V_B}{\partial \tau} = \frac{\partial \theta_B}{\partial \tau}[1 - F(\underline{R}')] - \theta_B f(\underline{R}') = 0.$$

The optimal τ is therefore given by (5). Uniqueness can be shown by defining

$$H(\tau) = \frac{\theta_B}{\frac{\partial \theta_B}{\partial \tau}} - \frac{[1 - F(\underline{R}')]}{f(\underline{R}')}$$

By inspection,

$$\lim_{\tau \to 0} H(\tau) < 0$$

and

$$\lim_{\tau \to \infty} H(\tau) > 0.$$

Taking the derivative

$$\frac{\partial H(\tau)}{\partial \tau} = \frac{\left[\frac{\partial \theta_B}{\partial \tau}\right]^2 - \frac{\partial^2 \theta_B}{\partial \tau^2}\theta_B}{\left[\frac{\partial \theta_B}{\partial \tau}\right]^2} - \frac{-[f(\underline{R}')]^2 + [1 - F(\underline{R}')]\frac{\partial^2 F}{\partial \tau^2}}{[f(\underline{R}')]^2} \tag{B.2}$$

$$= 1 - \frac{\frac{\partial^2 \theta_B}{\partial \tau^2}\theta_B}{\left[\frac{\partial \theta_B}{\partial \tau}\right]^2} + 1 - \frac{[1 - F(\underline{R}')]\frac{\partial^2 F}{\partial \tau^2}}{[f(\underline{R}')]^2}. \tag{B.3}$$

Since $\frac{\partial^2 \theta_B}{\partial \tau^2} \leq 0$ and $\frac{\partial^2 F}{\partial \tau^2} \leq 0$, then $\frac{\partial H}{\partial \tau} > 0$.

The change in value, ΔV, from using a buffered hurdle rate is calculated as the difference between V_B and V_N. It is positive as long as (7) holds.

Microfoundation for Tullock Bargaining Structure

We first present a stochastic productivity model (Jia, 2008)[34] and then consider a Nash bargaining solution.

Consider two firms $j \in \{F, O\}$ and two delegates that are each assigned hurdle rate H_j. Suppose that each perceives that there exists an alternative project k_j that characterizes their purported walkaway value. Define

$$k_j(H_j, \theta_j) = H_j \theta_j,$$

where θ_j is stochastic on $[0, \infty)$ according to the distribution function

$$G(z) = \exp\left\{\frac{-\alpha}{z}\right\}.$$

The corresponding probability density function is

$$g(z) = \frac{\alpha}{z^2} \exp\left\{\frac{-\alpha}{z}\right\}.$$

By construction, there is some probability that the outside project would ultimately be rejected (i.e., $k_j \leq H_j$).

We derive the Tullock function (Tullock, 1980) as a probability of winning a contest, with the interpretation from (Hirshleifer, 1989) that each party gains a share of the surplus from the project.

$$F_i(H_i, H_j) = P(H_i \theta_i > H_j \theta_j) = P\left(\theta_j < \frac{H_i}{H_j} \theta_i\right) \tag{B.4}$$

$$= \int_0^\infty P\left(\theta_j < \frac{H_i}{H_j} \theta_i \Big| \theta_i = z\right) g(z) dz \tag{B.5}$$

$$= \int_0^\infty P\left(\theta_j < \frac{H_i}{H_j} \theta_i \Big| \theta_i = z\right) \frac{\alpha}{z^2} \exp\left\{\frac{-\alpha}{z}\right\} dz \tag{B.6}$$

$$= \int_0^\infty \exp\left\{\frac{-H_j \alpha}{H_i z}\right\} \frac{\alpha}{z^2} \exp\left\{\frac{-\alpha}{z}\right\} dz \tag{B.7}$$

$$= \int_0^\infty \frac{\alpha}{z^2} \exp\left\{\frac{-\alpha}{z}\left(\frac{H_j}{H_i} + 1\right)\right\} dz \tag{B.8}$$

$$= \int_0^\infty \exp\left\{\frac{-\alpha}{z}\left(\frac{H_j + H_i}{H_i}\right)\right\} d\left(\frac{-\alpha}{z}\right) \tag{B.9}$$

$$= \frac{H_i}{H_i + H_j}. \tag{B.10}$$

We can also motivate the use of this function using Nash bargaining. For any potential trade, Nash bargaining maximizes

$$\max_s \ (s_F - d_F)^\alpha (s_O - d_O)^\beta, \tag{B.11}$$

where $s \equiv \{s_F, s_O\}$ is the surplus allocated to each party and $d \equiv \{d_F, d_O\}$ is each party's disagreement payoff.

---

[34] Jia (2008) considers the more general case of stochastic productivity models. We follow Theorem 1 in that paper.

Lemma B.1. *For any feasible R, suppose that $s = \{\theta[R - (H_F + H_O)], (1 - \theta)[R - (H_F + H_O)]\}$, $d = \{0, 0\}$, $\alpha = H_F$, and $\beta = H_O$. Then,*

$$\theta = \frac{H_F}{H_F + H_O}. \tag{B.12}$$

Proof If $s = \{\theta[R - (H_F + H_O)], (1 - \theta)[R - (H_F + H_O)]\}$, $d = \{0, 0\}$, $\alpha = H_F$, and $\beta = H_O$, then (1) becomes

$$\max_{\theta} \quad \left(\theta[R - (H_F + H_O)]\right)^{H_F} \left((1 - \theta)[R - (H_F + H_O)]\right)^{H_O}. \tag{B.13}$$

Taking first-order conditions,

$$H_F[R - (H_F + H_O)]\left(\theta[R - (H_F + H_O)]\right)^{H_F - 1} \left((1 - \theta)[R - (H_F + H_O)]\right)^{H_O}$$

$$- H_O[R - (H_F + H_O)]\left(\theta[R - (H_F + H_O)]\right)^{H_F} \left((1 - \theta)[R - (H_F + H_O)]\right)^{H_O - 1} = 0 \quad \text{(B.14)}$$

Solving for the Nash split yields

$$\theta = \frac{H_F}{H_F + H_O}.$$

∎

Proof of Proposition 2

Integrating (4) over all incentive compatible gross returns ($\underline{R}'$ to $\bar{R}$) yields

$$V_B = \frac{\tau}{\tau + W_O} R \Big|_{\underline{R}'}^{\bar{R}}.$$

Substituting in $\underline{R}' = \tau + W_O$ yields the following:

$$V_B = \frac{\tau}{\tau + W_O} [\bar{R} - (\tau + W_O)].$$

Simplifying gives the expression for the value of the firm in terms of τ:

$$V_B = \frac{\tau \bar{R}}{\tau + W_O} - \tau. \tag{B.15}$$

Taking the derivative of (B.15) with respect to τ yields the optimal hurdle rate

$$\frac{\partial V_B}{\partial \tau} = \frac{\bar{R}(\tau + W_O) - \tau \bar{R}}{(\tau + W_O)^2} - 1 = 0$$
$$\Rightarrow \quad \bar{R} W_O = (\tau + W_O)^2.$$

The optimal τ is therefore given by

$$\tau^* = \sqrt{\bar{R} W_O} - W_O, \tag{B.16}$$

which is (10) in the text. It follows that $\tau^* > W_F$ if

$$\sqrt{\bar{R} W_O} > W_F + W_O \Rightarrow \frac{\bar{R} W_O}{W_F + W_O} > W_F + W_O,$$

which is equivalent to the condition in (13). Otherwise, $\tau^* = W_F$.

Plugging (10) into (B.15) for τ gives us the value of the project at the optimal IRR hurdle rate

$$V_B^* = \frac{\bar{R}(\sqrt{\bar{R} W_O} - W_O)}{\sqrt{\bar{R} W_O}} - \sqrt{\bar{R} W_O} + W_O$$

which simplifies to

$$V_B^* = \bar{R} + W_O - 2\sqrt{\bar{R} W_O}. $$

This is (11) in the text.

The change in value, ΔV, from using a buffered hurdle rate is calculated as the difference between V_N from (3) and V_B from (11)

$$\Delta V = \bar{R} + W_O - 2\sqrt{\bar{R} W_O} - \frac{W_F \bar{R}}{W_F + W_O} + W_F$$
$$\Rightarrow = (1 - \frac{W_F}{W_F + W_O}) \bar{R} + W_F + W_O - 2\sqrt{\bar{R} W_O}. \tag{B.17}$$

It is straightforward to show that $\Delta V > 0$. We can re-write (B.17) as

$$\Delta V = \frac{W_O \bar{R}}{\underline{R}} + \underline{R} - 2R' > 0,$$

or

$$\Delta V = (R')^2 + \underline{R}^2 - 2R'\underline{R} > 0. \tag{B.18}$$

This expression is of the form $a^2 + b^2 - 2ab$, which is strictly greater than zero for all values of a and b. Therefore, B.18 is always positive.

Finally, the comparative statics are proven by straightforward differentiation.

1.

$$\frac{\partial \Delta V}{\partial \bar{R}} = 1 - \frac{\sqrt{\bar{R} W_O}}{\bar{R}} - \frac{W_F}{W_F + W_O} > 0.$$

To see this, note that $R' = \sqrt{\bar{R} W_O}$. Substituting leads to

$$1 - \frac{R'}{\bar{R}} - \frac{W_F}{\underline{R}} > 0$$

$$\Rightarrow \bar{R} - R' - \frac{\bar{R} W_F}{\underline{R}} > 0$$

$$\Rightarrow \bar{R}\underline{R} - R'\underline{R} - \bar{R} W_F > 0$$

$$\Rightarrow \bar{R}\underline{R} - \bar{R} W_F > R'\underline{R}$$

$$\Rightarrow \bar{R}(\underline{R} - W_F) > R'\underline{R}$$

$$\Rightarrow \bar{R}(W_O) > R'\underline{R}$$

$$\Rightarrow (R')^2 > R'\underline{R}.$$

The final expression holds because $R' > \underline{R}$.

2.

$$\frac{\partial \Delta V}{\partial W_F} = \left(1 - \frac{\bar{R} W_O}{(W_F + W_O)^2}\right) < 0$$

To see this, note that $\bar{R} W_O = (R')^2$ and $(W_F + W_O)^2 = \underline{R}^2$. Substitution leads to

$$\left(1 - \frac{(R')^2}{\underline{R}^2}\right) < 0$$

Since $R' > \underline{R}$, this expression holds.

∎

Proof of Proposition 3

Integrating (4) over all incentive compatible gross returns ($\underline{R}''$ to $\bar{R}$) yields

$$V_F = \frac{\tau_F}{\tau_F + \tau_O} R \Big|_{\underline{R}''}^{\bar{R}} .$$

Substituting in $\underline{R}'' = \tau_F + \tau_O$ yields the following:

$$V_F = \frac{\tau_F}{\tau_F + \tau_O} [\bar{R} - (\tau_F + \tau_O)] .$$

Simplifying gives the expression for the value of the firm in terms of τ_F:

$$V_F = \frac{\tau_F \bar{R}}{\tau_F + \tau_O} - \tau_F . \tag{B.19}$$

Similar calculation for the outside trading partner yields

$$V_O = \frac{\tau_O \bar{R}}{\tau_F + \tau_O} - \tau_O . \tag{B.20}$$

Taking first order conditions with respect to τ_F and τ_O

$$\frac{\partial V_F}{\partial \tau_F} = \frac{\bar{R}(\tau_F + \tau_O) - \tau_F \bar{R}}{(\tau_F + \tau_O)^2} - 1 = 0$$
$$\Rightarrow \quad \bar{R}\tau_O = (\tau_F + \tau_O)^2 , \tag{B.21}$$
$$\frac{\partial V_O}{\partial \tau_O} = \frac{\bar{R}(\tau_F + \tau_O) - \tau_O \bar{R}}{(\tau_F + \tau_O)^2} - 1 = 0$$
$$\Rightarrow \quad \bar{R}\tau_F = (\tau_F + \tau_O)^2 . \tag{B.22}$$

It follows that

$$\bar{R}\tau_F = \bar{R}\tau_O . \tag{B.23}$$

Substituting (B.23) into (B.21) for τ_O gives us

$$\bar{R}\tau_F = 4\tau_F^2$$
$$\Rightarrow \tau_F^* = \frac{\bar{R}}{4} .$$

It follows that $\tau_O^* = \frac{\bar{R}}{4}$ as well.

Taking second order conditions for each party yields

$$\frac{\partial^2 V_F}{\partial \tau_F^2} = \frac{-2\tau_O \bar{R}(\tau_F + \tau_O)}{(\tau_F + \tau_O)^4} < 0$$
$$\frac{\partial^2 V_O}{\partial \tau_O^2} = \frac{-2\tau_F \bar{R}(\tau_F + \tau_O)}{(\tau_F + \tau_O)^4} < 0,$$

so that τ_F^* and τ_O^* are global maxima.

It is straightforward to show that $\tau_F^* = \tau_O^* = \frac{\bar{R}}{4}$ is a unique symmetric equilibrium. The proof is

by contradiction. Suppose that $\tau_F = \tau_O = \frac{\bar{R}}{n}$ for some $n \neq 4$. Then, both best-response functions in (B.21) and (B.22) are violated.

At the optimal buffered discount rates, the value of the project

$$V_F^* = \frac{\tau_F^* \bar{R}}{\tau_F^* + \tau_O^*} - \tau_F^* .$$

Substitution yields

$$V_F^* = \frac{\bar{V}}{4},$$

which is (15) in the text. The same holds for V_O^*.

Finally, the projects that are undertaken when no IRR buffers are used yield an aggregate value of $\bar{R} - (W_F + W_O)$. The aggregate value with competitive IRR buffers is $\bar{R} - \frac{\bar{R}}{2} = \frac{\bar{R}}{2}$. The deadweight loss is the loss of positive NPV projects, which is computed as the difference $\frac{\bar{R}}{2} - (W_F + W_O)$. ∎

Proof of Proposition 4

The value for party i given the actions of the others is

$$V_i = \int_{\underline{R}}^{\bar{R}} \theta_i dR,$$

where $\underline{R} = \sum_{j \in N} H_j \equiv \Sigma$. This implies that

$$V_i = \frac{\bar{R} H_i}{\Sigma} - H_i. \tag{B.24}$$

Taking first-order conditions yields

$$\frac{\partial V_i}{\partial H_i} = \frac{\bar{R}\Sigma - \bar{R}H_i}{\Sigma^2} - 1. \tag{B.25}$$

Second-order conditions confirm that the objective function is strictly concave. Setting (B.25) equal to zero and re-arranging yields

$$\bar{R} \sum_{j \in J} H_j = \Sigma^2,$$

where J are all others except party i. For all pairs of parties i and j, $S \equiv \sum_{k \neq i,j}$ is the same. Therefore,

$$\bar{R}(S + H_j) = \Sigma^2 \tag{B.26}$$
$$\bar{R}(S + H_i) = \Sigma^2, \tag{B.27}$$

which implies that $H_i = H_j = H^*$ for all pairs i, j. Thus,

$$\bar{R}(n-1)H^* = n^2 (H^*)^2,$$

or

$$H^* = \frac{(n-1)\bar{R}}{n^2}. \tag{B.28}$$

Plugging (B.28) into (B.24)

$$V_i = \frac{\bar{R}}{n^2}.$$

∎

Proof of Proposition 5

With a buffer $H_F = W_F + b$, the Nash Bargaining split is

$$\theta_B = \frac{H_F}{H_F + W_O} \tag{B.29}$$

and the value of the firm can be calculated as

$$V_B = \frac{W_F \bar{R} + b\bar{R}}{W_F + b + W_O} - (W_F + b). \tag{B.30}$$

Without a buffer, the Nash Bargaining split is

$$\theta_N = \frac{W_F}{W_F + W_O} \tag{B.31}$$

and the value of the firm can be calculated as

$$V_N = \frac{W_F \bar{R}}{W_F + W_O} - W_F. \tag{B.32}$$

Therefore, $V_B > V_N$ if

$$V_B > V_N \Rightarrow$$
$$\frac{W_F \bar{R} + b\bar{R}}{W_F + b + W_O} - (W_F + b) > \frac{W_F \bar{R}}{W_F + W_O} - W_F \Rightarrow$$
$$\frac{W_F \bar{R} + b\bar{R}}{W_F + b + W_O} > \frac{W_F \bar{R}}{W_F + W_O} + b \Rightarrow$$
$$\frac{\bar{R} W_O - (W_F + W_O)^2}{(W_F + W_O)} > b \tag{B.33}$$

∎

Proof of Proposition 6

The hurdle rate, H_F, that implements the CFO's limitation on feasible projects is set such that the following holds with equality:

$$k[\bar{R} - W_F - W_O] = \bar{R} - H_F - W_O$$

Solving for H_F yields

$$H_F = (1-k)\bar{R} + kW_F - (1-k)W_O \Rightarrow$$
$$H_F = kW_F + (1-k)(\bar{R} - W_O). \tag{B.34}$$

The value of the project under the biased hurdle rate is:

$$V_B = \int_{\underline{R}_H}^{\bar{R}} \theta_H dR = \theta_H[\bar{R} - (H_F + W_O)] = \frac{H_F}{H_F + W_O} - H_F$$

The value under the biased hurdle rate exceeds the value under the true discount rate if:

$$V_B > V_N \Rightarrow$$
$$\theta_H[\bar{R} - (H_F + W_O)] > \theta_N[\bar{R} - (W_F + W_O)] \Rightarrow$$
$$\theta_H[\bar{R} - \underline{R}_H] > \theta_N[\bar{R} - \underline{R}] \Rightarrow$$
$$(\theta_H - \theta_N)\bar{R} > (H_F - W_F) \Rightarrow$$
$$(\theta_H - \theta_N) > (1-k)(1 - \frac{W_F + W_O}{\bar{R}}). \tag{B.35}$$

The last inequality follows from the fact that

$$H_F - W_F = (1-k)[\bar{R} - (W_F + W_O)].$$

The optimal hurdle rate that maximized the firm's share of the surplus, τ^*, is greater than the biased hurdle rate, H_F, if:

$$\tau^* > H_F \Rightarrow$$
$$\sqrt{\bar{R}W_O} - W_O > (1-k)\bar{R} + k(W_F + W_O) - W_O \Rightarrow$$
$$\underline{R}' > (1-k)\bar{R} + k\underline{R} \Rightarrow$$
$$k[\bar{R} - \underline{R}] > \bar{R} - \underline{R}' \Rightarrow$$
$$k > \frac{\bar{R} - \underline{R}'}{\bar{R} - \underline{R}} \tag{B.36}$$

■

C. Data Appendix

C.1. CFO Survey Data

The CFO survey has asked respondents about their hurdle rate and cost of capital jointly six different times: 2011q1, 2012q2, 2017q2, 2017q3, 2019q1 and 2022q2. The last survey was conducted jointly with the Federal Reserve Banks of Richmond and Atlanta. On each survey, the wording of the hurdle rate question specifically asked CFOs for their investment hurdle rates (the expected rate of return an investment project must exceed in order to be adopted). We similarly asked CFOs to supply their weighted average cost of capital (WACC), not their cost of equity or debt. Figure C.1 displays how we asked CFOs for their hurdle rate and WACC in the 2012q2 survey. The questions for the other surveys can be found at `https://cfosurvey.fuqua.duke.edu/` for surveys conducted prior to 2022q2 and `https://www.richmondfed.org/cfosurvey/` for the 2022q2 survey.

Figure C.1: Hurdle Rate and WACC Questions in 2012q2 CFO Survey

10a. What do you estimate is your firm's overall weighted average cost of capital (WACC)? (e.g., 11.2%)	10b. What is your firm's 'hurdle rate' (the rate of return that an investment must beat in order to be adopted)?
___ %	___ %

A potential concern with survey data is that respondents do not understand the survey questions, or do not respond accurately (Graham, 2022). While we cannot fully address these concerns, we can analyze the accuracy of the CFO survey forecasts for firms that also have archival data in Compustat (about 15% of the sample). Following analysis in Gormsen and Huber (2020) that relates firms' survey costs of capital to estimated costs of capital, Figure C.2 Panel A displays a binned scatter plot of the WACC as reported on the survey and the WACC we estimate using data from CRSP and Compustat.[35] The slope coefficient from this regression is 0.61 and highly significant, and the R^2 is 0.44. While exploring the relation between perceived and estimated costs of capital is not the point of our paper, we are reassured by the tightness of the relation. Secondly, Figure C.2 Panel B compares the survey-reported revenue categories of these same firms to the equivalent category calculated using Compustat; the proportions line up nearly one-to-one. Finally, recall the analysis of Figure 4, which indicates that ex post realized returns align with survey-provided hurdle rates, again providing assurance that our survey data are reliable.

A second concern with survey data is representativeness. Table IAI in the Internet Appendix of Graham (2022)[36] shows that, even though the CFO survey contains a large proportion of private firms, the distributions of employment counts conditional on firm size are quite similar in the CFO survey and Compustat. Thus, we do not detect anomalies that would suggest problems using our data to draw inference relative to well-known samples such as Compustat.

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[35]We estimate WACC in the simplest way possible. The cost of equity is derived using the CAPM. The cost of debt is total interest expense to total debt (i.e., the average cost of debt).

[36]See here: `https://onlinelibrary.wiley.com/doi/10.1111/jofi.13161`.

Figure C.2: Closeness of Data Reported on CFO Survey to Archival Data

This figure analyzes the closeness of survey-reported data and archival data using CFO survey firms that appear in Compustat. We match data from Compustat to the survey firms by survey year and calendar year in Comustat. Panel A displays a binned scatter plot from a regression of reported WACC on estimated WACC. The cost of equity is estimated using the CAPM, cost of debt is total interest expense to total debt. Panel B displays the percentage of these Compustat firms that fall into the stated revenue category on the survey (blue bars) vs. the same categories calculated using archival revenue data (orange bars).

(A) Reported and Estimated WACC

(B) CFO Survey and Compustat Revenue Categories
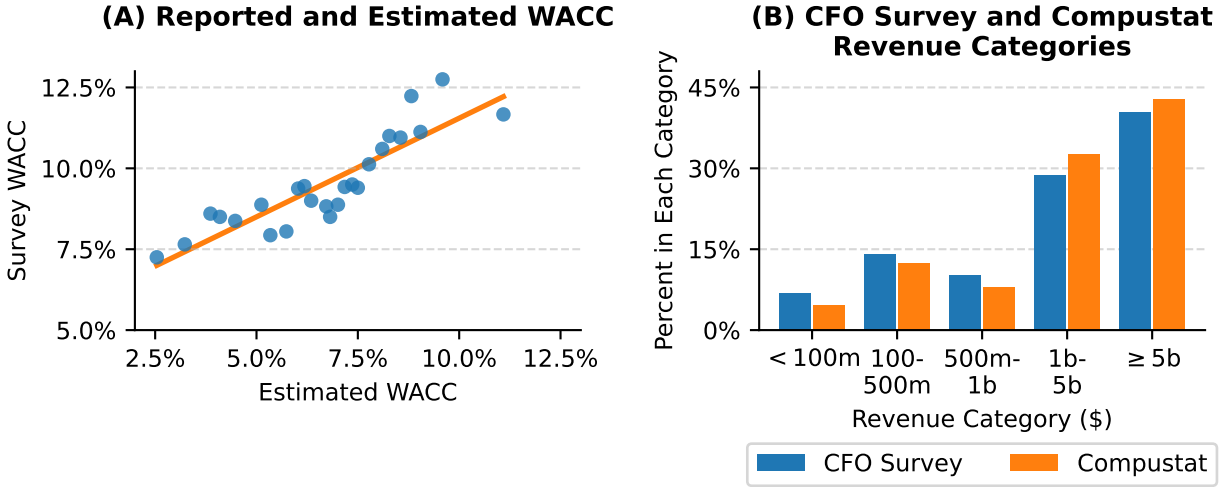
C.2. M&A Sample Construction and Variables

In Section 5.2.5, we use data on M&A deals to test the prediction that the use of a hurdle rate buffer by bidders in M&A deals leads to better bargaining outcomes for bidders. Our test sample comes from Refinitiv's SDC Platinum M&A database. A subset of M&A deals have data available on the range of discount rates used in fairness opinions (FOs). Findings from Dessaint et al. (2021) suggest that the discount rates used in FOs contain real information about the true discount rate used when valuing a target.

To construct our sample, we focus on the sample of public-to-public M&A deals which have FO discount rate data. We also require data on the target's WACC, the bidders CAR around the deal announcement, and a host of bidder, target and deal controls. Table C.1 Panel A displays the sample selection process, with the last row displaying our final test sample. We define the average discount rate as the average between the maximum and minimum discount rate used in the FO (Dessaint et al., 2021). The implied buffer is the difference between the average discount rate and the target's predicted WACC. Table C.1 Panel B displays the summary statistics for the main variables in our test. Figure C.3 displays a binned scatterplot of the implied buffer regressed on the target's predicted WACC. The slope coefficient from this regression is -0.365, very similar to the estimates we find using the CFO survey data in, e.g., Table 2 Panel B.

Table C.1: M&A Sample Construction and Summary Statistics

This table displays the sample selection process and summary statistics for the main variables for the analysis in Sections 5.2.5 and Table 7.

Panel A: Sample Construction

N	Reason for Reduction
2178	All public-public deals with FO data
2166	Missing high/low FO r or average $r > 40\%$
1352	Missing bidder/target GVKEY or PERMNO
1276	Missing deal value or deal value $< \$50m$ (2020 dollars)
800	Missing bidder/target or deal control(s)
769	Missing target WACC
746	Missing bidder CAR

Panel B: Summary Statistics

	N	Mean	Std Dev	25%	50%	75%
Average Discount Rate	746	12.612	4.105	10	12	14.500
Predicted Target WACC	746	7.874	2.136	6.363	7.700	8.989
Implied Buffer	746	4.737	3.737	2.331	3.858	6.096

Figure C.3: Binned scatterplot of implied buffer on the target predicted WACC

This figure displays a binned scatterplot of the implied buffer on the predicted target WACC using the sample in Table C.1.