Corporate Discount Rates*

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Abstract

We construct a dataset of firms' discount rates (i.e., required returns to capital) and perceived cost of capital using corporate conference calls. The relation between discount rates and the cost of capital is far below the one-to-one mapping assumed in standard theory, as it takes many years for changes in the cost of capital to be incorporated into discount rates. This pattern leads to large and time-varying discount rate wedges that affect firm investment. Moreover, increasing discount rate wedges can account for the recent puzzle of "missing investment." Cross-firm variation in market power and riskiness explains the evolution of wedges.

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How do asset prices and interest rates affect investment? In recent decades, asset prices have increased dramatically and interest rates have declined. These changes imply that financial investors have become willing to provide capital to firms in exchange for lower rates of return, so that firms' cost of capital in financial markets has decreased.

The stylized view in economics is that such changes in firms' cost of capital directly impact firm investment. According to the stylized view, firms should take on any investment project that offers returns above the cost of capital. As a result, firms should adjust their required returns on new investments (their so-called "discount rates") one-to-one with the cost of capital in financial markets. Firms' discount rates should, for example, have dropped substantially since the early 2000s, in line with the cost of capital, leading to a corporate investment boom (Gutiérrez and Philippon 2017). More generally, the stylized view implies that all shocks to the cost of capital, such as shocks to stock prices, monetary policy, and credit supply, directly influence firms' discount rates and thus investment.

It is possible, however, that fluctuations in the cost of capital in financial markets are largely irrelevant to firm investment. For the stylized view to work, firms must actively choose to incorporate fluctuations in this "financial cost of capital" into their discount rates. To do so, firms need to take two steps. First, they need to estimate their financial cost of capital based on observed asset prices and interest rates. As this is a non-trivial exercise, the resulting estimate, which we term the "perceived cost of capital," may deviate substantially from the financial cost of capital. Second, firms need to choose a required return on capital, their discount rate, and it could be that firms do not update their discount rate with changes in their cost of capital. It is thus possible that discount rates hardly comove with the financial cost of capital, so that financial prices have only modest impact on investment.

In this paper, we study the dynamics of corporate discount rates and their relation to investment and the cost of capital. Since there exist little data tracing individual firms' perceived cost of capital and discount rates over time, we construct a new firm-level dataset. The data reveal large deviations from the stylized view. While firms' perceived cost of capital moves with standard measures of the financial cost of capital, the perceived cost of capital is only associated with discount rates in the long run. In the short and medium run, changes in the cost of capital have little impact on discount rates. This weak relation generates large and time-varying "discount rate wedges" between discount rates and the perceived cost of capital. In addition, discount rates incorporate other factors than the cost of capital, further exacerbating the wedges. Discount rate wedges are strongly and negatively related to firm investment. The observed wedges reduce the sensitivity of investment with respect to the financial cost of capital by an order of magnitude. At the aggregate level, the increase in the average wedge is large enough to account for the fact that US investment has been low since 2002, relative to Tobin's Q. Managerial beliefs about investor preferences combined with market power as well as fluctuations in risk have contributed to higher discount rate wedges since 2002.

We begin the paper by measuring firms' discount rates and perceived cost of capital using corporate conference calls (Hassan et al. 2019). The majority of listed firms hold quarterly conference calls with analysts and investors, during which managers sometimes share their discount rates and perceived cost of capital when discussing their investment strategy.[1] Advantages of conference calls include that they are held regularly, that analysts can compare reported discount rates to realized outcomes, and that calls appear as evidence in securities lawsuits, incentivizing managers to report accurate values for discount rates and the perceived cost of capital. We identify 74,000 paragraphs on conference calls between 2002 and 2021 where managers mention a relevant term. We manually record firms' discount rates and perceived cost of capital by reading through each paragraph with a team of research assistants.

The product of the data collection is a database of firms' discount rates and perceived cost of capital, matched to investment rates. We observe discount rates and the perceived cost of capital for 19 sequential years in multiple countries. We also observe many firms in our sample multiple times, giving rise to a firm-level panel. This panel variation is new to the literature and key to understanding how discount rates and the perceived cost of capital relate to one another and to investment. According to surveys, roughly 90 percent of large firms use discount rates to make investment decisions (e.g., Poterba and Summers 1995, Graham 2022), but only around 3 percent of conference calls enter our dataset, likely because an explicit mention of their discount rate is just one way through which firms can communicate their investment strategy. Nonetheless, the final dataset contains roughly 2,500 large firms from 20 countries.

Firms with at least one reported discount rate or perceived cost of capital account for roughly 50 percent of the total assets of listed firms in Compustat, whereas firms reporting discount rates in multiple periods account for roughly 15 percent. Apart from being larger, firms in the dataset are similar to other listed firms in observable characteristics, including

[1] The perceived cost of capital is the firm's estimate of its weighted average after-tax cost of debt and cost of equity. The discount rate is the firm's after-tax minimum required return on capital, also known as "hurdle rate." Most firms use just one discount rate in their net present value (NPV) calculations (see Section 1).

those capturing financial distress and profitability. We find no evidence that firms report discount rates and the perceived cost of capital disproportionately in unusual states, such as times of distress.

Using our new data, we assess the stylized view that firms seamlessly transmit shocks to their cost of capital into their discount rates. We first verify that firms' perceived cost of capital incorporates changes in their financial cost of capital. To calculate their cost of capital, firms need to estimate expected returns to bonds and stocks, which is notably difficult (Fama and French 1997) and which investors often fail to do correctly (Greenwood and Shleifer 2014, Nagel and Xu 2023). We nonetheless find that firms' perceived cost of capital reflect changes in stylized measures of the financial cost of capital (e.g., variation in interest rates and the earnings yield). At the same time, there exists substantial heterogeneity in the perceived cost of capital that cannot be accounted for by our stylized measures. We refer to Gormsen and Huber (2025) for a general analysis of the perceived cost of capital and its implications for long-run capital allocation.

We next study the link between discount rates and the perceived cost of capital. One challenge for the stylized view is that firms' reported discount rates are often well above their perceived cost of capital, which has puzzled previous research (e.g., Poterba and Summers 1995). While our paper focuses on changes over time rather than level differences, the conference calls also allow us to understand the high reported average discount rates. We find that many firms use discount rates that are adjusted upward to compensate for the fact that some overhead costs, such as the costs to the headquarters of administering new projects, are omitted from the cash flow analyses. When we identify firms that include all overhead in their cash flow analyses, we find that average reported discount rates are substantially closer to, but still greater than, the perceived cost of capital and consistent with accounting returns. Throughout the paper, we ensure that our results are not driven by the amount of overhead that is incorporated by different firms.

More importantly, we document that changes in the perceived cost of capital only modestly affect discount rates in the short and medium run, in contrast to the stylized view. Over periods shorter than 2 years, changes in a firm's perceived cost of capital are not associated with changes in its discount rate, on average. Over periods from 3 to 4 years, a 1 percentage point increase in the perceived cost of capital is associated with an increase in discount rates of 0.25 percentage points. Only in the the long run, over periods greater than 10 years, is the association close to the one-to-one relation assumed by the stylized view. The weak relation in the short and medium run is consistent with the fact that discount rates change rarely.

For instance, only one-third of discount rates are different after 3-4 years.

The weak short- and medium-run relation between discount rates and the perceived cost of capital gives rise to time-varying wedges between discount rates and the perceived cost of capital. Using within-firm variation, we find that the average wedge in the US has increased by around 2.5 percentage points between 2002 and 2021. Since 2010, the perceived cost of capital has declined substantially, but discount rates have not fully incorporated this decline, consistent with our results on the slow incorporation of changes in the cost of capital. The slow incorporation can account for much, but not all, of the increase in the average wedge, suggesting other factors may have contributed as well. The increase in the wedge is large relative to typical movements in financial prices, for example, those due to secular interest rate trends and monetary policy shocks.[2] An increase of this magnitude is thus likely to be important for our understanding of investment dynamics.

Indeed, we show that discount rate wedges are associated with investment at the firm level. A 1 percentage point increase in the wedge is associated with a decrease in the investment rate over the subsequent year of 0.8 points. This estimate is robust to controlling for time fixed effects, Tobin's Q, measures of the cost of capital, analyst cash flow expectations, and other firm characteristics. The estimated magnitude is quantitatively consistent with a simple Q-model where firms use the measured discount rates in investment decisions. The perceived cost of capital is associated with discount rates and therefore investment in the long run (see Gormsen and Huber 2025), but has only weak explanatory power for short-run investment fluctuations because of the slow incorporation of changes in cost of capital into discount rates. In addition, we find that firms with higher discount rates report higher realized returns on their projects. These findings corroborate that the measured discount rates and wedges capture required returns and thereby a distinct component of firms' investment demand.

The existence of time-varying discount rate wedges challenges the stylized view that shocks to the cost of capital directly impact firm investment. We next analyze applications where the wedges shape the investment-finance nexus.

A literature argues that US investment has been low in recent decades, relative to the financial cost of capital. In particular, declines in the financial cost of capital have raised firms' market value and thereby increased Tobin's Q since the early 2000s. According to

[2]The secular decline in the natural real rate of interest amounted to roughly 1 percentage point between 2002 and 2020 (Bauer and Rudebusch 2020), whereas the Fed's quantitative easing reduced corporate bond yields by 0 to 0.5 percentage points (Krishnamurthy and Vissing-Jørgensen 2011, Swanson 2011).

standard Q-theory, investment should have risen with Tobin's Q (Gutiérrez and Philippon 2017). However, if anything, investment rates have been low relative to historical standards, leading researchers to argue that there is "missing investment," which exceeded 20 percent of the capital stock by 2019, even when accounting for intangibles and other measurement issues (Philippon 2019).

We find that changes in discount rate wedges can account for a large part of the missing investment. Intuitively, rising wedges imply that firms have been using increasingly higher discount rates than those assumed by standard Q-theory, which ultimately means that firms have been holding back investment relative to what Tobin's Q suggests. To quantify the role of changing wedges, we develop an "adjusted Q," which allows for discount rate wedges in firms' optimization problems. Using the adjusted Q, we show that the increase in the average wedge is large enough to account for most of the missing investment in the US since 2002. Consistent with this result, we document that firms that have increased their wedges by more have disproportionately contributed to the rise in aggregate Tobin's Q.

The above results help to disentangle competing interpretations of the missing investment puzzle. Low investment relative to high Tobin's Q could imply that the marginal profitability of capital is low, relative to the average profitability captured by Q (Gordon 2018). Alternatively, it could imply that firms' required returns (i.e., their discount rates) have diverged from the financial cost of capital at an increasing rate. It has so far been difficult to distinguish the two competing explanations because existing data do not measure how firms' marginal investment opportunities or required returns change over time. Our data reveal that the evolution of firms' required returns is indeed large enough to account for much of the missing investment. In this sense, one may not need a large decrease in marginal profitability to explain the data.[3] Relatedly, the results contribute to the debate on the falling labor share in national income, as growing discount rate wedges imply that the falling labor share is in part driven by rising rents accruing to firms.[4]

A further implication of discount rate wedges is that the sensitivity of investment to the financial cost of capital falls by a factor of ten relative to a stylized model. Fukui et al. (2025) explore the macroeconomic implications of the muted investment sensitivity, which substantially alters the effects of fiscal and monetary policy relative to conventional

[3] Our results rely on a BEA measure of investment that already accounts for intangibles and are consistent with the view that intangibles have also influenced investment.

[4] Our finding of relatively stable required returns (i.e., stable discount rates) is consistent with, but distinct from, the finding that aggregate realized returns have been relatively stable (e.g., Reis 2022). In principle, realized returns can move differently from required returns, but investment is determined by required returns.

models. In general, the investment sensitivity implied by a model with wedges is close to the sensitivity implied by micro data (e.g., Zwick and Mahon 2017), whereas standard models without wedges often imply an investment sensitivity that is far too high relative to empirical estimates (Koby and Wolf 2020).

In the final part of the paper, we study which firms have raised discount rate wedges over time. On the conference calls, many managers argue that stable discount rates can be beneficial for investors because they prevent managerial empire building and ensure prudence in investment decisions (Jensen 1986). Managers therefore have a tendency to maintain stable discount rates when the cost of capital is falling, which raises discount rate wedges. However, high wedges may still harm firm profitability, especially for firms with little market power, as competitive forces will not allow them to earn returns above their cost of capital for long. In the data, we find that firms with little market power have not substantially increased their discount rate wedges since 2002, whereas firms with greater market power have maintained stable discount rates and rising wedges. These results are consistent with the view that there are benefits to wedges for all types of firms, but that the costs are larger for firms with little market power. We show that alternative mechanisms, such as shocks to expected cash flows and technological trends, are unlikely to explain the association between discount rate changes and market power.[5]

We also consider how time variation in risk influences discount rate wedges. We find evidence consistent with a real options channel, meaning that shocks to risk raise the discount rates of firms with irreversible assets by more. Increases in aggregate risk may have contributed to a discount rate spike around the 2008-09 crisis as well as greater discount rate wedges after 2010. In comparison, firms facing greater financial constraints (according to Hadlock and Pierce 2010) have higher discount rate wedges on average, but have not significantly raised their wedges by more than other firms since 2002.

Related Literature

Academics and policymakers have long debated how firms' cost of capital and discount rates shape investment (e.g., Jorgenson 1963, Tobin 1969, Barro 1990, Cochrane 1991, Gilchrist and Zakrajšek 2012, Hall 2017, Cieslak and Vissing-Jørgensen 2021). We provide the first

[5]Our findings rely solely on cross-sectional, pre-existing variation in market power. The economic mechanism that we discuss is therefore distinct from existing work that has focused on changes in market power. The influence of market power on discount rates could be even greater if market power has indeed increased, as discussed in, for instance, Philippon (2019), De Loecker et al. (2020), Liu et al. (2022), and Eggertsson et al. (2021).

firm-level dataset that links discount rates, the perceived cost of capital, financial prices, and investment. The data allow us to present novel evidence on the full chain of transmission from the financial cost of capital to the perceived cost of capital, discount rates, and ultimately investment.

A large literature estimates the cost of capital in financial markets using asset pricing models (e.g., Fama and French 1997) or an "implied cost of capital" informed by analyst forecasts (e.g., Claus and Thomas 2001, Gebhardt et al. 2001, Easton 2004, Pástor et al. 2008, Hail and Leuz 2009). The measurement in this paper is about two different objects: the cost of capital as perceived by firms and the discount rates (i.e., required returns or "hurdle rates") used in firms' investment decisions.

Existing data on firms' discount rates come from surveys (e.g., Summers 1986, Poterba and Summers 1995, Graham and Harvey 2001, Jagannathan et al. 2016). The average level of reported discount rates in these surveys is roughly similar to our dataset (although reported rates do not always capture total project returns, as explained in Section 3.4). The cross-sectional relation between discount rate levels and firm risk is also consistent between surveys and our data (e.g., Jagannathan et al. 2016, Barry et al. 2024). In comparison to the surveys, we measure repeated observations for the same firm over time, allowing us to trace within-firm changes over time. Moreover, we link firms' discount rates to real investment, allowing us to study real implications.

Previous work has raised the possibility that discount rates move less than the cost of capital. Graham (2022) points out that firm decision-making processes often adjust slowly. Poterba and Summers (1995) conjecture that discount rates may not fully respond to financial shocks. Sharpe and Suarez (2021) and Graham (2022) show that average discount rates in eight different surveys have decreased since 1985, but by less than interest rates. The stylized view relates discount rates to the cost of capital, so interest rate changes are not directly informative about the stylized view. The cost of capital has likely decreased substantially less than interest rates since 1985, as leverage and tax rates have fallen. Given that the cost of capital is unobserved, it is unclear whether it has fallen by significantly more than discount rates. In fact, surveys measuring both the perceived cost of capital and discount rates suggest that the two move in parallel, as shown in Figure A10, although this comovement could be driven by varying sample composition in the surveys.

Our approach differs because we use only within-firm changes to measure time variation in discount rates and the perceived cost of capital. Sampling variation stemming from different firms being included in different years does not affect our results. Our data allow us to measure a wedge for every year since 2002. Moreover, our approach directly compares discount rates and the perceived cost of capital, so our conclusion that there is time variation in wedges is not subject to uncertainty about the true cost of capital, but instead driven by conscious decisions of firms. Our approach yields new conclusions both at the firm and aggregate level. For instance, at the firm level, we find zero short-run incorporation but a strong long-run relation. In the aggregate, we find a secular increase in the wedge since 2002 and a spike around the 2008-09 crisis.

Researchers have surveyed firms about how frequently and by how much they change their discount rates. The evidence is mixed.[6] Our results can explain the mixed evidence because the relation between the cost of capital and discount rates is not uniform, but depends on the time horizon and on the type of firm (e.g., heterogeneity by market power).

Our results can also help in interpreting existing findings on the relation between asset prices and investment (reviewed in Bond et al. 2012). For instance, Lamont (2000), Krüger et al. (2015), van Binsbergen and Opp (2019), Dessaint et al. (2021), Pflueger et al. (2020), Kim (2022), and He et al. (2023) study the relation between the cost of capital and investment, whereas an asset pricing literature estimates the relation between expected equity returns and investment (Gomes et al. 2003, Zhang 2005, Hennessy et al. 2007, Hou et al. 2015, Frank and Shen 2016). Moreover, while equity prices can affect investment when firms issue equity (e.g., Morck et al. 1990, Blanchard et al. 1993, Baker et al. 2003, Gilchrist et al. 2005), we find that equity prices also affect long-run investment without equity issuance through a discount rate channel.

1 Conceptual Framework

When deciding whether to undertake an investment project, managers evaluate whether the expected return to the project meets a threshold set by the managers. This threshold is the firm's discount rate, also known as the required return to capital or "hurdle rate." Whether

[6] Bruner et al. (1998) report that 77 percent of firms update their perceived cost of capital annually and 89 percent use the cost of capital as discount rate. Meier and Tarhan (2007) find that 48 percent changed their discount rate between 2000 and 2003. Sharpe and Suarez (2021) document that greater borrowing costs affect investment plans for 63 percent of firms and reduced borrowing costs affect investment plans for 32 percent. Out of those saying borrowing costs do not matter, 80 percent explain their answer by stating that borrowing costs are not directly relevant for their financing costs, consistent with interest rates having a modest impact on the cost of capital in their sample. Graham (2022) reports that 41 percent of US firms respond "zero" when asked: "Over the past 10 years, how many times has your firm changed your hurdle rate by 1 percent or more?" suggesting that few firms make changes above that size.

firms undertake a given project or not therefore depends directly on the discount rate.

Textbooks in economics and finance make a clear recommendation on how a firm should calculate its discount rate. As long as the project under consideration has the same risk as the firm's existing investments, the firm should set its discount rate δ_t equal to its financial cost of capital r_t^{fin}, also known as the weighted average cost of capital:

$$\begin{aligned}\delta_t &= r_t^{\text{fin}} && (1)\\ &= \omega_t \times (1-\tau) \times r_t^{\text{debt}} + (1-\omega_t) \times r_t^{\text{equity}}, && (2)\end{aligned}$$

where r_t^{debt} and r_t^{equity} are the costs of debt and equity, τ is the firm's tax rate, and ω_t is the leverage ratio (i.e., the market value of debt relative to the market value of debt plus equity).

The intuition behind this recommendation is that the financial cost of capital measures the return of an alternative financial investment with the same risk as the project under consideration. Investing in a new project creates value to financial investors as long as the return of the project exceeds the return of an alternative investment with the same risk and destroys value if the project return is below the return of an alternative investment with the same risk. The firm therefore maximizes its market value by setting the discount rate equal to the financial cost of capital and investing in all projects that clear this threshold. More generally, setting the discount rate this way ensures that the firm's marginal return to capital is equal to the opportunity cost of the capital.[7]

In practice, the vast majority of large firms use a method based on a discount rate to make investment decisions.[8] One approach is to use the discount rate as the threshold for the minimum internal rate of return (IRR) that a project must meet. A closely related approach is to use the discount rate in a net present value (NPV) calculation. The threshold and NPV rules lead to equivalent investment decisions as long as NPV smoothly declines in the discount rate.[9] This condition holds for typical projects and in standard models of

[7]Using the financial cost of capital as discount rate generally leads to the same investment decisions as a complex decision rule based on the stochastic discount factor in standard models, as we sketch in Appendix B, as long as the project has the same risk as the firm's existing investments. If project risk differs from the firm's existing investments, the optimal discount rate becomes project specific. However, if a firm on average carries out new projects that are in line with its existing ones, its average discount rate would still be close to its financial cost of capital. In practice, most firms in the conference call data and in previous surveys report using just one discount rate that is based on a firm's typical project (Graham and Harvey 2001).

[8]We discuss evidence on the use of discount rates in Section 3.3

[9]See Brealey et al. (2011), pages 109–113. The threshold and NPV rules can lead to different decisions if projects involve large lending transactions early in the lifetime of the project, if a project has multiple

firm investment. As a result, the finance literature often uses the terms "minimum required return" and "discount rate" interchangeably (see Jagannathan et al. 2016).

Standard models in economics and finance assume that firms follow the textbook recommendation. Specifically, the dominant assumption is that firms always use their financial cost of capital as their discount rate. The assumption gives rise to a stylized view, according to which firms seamlessly respond to financial prices and where shocks to the financial cost of capital, such as those to monetary policy, credit supply, and asset prices, have powerful effects on the real economy. The stylized view is implicit in most canonical models where firms use capital, such as real business cycle, New Keynesian, production-based asset pricing, and dynamic industrial organization models.

However, it is not at all clear whether firms adhere to the stylized view. Two processes within firms may cause discount rates to diverge from the financial cost of capital. First, firms cannot observe the financial cost of capital, but have to estimate it. Estimating the cost of equity is difficult due to modeling and statistical uncertainty (Fama and French 1997, Pástor and Stambaugh 1999, Goyal and Welch 2003, Campbell and Thompson 2008). Indeed, investor expectations in surveys are often at odds with model-based estimates of the cost of equity (Greenwood and Shleifer 2014) and managers are often taught simplifying assumptions (like a constant risk premium, Cochrane 2011). The cost of debt is easier to calculate, but still needs to be estimated based on bond prices and assumptions about default risk. As a result, firms' perceived cost of capital may differ from their financial cost of capital. The perceived cost of capital is the financial cost of capital plus a "cost of capital wedge," υ:

$$r_t^{\text{per.}} = r_t^{\text{fin.}} + \upsilon_t. \tag{3}$$

Second, firms need to decide how to incorporate their perceived cost of capital into their discount rates. Firms can set their discount rates relatively freely, in particular if they have market power in output markets. In contrast to the stylized view, firms may choose to incorporate a range of other factors apart from the perceived cost of capital into their discount rates. Examples of such factors include beliefs about value creation, risk, and financial constraints, as we detail in Section 7. We define the "discount rate wedge," κ_t, as

internal rates of return, and if projects are mutually exclusive.

the difference between the discount rate and the perceived cost of capital:

$$\delta_t = r_t^{\text{per.}} + \kappa_t \tag{4}$$

$$= r_t^{\text{fin.}} + \upsilon_t + \kappa_t. \tag{5}$$

The discount rate may thus differ from the financial cost of capital both because of the cost of capital wedge and the discount rate wedge. This paper analyzes both wedges but focuses mostly on the properties and economic consequences of κ_t.

2 Measurement

We construct a new dataset that measures firms' discount rates and their perceived costs of capital, equity, and debt. We combine these figures with measures of the financial cost of capital and investment. We summarize our methods here, with details in Appendix C.

2.1 Data from Conference Calls

Our measurement relies on information provided by managers during corporate earnings calls, investor conferences, and similar events, which we jointly call "conference calls." The majority of listed firms participate in one or multiple conference calls every quarter, so that managers can inform financial analysts, investors, and other observers about the firm's strategy (Frankel et al. 1999, Hassan et al. 2019).

Conference calls are high-stakes settings where managers have incentives to report accurate values. For one, analysts and investors often compare the discount rates and cost of capital given on the calls to accounting figures (such as estimates of the cost of capital or investment returns), forcing managers to present plausible values. In addition, since the calls are held regularly, analysts can compare reported discount rates to subsequent investment decisions and financial performance metrics, again incentivizing managers to report truthful numbers. Statements from conference calls are often used as evidence in securities lawsuits, underscoring that managers are held to statements made on the calls (Rogers et al. 2011). Several of our analyses below will confirm that the reported values are meaningful, for instance, that discount rate changes of individual firms predict changes in investment and that changes in the financial cost of capital are reflected in firms' perceived cost of capital.

We download all transcripts of conference calls for the period January 2002 (the first available month) to September 2021 from the Thomson One database and identify paragraphs that contain at least one keyword as well as one of the terms "percent," "percentage," or "%."[10] Details on the data extraction are in Appendix C.

It is difficult to train an algorithm to recognize discount rates and the perceived cost of capital from managers' transcripts, as context and background are of the essence. Instead, we rely on manual data entry. We educated a team of research assistants to identify and record the relevant figures from the text. Over the course of roughly 2.5 years, the team read 74,000 distinct paragraphs.

2.2 Identifying Discount Rates and the Perceived Cost of Capital in Conference Calls

In practical usage, a firm's discount rate is the minimum internal rate of return (IRR) that the firm is willing to accept on its investments (often called the "hurdle rate"), as explained in Section 1. Surveys among managers suggest that discount rates are set by top-level executives and then used to evaluate available investment projects throughout the firm (Graham 2022). As a result, discount rates influence firms' investment demand, conditional on the expected cash flow of projects available to the firm and measured in units of a financial rate. Even if managers identified a discount rate ex-post (e.g., to justify how they selected investment projects), the discount rates reported on calls would still capture this notion of firm investment demand.

We record a discount rate if managers explicitly state their required minimum rate of return on projects as part of an investment rule. Two types of terminology allow us to identify discount rates. First, managers often state the required IRR for future investment projects. Second, managers sometimes define a discount rate by mentioning their perceived cost of capital and a required return premium, which is added to the perceived cost of capital. In addition to discount rates (required IRRs), we also separately record realized returns (when managers talk about the ex-post performance of projects) and expected returns (when managers predict future performance without describing an explicit required rate). These cases are distinct from discount rates and by recording them separately, we ensure that we

[10]The keywords are capital asset pricing model, cost of capital, cost of debt, cost of equity, discount rate, expect a return, expected rate of return, expected return, fudge factor, hurdle rate, internal rate of return, opportunity cost of capital, require a return, required rate of return, required return, return on assets, return on invested capital, return on net assets, weighted average cost of capital, weighted cost of capital. We also include abbreviations of the keywords in the search, for example, IRR.

do not confuse them with required rates.

Around 80 percent of discount rates are reported when managers explain how the expected returns of future projects relate to their discount rate, as we detail in Appendix D. Most remaining discount rates are mentioned when managers describe realized returns of existing projects or the firm's overall returns and profitability.

To measure the perceived cost of capital, we study paragraphs where managers explicitly state their cost of capital (or costs of debt and equity). These figures come from firms' internal calculations, potentially relying on asset prices and interest rates. We also consider abbreviations (e.g., WACC). To ensure that we differentiate discount rates and the perceived cost of capital from other financial figures, we separately record a range of additional variables, such as required, expected, and realized returns on assets and on invested capital.

2.3 Practical Measurement Guidelines

To illustrate our measurement approach, consider the example of the Nasdaq 100 firm Intuit in the first quarter of 2014:

"We continued to take a disciplined approach to capital management (...). Our weighted average cost of capital is about 9 or 9.5 percent (...). Our IRR hurdle is a 15 percent rate of return."

From this paragraph, we record that Intuit's discount rate was 15 percent and its perceived cost of capital was 9.25 percent. Earlier on the same call, the firm said that it was only "investing in opportunities that yield 15 percent-plus." This last sentence on its own would not have been precise enough for our dataset because it does not specify that the return is a required IRR.

We generally record only contemporaneous measures stated by firm managers and exclude figures that are historical, speculative, or posited by outsiders. The majority of firms use only one discount rate, but some firms mention more than one type of discount rate, for example, varying by country. We record the type of discount rate that represents the majority of the firm's operations (e.g., the US discount rate for a firm with operations mainly in the US). We consistently record the same type of discount rate throughout all time periods where we observe a firm. According to the stylized view, all types of discount rate should move one-to-one with the financial cost of capital.

We restrict the data collection to figures representative of the firm overall (e.g., we do not include interest rates for just one bond issuance). Managers mostly discuss their after-tax discount rate and cost of capital. We convert the very few pre-tax observations into after-tax values (see Appendix C.3 for details).

To achieve high quality and consistency across research assistants, we had weekly team meetings where we discussed specific paragraphs. Moreover, all paragraphs were read by at least two separate research assistants. All outlier observations (in levels and changes) for discount rates were checked by hand by the authors.

2.4 Measuring the Financial Cost of Capital

The financial cost of capital is the weighted average cost of debt and equity (equation 2). The cost of debt is the expected return to investors holding the firm's debt, adjusted for tax benefits of debt. The cost of equity is the return that shareholders require for holding the firm's equity (i.e., the expected return on the firm's outstanding shares in financial markets). We estimate two stylized measures of the financial cost of capital, one at the country level and one at the firm level.

2.4.1 Financial Cost of Capital at the Country Level

We estimate the expected equity return at the country level using the balanced growth model. For each country in our sample, we calculate average five-year earnings (based on all firms listed in the country) and compare the trailing five-year earnings to total market capitalization to obtain the earnings yield. In the US, we use the inverse of the CAPE ratio maintained by Robert Shiller as the earnings yield. We shrink the earnings yield towards the time series mean in each country outside the US by a shrinkage factor of 0.5. In the balanced growth model, long-run expected equity returns are:

$$r_t^{\text{equity, country}} = \frac{E_t[\text{Earnings}_{t+1}]}{\text{Price}_t} + g_t. \tag{6}$$

We approximate g_t as 2 percent plus average inflation over the last ten years.[11] We approximate the cost of debt using the long-run (ten-year) yield on government debt from the OECD and assuming a tax rate of 20 percent.

The country-level financial cost of capital is then the average cost of debt and equity, weighted by average leverage in the country.

2.4.2 Financial Cost of Capital at the Firm Level

We use the Capital Asset Pricing Model (CAPM) to estimate the firm-level cost of equity. While the CAPM model does not fully explain long-run expected stock returns (Fama and French 1992), it is a model that practitioners use commonly. The model is:

$$E_t^{\text{CAPM}}[r_t^{\text{equity, firm}}] = r_t^f + \beta_t^{\text{firm}} \lambda_t, \tag{7}$$

where r_t^f is the risk-free rate, β_t^{firm} is the market beta of the firm, and λ_t is the market risk premium. The market risk premium is the difference between $r_t^{\text{equity, country}}$ and the risk-free rate, which we take to be the short-term interest rate on government debt issued in the given currency.[12] We estimate market betas in rolling five-year regressions of weekly data.[13]

We measure the firm-level cost of debt as the weighted average cost of outstanding debt based on data from Capital IQ. For bond debt, we use the yield to maturity as the cost of debt, which is an upper bound on the cost of debt in case default is expected. We calculate yield to maturity by matching firms' bonds from Capital IQ with yields from the Wharton Research Data Services bond database.[14] We assume a corporate tax rate of 20 percent.

[11] Ideally we would use expected inflation in this calculation. In the US, one can use breakeven inflation as a measure of expected inflation, but such measures are not available for all countries in our sample. Using past 10-year inflation as a proxy for future inflation is common practice (e.g., the definition of Excess CAPE by Robert Shiller). We shrink inflation towards the cross-country conditional mean with a shrinkage factor of 0.5.

[12] For EU countries, we use the short-term rate on German government debt.

[13] We use weekly data as is common among practitioners. Asset pricing researchers often estimate betas using monthly data over five-year horizons. We follow Frazzini and Pedersen (2014) and shrink betas towards the cross-sectional mean of 1 using a shrinkage factor of 0.5.

[14] If we cannot find information on the cost of debt from Capital IQ, we use interest expenses over the sum of short- and long-term liabilities from Compustat as the cost of debt. If we cannot find the required information in Compustat, we approximate the cost of debt by the long-run interest rate in the country.

2.5 A Predicted Measure of the Perceived Cost of Capital

We construct a predicted measure of the perceived cost of capital at the firm level. We will use this predicted cost of capital as a proxy for the perceived cost of capital in some analyses because it can be constructed for a large set of firms. We employ a standard lasso procedure for out-of-sample prediction. The potential predictors are the seven variables determining the financial cost of capital: the equity risk premium, beta, the interaction of equity premium and beta, the short-term risk-free rate, the long-term risk-free rate, the financial cost of debt, and leverage. The lasso procedure selects all seven variables as predictors. The R^2 in the lasso procedure is 15 percent. The baseline F-statistic in the prediction regression is 18.8 and the effective F-statistic is 15.5 (Pflueger and Wang 2015), suggesting that the prediction is relatively strong.

3 Overview of the New Dataset

3.1 Summary Statistics

We present summary statistics of the new dataset in Panel A of Table 1. The dataset contains 2,728 observations of discount rates from 1,284 distinct firms. We observe discount rates in multiple quarters for 519 distinct firms (1,820 observations in total), as shown in Figure A1. The sample mean of discount rates is 15.7 percent, although the raw level of reported discount rates does not capture overall project returns due to overhead accounting, as explained in Section 3.4.

The dataset contains 2,673 observations of the perceived cost of capital from 1,303 distinct firms, 4,812 of the perceived cost of debt from 1,363 firms, and 363 of the perceived cost of equity from 227 firms. As shown in Figure 1, the perceived cost of capital is distributed fairly symmetrically around a sample mean of 8.4 percent. The dataset is updated regularly and more information is available under costofcapital.org.

We plot raw averages for US firms by year in Figure 2. The average perceived cost of debt has trended downward since 2002, in line with the secular decrease in interest rates over this period. The average perceived cost of capital has also trended downward, in line with the falling financial costs of debt and equity. Average discount rates do not display a clear secular trend but fluctuate more over time. We will formally study changes over time in Sections 4 and 5, where we focus on within-firm changes to ensure that differences in sample composition across years do not influence the estimates.

The market value of firms in the sample ranges from 342 million USD at the 5$^{\text{th}}$ percentile to 51,812 million at the 95$^{\text{th}}$. The data include some of the world's largest corporations, including AT&T, Bank of America, Disney, Exxon, Home Depot, Intel, JPMorgan Chase, Mastercard, Nestle, Novartis, UnitedHealth, and Visa. Around 60 percent of observations are for US firms, as shown in Figure A2.

3.2 Representativeness

We assess how similar firms in the dataset are to other firms in Compustat. We first measure the percentile rank (for different firm characteristics) of each firm in our sample relative to other Compustat firms in the same year and country. We calculate the average percentile rank of firms in the sample for three subsamples of our dataset. If the average characteristic of firms in a sample is similar to the Compustat population in the same country-year bin, the average percentile rank in the sample is close to 50. The results, reported in Panel A of Table 2, suggest that this is true for many of the characteristics we consider.

The main dimension along which the sample is not fully representative is firm size. The firms in our data are relatively large, as their average market value rank is 79 in the discount rate sample. The unconditional probability of a Compustat firm being in our sample is 3 percent, whereas it is 50 percent for the 100 largest firms. The selection of large firms is likely driven by the fact that conference calls are more common among large firms. The other metric along which the sample is not fully representative is financial constraints. The firms in our data are generally less constrained (average rank of 23 in the discount rate sample) because large firms are less constrained (Hadlock and Pierce 2010).

On average, firms in our discount rate sample do not seem to be unusually distressed as they do not exhibit high bankruptcy risk (Z-score rank of 49), low investment rates (rank of 54), or low profitability (return on equity rank of 58). It is unclear a priori whether firms with higher bankruptcy risk should discuss discount rates more or less: on the one hand, firms in distress need to be more restrictive in their investment, which could lead them to discuss discount rates more, whereas on the other hand, they are focused on short-term financing constraints and the elements causing distress, which could leave less time to discuss discount rates. The distribution of sample firms across industries is also similar to the distribution for all Compustat firms, as shown in Figure A3.

We do not find evidence that firms systematically disclose discount rates in bad states of the world. Panel B of Table 2 reports results of firm-level panel regressions where the outcomes are indicator variables (scaled by 100) for whether a firm mentions a particular variable in a given quarter. In column 1, we regress an indicator for whether we observe a discount rate in a quarter on the contemporaneous Z-score, a measure of bankruptcy risk (measured in country-year percentile ranks). We include firm and quarter fixed effects, so that we analyze only variation within firms over time. The coefficient on the Z-score is insignificant and implies that the probability of observing a discount rate increases by 0.08 percentage points in the extreme hypothetical case where bankruptcy risk falls from the highest to the lowest value observed in the country-year bin. In column 2, we find small and insignificant coefficients on several other firm characteristics (some of which are components of the Z-score). Similarly, there is also no evidence that characteristics are different when we observe a perceived cost of capital, as shown in columns 3 and 4. In column 6, we report that we are significantly more likely to observe a perceived cost of debt when leverage or the return to equity are high, relative to the firm's average. This finding is consistent with the fact that the cost of debt is more important to firms at times of high leverage.

Overall, the results suggest that the sample is representative of the Compustat population along most observable dimensions, with the exception of firm size.

3.3 Sample Coverage and Reporting Frequencies on Conference Calls

Firms for which we observe at least one discount rate or perceived cost of capital account for roughly 50 percent of the total assets of listed firms in Compustat in our sample period. Subsamples of firms that we use in specific analyses below also capture non-negligible shares. For instance, firms for which we observe at least one discount rate account for roughly 30 percent of the total assets of listed Compustat firms. This set of firms informs the estimate of the cross-sectional relation between discount rates and the cost of capital (e.g., Table 4, column 4). Firms with at least two discount rate observations account for roughly 15 percent of the total assets of listed Compustat firms. These firms contribute to the estimate of the within-firm relation between discount rates and the cost of capital (e.g., Table 4, columns 5 to 6). While we do not observe these firms every quarter (but an average of 3.5 times per firm), observing a few within-firm changes for a firm is informative about the average relation between the discount rate and the cost of capital in the sample.

The vast majority of large firms use discount rates to make investment decisions, even when they do not explicitly report their discount rate on conference calls. For instance, essentially all Forbes-listed firms surveyed by Trahan and Gitman (1995) and 90 percent of Fortune 1,000 firms surveyed by Poterba and Summers (1995) use discount rates. Similarly, 80 percent of large firms use discount rates in NPV calculations and 80 percent of large firms use discount rates as IRR thresholds, according to Graham (2022), suggesting that most large firms use discount rates in at least one way. Standard business schools and management courses also advise firms to use discount rates.

Despite the wide-spread use of discount rates, firms do not report discount rates on most conference calls. In total, we downloaded roughly 400,000 conference calls from the Thomson One database for the 2002 to 2021 period. Around 10 percent of the calls contain paragraphs that we read manually because they mention at least one keyword and a percentage term (see Section 2.1). Our final dataset includes around 10,000 observations of discount rates and financial costs, so around 3 percent of calls enter the dataset and 1 percent of calls contain a discount rate.

There are several reasons why we do not observe discount rates on conference calls more regularly. One reason is that some firms mention discount rates, but their statements are not explicit enough to meet the high bar for our data collection. For example, we do not include vaguer phrases (e.g., "we hope to achieve a return of x percent"), hypothetical statements (e.g., "we may use a discount rate of x percent"), qualitative comparisons (e.g., "the discount rate has increased slightly"), and figures mentioned by outsiders in our dataset (see Appendix C). We also miss discount rates that are not expressed using a keyword and a percentage term, since our manual reading criteria require both to be mentioned in the same paragraph.

A further reason for the low reporting frequency on conference calls is that some firms do not discuss discount rates at all. Many of these firms likely still use discount rates internally, as suggested by the surveys. These firms may, however, communicate their investment strategies differently, focusing on qualitative information or balance sheet items such as return on assets. While such communication can convey information that is related to discount rates, we focus on explicit discount rate mentions in our data collection because they are unambiguous and can be directly linked to the required returns in standard models. Firms reporting other figures thus do not enter our dataset.[15]

From the point of view of managers, analysts, and investors, it is not clear that communicating the firm's project selection strategy using discount rates is preferable to other

[15] If some firms do not use discount rates at all, the average discount rates we measure may still inform their behavior, as long as firms respond to changing financial costs "as if" they were following a formal discount rate rule. If firms follow completely different decision models, the deviations between standard models and actual firm behavior would be even greater than what our findings imply.

methods. As a result, there is also no clear reason why firms with reported discount rates should be systematically different from other firms, as also suggested by Section 3.2.

3.4 Discount Rates, Overhead Costs, and Average Returns

Discount rates are firms' minimum required returns on investment (see Section 1). On average, discount rates should therefore be greater than or equal to firms' realized returns, as long as firms' cash flow expectations are not strongly distorted. However, the raw average discount rate in the new dataset is 15.7 percent, which is substantially above the average realized returns on firms' accounting statements. For instance, the average return on invested capital (ROIC) is 13.5 percent in Compustat US over our sample period, as shown in Panel B of Table 1.[16] The average discount rate in the new dataset is close to the averages reported in previous surveys (Poterba and Summers 1995, Jagannathan et al. 2016, Graham 2022). A long-standing puzzle in the literature is how to reconcile high reported discount rates with relatively low realized returns.

We find that this puzzle can be explained by how firms incorporate overhead costs in their capital budgeting decisions. The textbook recommendation is that firms should include all costs, including overhead costs, in the cash flows of their NPV analyses when considering a new project. If firms do so, the reported discount rates indeed represent the minimum overall return (in terms of an IRR) that the firm will accept on a new project. However, the conference calls reveal that many firms do not include all overhead costs in their NPV analyses, which implies that a project's IRR implied by the NPV analysis is no longer the overall return to the project. In particular, some firms report discount rates that "exclude a corporate overhead allocation" (Hovnanian Enterprises, Q2-2012), while other firms explicitly refer to "IRRs after allocating corporate overhead" (Lottomatica Q1-2006). Total overhead includes, for example, the costs to the headquarters associated with planning, administering, and marketing a new retail store. Total overhead (SG&A) in Compustat amounted to 30.7 percent of invested capital, suggesting that the allocation of overhead can substantially affect the level of returns and discount rates.

To measure the impact of overhead on the level of discount rates, we first define a discount rate for cash flows that account for all corporate overhead costs of firm i at time t: δ_t^i. In comparison, we define $\tilde{\delta}_t^i$ as the discount rate that we observe on conference calls. If the firm accounts for all overhead cost in the cash flows, then $\delta_t^i = \tilde{\delta}_t^i$. However, in general, if a firm

[16] The return on total assets (ROA) is not comparable to the discount rate because it includes non-invested capital (e.g., cash) among the assets in the denominator.

excludes certain overhead costs from its cash flows and instead adds o^i to its discount rate, then:

$$\begin{aligned}\tilde{\delta}_t^i &= \delta_t^i + o^i && (8)\\ &= r^{\text{fin.}}{}_t^i + \upsilon_t^i + \kappa_t^i + o^i && (9)\\ &= r^{\text{fin.}}{}_t^i + \upsilon_t^i + \tilde{\kappa}_t^i, && (10)\end{aligned}$$

where $0 \leq o^i < 1$ and $\tilde{\kappa}_t^i = \kappa_t^i + o^i$ is the observed discount rate wedge (i.e., the difference between observed discount rate $\tilde{\delta}_t^i$ and the perceived cost of capital).

Using the full call transcripts, we identify cases where we are certain that the observed discount rates fully account for corporate overhead (i.e., where $o^i = 0$). This is the case for 15 percent of the observed discount rates. The average discount rate in these cases is 11.5 percent, as reported in Panel B of Table 1. The average difference between discount rates fully accounting for overhead and other discount rates in our sample has remained roughly constant over time, at around 4 to 5 percentage points, as documented in Figure A4. Once accounting for corporate overhead, the average discount rate is thus below the accounting return on invested capital, consistent with discount rates accurately capturing firms' required returns.[17]

In our measurement, we always record the discount rate that is most representative of the firm's operations (see Appendix C). We are careful to always record the same type of discount rate for each firm across all time periods, so that discount rates recorded in different periods account for overhead in the same way and the firm-specific overhead fraction o^i is constant across observations of the same firm. Our approach is helped by the fact that managers and analysts often explicitly refer to discount rates reported on a previous conference call.

Much of the analysis in this paper focuses on within-firm changes in discount rates and wedges where we difference out the overhead fraction used by each firm. As a result, most findings are unaffected by what type of discount rate each firm reports and we can use the observed discount rates $\tilde{\delta}_t^i$ and wedges $\tilde{\kappa}_t^i$ in most of our analyses. In the two subsections where the level of discount rates plays a role, we control for differences between firms accounting for all overhead costs and other firms (in Sections 6.2 and 7).

[17]The literature has discussed whether high discount rates correct for excessively optimistic cash flow forecasts. Our analysis does not exclude this possibility but shows that it is not necessary to explain the level of discount rates. In principle, discount rates could also be elevated above realized returns if managers account for taxes by using higher discount rates. However, as almost all firms report after-tax discount rates, taxes are unlikely to matter in our sample (see Appendix C.3).

3.5 Discount Rates and Realized Project Returns

Some firms report a concrete realized return of a specific project in the context of discussing their discount rate. We analyze the relation between these realized project returns and discount rates in Table A3 using the 211 realized project returns that we can observe on conference calls for the same firm and in the same quarter as a discount rate.[18] We find that a firm whose discount rate is one percentage point higher has realized returns that are on average 1.26 percentage points higher. The coefficient is statistically significant at the 1 percent level. We find similar results when controlling for only country in column 1 and for country, quarter, and type (i.e., whether the discount rate includes all corporate overhead costs) in column 2.

While the sample is small, the findings are consistent with the view that discount rates are the required returns of firms, so that firms with higher discount rates also earn higher realized returns on their projects on average.

4 Dynamics of Discount Rates and the Cost of Capital

In this section, we study the dynamic relation between discount rates and the perceived cost of capital. Our main finding is that changes in the perceived cost of capital are slowly incorporated into discount rates, leading to time-varying wedges between discount rates and the perceived cost of capital.

4.1 The Perceived and the Financial Cost of Capital

Before studying the relation between discount rates and the perceived cost of capital, we verify that the perceived cost of capital is related to the stylized measures of the financial cost of capital introduced in Section 2.4. We focus on documenting that firms have incorporated changes in these stylized measures into their perceived cost of capital and refer to Gormsen and Huber (2025) for a general analysis of the perceived cost of capital.

In columns 1 and 2 of Panel A of Table 3, we regress the firm-level perceived cost of capital on the country-level measure of the financial cost of capital. We include country fixed effects in column 1 and firm fixed effects in column 2, so that the variation stems entirely

[18] Most firms do not discuss discount rates in the context of realized returns, but instead state that the expected returns of future projects exceed the discount rate, as documented in Appendix D.

from country-level, time-series fluctuations in asset prices and interest rates.[19] The slope coefficients are between 0.8 and 1, implying that firms, on average, increase their perceived cost of capital by 0.8 to 1 percentage points when the estimated country-level financial cost of capital rises by 1 percentage point. In columns 3 and 4, we consider our firm-level measure of the financial cost of capital on the right-hand side. The point estimates decrease to 0.7 (using country fixed effects) and 0.5 (using firm fixed effects). In columns 5 and 6, we find that the perceived cost of capital incorporates the financial cost of debt to a similar degree as the financial cost of equity. Despite the high slope coefficients, the standard measures of the financial cost of capital explain only a modest part of the time variation in the perceived cost of capital, as seen from the R^2 lying below 10 percent.

The slope coefficients in Panel A of Table 3 are slightly below the prediction of the stylized view (i.e., slope coefficients of 1). However, we cannot rule out that this deviation arises because of measurement error. In particular, if we measure the financial cost of capital with error, there may be attenuation bias in the slope coefficients. Measurement error is likely more relevant in the firm-level financial cost of capital and when using only within-firm variation. Our main analysis of discount rates and the perceived cost of capital in the upcoming section is less prone to measurement error because the perceived cost of capital is directly observed and not estimated and because we can use the predicted measure of the perceived cost of capital, which overcomes classical measurement error.

In Panel B of Table 3, we report that measures of the financial cost of debt (country-level long-term rates and firm-level interest expenses) predict the perceived cost of debt. In Figure 3, we plot the perceived cost of equity along with three estimates of the financial cost of equity. Two of these are based on Shiller's CAPE ratio and the third assumes a constant risk premium of 6 percent. The average perceived cost of equity moves over time with the CAPE ratio measures.[20] It is most closely aligned with the estimate that has a bullish expected real growth rate of 4 percent. Overall, the results are consistent with the view that firms have incorporated the secular declines in both the cost of equity and the cost of debt into their perceived cost of capital.

[19] We do not include time fixed effects in these specifications, since much of the variation in the financial cost of capital is driven by common changes over time.

[20] Consistent with this result, Dahlquist and Ibert (2024) also find that sophisticated investors have long-run expectations that comove with the CAPE measure over time.

4.2 Discount Rates and the Perceived Cost of Capital

We examine the association between discount rates and the perceived cost of capital in Table 4. In columns 1 to 3, we use only observations where firms report both their discount rate and perceived cost of capital in the same quarter. In columns 4 to 6, we use the predicted measure of the perceived cost of capital as regressor (see Section 2.5). This approach is akin to a two-stage estimation procedure and thus ensures that classical measurement error does not bias the estimate, as shown in simulations in Appendix E. We can observe the predicted cost of capital for all firms for which we observe discount rates, leading to a larger sample in columns 4 to 6.

We find that the cross-sectional association between discount rates and the perceived cost of capital (controlling for only country fixed effects) is relatively strong. The cross-sectional coefficients are 0.7 in column 1 and 1.1 in column 4. These coefficients are statistically different from 0 and close to 1, in line with the stylized view. When including firm fixed effects, however, the relation becomes substantially weaker. For instance, the coefficients are 0.4 and 0.3 in columns 2 and 5 where we condition on firm fixed effects. The coefficients remain similar in columns 3 and 5 when we add quarter fixed effects. All within-firm coefficients reject a coefficient of 0. They also reject a coefficient of 1 and thus the stylized view that all changes in the perceived cost of capital are fully transmitted into discount rates.[21]

The slope coefficients are higher in the cross-sectional regressions than in the within-firm regressions because firms are slow to incorporate changes in their perceived cost of capital into their discount rates. To investigate this slow incorporation, we estimate the transmission of changes in the perceived cost of capital to changes in discount rates over different time horizons. We analyze all within-firm changes in discount rates observed in our dataset (i.e., all differences between different discount rate observations of the same firm). We regress the change in the firm-level discount rate onto the change in the predicted cost of capital for the firm over the same time horizon. We interact the change in the cost of capital with indicators for the number of years between the observations, thereby allowing the transmission to vary with the horizon over which the change in the cost of capital took place.

Figure 4 plots the transmission coefficients for different horizons. The figure shows that the transmission coefficients differ over time. The coefficient for 1-2 years implies that a 1

[21] The rejection of 1 in columns 5 and 6 needs to be interpreted with caution because the standard errors do not account for noise induced by the predicted regressors. In Appendix E, we verify that controlling for the noise coming from generated regressors does not change inference, as the slope coefficient remains statistically different from 1 with p-values well below 0.05. The tests in columns 2 and 3 are not affected by this issue.

percentage point annual increase in the cost of capital over a period of at most 2 years is, on average, not associated with a significant change in the discount rate over the same period. Over a 3-4 year period, the coefficient is around 0.25 percentage points and statistically different from 0, 1, and the 1-2 year coefficient. For periods exceeding 12 years, the association is around 0.6 percentage points and statistically different from 0 and the 1-2 year coefficient, but not from 1.

The pattern in Figure 4 arises in part because discount rates change infrequently. We again consider all within-firm changes in discount rates and regress an indicator for whether the discount rate differs between two observations onto indicators for the number of years between the observations. Figure 5 reveals that less than 20 percent of discount rates observed within 2 years are different from the previous observation. Around one-third of discount rates differ after 3 to 4 years and around three-quarter differ after 12 or more years. This pattern is consistent with the survey result in Graham (2022) that few firms move their discount rate by 1 percent or more in one go. In contrast, the perceived cost of capital changes more frequently. Around 70 percent of firms use a different perceived cost of capital after 1-2 years and essentially all firms use a different one after 12 or more years.[22]

The results in Figures 4 and 5 imply that firms' discount rates do not move with the perceived cost of capital in the short and medium run, but incorporate the majority of variation in the perceived cost of capital in the long run. This finding explains why the cross-sectional regressions in columns 1 and 4 of Table 4, which reflect the accumulated transmission of past changes in the perceived cost of capital, are relatively high and why the within-firm coefficients in the remaining columns, which reflect only the transmission of changes over our sample period, are substantially lower.

In the simulations of Appendix E, we document that the observed infrequent adjustment in discount rates can generate the patterns in Table 4 and Figure 4. In particular, the simulated slope coefficients drop by 60 percent when introducing firm fixed effects, as is the case in Table 4, and the transmission of changes in the cost of capital into discount rates increases with the time horizon. The simulations also show that classical measurement error can only play a limited role in explaining the results and that statistical inference is unlikely

[22] We find a similar pattern using only firms for which we observe two discount rates at least seven years apart in Figure A5. Moreover, in unreported tests, we find that firms for which we observe two discount rates at least seven years apart do not change their discount rates more frequently at shorter horizons, which implies that firm heterogeneity in the composition across year bins does not explain the pattern. We use all available observations of discount rate changes and perceived cost of capital changes in Figure 5, so the samples used for the two series differ.

to be materially biased. A simulated impulse response in Figure A8 suggests that 3 to 4 years after a 1 percentage point shock to the perceived cost of capital the average discount rate is only 0.4 percentage points greater.

Overall, the results suggest that firms are aware of changes in their cost of capital, but choose not to incorporate this variation into discount rates in the short and medium run. Conference call statements support this view. The following quotes by a Russell 1000 CFO and a Fortune 500 CFO are typical examples:

Premier, Craig McKasson, CFO, Q1-2017: *"We obviously, with changing markets, will always reassess and evaluate what our weighted average cost of capital is and whether that return hurdle needs to change."*

Spectra Energy, John Patrick Reddy, CFO, Q3-2014: *"We didn't lower our hurdle rates (...) all the way down with long-term rates (...) We are still looking at returns of, say, 10 percent, on average for our projects."*

Finally, we note that discount rates have a "life of their own," so that they are not just driven by how much firms incorporate the perceived cost of capital. For example, changes in discount rates are more dispersed than changes in the perceived cost of capital. The raw averages of Figure 2 already hint at this wider dispersion. We document the dispersion more directly by using within-firm data in Figure A6. The figure plots histograms of annualized changes in discount rates (in Panel A) and in the perceived cost of capital (in Panel B), relative to each firm's first observed value of the respective object. By annualizing, we ensure that changes over different horizons are comparable. The pattern implies that, if firms adjust their discount rates, the changes cannot be fully explained by previous or contemporaneous changes in the perceived cost of capital, but also by other factors, which we analyze in Section 8.

4.3 Time-Varying Discount Rate Wedges

A key implication of the partial comovement of the perceived cost of capital and discount rates is that the average discount rate wedge κ (difference between the average discount rate and average perceived cost of capital) varies over time. We analyze the time series behavior of κ in the US by controlling for time-invariant differences across firms. This approach removes potential sampling noise stemming from the random inclusion of different firms in different years and ensures that we measure only true changes affecting individual firms. To do so, we first regress firm discount rates on year and firm fixed effects (using all observations of US discount rates). We measure the average "within-firm" discount rate in every year by adding the year fixed effect to the unconditional mean. We follow an analogous procedure to create the average "within-firm" perceived cost of capital in every year (using all observations of the perceived cost of capital in the US). We correct for the fact that some discount rates do not fully account for overhead by subtracting the difference between the average reported discount rate (15.7) and the average discount rate including all corporate overhead cost (11.5) from the within-firm discount rate series (see Section 3.4 for details). This final adjustment affects the level of the average discount rate but not its evolution over time. The difference between the two series is the average "within-firm" discount rate wedge κ.

We plot the within-firm κ in Figure 6 as a three-year moving average. The wedge has increased by roughly 2.5 percentage points between 2002 and 2021. This is a large change relative to historical movements in expected stock returns and interest rates. Much of the secular increase since 2010 is driven by the fact that the perceived cost of capital has fallen while discount rates have remained relatively more stable.[23]

We conduct a simple numerical exercise to explore how much of the increase in the wedge can be explained by the slow incorporation documented in Section 4.2. We simulate a panel of firms for which the perceived cost of capital on average evolves exactly as in the time series underlying Figure 6. We then assume that firms update their discount rates infrequently such that we replicate the slow incorporation and infrequent adjustment observed in Figures 4 and 5. This simple framework allows us to calculate the evolution of discount rate wedges implied by the slow incorporation. Because the perceived cost of capital decreases almost monotonically over the sample and at a faster rate toward the end of the sample, the implied average discount rate wedge also increases throughout the sample, as shown in Figure A9. In total, the slow transmission can account for over 50 percent of the increase in the average wedge between 2002 and 2021. The analysis also suggests that if the perceived cost of capital were to remain at its 2021 level going forward, it would take up to 20 years for the average wedge to return to its 2002 level.

These findings support the view that limited incorporation plays an important role in the evolution of the average wedge but that other factors likely contributed to the post-2010 rise

[23]We confirm that the empirical relations between discount rates and the cost of capital and investment do not depend on the pre-2010 period in Tables A1 and A2.

as well, such as changes in risk, which we discuss in Sections 7 and 8. The remaining parts of the paper will study the consequences and drivers of changes in discount rate wedges.

5 Dynamics of Discount Rate Wedges and Investment

In this section, we show that discount rates and discount rate wedges predict future investment. The findings imply that the discount rates and wedges observed on the conference calls capture a component of firm investment demand.

To motivate the analysis, we first plot the average discount rate of US firms and aggregate net investment in the following year, as measured in the US national accounts. Figure 7 shows that discount rates and investment comove, suggesting that the measured discount rates may have some relevance for the aggregate economy. Since aggregate data do not allow us to investigate the mechanisms underlying this comovmenent in detail, we turn to firm-level data.

Table 5 reports regressions of firm-level net capital investment one year ahead on firm-level discount rates and wedges. A 1 percentage point increase in the discount rate is associated with a decrease in the investment rate in the following year of 0.8 percentage points, as shown in column 1. The coefficient is robust to adding quarter fixed effects in column 2. We test whether discount rate wedges on their own also predict investment in columns 3 and 4. Indeed, both the discount rate wedge and the sum of discount rate and cost of capital wedges are associated with lower investment. In column 5, we report that the coefficient on the discount rate is not driven by the perceived and financial cost of capital or Tobin's Q.

The estimates are quantitatively consistent with a simple Q-model that allows for wedges and is calibrated using the assumptions in Philippon (2009), as detailed in Appendix F.3. The model predicts a slope coefficient of -1, which is close to the empirical estimates.

The relation between investment and discount rates is similar across different types of firms. In Figure 8, we plot slope coefficients on the discount rate estimated on subsamples of firms. We define each subsample by splitting the sample at the median for different characteristics (bankruptcy risk, market power, financial constraints, risk, return on equity, size, leverage). All estimates are of similar magnitude to the baseline effect and statistically different from zero. The findings imply that certain subgroups of firms, such as distressed firms, do not drive the entire relation between investment and discount rates.

In Table A4, we report that the coefficient on the wedge is robust to individual components of the financial cost of capital, including the credit spread (Gilchrist and Zakrajšek 2012, López-Salido et al. 2017), the risk-free rate, the financial cost of equity, Tobin's Q, and the return on book equity.

Cash flow expectations can also affect investment (Cummins et al. 2006, Greenwood and Hanson 2015, Gennaioli et al. 2016). However, changes in discount rates are not significantly correlated with changes in analyst expectations of earnings growth from the Institutional Brokers' Estimate System, as shown in Table A5. We also find that the effect of discount rates and wedges on investment remains stable when controlling for expectations. Overall, the results suggest that the measured discount rates capture a component of firm investment demand that is distinct from expected cash flows and other financial channels.

The results are similar for different measures of investment, as discount rates and wedges also are associated with changes in total assets in Table A6 and net investment including intangibles in Table A7.

6 Implications of Discount Rate Wedges

The results so far imply that wedges between the discount rates used by firms and the perceived cost of capital vary over time and affect firm investment. In this section, we argue that these discount rate wedges have broad implications for the link between financial prices and the real economy. We focus on the implications of wedges for two important real phenomena: the recent puzzle of "missing investment" in the US and the sensitivity of real investment to the cost of capital implied by a standard model.

The motivation for the "missing investment" analysis is a recent literature arguing that US investment has been low since 2002, relative to firms' profitability, market value, and the financial cost of capital. The argument is usually made using Q-theory. A decline in the perceived cost of capital has increased firms' market value and thereby led to high and rising values of Tobin's Q. According to standard Q-theory, investment should have risen with Tobin's Q. However, if anything, observed investment rates have been low relative to historical standards, leading researchers to argue that there is "missing investment" (Furman 2015, Gutiérrez and Philippon 2017).[24]

[24] The puzzle remains when accounting for intangibles and similar measurement issues (Philippon 2019), since increases in intangible capital account for 30 to 60 percent of the investment shortfall, depending on the exact measurement (Crouzet et al. 2022). Our findings address the remaining investment shortfall not explained by intangibles alone. Throughout this section, we use a measure of aggregate investment from the BEA that already accounts for intangibles. Our adjusted Q therefore captures wedges on both tangible and

We will argue that changes in discount rate wedges can account for a large part of the "missing investment" puzzle. Intuitively, the rising wedges imply that firms have been using increasingly higher discount rates than those assumed by standard Q-theory, which means that firms have been holding back increasingly more investment relative to what Tobin's Q would suggest. To make this point precise, we develop an "adjusted Q," which accurately captures firms' investment demand in the presence of discount rate wedges. Once accounting for the observed rise in discount rate wedges over time, we find that investment is close to the level predicted by the simple adjusted Q-model. This finding suggests that the secular increase in discount rate wedges may account for much of the decoupling between Tobin's Q and investment over this period.

6.1 An Adjusted Q-Model

To assess how much discount rate wedges influence corporate investment, we introduce a modified version of the traditional Q-model. We change the standard Q-model along only one dimension, namely by allowing for wedges between discount rates and the perceived cost of capital. This minimally invasive approach produces an "adjusted Q," which incorporates wedges and which can be compared to the standard Tobin's Q used in the literature on the missing investment puzzle.

In the adjusted Q-model, as in the standard Q-model, the firm chooses optimal investment I_t by maximizing the discounted value of future profits net of investment costs. In the standard Q-model, the firm and financial markets discount the firm's cash flows using the financial cost of capital $1 + r^{\text{fin.}}$. In contrast, in the adjusted Q-model, the firm discounts cash flows using $1 + \delta = 1 + r^{\text{fin.}} + \upsilon + \kappa$ (i.e., adding a cost of capital wedge and a discount rate wedge), whereas financial markets still discount using $1 + r^{\text{fin.}}$. In line with how firms operate in practice, we assume that, at any point in time, firms evaluate cash flows earned

intangible investment.

in different future periods using the same discount rate.[25] The firm's problem is thus:

$$V_0(\upsilon+\kappa, k_t) = \max_{I_t} \quad \sum_{t=0}^{\infty} \frac{\Pi_t(k_t) - I_t - \Phi(I_t, k_t, \xi)}{(1+r^{\text{fin.}}+\upsilon+\kappa)^t} \tag{11}$$

$$\text{s.t.} \qquad k_{t+1} = I_t + (1-\xi)k_t, \tag{12}$$

where $\Pi_t(k_t)$ is profits earned at time t using k_t units of capital, I_t is investment at time t, ξ is the depreciation rate of capital, and $V_t(\upsilon+\kappa, k_t)$ is the discounted value of the firm in the eyes of the manager at time t. The function $\Phi(I_t, k_t, \xi)$ represents adjustment costs, which are quadratic in net investment:

$$\Phi(I_t, k_t, \xi) = \frac{\phi}{2}\left(\frac{I_t}{k_t} - \xi\right)^2 k_t,$$

where $\phi \in \mathbb{R}^+$ governs the magnitude of adjustment costs. Analogously to a standard Q-model, optimal investment is:

$$\frac{I_t}{k_t} - \xi = \frac{1}{\phi}(q_t - 1), \tag{13}$$

where q_t is the Lagrange multiplier that captures the marginal value of capital to the firm:

$$q_t = \frac{1}{(1+\delta)} \frac{\partial V_{t+1}(\upsilon+\kappa, k_{t+1})}{\partial k_{t+1}}.$$

The marginal value of capital q_t is not observed without additional assumptions. The literature usually follows Hayashi (1982) and assumes that the profit function is homogeneous of degree one in k_t. In this case, the marginal value of capital equals the average value of capital, denoted Q_t:

$$q_t = \frac{1}{(1+\delta)} \frac{\partial V_{t+1}(\upsilon+\kappa, k_{t+1})}{\partial k_{t+1}} = \frac{1}{(1+\delta)} \frac{V_{t+1}(\upsilon+\kappa, k_{t+1})}{k_{t+1}} = Q_t. \tag{14}$$

We can thus measure q_t as the value of the firm's capital relative to its replacement value. We emphasize that $V_t(\upsilon+\kappa, k_t)$ is the value in the eyes of the firm and thus calculated using

[25]In theory, if firms expect discount rates to vary in future, they should apply different discount rates to cash flows earned in different future periods. In practice, few, if any, firms do so. To facilitate a precise mapping between the model and the empirically observed discount rates, we therefore follow firms' observed behavior and assume one discount rate.

$r^{\text{fin.}} + \upsilon + \kappa$ as the discount rate. If $\upsilon + \kappa = 0$, such that the firm uses the financial cost of capital as its discount rate, we could estimate Q_t in financial markets using Tobin's Q, denoted by Q_t^{Tobin}. Otherwise, however, one must correct Tobin's Q to obtain the marginal value of capital in the eyes of the firm, as summarized in the following proposition.

Proposition 1 (Adjusted Q) *If the profit and adjustment cost functions are homogeneous of degree one in k_t, the shadow cost of capital on the balanced growth path is:*

$$Q^{\text{Adjusted}} = Q^{\text{Tobin}} \times \frac{1}{(\upsilon + \kappa) \times \text{Dur} + 1}, \tag{15}$$

where Dur is the duration of the firm's future cash flows calculated using $r^{\text{fin.}}$ as the discount rate. See Appendix F for derivations.

If the wedges sum to zero ($\upsilon + \kappa = 0$), we can approximate marginal q using Tobin's Q. Intuitively, when wedges are zero, the firm and financial markets use the same discount rate and therefore agree on the value of the profits produced by the capital. If the sum of the wedges is positive ($\upsilon + \kappa > 0$), we need to adjust Tobin's Q downward to correctly measure the marginal value of capital in the eyes of the firm (Q^{Adjusted}). Intuitively, if the firm uses a higher discount rate than the market, it puts a lower value on the profits produced by the capital than the market. The strength of the adjustment naturally depends on the magnitude of the wedges, but also on the duration of the cash flows. Indeed, it is well known that the impact of the discount rate on the value of an asset depends on the duration of the asset's cash flows, which is calculated as the weighted time to maturity of future cash flows. The longer the duration (i.e., the further into the future the average cash flow is earned), the larger the effect of the discount rate on the value of the asset. For this reason, the effect of wedges increases with duration.

6.2 Adjusted Q Accounts for "Missing Investment"

We can measure adjusted Q, given by equation 15, for the US using our new dataset. We calculate Tobin's Q using data on aggregate market value from the Flow of Funds (in the numerator) and data on tangible plus intangible capital from the BEA (in the denominator). We calculate adjusted Q by inserting the average discount rate wedge (κ) for every year in the adjustment factor.[26] We set the cost of capital wedge (υ) equal to zero for this exercise, so that the results are driven by wedges consciously introduced by managers and not by different perceptions about the financial cost of capital. We calculate that the average duration for listed firms over our sample is 20 years, based on the duration of Compustat firms' outstanding debt and equity (for equity, duration is approximated by the price-earnings ratio).[27]

Figure 9 plots Tobin's Q along with our new adjusted Q. Tobin's Q is well above 1 and rises throughout the sample. Standard Q-theory would therefore predict high and rising investment throughout the sample. In contrast, adjusted Q is closer to 1 and relatively stable. Adjusted Q thus corresponds more closely to the relatively low investment observed during this period.

We assess whether the variation in discount rate wedges and adjusted Q is large enough to account for missing investment. We use the method of Gutiérrez and Philippon (2017). We first estimate the relation between aggregate investment and Tobin's Q in the years 1990 to 2002. We then predict what investment since 2002 would have been if the relation between Tobin's Q and investment had remained constant. The difference between actual investment and predicted investment is "missing investment," the cumulative shortfall in investment since 2002 due to the decoupling between Tobin's Q and observed investment. The line with circle markers in Figure 10 shows that this shortfall reached roughly 20 percent of the capital stock in 2019.

We repeat the exercise using adjusted Q. To estimate the relation between adjusted Q and investment in the pre-2002 sample, we need to measure the discount rate wedge before 2002. We exploit survey data from Poterba and Summers (1995) to estimate the discount rate wedge in 1990 and linearly interpolate between this 1990 estimate and our observed wedge in 2003.[28] The line with square markers shows that the investment shortfall relative

[26] As in Section 4.3, we calculate the average κ in year t as the average of $\tilde{\kappa}$ in year t minus the difference between the average discount rate (15.7) and the average discount rate including all corporate overhead cost (11.5). This adjustment affects the level of adjusted Q but not its evolution over time. For a full discussion of κ and $\tilde{\kappa}$, see Section 3.4.

[27] This method of calculating duration is a liability-based approach, focusing on the duration of the cash flows of outstanding debt and equity. It captures the duration of all future cash flows produced by the firm. When we use time-varying price-earnings ratios to calculate duration separately for every year, the divergence between adjusted and Tobin's Q shown in Figures 9 and 10 becomes even more pronounced.

[28] Poterba and Summers report an average real discount rate of $\tilde{\delta}^{\text{real}} = 12.2$ percent in 1990, which is approximately 1.8 percentage points lower than the real discount rate we observe in 2003. Poterba and Summers report division-level discount rates, which mostly do not account for overhead. We further estimate that the real financial cost of capital fell by approximately 0.5 percentage points between 1990 and 2003. Taken together, these estimates suggest that the wedge in 1990 was 2.3 percentage points lower than in 2003

to adjusted Q is relatively small throughout. It is also not statistically different from zero, as shown by the coefficient on the post-2002 indicator in Table A8. Hence, the secular investment trend observed since 2002 is consistent with the evolution of adjusted Q but not with Tobin's Q. In the same vein, Figure 11 shows that adjusted Q tracks the US net investment rate since 1990 relatively well, whereas Tobin's Q diverges after 2002.

The view that discount rate wedges have contributed to missing investment finds further support in the firm-level data. The estimate in Table A9 implies that a firm that has increased its discount rate wedge by more, relative to other firms, has experienced a stronger increase in its Tobin's Q. This finding suggests that firms with rising discount rate wedges have disproportionately contributed to the rise in aggregate Tobin's Q.

The results allow us to evaluate competing explanations for the missing investment. One potential explanation is that the marginal profitability of capital has decreased, so that firms have invested less because there are fewer profitable opportunities (Gordon 2018). An alternative explanation is that the gaps between required returns and the perceived cost of capital (i.e., discount rate wedges) have increased, so that firms have not seized existing opportunities that promise returns greater than the perceived cost of capital. Changes in marginal profitability and discount rate wedges are typically not directly observed, so it has been difficult to separate the explanations. Our new data reveal that discount rate wedges are sufficient to account for most of missing investment. In this sense, one may not need a large decrease in marginal profitability to explain low investment.

Taken together, the analysis suggests that the increase in discount rate wedges is large enough to account for a large part of missing investment in the 21$^{\text{st}}$ century. Understanding why discount rate wedges exist and why they have expanded in recent times is therefore likely to be fruitful for our understanding of the seemingly low investment in recent years. We study drivers of wedges in Sections 7 and 8.

The results on the discount rate wedge also contribute to the debate on whether changing rents or risk premia can explain the falling labor share in national income (Karabarbounis and Neiman 2014, 2019, Rognlie 2019). Growing discount rate wedges imply that firms are gaining rents, which suggests that the falling labor share is, at least in part, driven by rising rents. In contrast, firms perceive that their cost of capital has gone down, which supports the view that changes in risk premia have not fully offset decreases in risk-free rates.

(where we observe $\kappa = 3.2$ percent). Our calculations thus assume that the overhead fraction in reported discount rates (o) has been constant over time. Consistent with low discount rate wedges around 1990, Summers (1986) documents an average real discount rate of 10 percent in 1986.

6.3 Wedges Lower the Sensitivity of Investment to the Financial Cost of Capital

Going beyond the missing investment puzzle and factor shares, the behavior of discount rate wedges generally affects the sensitivity of investment to the financial cost of capital in standard models. This investment sensitivity matters for the real effects of a range of financial shocks in standard models (e.g., shocks to monetary policy, credit supply, asset prices, etc.). It also plays an important role in the calibration of macroeconomic models (e.g., see discussions in Koby and Wolf 2020 and Reis 2022).

We study how wedges impact the investment sensitivity in the model of adjusted Q. The effect of the financial cost of capital on net investment is:

$$\frac{\partial\left(\frac{I_t}{k_t}-\xi\right)}{\partial r^{\text{fin.}}}=\frac{\partial\delta}{\partial r^{\text{fin.}}}\times\frac{\partial\left(\frac{I_t}{k_t}-\xi\right)}{\partial\delta}=\frac{\partial\delta}{\partial r^{\text{fin.}}}\times\frac{-1}{\phi}\times\frac{\text{Dur}(1+\phi r^{\text{fin.}})-\phi}{1+\text{Dur}(\kappa+\upsilon)}. \tag{16}$$

The derivation of the second step is in Appendix F.3.

Two channels dampen the investment sensitivity when wedges are positive: a partial transmission channel and a duration channel. First, the partial transmission channel operates through the ratio $\frac{\partial\delta}{\partial r^{\text{fin.}}}$, which measures how strongly firms transmit changes in the financial cost of capital into discount rates. As documented in Section 4, this transmission ratio is substantially smaller than 1 in the short and medium run, leading to a reduction in the investment sensitivity.

Second, to understand the duration channel, assume (counterfactually) that firms transmit changes in the financial cost of capital one-to-one into discount rates $\left(\text{i.e., } \frac{\partial\delta}{\partial r^{\text{fin.}}}=1\right)$. In this case, higher wedges would still affect the investment sensitivity because greater wedges mechanically reduce the duration of firms' cash flows. In turn, a shorter duration lowers the sensitivity of investment to movements in discount rates (and thus in the financial cost of capital) because discount rates are generally less important for cash flows with short duration. As a result, the duration channel further lowers the investment sensitivity.

We quantify how these two channels affect the sensitivity of investment to the financial cost of capital using our new data. We begin with a baseline case assuming the standard calibration of Philippon (2009), zero wedges, and perfect transmission (see Appendix F.3). The sensitivity in the baseline case is -2. To incorporate the duration channel, we allow for positive wedges but (counterfactually) assume that transmission is perfect (i.e., $\frac{\partial\delta}{\partial r^{\text{fin.}}}=1$). We set the wedges equal to 6 percentage points, the difference between the average discount rate and an average financial cost of capital of 5.5 percent. This changes the sensitivity to -1.

Next, we additionally incorporate imperfect transmission by considering the transmission estimates in Figure 4. Over periods below two years, discount rates do not significantly respond to the cost of capital, suggesting that $\frac{\partial \delta}{\partial r^{\text{fin.}}}$ is close to 0 and thus the sensitivity is close to 0. Over periods between 3 and 4 years, the transmission $\frac{\partial \delta}{\partial r^{\text{fin.}}}$ is close to 0.25, implying that the sensitivity is around 0.25. Even for longer periods between 7 to 11 years, the sensitivity is only around 0.5.[29] In sum, the behavior of wedges over time strongly lowers the investment sensitivity, particularly in the short run.

7 Cross-Sectional Drivers of Discount Rate Wedges

The final two sections of the paper explore drivers of discount rate wedges. In this section, we describe theoretical mechanisms that could generate non-zero discount rate wedges and that motivate our empirical analysis: managerial beliefs about investor preferences combined with market power; risk; and financial constraints. We find that market power, risk, and financial constraints are all associated with greater wedges in the cross-section of firms. In the subsequent Section 8, we will study how these characteristics shape the evolution of wedges over time.

7.1 Managerial Beliefs and Market Power

Managers may introduce discount rate wedges because they believe that investors prefer high and stable discount rates, even when the cost of capital is falling. A key principle of modern management is that firms should be disciplined in their capital allocation and ensure that new investments contribute to shareholder value (Jensen 1986). By maintaining high and relatively stable discount rates, managers ensure that they are prudent and conservative in their capital allocation and that they only engage in projects that generate substantial "economic value added."[30]

We systematically categorize all statements on conference calls where managers justify either why their discount rate is above the perceived cost of capital or why they did not lower

[29] If we additionally incorporated a transmission from the financial to the perceived cost of capital slightly below 1, as suggested by Table 3, the sensitivity would be even lower.

[30] Economic value added is a performance metric commonly used in practice. It is calculated as the difference between the expected return and cost of capital for a project, multiplied by the size of the investment.

their discount rate with the perceived cost of capital. We find that 59 percent of firms argue that wedges and stable discount rates are beneficial because they lead to value creation.[31] The following quotes exemplify managerial beliefs.

Lincoln National Corporation, Fred Crawford, CFO, Q3-2009: *"As a matter of being conservative in our approach, we've been hiking up those discount rates quite considerably."*

Ball Corporation, Scott Morrison, CFO, Q3-2015: *"We haven't changed the 9 percent [discount rate]. It's been 9 percent for a long time. In fact, sometimes we get the question, because our weighted average cost of capital is less than 6 percent now, so people have said: Well, why don't you lower the hurdle rate? And we look at this over the long term. On the correlation of value creation, the investors actually start getting paid when we get returns greater than our weighted average cost of capital."*

Introducing wedges may still come at a cost to profitability. Positive wedges imply that firms require a marginal return to capital above the marginal cost of capital. As a result, firms with wedges violate the Lerner condition, leading to subpar output and profits. This violation of the Lerner condition may be less costly for firms with relatively more market power for two reasons. For one, firms with more market power may face less scrutiny when they make subpar investment decisions because they are unlikely to go bankrupt even when they do not optimize at the margin. This intuition is consistent with previous work arguing that firms with market power can more easily afford to make suboptimal decisions (e.g., Holmes and Schmitz Jr. 2010). In addition, firms with more market power face more inelastic demand curves and therefore have to reduce output and profits by less to obtain an equivalent increase in their marginal return (i.e., their discount rate).

Taken together, firms with more market power may therefore choose greater discount rate wedges. In the cross section, we indeed find that firms with higher market power have significantly greater discount rates and wedges, as reported in Table A10. Our baseline measure of market power uses the accounting approach in Baqaee and Farhi (2020), but we find similar results using the user-cost approach and the De Loecker et al. (2020) measure.[32]

[31] The total number of relevant calls (where managers explicitly explain why their wedge is positive or why their discount rate is stable) is 123. The second most common explanation after the buffer is risk and uncertainty, discussed below, with 33 percent.

[32] We always average characteristics over the period 2000 to 2002 to be consistent with the analysis in Section 8, where using averages over this fixed period eases concerns about reverse causality. Characteristics

7.2 Idiosyncratic Firm Risk

Firms may introduce discount rate wedges to reflect firm-specific risk. A firm's cost of capital already captures the compensation for risk required by investors. However, there are a number of reasons why firms might incorporate risk into their discount rates over and above their perceived cost of capital. First, real option theory shows that when investment projects are risky and (fully or partially) irreversible, the optimal investment decision depends on the uncertainty of the cash flows (Abel 1983, Ingersoll Jr. and Ross 1992, Dixit and Pindyck 1994). The more uncertainty, the longer the firm should postpone investing. While in theory the optimal investment decision uses the financial cost of capital as discount rate, a firm can approximate optimal behavior by increasing its wedge in the face of uncertainty (McDonald 2000). To the extent that firms adopt such approximations, firms with more uncertain projects have higher wedges in the cross section.

Second, if a firm's new projects are systematically riskier than its current projects, the firm should use positive discount rate wedges when evaluating new projects. Third, if equity is mispriced, managers may want to adjust discount rates by incorporating corrected risk factors (Stein 1996). Finally, if certain investors are imperfectly diversified, it may be in their interest that the firm uses high discount rate wedges.

The 2020 Association of Finance Professionals Survey finds that close to half of respondents increase discount rates in the face of increased risk. Similarly, 33 percent of managers who justified a positive discount rate wedge on their conference call argue that a positive discount rate wedge is needed to account for risk. The following quote gives an example of such behavior:

Halyard Health Inc., Steve Voskuil, CFO, Q4-2016: *"So that's kind of how we come to the 9 percent [discount rate]. We start with the capital markets' rates and look at our capital structure, and then we add a little bit to that to reflect risk in the portfolio and execution."*

In Table A10, we find that firm-level risk, measured using the one-year option-implied equity volatility, is associated with significantly greater discount rates and wedges. The result is consistent with recent cross-sectional findings by Décaire (2024) and Barry et al. (2024).

are relatively persistent over time, as shown in Appendix G, so this choice is not consequential.

7.3 Financial Constraints

Firms facing financial constraints may maintain discount rate wedges because conventional measures of the cost of capital do not incorporate discontinuous financial constraints. Firms typically calculate their perceived cost of capital as the weighted average cost of debt and cost of equity (WACC), which is estimated using expected returns on the firm's existing outstanding liabilities. This calculation of the cost of capital does not capture changes in financing costs that would apply to future increases in liabilities. In particular, the perceived cost of capital reported on calls does not incorporate any discontinuous borrowing limits or other types of hard financing constraints. Firms may thus raise their discount rates if they are currently facing such constraints or expect to face them in future (see also Jagannathan et al. 2016). The following quote from a firm whose discount rate exceeds its cost of capital illustrates how financial constraints can affect discount rates:

Kinder Morgan, Kim Dang, CFO, Q4-2016: *"We are living within our cash flow, meaning that we want to be able to fund our CapEx and our dividend from our cash flow. And so that is the constraint, and so, because we have a limited amount of capital, that is why we have the hurdle rate set at 15 percent IRR for projects."*

Indeed, firms facing greater financial constraints according to the index by Hadlock and Pierce (2010) maintain significantly higher discount rates and wedges, as shown in Table A10.

8 Accounting for Changes in Discount Rate Wedges

We turn to empirically exploring the drivers of time variation in discount rate wedges. We find that the increase in wedges since 2002 was driven by firms with high market power. We also find that fluctuations in risk are associated with increases in wedges.

8.1 The Secular Increase in Wedges and Market Power

Figure 12 plots the time series of discount rates for firms with high and low market power (as three-year moving averages normalized to zero in 2002). We split the sample based on firms' average market power between 2000 and 2002 according to the accounting approach.[33] Discount rates of firms with high market power have been relatively stable since 2002, even though the perceived cost of capital has trended downward over this period. In contrast, discount rates of firms with low market power have fallen.

We test these dynamics formally in Table 6. We regress firm-level discount rates and wedges on a series of interaction terms. We include firm fixed effects so the results are driven by within-firm variation in discount rates and wedges over time. We first interact market power with a time trend. The results show that firms with higher initial market power (averaged over 2000-2002) increased their discount rate (column 1) and their wedges (columns 4 and 7) by significantly more between 2002 and 2021. The point estimate implies that a standard deviation increase in market power is associated with a 1.8 percentage point increase in the discount rate wedge over the sample (coefficient of 0.094*19 years). Similarly, we find that firms with higher market power reacted significantly less to changes in the average perceived cost of capital in the country (columns 2, 5, and 8). The interaction of market power with the predicted firm-level perceived cost of capital also supports this conclusion, although estimates are less precise because of the estimated cost of capital (columns 3, 6, and 9). In Tables A11 and A12, we find similar results when we measure market power with the user-cost approach and the De Loecker et al. (2020) measure. In contrast, we find no clear evidence that riskier or financially constrained firms changed their discount rates by more in Tables A13 and A14.

In Table A15, we find that firms with high market power have also invested less than other firms since 2002. The result supports the view that firms with greater initial market power have disproportionately contributed to the missing investment phenomenon. The finding is distinct from the well-known relation that greater market power lowers investment because we document a relation between cross-sectional variation in market power and future changes in investment.

Taken together, the results suggest that market power has limited the extent to which firms have incorporated the secular decline in the cost of capital into their discount rates. The results are consistent with the view that managers prefer stable discount rates because they convey prudence to investors and that firms with market power can afford to maintain stable discount rates because they face less competitive pressure, as we outline in Section 7.1.

[33] We generally use the 2000-02 averages of characteristics because using this fixed period eases concerns about reverse causality. In Appendix G, we show that the characteristics are relatively persistent over time.

We do not find evidence that other prominent secular shocks over the sample period can explain the results. In particular, communication firms (which include search engines and social media firms) were affected by technological change, health care firms by government intervention, and utilities firms by new energy technologies and regulation. However, in columns 1 to 3 of Table A16, we estimate similar trends on market power when we exclude these industries from the sample. We also explore whether firms with market power were affected differently by the rise in intangible investment over the sample period. In columns 4 to 6 of Table A16, we interact market power (averaged over 2000-2002) with the time-varying firm-level ratio of intangible to tangible investment and we also control for this ratio. We find stable coefficients on market power and small, insignificant coefficients on the interaction. These results show that market power was associated with discount rates and investment through a distinct channel from intangibles.

We consider whether changes in discount rates reported on conference calls reflect not just changes in required returns but also—in contrast to standard theory—changes in expected cash flows. This consideration would in principle be consistent with the fact that firms with greater market power, whose cash flows are often higher, report larger discount rates. However, the negative relation between changes in discount rates and investment as well as the weak and insignificant association between changes in discount rates and analyst cash flow forecasts, both documented in Section 5, are more consistent with the view that discount rates capture required returns. Further supporting the required return interpretation, firms with higher discount rates report higher realized project returns, as shown in Section 3.5.[34]

8.2 Fluctuations in Wedges and Risk

Real options theories predict that increases in firm-level risk raise discount rate wedges by more for firms with more irreversible investment projects, as explained in Section 7.2. We test this prediction by regressing discount rates and wedges on the interaction of option-implied volatility and asset irreversibility, conditional on firm fixed effects. We measure irreversibility using the index by Kim and Kung (2017), averaged at the firm level over the sample period. In Table 7, we find that changes in risk affect discount rates and wedges of firms with high irreversibility more strongly. The results support the view that time variation in risk can lead to time variation in wedges through the real options channel.

[34] The discount rate-investment, discount rate-cash flow forecast, and discount rate-realized return relations are similar for firms with above-median market power and for the full sample, suggesting that discount rates are also required returns for firms with high market power.

Standard measures of risk have fluctuated significantly in recent years. For instance, aggregate option-implied volatility, the probability of a rare disaster (Martin 2017), policy uncertainty (Baker et al. 2016), and political risk (Hassan et al. 2019) increased before and during the financial crisis of 2008 and fell thereafter. These factors may thus have contributed to an increase in discount rate wedges around 2008.

In addition, the indices reflecting policy uncertainty and political risk have generally increased after 2010. This pattern suggests that managers have perceived greater risk for their firms, which may have contributed to high discount rate wedges since 2010. This channel is distinct from increasing financial risk premia (Farhi and Gourio 2018). Risk premia influence discount rates through the financial cost of capital, whereas in our analysis, risk generates a distinct impact on discount rates through the wedges chosen by managers.

9 Conclusion

This paper presents a new dataset on firms' discount rates and perceived cost of capital, augmented with measures of the financial cost of capital and investment.

We use the new data to assess whether firms follow the stylized view and move discount rates with the cost of capital. We find that firms incorporate changes in financial prices into their perceived cost of capital. Discount rates do not move with the perceived cost of capital in the short run, although there is a strong long-run association between discount rates and the cost of capital. This pattern leads to large and time-varying wedges between discount rates and the perceived cost of capital. We show that changes in discount rate wedges, measured using the conference calls, predict future changes in investment at the firm level.

The average US firm in our sample has increased its discount rate wedge by 2.5 percentage points between 2002 and 2021. The rising wedge implies that firms have invested substantially less relative to what we would expect given the secular decline in the perceived cost of capital since 2002. Using an adjusted Q-model, we show that the increase in the average wedge is large enough to account for the low levels of aggregate US investment (relative to financial prices) in recent decades. Moreover, we show that the medium-run sensitivity of investment with respect to the financial cost of capital falls by a factor of ten once one accounts for discount rate wedges in an otherwise standard Q-model.

We explore the motivations behind the secular increase in discount rate wedges. On the conference calls, many managers argue that increasing wedges convey prudence to investors, especially when the cost of capital is falling. In the data, firms with high market power in

2002 have been chiefly responsible for the secular increase in wedges since 2002, suggesting that weak competition makes it less costly for firms to raise their wedges.

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Figure 1
Histograms of Discount Rates and the Perceived Cost of Capital

Panel A plots a histogram of discount rates (in percent) using all firm-quarter observations with observed discount rates. The sample runs from 2002 to 2021. The right-most bar combines all observations greater than 35 percent. Panel B plots the corresponding histogram for the perceived cost of capital.

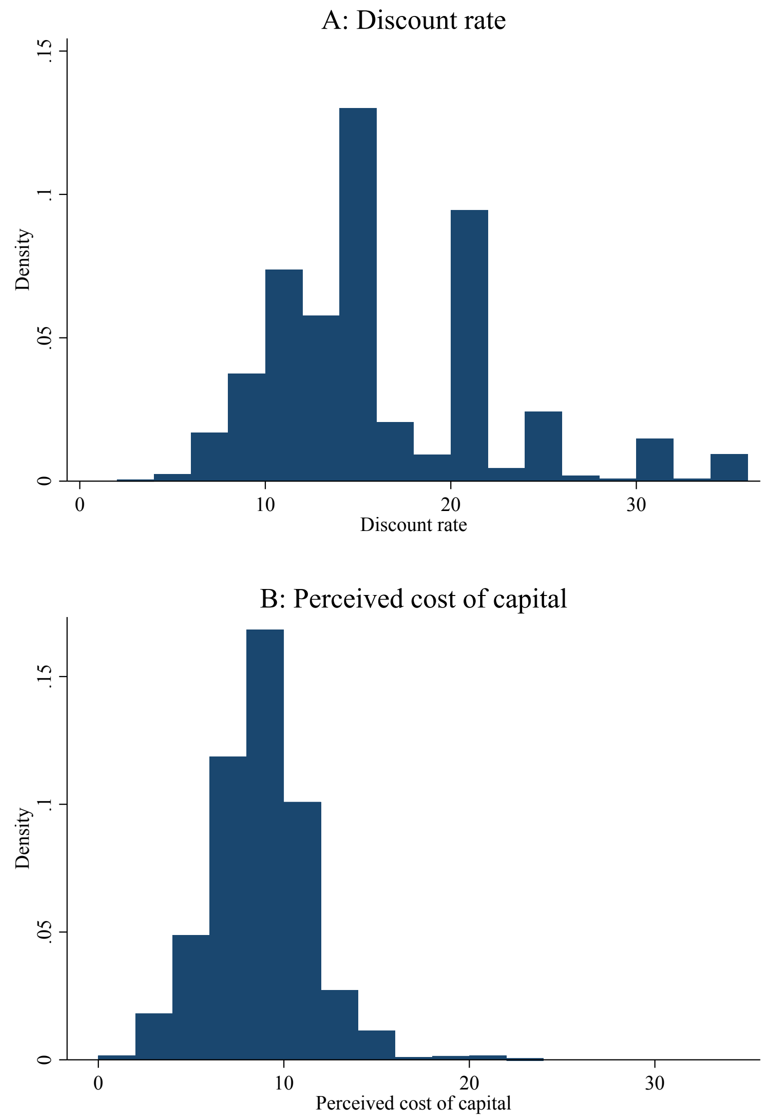

Figure 2
The Time Series of Corporate Discount Rates

The figure plots the raw average discount rate, perceived cost of capital, and perceived cost of debt by year for US firms. The variables are in percent and measured using conference calls.

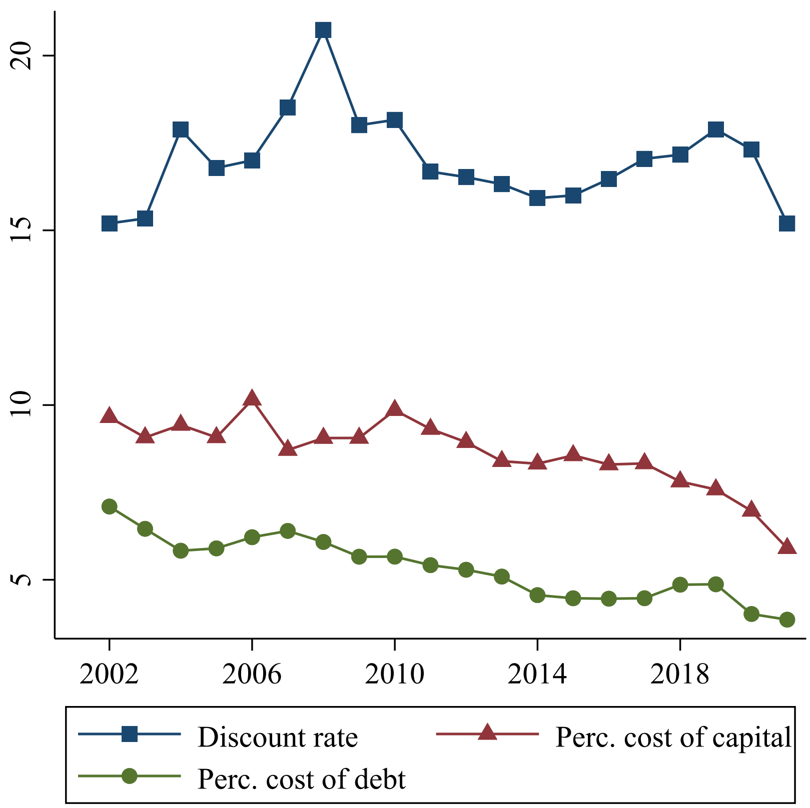

Figure 3
Time Variation in the Perceived Cost of Equity

Panel A plots the average perceived cost of equity (measured using conference calls) and expected stock returns by year (measured using asset prices). We estimate the average perceived cost of equity in each year using a firm-year panel that includes firm fixed effects. The figure adds in the unconditional mean and plots three-year moving averages. Two measures of expected stock returns are based on the earnings yield, one assuming a real growth of 2 percent ("earnings yield") and the other a real growth of 4 percent ("earnings yield (high growth)"). The "constant risk premium" measure is the risk-free rate plus a long-run market risk premium of 6 percent, as is often taught to MBA students (Cochrane 2011). Panel B plots the perceived cost of equity in excess of the risk-free interest rate and the three measures of expected stock returns in excess of the risk-free interest rate.

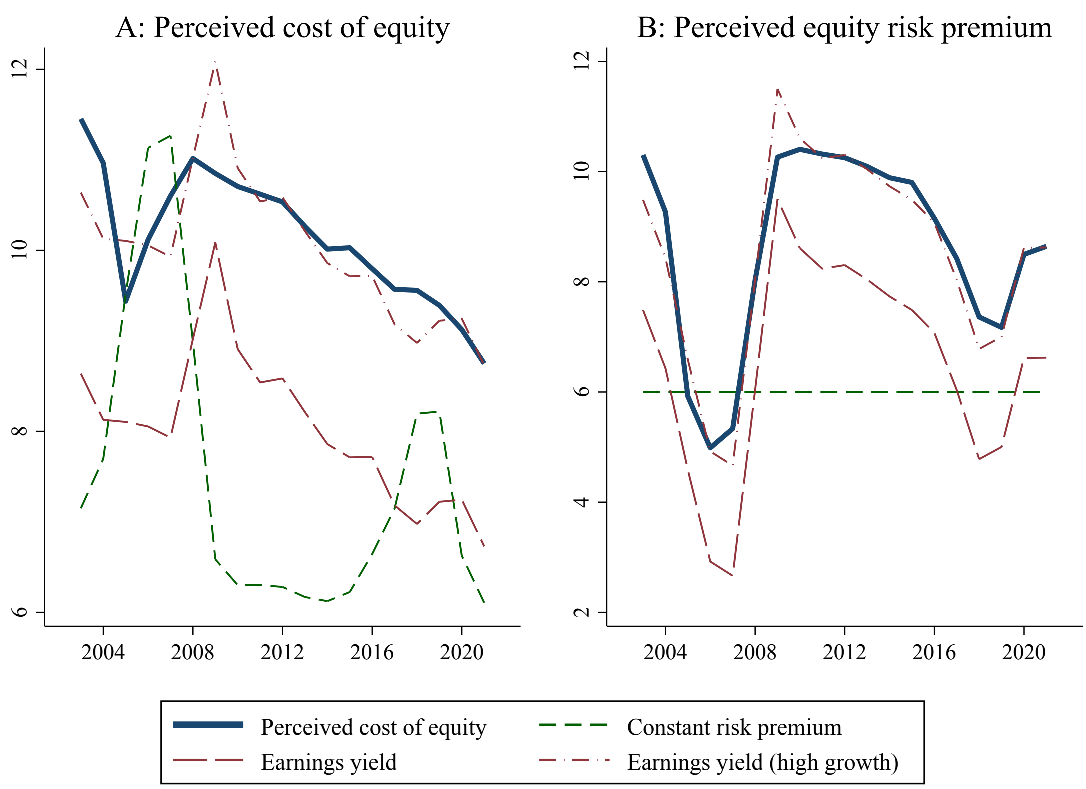

Figure 4
The Transmission from the Cost of Capital to Discount Rates Over Time

The coefficients are estimated by regressing the average yearly within-firm change in the discount rate on the average yearly within-firm change in the predicted cost of capital over the same period. We interact the change in the cost of capital with indicators for the number of years between the observations. We plot the coefficients on the interactions. The regression sample contains all within-firm changes in discount rates observed in our dataset (i.e., all differences between different discount rate observations of the same firm). The vertical lines measure 90 percent confidence intervals. Standard errors are clustered by firm and quarter of the later observation.

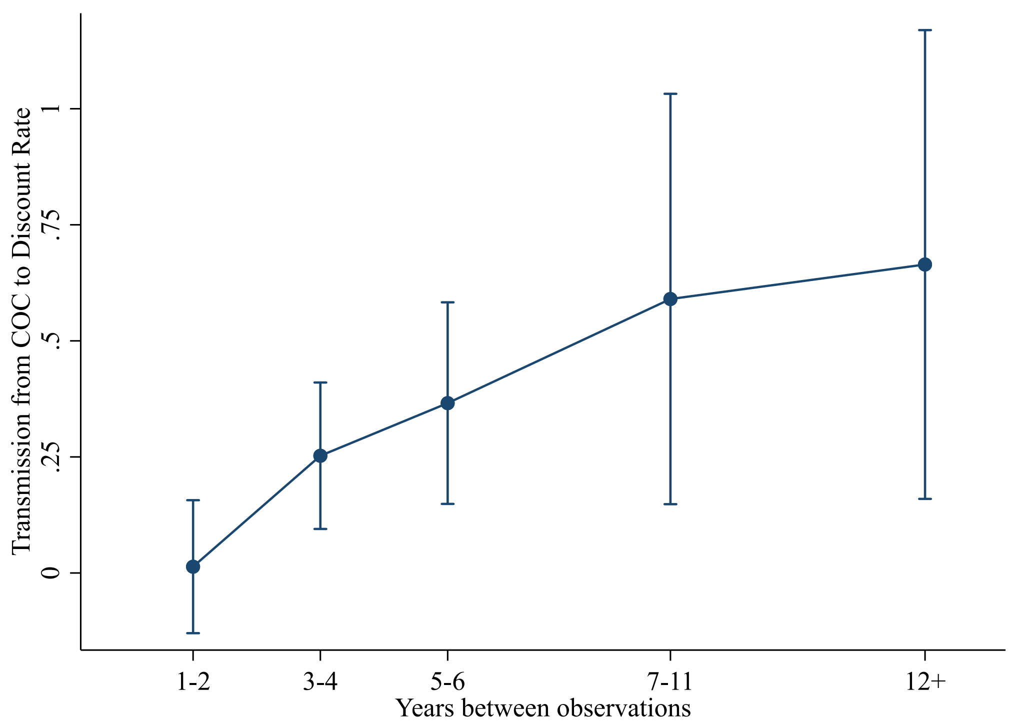

Figure 5
The Share of Different Discount Rates and Perceived Costs of Capital

The coefficients with circle markers are estimated by regressing an indicator for whether a firm has a different discount rate between two observations on indicators for the number of years between the two observations. The first coefficient implies that 17 percent of discount rates are different for observations that are at most two years apart. The second coefficient implies that 33 percent of discount rates are different for observations that are more than two years and at most four years apart. The regression sample contains all within-firm changes in discount rates observed in our dataset (i.e., all differences between different discount rate observations of the same firm). The coefficients with square markers use an indicator for whether a firm has a different perceived cost of capital between two observations. The vertical lines measure 90 percent confidence intervals. Standard errors are clustered by firm and quarter of the later observation.

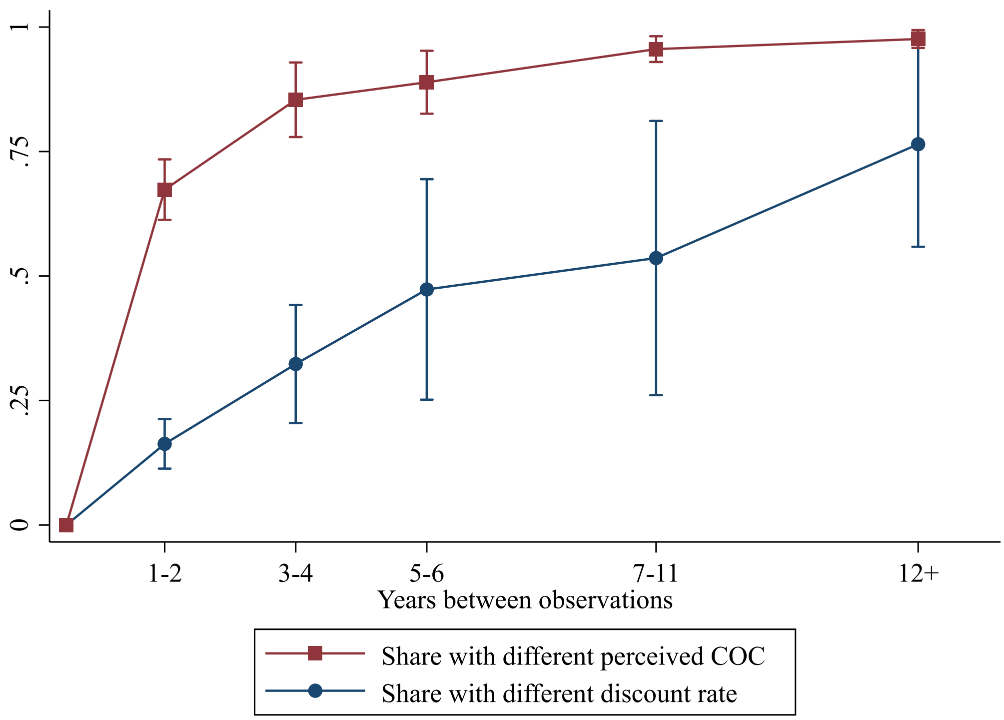

Figure 6
The Discount Rate Wedge in the US

The figure plots the average discount rate wedge κ (difference between discount rate and perceived cost of capital) for US firms in percentage points. To construct the average wedge, we isolate variation over time in discount rates by controlling for time-invariant differences across firms. Specifically, we regress the firm discount rate, as reported on a conference call, on year and firm fixed effects (using the full sample of 1,210 US discount rate observations). We measure the average "within-firm" discount rate in every year by adding the estimated year fixed effect to the unconditional mean. We follow an analogous procedure to create the average "within-firm" perceived cost of capital in every year (using the full sample of 1,240 US perceived cost of capital observations). We correct for the fact that some discount rates do not fully account for overhead by subtracting the difference between the average reported discount rate (15.7) and the average discount rate including all corporate overhead cost (11.5) from the within-firm discount rate series. This final adjustment affects the level of the average discount rate but not its evolution over time. The difference between the corrected within-firm discount rate and the within-firm cost of capital is the average within-firm discount rate wedge. We plot a three-year moving average of this average discount rate wedge.

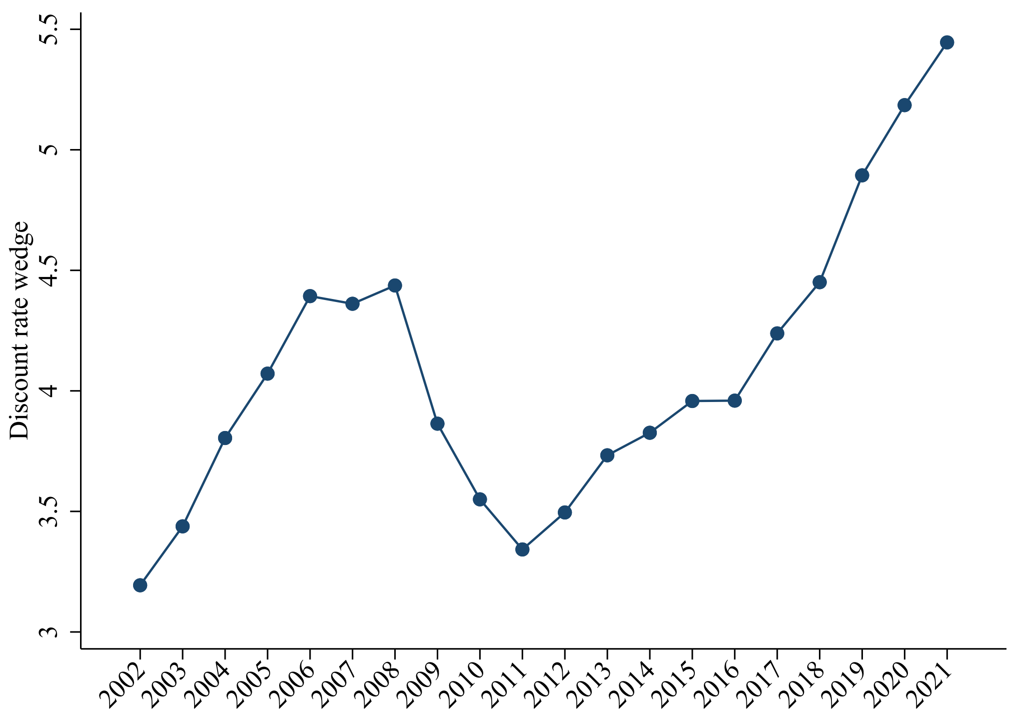

Figure 7
Discount Rates and Investment in the US

The figure plots the time series of the average discount rate and aggregate net investment rate in the US. Discount rates are in percent and measured using conference calls. The net investment rate is from the BEA, in percent of the capital stock at the start of the year, and measured one year ahead relative to discount rates and the year on the axis.

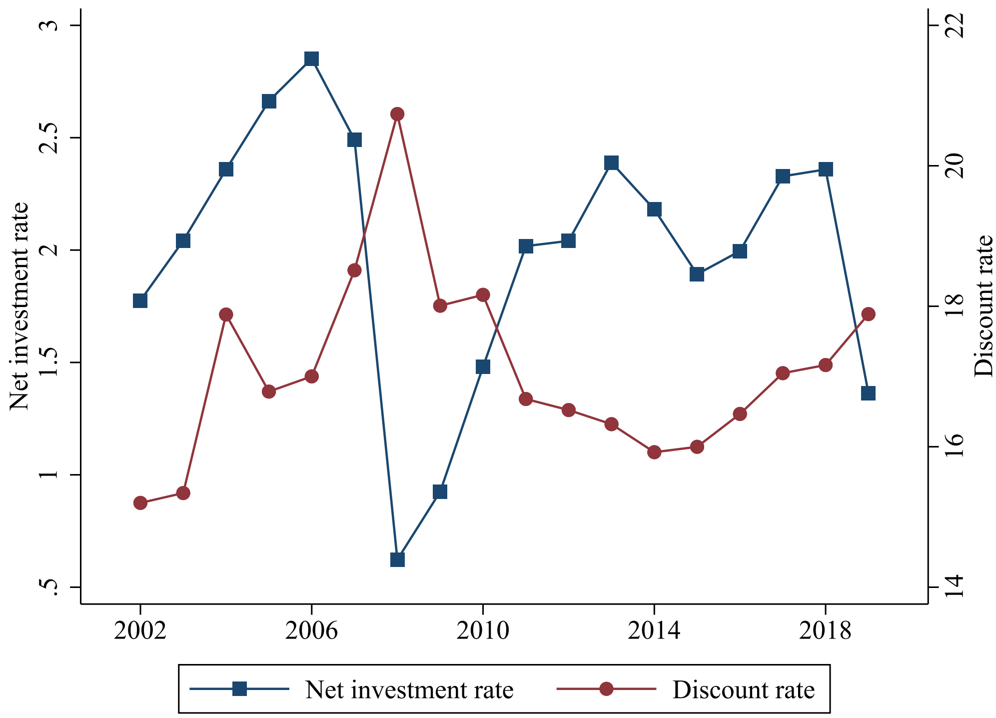

Figure 8
The Response of Investment to Discount Rates Across Firm Types

The figure plots the relation between investment and discount rates for different subsamples of firms. The subsamples are defined by splitting the sample at the sample median of the characteristic given on the horizontal axis. Bankruptcy risk is measured using the Z-score. Market power is measured using the accounting method in Baqaee and Farhi (2020). Risk is measured using option-implied volatility of equity. Financial constraints are measured using the index by Hadlock and Pierce (2010). Size is measured using market value. Each plotted coefficient is based on a separate regression. The specifications are identical to column 2 of Table 5. The square measures the magnitude of the coefficient on the discount rate. The vertical lines measure 90 percent confidence intervals. Standard errors are clustered by firm and quarter.

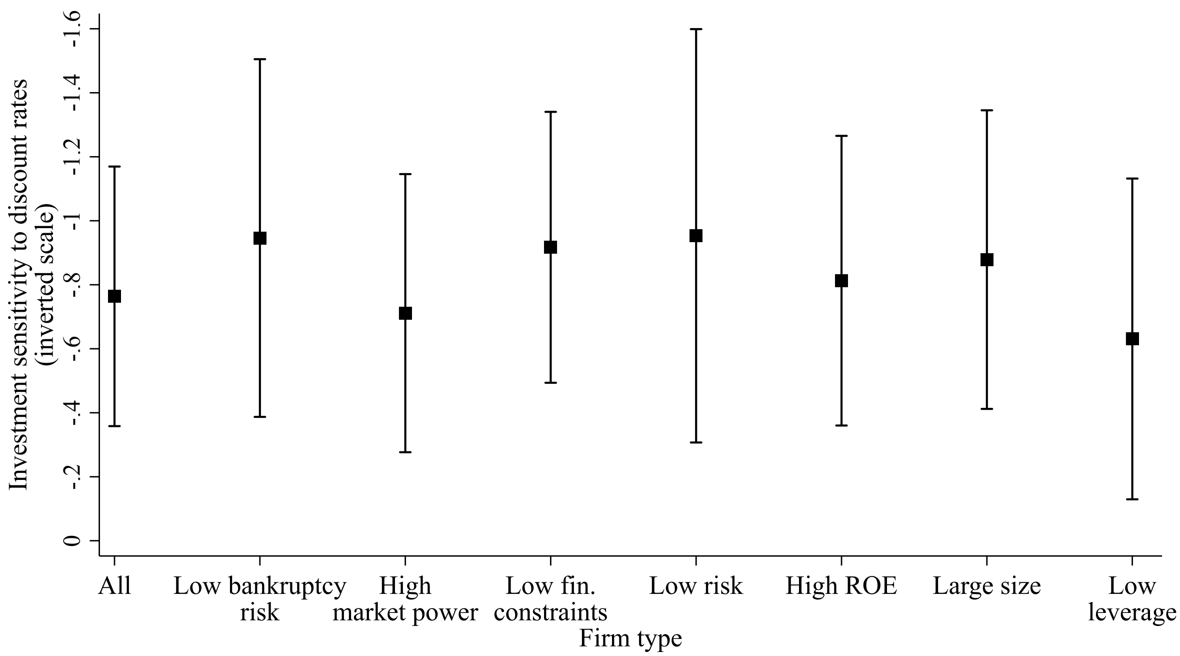

Figure 9
Adjusted Q

The figure plots Tobin's Q and adjusted Q. We calculate Tobin's Q using data on market value from the Flow of Funds (in the numerator) and data on tangible plus intangible capital from the BEA (in the denominator). Adjusted Q is calculated by adjusting Tobin's Q for the average wedge between discount rates and the perceived cost of capital, as explained in the text.

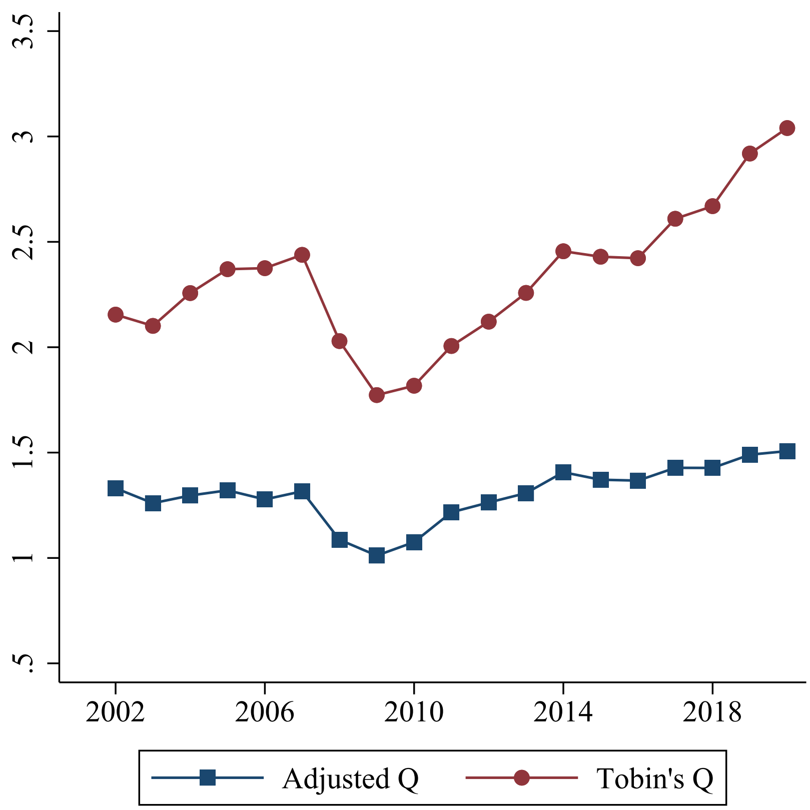

Figure 10
Adjusted Q and Missing Investment

The figure plots the cumulative investment shortfall in the US in percent of the capital stock. We separately estimate the investment shortfall implied by Tobin's Q and by adjusted Q. We calculate Tobin's Q using data on market value from the Flow of Funds (in the numerator) and data on tangible plus intangible capital from the BEA (in the denominator). Adjusted Q is calculated by correcting Tobin's Q for the wedge between discount rates and the perceived cost of capital, as explained in the text. We estimate the relation between investment and Q using data for 1990-2002, separately for each type of Q. For the years after 2002, we then calculate cumulative residuals between observed investment and the values predicted by the 1990-2002 data. The pre-2002 adjusted Q is based on backwards extrapolated discount rate wedges (see text for details). 95 percent confidence intervals (shaded region) are calculated using Newey-West standard errors adjusted for 5 lags. Investment is aggregate US investment from the BEA, which includes intangibles.

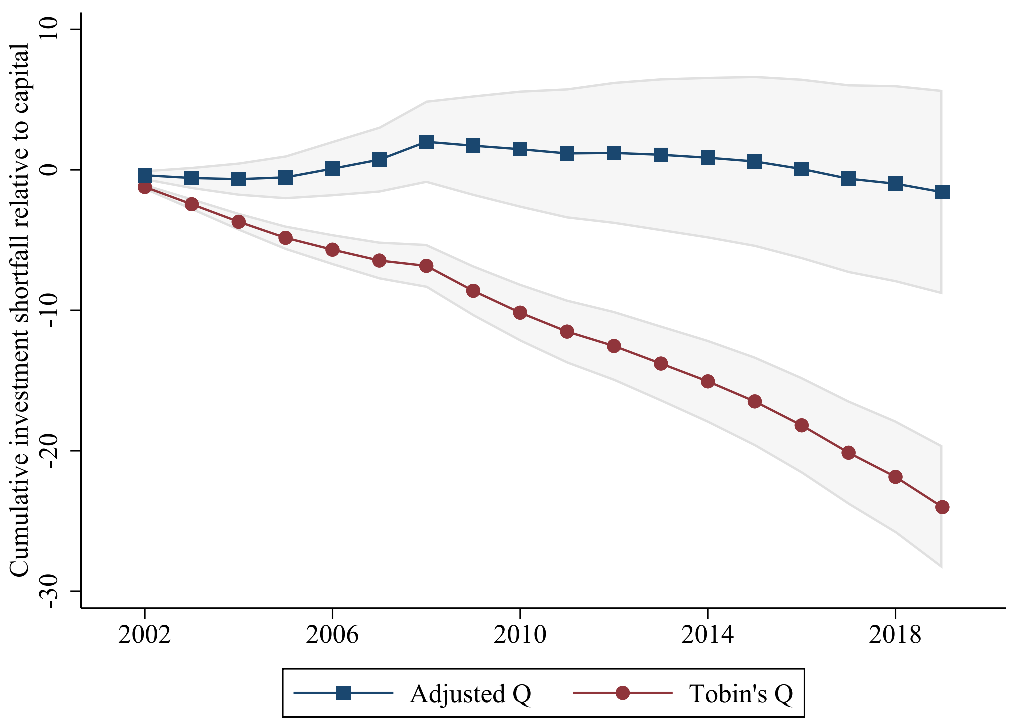

Figure 11
Tobin's Q, Adjusted Q, and Net Investment

The figure plots Tobin's Q and adjusted Q along with the net investment rate. The construction of adjusted Q is described in the text. The net investment rate is from the BEA and in percent of the capital stock at the start of the year. The sample runs from 1990 to 2021.

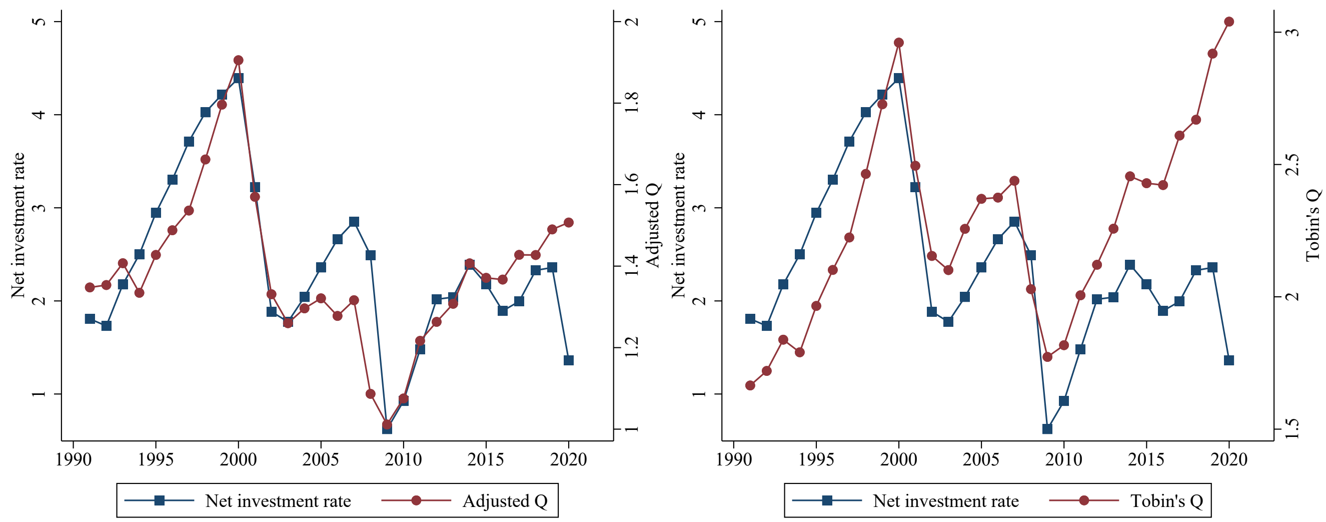

Figure 12
Market Power and the Secular Evolution of Discount Rates

The figure plots the average discount rate for high- and low-markup firms over time. We group firms into high- and low-markup firms based on the average markup of the firm between 2000 and 2002. Markups are measured using the accounting method following Baqaee and Farhi (2020). For each group, we estimate the average annual discount rate in panel regressions that include firm fixed effects. We plot a three-year moving average of the resulting time series for discount rates and subtract the 2002 value from both series, so that they start at zero.

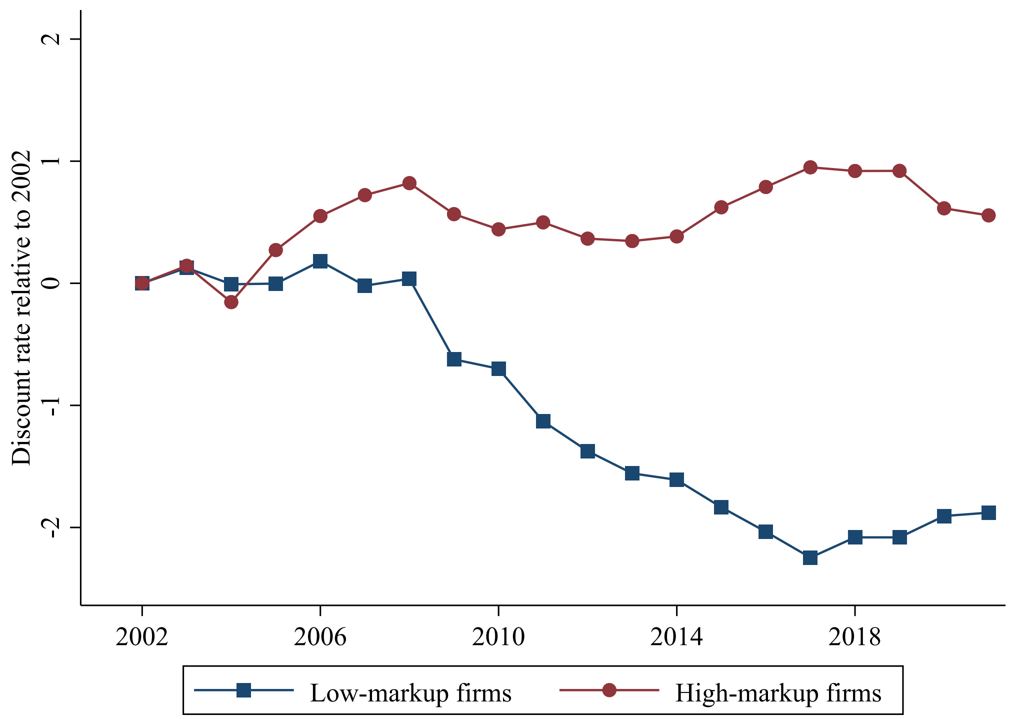

Table 1
Summary Statistics

Panel A reports summary statistics for the new dataset at the firm-quarter level. For the variables based on manual reading of conference calls (discount rate, perceived cost of capital, perceived cost of debt, perceived cost of equity), we report statistics for all firm-quarter observations that we can observe in the conference calls. For market value and the return on equity, we report statistics (from Compustat) for all firm-quarter observations where we observe at least one discount rate, perceived cost of capital, perceived cost of debt, or perceived cost of equity in the conference calls. Panel B reports different measures of firm returns over the period 2002 to 2021. The discount rates are averages over the full conference call sample (column "raw average") and over the observations where firms include all corporate overhead costs in their cash flows, as opposed to adjusting their discount rates (column "without overhead adjustment"). The remaining columns report value-weighted averages for US firms from Compustat. ROA is return on total assets, defined as [earnings before interest] over [total assets]. ROIC is return on invested capital, the balance sheet analogue to the average rate of return on investment projects. We define it as [earnings before interest] over [long-term book debt plus book equity minus cash minus financial investments]. All variables are in percent, except for market value.

Panel A: Statistics from the dataset based on conference calls

	mean	p5	p95	N obs.	N firms
Discount rate	15.7	8	27.5	2,728	1,284
Perceived cost of capital	8.43	4	12.8	2,673	1,303
Perceived cost of debt	4.75	1.80	8.50	4,812	1,363
Perceived cost of equity	10.1	5	15	363	227
Market value (million USD)	13,446	342	51,812	6,168	1,815
Return on equity	10	-6.5	28	5,569	1,756

Panel B: Comparing discount rates to realized returns

	Discount rates		Compustat returns	
	Raw average	Without overhead adjustment	ROIC	ROA
Average	15.7	11.5	13.5	5.4

Table 2
Representativeness

Panel A reports characteristics of firms for three samples: firms for which we observe at least one discount rate; at least one perceived cost of capital; and at least one perceived cost of equity or debt. Characteristics are measured in percentile ranks relative to the universe of firms in Compustat in the same year and same country of listing. A mean value close to 50 indicates that the average rank of firms in our dataset is close to the average rank of firms in the Compustat year-country population. Financial constraints are measured using the index by Hadlock and Pierce (2010). Panel B reports firm-level panel regressions using a dataset at the firm-quarter level. The outcome is 100 when we observe the firm's discount rate (columns 1 and 2), the perceived cost of capital (columns 3 and 4), or the perceived cost of debt or equity (columns 5 and 6) in the given quarter, and 0 otherwise. The samples in Panel B include the full panel of firm-quarter observations between 2002 and 2021 for all firms for which we observe at least once a discount rate, perceived cost of capital, perceived cost of debt, or perceived cost of equity. The regressors are in percentile ranks relative to the universe of firms in Compustat in the same year and country of listing. Standard errors (in parentheses) are clustered by firm and quarter. Statistical significance is denoted by *** p<0.01, ** p<0.05, * p<0.1.

Panel A: Characteristics of included firms in cross-sectional percentiles

	Firms with observed discount rate			Firms with observed perc. cost of capital			Firms with observed perc. cost of debt/equity		
	mean	min	max	mean	min	max	mean	min	max
Market value	79.40	8.54	100.00	83.06	3.00	100.00	84.48	7.60	100.00
Return on equity	58.29	0.23	100.00	59.80	0.81	100.00	58.37	0.15	100.00
Book-to-market	47.34	0.16	100.00	49.41	0.17	100.00	46.60	0.26	100.00
Investment rate	53.95	1.36	100.00	53.64	0.32	100.00	53.35	0.13	100.00
Physical capital to assets	59.69	2.36	100.00	58.98	2.16	100.00	65.08	2.00	100.00
Z-score (bankruptcy risk)	48.83	2.31	98.98	47.57	0.77	99.02	37.14	1.40	99.36
Financial constraints	23.03	0.05	90.67	20.46	0.05	100.00	23.86	0.05	91.52
Leverage	59.27	0.53	100.00	60.44	1.17	100.00	62.10	0.84	100.00

Panel B: Within-firm variation in characteristics and timing of inclusion

	(1)	(2)	(3)	(4)	(5)	(6)
	Discount rate observed in quarter		Perc. cost of capital observed in quarter		Perc. cost of equity or debt observed in quarter	
Z-score (bankruptcy risk)	0.00081		0.00047		-0.00068	
	(0.0019)		(0.0016)		(0.0022)	
Return on equity		0.00095		0.0011		0.0025*
		(0.0013)		(0.0013)		(0.0015)
Book-to-market		0.00046		0.0013		-0.0024
		(0.0018)		(0.0014)		(0.0019)
Investment rate		-0.0016		0.00043		-0.000029
		(0.0012)		(0.0011)		(0.0015)
Financial constraints		0.0016		0.0037		0.0016
		(0.0028)		(0.0038)		(0.0041)
Leverage		-0.00091		0.00066		0.0090***
		(0.0023)		(0.0019)		(0.0027)
Observations	228,501	235,329	228,501	235,329	228,501	235,329
FE	Firm/quarter	Firm/quarter	Firm/quarter	Firm/quarter	Firm/quarter	Firm/quarter
Within R^2	2.6e-06	0.000020	9.2e-07	0.000036	1.4e-06	0.00020

Table 3
The Perceived and the Financial Cost of Capital

Panel A reports results of panel regressions of the perceived cost of capital on measures of the financial cost of capital (see Section 2.4 for definitions). We scale the financial cost of equity by 1 minus firm leverage and the financial cost of debt by firm leverage. The dataset is at the firm-quarter level and runs from 2002 to 2021. Standard errors (in parentheses) are clustered by firm and quarter. The left- and right-hand side variables are in percent. Panel B reports results of panel regressions of the perceived cost of debt in financial variables. The long-term rate is the long-run yield on government debt in the firm's country of listing. Interest expenses are the firm's current interest expenses relative to current outstanding debt. Leverage is the firm's book debt relative to book debt plus equity. Beta is the firm's CAPM market beta. Statistical significance is denoted by *** p<0.01, ** p<0.05, * p<0.1.

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A	Perceived cost of capital					
Fin. COC (country level)	0.97***	0.81***				
	(0.14)	(0.20)				
Fin. COC (firm level)			0.69***	0.47***		
			(0.086)	(0.13)		
Fin. cost of equity (scaled, firm level)					0.75***	0.42**
					(0.096)	(0.17)
Fin. cost of debt (scaled, firm level)					0.56***	0.59***
					(0.10)	(0.15)
Observations	1,981	1,981	1,981	1,981	1,981	1,981
FE	Country	Firm	Country	Firm	Country	Firm
Within R^2	0.055	0.094	0.094	0.077	0.096	0.079

	(1)	(2)	(3)	(4)	(5)	(6)
Panel B	Perceived cost of debt					
Long-term rate (country level)	0.37***	0.31***	0.37***	0.31***	0.37***	0.31***
	(0.050)	(0.063)	(0.051)	(0.063)	(0.052)	(0.063)
Interest expenses (firm level)	0.30***	0.18***	0.29***	0.18***	0.28***	0.18***
	(0.026)	(0.030)	(0.025)	(0.030)	(0.025)	(0.031)
Leverage ratio			0.86***	0.12	0.75***	0.084
			(0.19)	(0.46)	(0.20)	(0.46)
Beta					0.48**	0.12
					(0.19)	(0.21)
Observations	3,238	3,238	3,238	3,238	3,238	3,238
R-squared	0.515	0.857	0.526	0.857	0.530	0.857
FE	Country	Firm	Country	Firm	Country	Firm
Within R^2	0.39	0.28	0.40	0.28	0.41	0.28

Table 4
Discount Rates and the Perceived Cost of Capital

The table reports results of panel regressions of discount rates on the perceived cost of capital. The regressor of interest in columns 1 to 3 is the perceived cost of capital, measured using conference calls. The regressor of interest in columns 4 to 6 is a predicted measure of the perceived cost of capital. The prediction relies on a lasso procedure where the inputs are the components of the CAPM-based firm-level financial cost of capital, as explained in the text. The dataset is at the firm-quarter level and runs from 2002 to 2021. Standard errors (in parentheses) are clustered by firm and quarter. The left- and right-hand side variables are measured in percent. Statistical significance is denoted by *** p<0.01, ** p<0.05, * p<0.1.

	(1)	(2)	(3)	(4)	(5)	(6)
Perceived COC (observed)	0.68***	0.43***	0.36***			
	(0.093)	(0.12)	(0.092)			
Perceived COC (predicted)				1.06***	0.33**	0.25*
				(0.33)	(0.15)	(0.13)
Observations	257	257	257	1,893	1,893	1,893
FE	Country	Firm	Firm/quarter	Country	Firm	Firm/quarter
P(slope = 1)	0.00086	0.000011	1.8e-09	0.86	0.000044	1.5e-07
Within R^2	0.17	0.37	0.28	0.025	0.018	0.0062

Table 5
Investment and Discount Rates

The table reports results of panel regressions of the annual net investment rates, measured one year ahead, on discount rates. Net investment of firm i is from Compustat and measured as $(\text{CAPEX}^i_{t+1} - \text{Depreciation}^i_{t+1})/\text{PPEN}^i_t$, winsorized at the 2.5$^{\text{th}}$ and 97.5$^{\text{th}}$ percentiles. Right-hand side variables are measured at time t. The discount rate wedge $\tilde{\kappa}$ is the discount rate minus the perceived cost of capital (predicted as in Table 4). The discount rate and cost of capital wedge, $\tilde{\kappa}+\upsilon$, is the discount rate minus the CAPM-based financial cost of capital. The financial COC is the CAPM-based firm-level financial cost of capital. Tobin's Q is the market-to-book value of debt and equity and is winsorized. The dataset is at the firm-quarter level and runs from 2002 to 2021. Standard errors (in parentheses) are clustered by firm and quarter. The left- and right-hand side variables are measured in percent, except the wedges are in percentage points. Statistical significance is denoted by *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

	(1)	(2)	(3)	(4)	(5)
Discount rate	-0.79***	-0.84***			-0.84**
	(0.26)	(0.23)			(0.36)
Discount rate wedge $\tilde{\kappa}$			-0.81***		
			(0.22)		
Discount rate and COC wedge $\tilde{\kappa}+\upsilon$				-0.83***	
				(0.23)	
Perceived COC (predicted)			-1.72		0.67
			(1.16)		(1.63)
Fin. COC (firm level)				-1.80**	-1.19
				(0.82)	(1.21)
Tobin's Q					0.57**
					(0.28)
Observations	1,472	1,472	1,472	1,472	1,321
FE	Firm	Firm/quarter	Firm/quarter	Firm/quarter	Firm/quarter
Within R^2	0.018	0.020	0.022	0.025	0.025

Table 6
Market Power and the Secular Evolution of Discount Rates and Wedges

The table reports results of panel regressions of firm-level discount rates, discount rate wedges, and discount rate and cost of capital wedges on firm-level market power (averaged over 2000 to 2002) interacted with three different variables: calendar year, mean perceived cost of capital in the firm's country of listing, and the perceived cost of capital at the firm level (predicted as in Table 4). The specifications include these variables on their own as well as interacted with average market power in 2000-2002. The table reports the slope coefficients for the interaction terms. The discount rate wedge $\tilde{\kappa}$ is the discount rate minus the perceived cost of capital (predicted as in Table 4). The discount rate and cost of capital wedge, $\tilde{\kappa} + \upsilon$, is the discount rate minus the CAPM-based financial cost of capital. The dataset is at the firm-quarter level and runs from 2002 to 2021. Standard errors (in parentheses) are clustered by firm and quarter. The left-hand side variables are in percent. Market power is standardized, so that the coefficients estimate the impact of a 1 standard deviation increase, and measured using the accounting method in Baqaee and Farhi (2020). Statistical significance is denoted by *** p<0.01, ** p<0.05, * p<0.1.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Discount rate		$\tilde{\kappa}$	$\tilde{\kappa}$	$\tilde{\kappa}$	$\tilde{\kappa} + \upsilon$	$\tilde{\kappa} + \upsilon$	$\tilde{\kappa} + \upsilon$
Market power (2002)*Year	0.094*			0.083*			0.087*		
	(0.050)			(0.046)			(0.048)		
Market power (2002)*Perc. COC (country mean)		-0.29**			-0.26**			-0.26**	
		(0.13)			(0.12)			(0.13)	
Market power (2002)*Perc. COC (firm level)			-0.37*			-0.37*			-0.38
			(0.21)			(0.21)			(0.23)
Observations	976	976	976	976	976	976	976	976	976
FE	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm
Within R^2	0.098	0.030	0.049	0.041	0.020	0.078	0.037	0.020	0.088

Table 7
Firm-level Risk and Fluctuations in Discount Rates and Wedges

The table reports results of panel regressions of firm-level discount rates, discount rate wedges, and discount rate and cost of capital wedges on firm-level option-implied volatility interacted with asset irreversibility. The discount rate wedge $\tilde{\kappa}$ is the discount rate minus the perceived cost of capital (predicted as in Table 4). The discount rate and cost of capital wedge, $\tilde{\kappa} + \upsilon$, is the discount rate minus the CAPM-based financial cost of capital. Irreversibility is the negative of asset redeployability from Kim and Kung (2017), averaged between 2002 and 2021. The dataset is at the firm-quarter level and runs from 2002 to 2021. Standard errors (in parentheses) are clustered by firm and quarter. The left-hand side variables are in percent. Statistical significance is denoted by *** p<0.01, ** p<0.05, * p<0.1.

	(1)	(2)	(3)
	Discount rate	$\tilde{\kappa}$	$\tilde{\kappa} + \upsilon$
Risk*Irreversibility (2002)	18.1*	24.2**	27.8**
	(10.6)	(10.9)	(11.7)
Risk	8.58*	7.67	6.92
	(5.09)	(5.39)	(5.80)
Observations	872	872	872
FE	Firm	Firm	Firm
Within R^2	0.022	0.052	0.091

Online Appendix to "Corporate Discount Rates"

Appendix A Figures and Tables

Figure A1
Number of Observations Per Firm

Panel A plots a histogram of the number of times that we observe a discount rate for a firm. The sample includes only firms for which we observe at least one discount rate. Conditional on observing more than one discount rate, we observe a discount rate an average of roughly 3.5 times. Panel B plots a histogram of the number of times that we observe a perceived cost of capital for a firm. Conditional on observing more than one perceived cost of capital, we observe a perceived cost of capital an average of roughly 3.5 times. The right-most bars combine all values greater than 15.

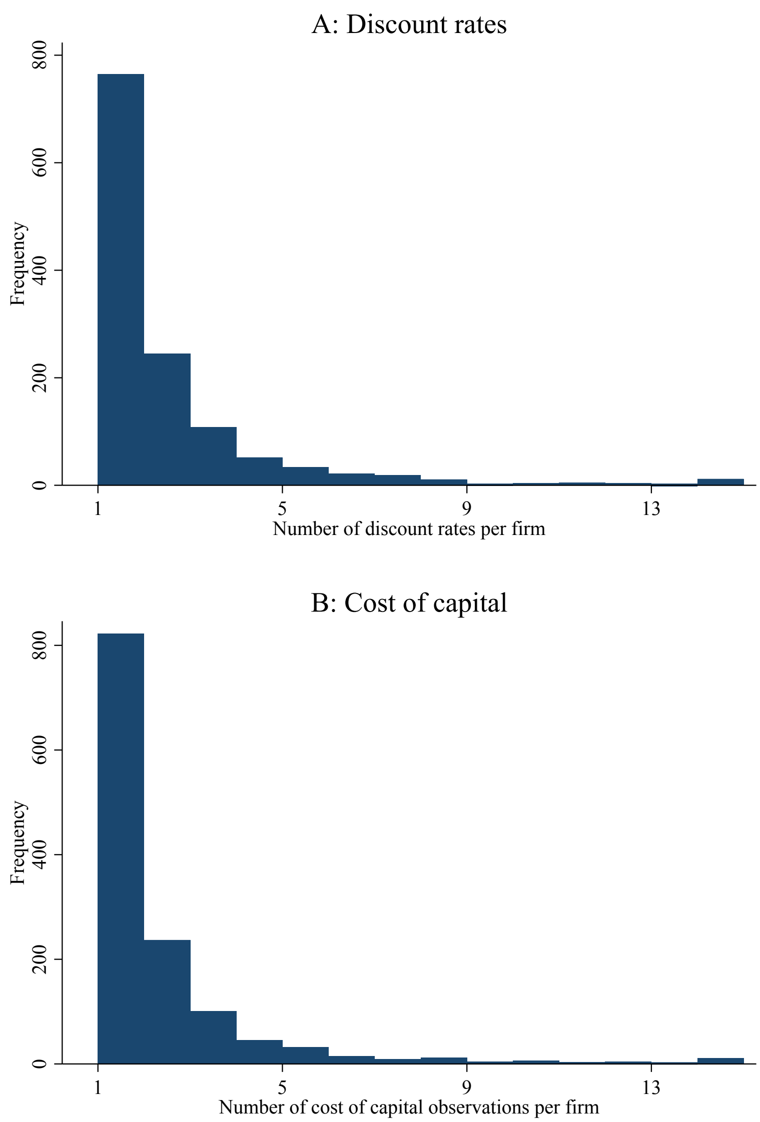

Figure A2
Observation Shares by Country

The figure plots the share of discount rate and perceived cost of capital observations by firms' country.

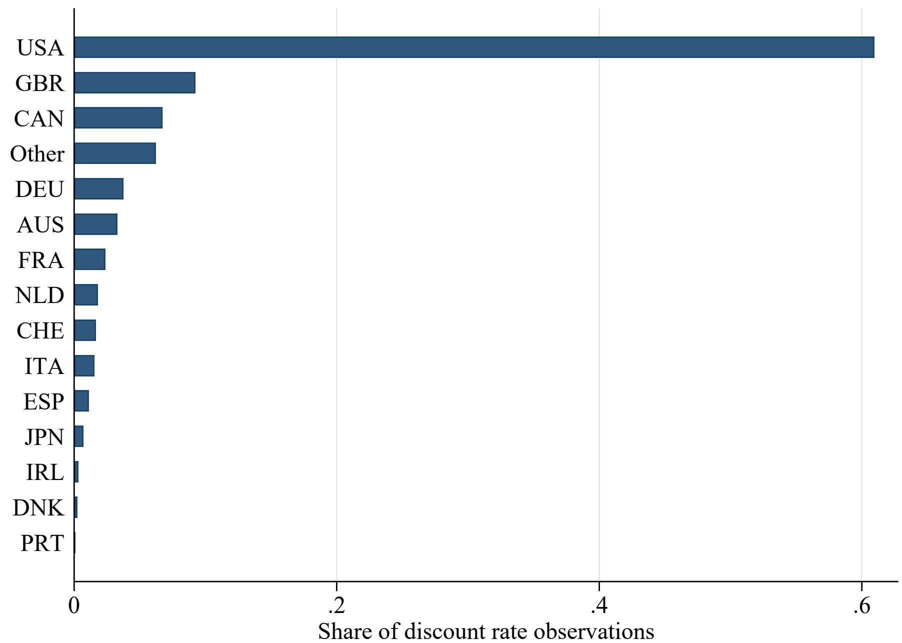

Figure A3
Industries Shares in Compustat and the New Dataset

The figure plots the share of firms in different industries in the Compustat universe for 2002 to 2021 (left-hand bar in each industry group in red) and in the sample of firms with at least one observed discount rate or perceived cost of capital (right-hand bars in blue).

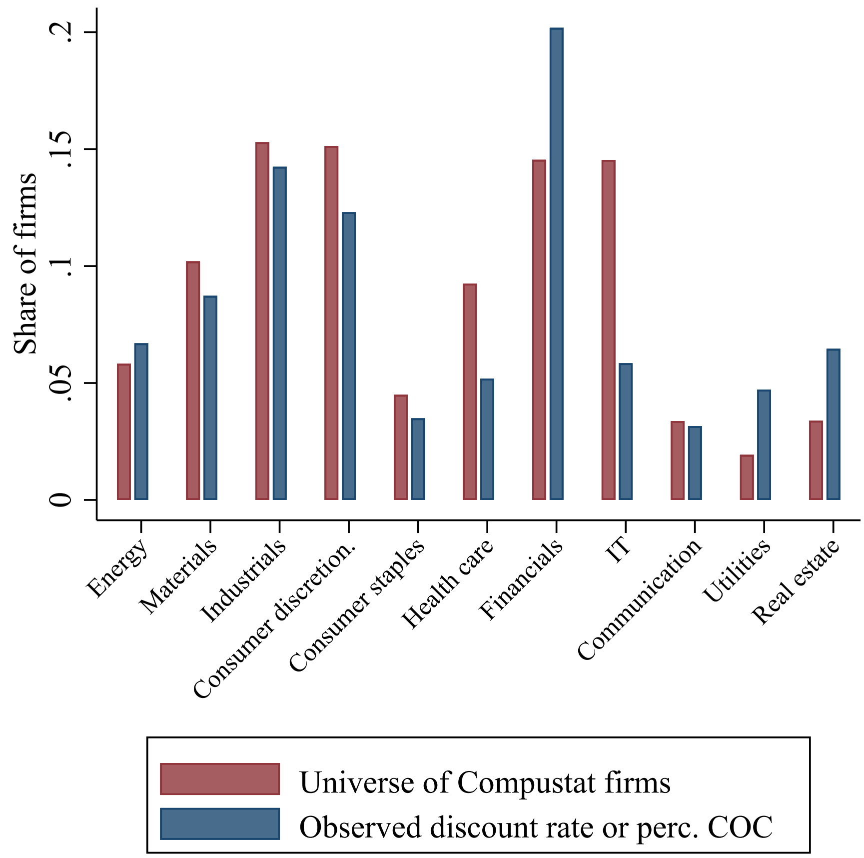

Figure A4
Difference in Discount Rates by Whether Firms Fully Account for Overhead

The figure illustrates the difference between discount rates not accounting for all overhead and discount rates accounting for all overhead over time. We calculate a three-year moving average of the annual average discount rate not accounting for overhead as well as the corresponding three-year moving average of the annual average discount rate accounting for all overhead. We plot the difference between the two series.

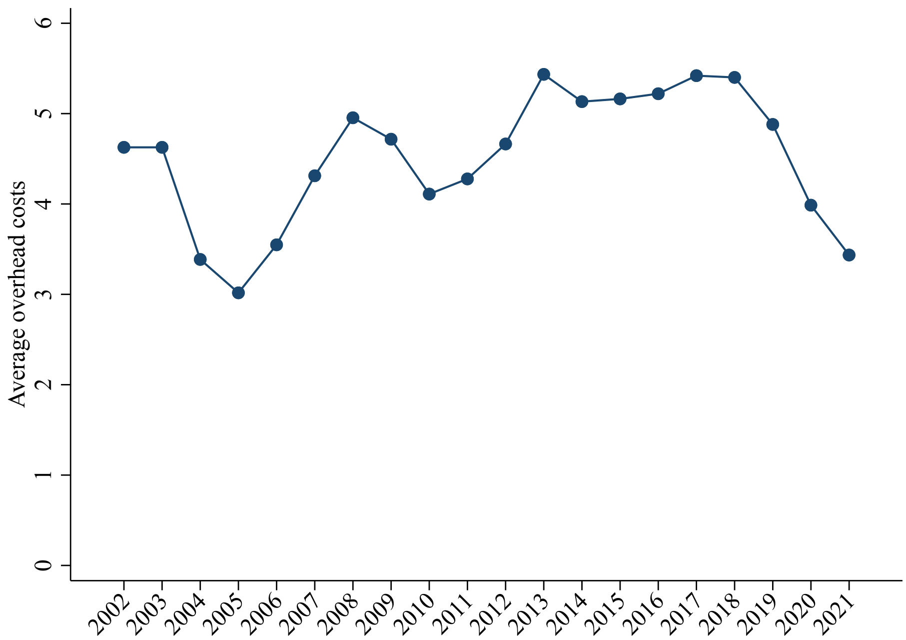

Figure A5
Robustness: Shares of Different Discount Rates and Perceived Costs of Capital

The figure reproduces Figure 5 using a restricted sample. We only include firms for which we observe two discount rates at least seven years apart to construct the share with different discount rates (which excludes about 40 percent of the observations from Figure 5). Similarly, we only include firms for which we observe two values of the perceived cost of capital at least seven years apart to construct the share with different perceived cost of capital. The restrictions ensure that the low share adjusting their discount rate over short horizons cannot be driven by differences in sample composition across the year bins on the horizontal axis.

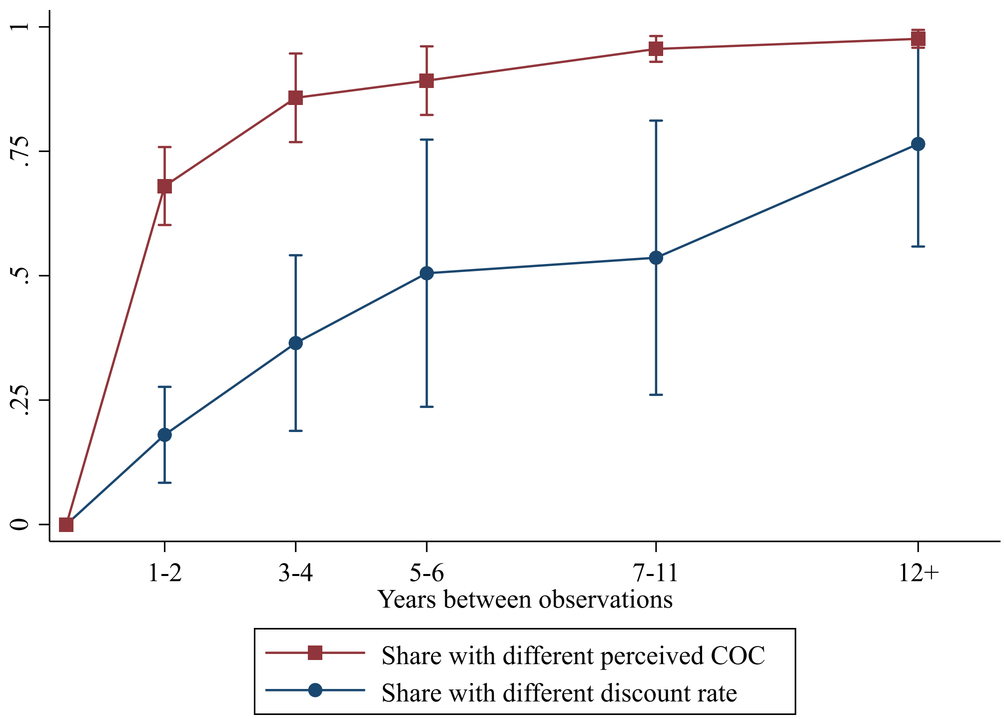

Figure A6
Non-Zero Changes in Discount Rates and the Perceived Cost of Capital

Panel A plots a histogram of the difference between a firm's discount rate in a given quarter and the firm's first observed discount rate. The plotted difference is in percentage points and annualized (i.e., normalized by the years between the quarter of observation and the quarter of the first observation). The sample includes only observations with non-zero changes (i.e., observations where the firm's discount rate in the given quarter differs from the first observed discount rate). The sample runs from 2002 to 2021. The left-most bar combines all changes below -4 percentage points. The right-most bar combines all observations greater than 4 percentage points. Panel B plots the corresponding histogram for the perceived cost of capital.

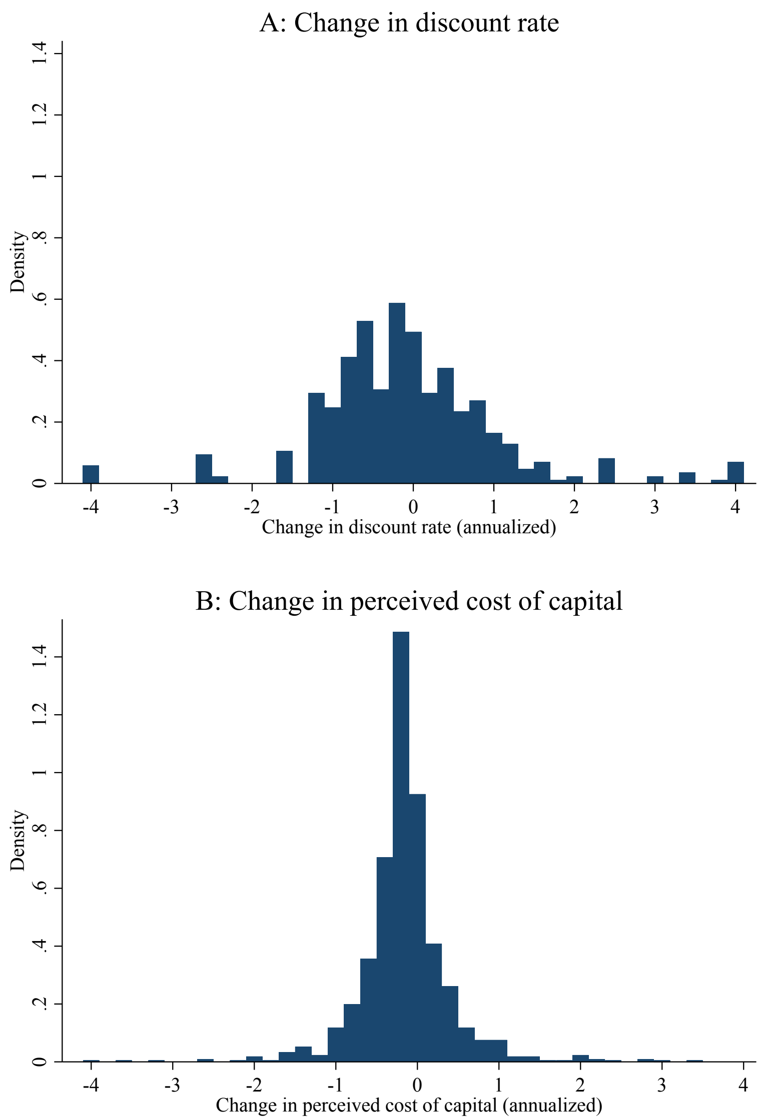

Figure A7
Simulation: The Transmission from the Cost of Capital to Discount Rates Over Time

This figure replicates Figure 4 by plotting average coefficients across 50,000 simulations of artificial data. The simulations are described in Appendix E.

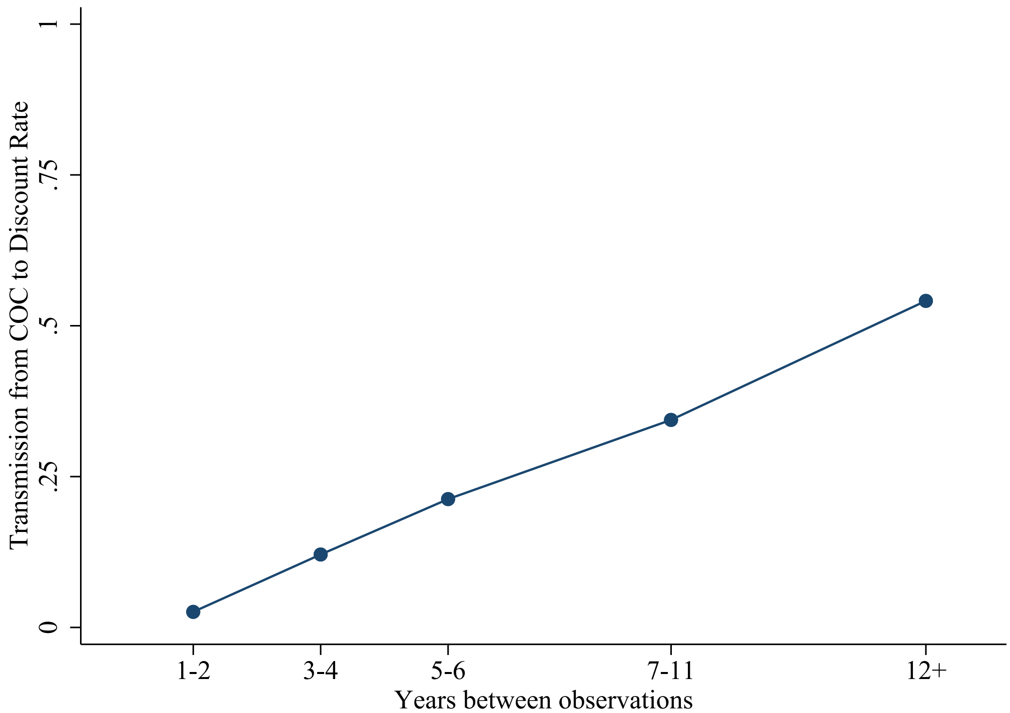

Figure A8
Simulation: Response of the Average Discount Rate to a Cost of Capital Shock

This figure plots the impulse response of the average discount rate in response to a shock to the perceived cost of capital based on the simulations described in Appendix E. We simulate the shock as a 1 percentage point increase in $\varepsilon_{i,0}^{\mathrm{firm}}$ for all firms.

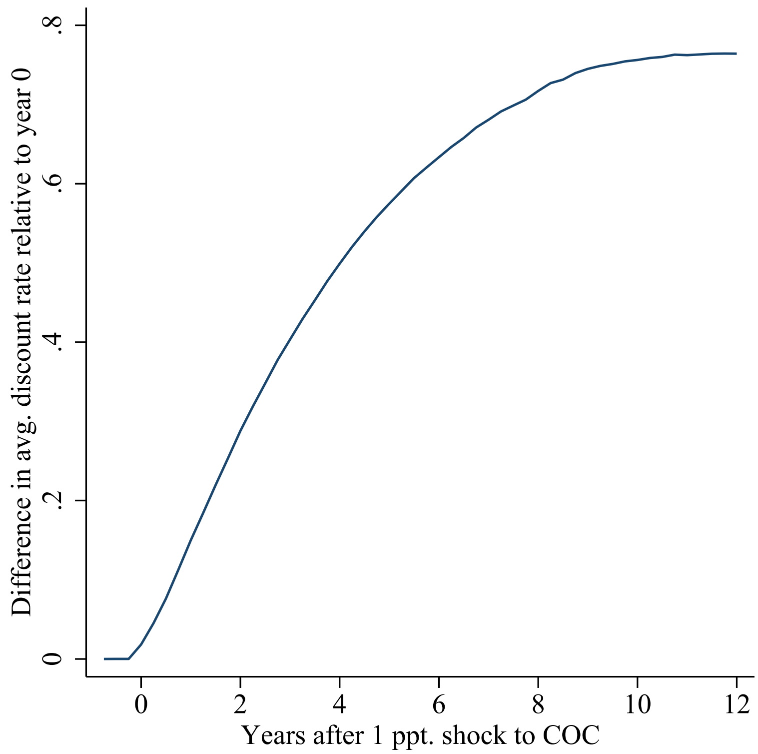

Figure A9
Simulation: Implied Evolution of Discount Rate Wedges

This figure shows the true discount rate wedge (as observed in the data) and the simulated wedge implied by the slow incorporation of the perceived cost of capital into discount rates. To calculate the implied wedge, we simulate a panel of firms for which the perceived cost of capital on average moves according to the time series underlying Figure 6 up to 2021 and then stays at the 2021 level going forward. We then impose that firms can only update their discount rates infrequently, such that we match the infrequent adjustment and slow transmission observed in Figures 4 and 5. Finally, we calculate the implied discount rate wedge arising from this combination of hypothetical discount rates and the observed average perceived cost of capital. The simulations are similar to the ones in Appendix E, except that we force the perceived cost of capital to evolve exactly like the empirically observed series, on average. We plot the wedge as the ratio of average discount rate to average perceived cost of capital in this figure (rather than as difference in levels) because the ratio does not depend on how we simulate the origin of the average level of the wedge.

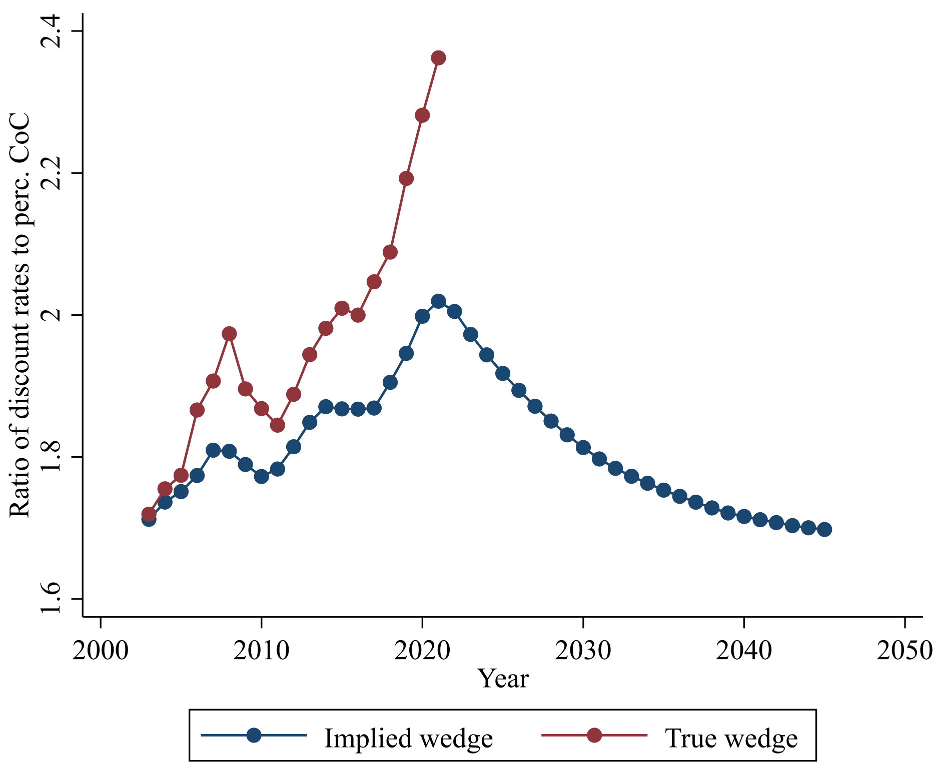

Figure A10
Discount Rate and the Perceived Cost of Capital in Surveys

This figure plots the average values of discount rates and perceived cost of capital from surveys where they are jointly observed (also reported in Sharpe and Suarez 2021 and Graham 2022).

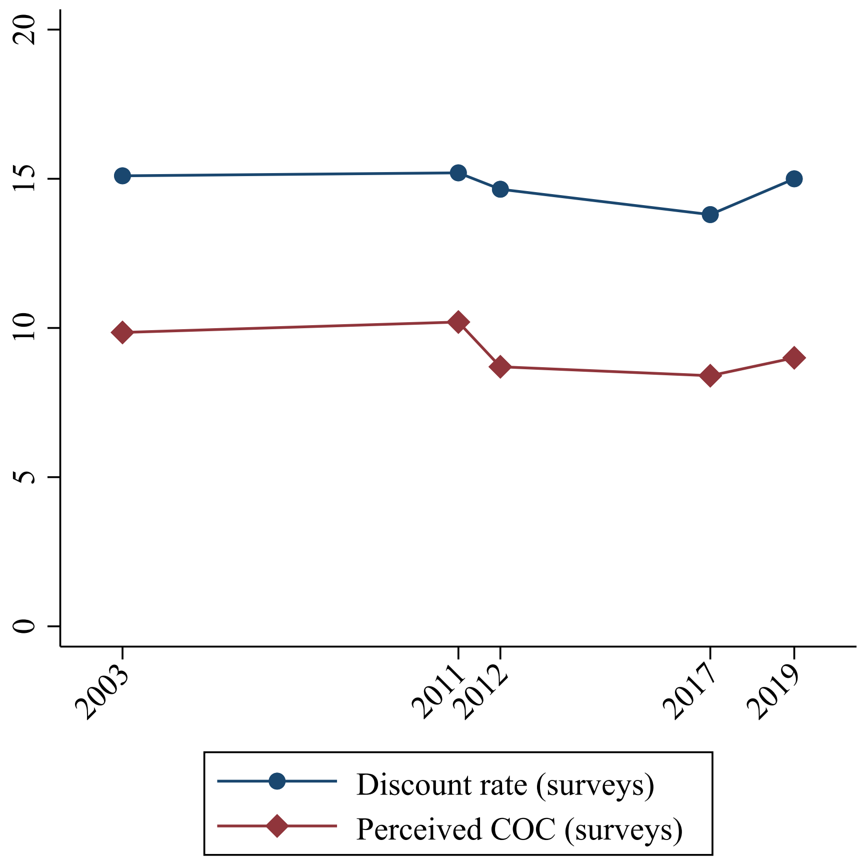

Table A1
Discount Rates and the Perceived Cost of Capital From 2010

The table reproduces Table 4 using observations from 2010 onward. For the regressions conditional on firm fixed effects, we residualize the outcome variable and the regressors using firm fixed effects for the whole sample and then use only the residualized variables for the period from 2010 in the regressions. This approach ensures that the firm fixed effects are estimated in a relatively longer sample.

	(1)	(2)	(3)	(4)	(5)	(6)
Perceived COC (observed)	0.74***	0.42***	0.43***			
	(0.11)	(0.12)	(0.11)			
Perceived COC (predicted)				1.14***	0.29*	0.33*
				(0.29)	(0.16)	(0.17)
Observations	214	214	214	1,505	1,505	1,505
FE	Country	Firm	Firm/quarter	Country	Firm	Firm/quarter
P(slope = 1)	0.018	0.000015	5.9e-06	0.63	0.000050	0.00024
Within R^2	0.19	0.34	0.36	0.029	0.016	0.019

Table A2
Investment and Discount Rates From 2010

The table reproduces Table 5 using only observations from 2010 onward. For the regressions conditional on firm fixed effects, we residualize the outcome variable and the regressors using firm fixed effects for the whole sample and then use only the residualized variables for the period from 2010 in the regressions. This approach ensures that the firm fixed effects are estimated in a relatively longer sample.

	(1)	(2)	(3)	(4)	(5)
Discount rate	-0.69***	-0.65***			-0.75**
	(0.23)	(0.21)			(0.30)
Discount rate wedge $\tilde{\kappa}$			-0.71***		
			(0.21)		
Discount rate and COC wedge $\tilde{\kappa} + \upsilon$				-0.66***	
				(0.21)	
Perceived COC (predicted)			0.53		3.99***
			(1.03)		(1.44)
Fin. COC (firm level)				-0.40	-1.42
				(0.77)	(1.26)
Tobin's Q					0.30
					(0.37)
Observations	895	895	895	895	792
FE	Firm	Firm/quarter	Firm/quarter	Firm/quarter	Firm/quarter
Within R^2	0.011	0.0096	0.015	0.010	0.030

Table A3
Realized Project Returns and Discount Rates

Some firms report a realized return of a specific project in the context of discussing their discount rate (see also Appendix D). The table reports results of panel regressions of the average realized project-level return reported by a firm in a quarter on the discount rate reported by the same firm in the same quarter. Column 1 includes fixed effects for firm country of listing. Column 2 additionally includes fixed effects for quarter and for whether the discount rate includes all corporate overhead costs. The dataset is at the firm-quarter level and runs from 2002 to 2021. Standard errors (in parentheses) are clustered by firm and quarter. Statistical significance is denoted by *** p<0.01, ** p<0.05, * p<0.1.

	(1) Rlzd. return	(2) Rlzd. return
Discount rate	1.26***	1.19***
	(0.23)	(0.21)
Observations	211	211
FE	Country	Country/quarter/type
Within R^2	0.24	0.22

Table A4
Investment, Wedges, and Components of the Financial Cost of Capital

The table reports results of panel regressions of net investment rates on discount rates. Net investment of firm i is from Compustat and measured as $(\text{CAPEX}^i_{t+1} - \text{Depreciation}^i_{t+1})/\text{PPEN}^i_t$, winsorized at the 2.5^{th} and 97.5^{th} percentiles. Right-hand side variables are measured at time t. The discount rate and cost of capital wedge, $\tilde{\kappa} + \upsilon$, is the discount rate minus the CAPM-based financial cost of capital. The remaining regressors of interest are components of the financial cost of capital. The credit spread is the difference between the representative corporate bond yield and the risk-free rate in the country of firm i in quarter t. The risk-free rate is the yield on government debt in the country of listing of firm i in quarter t. We scale the credit spread and risk-free rate by the leverage of firm i, since firms with higher leverage are more exposed to movements in the bond yield and risk-free rate. The financial cost of equity is the CAPM-based financial cost of equity, scaled by 1 minus firm leverage. Tobin's Q is the market-to-book value of debt and equity. Tobin's Q and ROE are winsorized. The dataset is at the firm-quarter level and runs from 2002 to 2021. Standard errors (in parentheses) are clustered by firm and quarter. The left- and right-hand side variables (apart from Tobin's Q) are measured in percent, except the wedges are in percentage points. Statistical significance is denoted by *** p<0.01, ** p<0.05, * p<0.1.

	(1)	(2)	(3)
Discount rate and COC wedge $\tilde{\kappa} + \upsilon$	-0.56***	-0.72***	-0.70**
	(0.21)	(0.26)	(0.35)
Credit spread (scaled)	-0.57		-0.50
	(0.61)		(0.61)
Risk-free rate (scaled)	-0.99		-1.77
	(1.06)		(1.94)
Fin. cost of equity (scaled)		-0.82	-0.76
		(1.05)	(1.47)
Tobin's Q			-0.16
			(0.67)
ROE			0.17***
			(0.049)
Observations	1,472	1,472	1,219
FE	Firm	Firm	Firm
Within R^2	0.015	0.016	0.027

Table A5
Discount Rates and Expected Earnings Growth

The table reports results of panel regressions of firm-level discount rates on firm-level long-run expected earnings growth from the Institutional Brokers' Estimate System. The dataset is at the firm-quarter level and runs from 2002 to 2021. Standard errors (in parentheses) are clustered by firm and quarter. Statistical significance is denoted by *** p<0.01, ** p<0.05, * p<0.1.

	(1)	(2)
Exp. earnings growth	-0.0014	-0.0020
	(0.0031)	(0.0039)
Observations	887	887
FE	Firm	Firm/quarter
Within R^2	0.00041	0.00072

Table A6
Asset Expansion and Corporate Discount Rates

The table reports results of panel regressions of firm-level asset expansion, measured using Compustat as $\text{Assets}^i_{t+1}/\text{Assets}^i_t$, winsorized at the 2.5^{th} and 97.5^{th} percentiles, on discount rates. Right-hand side variables are measured at time t. The financial COC is the CAPM-based firm-level financial cost of capital. Tobin's Q is the market-to-book value of debt and equity and is winsorized. The dataset is at the firm-quarter level and runs from 2002 to 2021. Standard errors (in parentheses) are clustered by firm and quarter. The left- and right-hand side variables are measured in percent, except the wedges are in percentage points. Statistical significance is denoted by *** p<0.01, ** p<0.05, * p<0.1.

	(1)	(2)	(3)	(4)	(5)
Discount rate	-0.79**	-0.92***			-1.09**
	(0.33)	(0.34)			(0.54)
Discount rate wedge $\tilde{\kappa}$			-0.85**		
			(0.35)		
Discount rate and COC wedge $\tilde{\kappa} + \upsilon$				-0.92***	
				(0.34)	
Perceived COC (predicted)			-3.41		-2.04
			(2.09)		(3.48)
Fin. COC (firm level)				-1.59	0.47
				(1.39)	(1.89)
Tobin's Q					5.24***
					(0.84)
Observations	1,782	1,782	1,782	1,782	1,377
FE	Firm	Firm/quarter	Firm/quarter	Firm/quarter	Firm/quarter
Within R^2	0.0042	0.0057	0.0095	0.0063	0.13

Table A7
Investment Including Intangibles and Corporate Discount Rates

The table reports regressions of firm-level net investment rates (in tangible and intangible capital) on discount rates. We measure investment in intangible capital as R&D expenditures plus adjusted Selling and General Administrative expenses, as described in Eisfeldt and Papanikolaou (2014). We measure investment in tangible capital as in Table 5. The net investment rate including intangibles is winsorized at the 2.5$^{\text{th}}$ and 97.5$^{\text{th}}$ percentiles. Right-hand side variables are measured at time t. The financial COC is the CAPM-based firm-level financial cost of capital. Tobin's Q is the market-to-book value of debt and equity and is winsorized. The dataset is at the firm-quarter level and runs from 2002 to 2021. Standard errors (in parentheses) are clustered by firm and quarter. The left- and right-hand side variables are measured in percent, except the wedges are in percentage points. Statistical significance is denoted by *** p<0.01, ** p<0.05, * p<0.1.

	(1)	(2)	(3)	(4)	(5)
Discount rate	-0.28	-0.32***			-0.44***
	(0.17)	(0.12)			(0.14)
Discount rate wedge $\tilde{\kappa}$			-0.30***		
			(0.11)		
Discount rate and COC wedge $\tilde{\kappa} + \upsilon$				-0.32***	
				(0.11)	
Perceived COC (predicted)			-0.85**		0.15
			(0.34)		(0.52)
Fin. COC (firm level)				-0.79***	-0.49
				(0.21)	(0.31)
Tobin's Q					0.47***
					(0.082)
Observations	1,359	1,359	1,359	1,359	1,211
FE	Firm	Firm/quarter	Firm/quarter	Firm/quarter	Firm/quarter
Within R^2	0.023	0.029	0.037	0.042	0.091

Table A8
Missing Investment

The table reports results of annual time series regressions of net investment on Tobin's Q, adjusted Q, and variables capturing trends. The construction of adjusted Q is described in the text. We consider calendar year and a post-2002 dummy as trend variables. Net investment is calculated from the BEA tables. The sample runs from 1990 to 2020. Standard errors (in parentheses) are calculated using the Newey-West method adjusted for 5 lags. Statistical significance is denoted by *** p<0.01, ** p<0.05, * p<0.1.

	(1)	(2)	(3)	(4)
Tobin's Q	2.13***	1.37***		
	(0.34)	(0.46)		
Adjusted Q			3.49***	3.41***
			(0.55)	(0.73)
Year	-0.09***		-0.02	
	(0.01)		(0.02)	
Post-2002 indicator		-1.23***		-0.22
		(0.27)		(0.35)
Observations	30	30	30	30
R^2	0.72	0.62	0.70	0.68

Table A9
Tobin's Q and Wedges at the Firm Level

The table reports results of panel regressions of firm-level Tobin's Q on firm-level wedges. The discount rate wedge $\tilde{\kappa}$ is the discount rate minus the perceived cost of capital (predicted as in Table 4). The discount rate and cost of capital wedge, $\tilde{\kappa} + \upsilon$, is the discount rate minus the CAPM-based financial cost of capital. Tobin's Q is the market-to-book value of debt and equity, winsorized at the 2.5^{th} and 97.5^{th} percentiles. The dataset is at the firm-quarter level and runs from 2002 to 2021. Standard errors (in parentheses) are clustered by firm and quarter. The wedges are measured in percentage points. Statistical significance is denoted by *** p<0.01, ** p<0.05, * p<0.1.

	(1)	(2)
Discount rate wedge $\tilde{\kappa}$	0.15***	
	(0.054)	
Discount rate and COC wedge $\tilde{\kappa} + \upsilon$		0.13***
		(0.046)
Observations	708	708
FE	Firm	Firm
Within R^2	0.023	0.021

Table A10
Differences in Discount Rates and Wedges Across Firms

The table reports results of panel regressions of discount rates, discount rate wedges, and discount rate and cost of capital wedges on three regressors. The discount rate wedge $\tilde{\kappa}$ is the discount rate minus the perceived cost of capital (predicted as in Table 4). The discount rate and cost of capital wedge, $\tilde{\kappa} + \upsilon$, is the discount rate minus the CAPM-based financial cost of capital. The first regressor is market power, measured using the accounting method in Baqaee and Farhi (2020). The second is risk, measured using option-implied volatility of equity. The third is financial constraints, measured using the index by Hadlock and Pierce (2010). The right-hand side variables are firm-level averages between 2000 and 2002 (in the case of risk, we use the firm-level average over all years in the sample if no data are available for 2000 to 2002). The dataset is at the firm-quarter level and runs from 2002 to 2021. Standard errors (in parentheses) are clustered by firm and quarter. The left-hand side variables are in percent. The three regressors are standardized, so that the coefficients estimate the impact of a 1 standard deviation increase. The specification includes fixed effects for firm country of listing, quarter, and whether the discount rate includes all corporate overhead costs. Statistical significance is denoted by *** p<0.01, ** p<0.05, * p<0.1.

	(1) Discount rate	(2) $\tilde{\kappa}$	(3) $\tilde{\kappa} + \upsilon$
Market power (2002)	1.03**	0.92**	0.95**
	(0.43)	(0.43)	(0.45)
Risk (2002)	1.64***	1.28***	1.17**
	(0.49)	(0.46)	(0.46)
Fin. constraints (2002)	0.67*	0.69**	0.68**
	(0.34)	(0.34)	(0.34)
Observations	810	810	810
FE	Country/quarter/type	Country/quarter/type	Country/quarter/type
Within R^2	0.10	0.080	0.073

Table A11
Robustness: Market Power (User-Cost Approach) and the Secular Evolution of Discount Rates and Wedges

The table replicates Table 6, relying on the user-cost approach as in Baqaee and Farhi (2020) to measure market power.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Discount rate		$\tilde{\kappa}$	$\tilde{\kappa}$	$\tilde{\kappa}$	$\tilde{\kappa}+\upsilon$	$\tilde{\kappa}+\upsilon$	$\tilde{\kappa}+\upsilon$
Market power (2002)*Year	0.12**			0.11**			0.11**		
	(0.050)			(0.050)			(0.050)		
Market power (2002)*Perc. COC (country mean)		-0.44**			-0.36*			-0.38**	
		(0.18)			(0.19)			(0.19)	
Market power (2002)*Perc. COC (firm level)			-0.41**			-0.41**			-0.43**
			(0.18)			(0.18)			(0.19)
Observations	943	943	943	943	943	943	943	943	943
FE	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm
Within R^2	0.12	0.038	0.059	0.057	0.026	0.087	0.054	0.026	0.099

Table A12

Robustness: Market Power (De Loecker et al. 2020 Measures) and the Secular Evolution of Discount Rates and Wedges

The table replicates Table 6, relying on the market power measure of De Loecker et al. (2020).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Discount rate			$\tilde{\kappa}$	$\tilde{\kappa}$	$\tilde{\kappa}$	$\tilde{\kappa}+\upsilon$	$\tilde{\kappa}+\upsilon$	$\tilde{\kappa}+\upsilon$
Market power (2002)*Year	0.17**			0.16**			0.17**		
	(0.078)			(0.075)			(0.072)		
Market power (2002)*Perc. COC (country mean)		-0.30			-0.26			-0.28	
		(0.20)			(0.20)			(0.21)	
Market power (2002)*Perc. COC (firm level)			-0.58**			-0.58**			-0.67**
			(0.28)			(0.28)			(0.28)
Observations	815	815	815	815	815	815	815	815	815
FE	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm
Within R^2	0.16	0.038	0.049	0.10	0.020	0.077	0.11	0.021	0.10

Table A13
Firm-level Risk and the Secular Evolution of Discount Rates and Wedges

The table reports results of panel regressions of firm-level discount rates, discount rate wedges, and discount rate and cost of capital wedges on firm-level risk (averaged over 2000 to 2002 if available for those years and over all years with available firm-level data otherwise) interacted with three different variables: calendar year, mean perceived cost of capital in the firm's country of listing, and the perceived cost of capital at the firm level (predicted as in Table 4). The specifications include these variables on their own as well as interacted with average risk in 2000-2002. The table reports the slope coefficients for the interaction terms. The discount rate wedge $\tilde{\kappa}$ is the discount rate minus the perceived cost of capital (predicted as in Table 4). The discount rate and cost of capital wedge, $\tilde{\kappa} + \upsilon$, is the discount rate minus the CAPM-based financial cost of capital. The dataset is at the firm-quarter level and runs from 2002 to 2021. Standard errors (in parentheses) are clustered by firm and quarter. The left-hand side variables are in percent. Risk is standardized, so that the coefficients estimate the impact of a 1 standard deviation increase, and measured using the option-implied volatility of equity. Statistical significance is denoted by *** p<0.01, ** p<0.05, * p<0.1.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Discount rate			$\tilde{\kappa}$	$\tilde{\kappa}$	$\tilde{\kappa}$	$\tilde{\kappa}+\upsilon$	$\tilde{\kappa}+\upsilon$	$\tilde{\kappa}+\upsilon$
Risk (2002)*Year	-0.092			-0.086			-0.093		
	(0.069)			(0.071)			(0.076)		
Risk (2002)*Perc. COC (country mean)		0.098			0.080			0.071	
		(0.17)			(0.14)			(0.14)	
Risk (2002)*Perc. COC (firm level)			0.19			0.19			0.14
			(0.16)			(0.16)			(0.16)
Observations	1,167	1,167	1,167	1,167	1,167	1,167	1,167	1,167	1,167
FE	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm
Within R^2	0.052	0.0054	0.014	0.036	0.021	0.098	0.030	0.024	0.10

Table A14
Financial Constraints and the Secular Evolution of Discount Rates and Wedges

The table reports results of panel regressions of firm-level discount rates, discount rate wedges, and discount rate and cost of capital wedges on firm-level financial constraints (averaged over 2000 to 2002) interacted with three different variables: calendar year, mean perceived cost of capital in the firm's country of listing, and the perceived cost of capital at the firm level (predicted as in Table 4). The specifications include these variables on their own as well as interacted with average financial constraints in 2000-2002. The table reports the slope coefficients for the interaction terms. The discount rate wedge $\tilde{\kappa}$ is the discount rate minus the perceived cost of capital (predicted as in Table 4). The discount rate and cost of capital wedge, $\tilde{\kappa} + \upsilon$, is the discount rate minus the CAPM-based financial cost of capital. The dataset is at the firm-quarter level and runs from 2002 to 2021. Standard errors (in parentheses) are clustered by firm and quarter. The left-hand side variables are in percent. Financial constraints are standardized, so that the coefficients estimate the impact of a 1 standard deviation increase, and measured using the index by Hadlock and Pierce (2010). Statistical significance is denoted by *** p<0.01, ** p<0.05, * p<0.1.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Discount rate		$\tilde{\kappa}$	$\tilde{\kappa}$	$\tilde{\kappa}$	$\tilde{\kappa}+\upsilon$	$\tilde{\kappa}+\upsilon$	$\tilde{\kappa}+\upsilon$
Fin. constraints (2002)*Year	-0.028			-0.029			-0.034		
	(0.024)			(0.025)			(0.027)		
Fin. constraints (2002)*Perc. COC (country mean)		-0.030			0.083			0.091	
		(0.10)			(0.094)			(0.10)	
Fin. constraints (2002)*Perc. COC (firm level)			0.18			0.18			0.33**
			(0.15)			(0.15)			(0.16)
Observations	1,373	1,373	1,373	1,373	1,373	1,373	1,373	1,373	1,373
FE	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm
Within R^2	0.044	0.0021	0.027	0.0043	0.015	0.060	0.0037	0.017	0.067

Table A15
Firm Market Power and Investment Over Time

The table reports results of regressions of the firm-level capital stock (measured as log PPEN from Compustat) on firm-level market power (averaged over 2000 to 2002) interacted with calendar year. The table reports the slope coefficient on the interaction term. The dataset is at the firm-quarter level for US firms and runs from 2002 to 2019. Standard errors (in parentheses) are clustered by firm and quarter. Market power is standardized, so that the coefficients estimate the impact of a 1 standard deviation increase, and measured using the accounting method in Baqaee and Farhi (2020). Statistical significance is denoted by *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

	(1)	(2)
Market power (2002)*Year	-0.013*	-0.021**
	(0.0068)	(0.0095)
Observations	6,987	6,987
FE	Firm/quarter	Firm/quarter
Weight	None	Capital stock
Within R^2	0.013	0.033

Table A16

Additional Tests: Market Power and the Secular Evolution of Discount Rates and Wedges

The table reports additional tests based on the specifications in Table 6. We investigate whether the role of market power is driven by certain industries or is different for firms with a larger share of intangible investment. In columns 1 to 3, we exclude firms in communication services, health care, and utilities (according to the Global Industry Classification Standard). During our sample period, communication services was affected by digitization, health care by government interventions, and utilities by new energy technologies and government regulation. In columns 4 to 6, we interact market power (2002)*year with the firm-level ratio of intangible investment relative to tangible investment. The intangibles ratio is standardized, so that the coefficients estimate the impact of a 1 standard deviation increase. The specifications also include all the variables on their own. We measure investment in intangible capital as R&D expenditures plus adjusted Selling and General Administrative expenses, as described in Eisfeldt and Papanikolaou (2014). We measure investment in tangible capital as in Table 5. The table reports the slope coefficients for the interaction terms. The discount rate wedge $\tilde{\kappa}$ is the discount rate minus the perceived cost of capital (predicted as in Table 4). The discount rate and cost of capital wedge, $\tilde{\kappa} + \upsilon$, is the discount rate minus the CAPM-based financial cost of capital. The dataset is at the firm-quarter level and runs from 2002 to 2021. Standard errors (in parentheses) are clustered by firm and quarter. The left-hand side variables are in percent. Market power is standardized, so that the coefficients estimate the impact of a 1 standard deviation increase, and measured using the accounting method in Baqaee and Farhi (2020). Statistical significance is denoted by *** p<0.01, ** p<0.05, * p<0.1.

	(1) Discount rate	(2) $\tilde{\kappa}$	(3) $\tilde{\kappa} + \upsilon$	(4) Discount rate	(5) $\tilde{\kappa}$	(6) $\tilde{\kappa} + \upsilon$
Market power (2002)*Year	0.098*	0.088*	0.095*	0.093*	0.082*	0.085*
	(0.052)	(0.049)	(0.051)	(0.050)	(0.047)	(0.049)
Market power (2002)*Year*Intangibles ratio				0.00091	0.0012	0.0012
				(0.00078)	(0.00094)	(0.0012)
Observations	876	876	876	976	976	976
FE	Firm	Firm	Firm	Firm	Firm	Firm
Sample	No communication/health/utilities			Full	Full	Full
Within R^2	0.096	0.047	0.044	0.11	0.070	0.084

Table A17
Results from Simulations

The table reports regressions of discount rates on the perceived cost of capital. The first four columns show results from simulations described in Appendix E. The final two columns reproduce columns 4 and 5 from Table 4.

	Dependent variable: $\delta_{i,t}$					
	Simulations				Original data	
True $r^{\text{perc}}_{i,t}$	1.05	0.42				
	(0.05)	(0.07)				
Predicted $r^{\text{perc}}_{i,t}$			1.07	0.38	1.06	0.33
			(0.17)	(0.17)	(0.33)	(0.15)
FE	None	Firm	None	Firm	None	Firm

Table A18
Relation Between 2000-02 and Future Characteristics

The table displays coefficients from regressions of a future characteristic on the same characteristic averaged over 2000 to 2002. Standard errors are clustered at the firm level. Statistical significance is denoted by *** p<0.01, ** p<0.05, * p<0.1.

	(1) Mkt. power 2005	(2) Mkt. power 2021	(3) Fin. constr. 2005	(4) Fin. constr. 2021	(5) Risk 2005	(6) Risk 2021
Mkt. power 2002	0.88***	0.90***				
	(0.033)	(0.065)				
Fin. constr. 2002			0.88***	0.76***		
			(0.017)	(0.027)		
Risk 2002					0.54***	0.39***
					(0.015)	(0.034)
Observations	1,202	790	3,173	2,483	1,429	796
R^2	0.64	0.35	0.83	0.65	0.59	0.22

Appendix B Firms' Optimal Investment Decision According to the Textbook Model

In general, firms should use the stochastic discount factor to discount cash flows associated with investment projects. Textbooks nonetheless tend to present a simpler rule based on a discount rate. The idea behind both approaches is the same—to maximize shareholder value—and in many models, the two approaches leads to similar outcomes, as long as the firm is considering a representative project (i.e., the risk of the project is the same as the risk of the firm's existing assets). For illustrative purposes, we compare the two rules using a simple project with uncertain returns. This project generates expected revenue $\mathbb{E}_t[\text{Revenue}_{t+j}]$ at time $t+j$ and costs Cost_t at time t.

Using the Stochastic Discount Factor The first decision rule is that the firm should accept the project if the net present value, discounted using the stochastic discount factor M_{t+j}, is positive:

$$\mathbb{E}_t\left[\mathrm{M}_{t+j}\text{Revenue}_{t+j}\right] - \text{Cost}_t > 0. \tag{A1}$$

Using the definition of covariance, we can rewrite equation A2 as:

$$\mathbb{E}_t\left[\text{Return}_{t,t+j}\right] > R^f_{t,t+j} - \text{Cov}_t\left[\mathrm{M}_{t+j}, \text{Return}_{t,t+j}\right] R^f_{t,t+j}, \tag{A2}$$

where $R^f_{t,t+j} = \mathbb{E}_t\left[\mathrm{M}_{t+j}\right]^{-1}$ is the risk-free interest rate between t and $t+j$ and $\text{Return}_{t,t+j} = \frac{\text{Revenue}_{t+j}}{\text{Cost}_t}$ is the return to the project.

Using a Discount Rate The second rule is set out in Section 1 in the main paper. It states that the firm should invest if the expected return is above the discount rate. This rule can also be formulated as saying that the firm should invest if the net present value of the project, discounted using a discount rate δ_t, is positive:

$$\sum_{s=0}^{\infty}(1+\delta_t)^{-s}\,\mathbb{E}_t[\text{Revenue}_{t+s} - \text{Cost}_{t+s}] = (1+\delta_t)^{-j}\,\mathbb{E}_t[\text{Revenue}_{t+j}] - \text{Cost}_t > 0. \tag{A3}$$

We can rewrite equation A3 as:

$$\mathbb{E}_t \left[\text{Return}_{t,t+j}\right] > (1+\delta_t)^j. \tag{A4}$$

The two rules in equations A2 and A4 are equivalent, as long as the firm sets the discount rate such that:

$$(1+\delta_t)^j = R^f_{t,t+j} - \text{Cov}_t \left[\text{M}_{t+j}, \text{Return}_{t,t+j}\right] R^f_{t,t+j}. \tag{A5}$$

To determine this discount rate, the firm can use information from asset markets. Assume that the firm just issues equity. By definition, the expected return to the financial asset of firm i over one period is equal to 1 plus the firm's "financial cost of capital," given by r^{fin}_{it}. The basic asset pricing equation implies that the expected return to the financial asset over the lifetime of the project is:

$$(1+r^{\text{fin}}_{it})^j = \mathbb{E}_t \left[R^i_{t,t+j}\right] = R^f_{t,t+j} - \text{Cov}_t \left[\text{M}_{t+j}, R^i_{t,t+j}\right] R^f_{t,t+j}. \tag{A6}$$

If the covariance between the stochastic discount factor and the project return is identical to the covariance between the stochastic discount factor and the financial asset return (i.e., $\text{Cov}_t \left[\text{M}_{t+j}, R^i_{t,t+j}\right] = \text{Cov}_t \left[\text{M}_{t+j}, \text{Return}_{t,t+j}\right]$), then the rules in equations A2 and A4 are equivalent for a firm that sets the discount rate equal to its financial cost of capital. Intuitively, if the project under consideration exhibits the same risk profile as the firm's existing investments, then the financial cost of capital tells the firm how financial markets price the risk of the project.

Generalizations The above results generalize to firms with multiple liabilities (e.g., debt and equity). In such cases, r^{fin}_{it} is the weighted average cost of capital, where the expected return is separately estimated for each asset type and weights are calculated using the value of outstanding assets of that type relative to firm total assets, accounting for differential tax treatments of different assets.

The results can also be extended to investments with more complex cash flows. For instance, consider an investment consisting of multiple sub-projects, indexed by s, where each project requires a cost at time t and pays uncertain revenue in one period $t+j$. In that case, the firm could still apply a decision rule as in equations A2 and A4, by summing over each individual sub-projects s.

If $\mathrm{Cov}_t\left[\mathrm{M}_{t+j}, R^i_{t,t+j}\right] \neq \mathrm{Cov}_t\left[\mathrm{M}_{t+j}, \mathrm{Return}_{t,t+j}\right]$, then firms cannot infer the riskiness of an individual project using expected returns on the firm's existing financial assets. Instead, firms should then adjust the discount factor by a project-specific risk premium.

Appendix C Details on Measurement

Appendix C.1 Extraction of Paragraphs from Conference Calls

The Thomson One database contains transcripts of conference calls held since January 2002. We download all calls in English that were available on September 9, 2021. Using an automatic text search algorithm, we identify relevant paragraphs in all the calls that fulfill two criteria: first, they contain one of the terms "percent," "percentage," or "%" and second, they contain at least one keyword related to cost of capital, discount rates, and investment. The keywords are capital asset pricing model, cost of capital, cost of debt, cost of equity, discount rate, expect a return, expected rate of return, expected return, fudge factor, hurdle rate, internal rate of return, opportunity cost of capital, require a return, required rate of return, required return, return on assets, return on invested capital, return on net assets, weighted average cost of capital, weighted cost of capital. We also include abbreviations of the keywords in the search, for example, IRR. We identify roughly 74,000 such paragraphs.

We match the firm name listed on Thomson One to Compustat by using a fuzzy merge algorithm, checking each match by hand. Ultimately, we link 88 percent of paragraphs to a Compustat firm. We combine the relevant paragraphs into data entry sheets of 500 paragraphs each. To facilitate manual data entry, we include the date of the call, firm name, and blank columns for all financial figures of interest in the sheet. These figures are:

- discount rate
- hurdle rate
- hurdle premium over the cost of capital
- fudge factor over the cost of capital
- cost of debt
- weighted average cost of capital (WACC)
- opportunity cost of capital (OCC)
- cost of capital
- cost of equity
- required, expected, and realized internal rate of return (IRR)

- required, expected, and realized return on invested capital (ROIC)
- required, expected, and realized return on equity (ROE)
- required, expected, and realized return on assets (ROA)
- required, expected, and realized return on net assets

Appendix C.2 Data Entry Team

We read through each paragraph and enter the figures into the sheets. A total of 15 undergraduate research assistants contributed to the data collection. The average team size at any point in time was 5. Our research team met on a weekly basis to discuss individual cases and to coordinate on consistent guidelines.

We train all assistants in how discounting cash flows and firm investment work. Each assistant reads roughly 2,000 randomly selected paragraphs for training, which we check and discuss. All paragraphs entering the final dataset were read at least twice, by different assistants, to minimize errors. The authors also checked all outlier observations in the distribution of discount rates and changes in discount rates.

Appendix C.3 Guidelines for Manual Data Entry

We establish clear rules for which figures should be recorded. For the main analysis of this paper, we are interested in discount rates (as hurdle rate, premium or fudge factor over the cost of capital, or required IRR) and the internally calculated perceived cost of capital (as OCC or WACC). However, we include a larger set of terms, listed above, among the keywords and in the data entry sheets to ensure that our team differentiates required from expected and realized IRR as well as from various types of other returns. (The difference between how managers use the terms IRR and ROIC in practice is noteworthy. IRR usually refers to the marginal return on an individual project, while ROIC refers to operating profits relative to the entire value of capital on the firm's balance sheet.)

We do not record hypothetical numbers (e.g., "we may use a discount rate of x percent" or "imagine that we use a cost of capital of x") and figures given by someone outside the firm (e.g., an analyst on the call suggesting a specific cost of capital for the firm). The context of statements is often key, so automated text processing cannot easily replace human reading for this task. For instance, the abbreviation OCC may refer to the opportunity cost of capital but more often than not actually refers to Old Corrugated Cardboard, a term for cardboard boxes used in the transport and recycling industries.

We only measure discount rates when managers explicitly discuss them as part of an investment rule. This means, for example, that we do not record discount rates used to value firms' pension liabilities. We focus on discount rates and the cost of capital that represent investment rules of the firm, as opposed to specific figures related to individual projects. For instance, we do not record the interest rate for a particular bond issuance. The paragraphs in the data entry sheets are sorted by firm and date, which helps us to interpret statements from the same firm consistently. When managers list multiple discount rates (usually for different regions and industries), we enter the figures that are representative of most of the company's operations (e.g., US figures for a US company). We discuss all cases with multiple rates among the whole team.

Managers mostly discuss their after-tax discount rate and cost of capital. We note when managers refer to pre-tax discount rates (0.7 percent of discount rate observations) and pre-tax cost of capital (1.9 percent of cost of capital observations). We convert all observations into after-tax values in two steps. First, we estimate the average percentage point difference between after-tax and pre-tax observations, controlling for country-by-year fixed effects. Second, we then adjust the pre-tax values reported on the calls using this average difference.

Similarly, managers occasionally mention a "levered" discount rate (only 1.7 percent of discount rate observations), which is used in return calculations that do not take into account all the capital used to finance the investment. We convert all levered observations into unlevered values. Again, we estimate the average percentage point difference between levered and unlevered observations, conditional on country-by-year fixed effects, and then adjust the levered values using this difference.

Managers sometimes specify a range rather than an actual value. We enter the average value in these cases. We do not record values when the range is very large or ambiguous. Managers sometimes give different realized returns depending on the time horizon (e.g., "we have achieved a 5 percent ROIC over the last five years and a 10 percent ROIC over the last ten.") We enter the most recent horizon for such cases. Realized returns referring to a previous episode unconnected to current years (e.g., "return in the 1990s") are not recorded.

Appendix D Context of Reported Discount Rates

We study the context in which discount rates are mentioned by assigning each paragraph with a reported discount rate to one of four categories, depending on whether the paragraph additionally mentions: (1) an expected return of a specific potential project, (2) expected returns of potential projects in general, (3) a realized return of a specific existing project, and (4) realized returns and profitability of existing projects in general. Only a handful of cases (where managers state the discount rate in isolation) do not fall into the four categories.

Paragraphs in category (1) typically compare the expected return of at least one specific potential investment project to the discount rate, for example by stating "this is just a really good project that far exceeds our 25 percent IRR threshold" or "you see an internal rate of return of 24 percent. That far exceeds our 15 percent hurdle rate." We find that 38 percent of paragraphs that contain a discount rate in our dataset fall into category (1).

Category (2) includes paragraphs where managers discuss in general terms the returns that they expect to generate from future projects, often in the context of explaining their approach to project selection, for instance by stating "our base expectations around any capital we invest is a minimum 15 percent internal rate of return" or "far fewer new store proposals are now achieving our 20 percent internal rate of return investment hurdle (...). So the reduction in capital expenditure on existing stores really reflects our discipline in sticking to our 20 percent IRR." Category (2) accounts for 41 percent of relevant paragraphs.

Category (3) includes paragraphs where managers mention the discount rate in relation to the realized return of existing projects, for instance, stating "the 14.5 percent internal rate of return on new business (...), it's well above our internal 11 percent hurdle rate." Category (3) accounts for 11 percent of relevant paragraphs.

Finally, category (4) accounts for the 9 percent of paragraphs where managers report realized returns of the firm and then use the discount rate to explain how future firm-level returns may evolve, for instance, stating "our IRR hurdle is a 15 percent rate of return. This year, our return on invested capital was in the neighborhood of 23.6 percent."

Appendix E Simulations of Discount Rates and the Perceived Cost of Capital

We conduct simulations of the relation between discount rates and the perceived cost of capital. The simulations allow us to assess the properties of our regressions and robustness to classical measurement error. The simulations also illustrate that the results in Figure 4 and Table 4 arise from the infrequent adjustments in discount rates.

We run 50,000 simulations using artificial data that are generated to resemble the data studied in the main paper. We conduct the analyses in Figure 4 and Table 4 using each set of artificial data and study the distribution of outcomes across the simulations.

Appendix E.1 Setup of Each Simulation

Each simulation starts by creating a balanced panel of 1,000 firms with 20 years of data (plus a ten-year burn-in period). We construct the perceived cost of capital based on two persistent processes. The first process determines the financial cost of capital, $r_{i,t}^{fin.}$, which is a function of standard variables such as the market beta, market risk premium, and interest rates. All these variables are observed by the econometrician, although with error. The second process, $r_{i,t}^{\text{firm}}$, is a zero-mean process capturing unobserved firm-specific variation. Both processes are AR(1) with normally distributed innovations:

$$r_{i,t}^{\text{firm}} = \phi^{\text{firm.}} r_{i,t-1}^{\text{firm}} + \varepsilon_{i,t}^{\text{firm}}$$

and

$$r_{i,t}^{\text{fin.}} = (1 - \phi^{\text{fin.}})\overline{r^{\text{fin.}}} + \phi^{\text{fin.}} r_{i,t-1}^{\text{fin.}} + \varepsilon_{i,t}^{\text{fin.}}.$$

We also simulate a long-term interest rate as a persistent AR(1) process,

$$r_t^{\text{int.}} = (1 - \phi^{\text{int}})\overline{r^{\text{int}}} + \phi^{\text{int}} r_{t-1}^{\text{int}} + \varepsilon_t^{\text{int}}.$$

Given the long-term interest rate and $r_{i,t}^{\text{fin.}}$, we calculate the aggregate risk premium, λ_t, which is the average cost of capital at time t across firms minus the interest rate at time t, $\lambda_t = \sum_i r_{i,t}^{\text{fin.}} - r_t^{\text{int.}}$. We then back out the implied firm-level beta, so that $r_{i,t}^{\text{fin.}} = r_t^{\text{int.}} + \beta_{i,t}\lambda_t$.

We construct the perceived cost of capital based on $r_{i,t}^{\text{firm}}$ and $r_{i,t}^{\text{fin.}}$. To generate the empirically observed persistence in the perceived cost of capital, we assume a Calvo-style friction, where only a certain fraction of firms, $\alpha^{\text{perc.}}$, can update their perceived cost of capital each period. Firms that are allowed to update their perceived cost of capital update it such that

$$r_{i,t}^{\text{perc.}} = r_{i,t}^{\text{firm}} + r_{i,t}^{\text{fin.}},$$

whereas firms that are not allowed to update keep the same value of the perceived cost of capital as last period.

We impose a similar Calvo-style friction to generate the observed infrequent adjustment in discount rates. We assume that only a certain fraction of firms, $\alpha^{\text{discount rate}}$, can update their discount rate each period. Firms that are allowed to update their discount rate update it such that,

$$\delta_{i,t} = \Lambda \times r_{i,t}^{\text{perc.}}$$

where the parameter Λ determines to what extent firms match their discount rate to the perceived cost of capital. Firms that cannot change their discount rate keep the same value as last period.

The simulations give rise to a balanced panel of the perceived cost of capital and discount rates. We next turn to matching the unbalanced nature of our data by removing most observations on the perceived cost of capital and discount rates. In doing so, we ensure that we have the same distribution of observations per firm as in our data.

Using the unbalanced panel of the perceived cost of capital, we estimate a Lasso regression similar to the one in the main paper. We use Lasso to construct the optimal out-of-sample estimate of the perceived cost of capital based on four inputs: the long-term interest rates, market betas, market risk premia, and the product of the risk premia and the market betas. We assume that market beta and risk premia are measured with persistent errors. We simulate these errors using an AR(1) processes similar to the one for the financial cost of capital.

Appendix E.2 Calibration of the Simulations

We calibrate the Calvo parameters to match the observed adjustment frequency in discount rates and the perceived cost of capital. We calibrate the processes for $r_{i,t}^{\text{firm}}$ and $r_{i,t}^{\text{fin.}}$ to replicate the observed behavior of the perceived cost of capital and the predicted value of the perceived cost of capital. We set the persistence parameters $\phi^{\text{fin.}}$ and ϕ^{firm} equal to 0.98 to match the persistence observed in the data. We calibrate the innovation for the processes to have standard deviations of $\sigma_{\varepsilon}^{\text{fin.}} = 0.00205$ and $\sigma_{\varepsilon}^{\text{firm}} = 0.0048$. These estimates ensure that the volatility of the perceived cost of capital equals 2.8 percent, as in the data. The volatility in the innovations of the measurement error in β and λ is 0.0006. The assumptions ensure that the volatility of the predicted value of the perceived cost of capital is 1.08 percent, as is the case empirically, and that the R^2 of the regression of $r_{i,t}^{\text{perc.}}$ on the predicted value $\widehat{r_{i,t}^{\text{perc.}}}$ is 15.4 percent, as in the data. To ensure stationary distributions over time, we start the cross-sectional distribution of all variables at the long-run average and impose a ten-year burn-in period for the simulations.

Appendix E.3 Results of the Simulations

Table A17 reports regressions identical to those in Table 4 of the main paper. The first four columns show regressions using the simulated data and the last two columns reproduce the results from Table 4 in the paper. For the simulated data, we report the average and standard deviation of slope coefficients across the 50,000 simulations.

Columns 1 and 2 use the true cost of capital on the right-hand side. The coefficient is 1.05 without fixed effects. When we include firm fixed effects in column 2, the slope coefficient drops to 0.42. This drop is similar in magnitude to the one observed in the data (columns 5 and 6).

Columns 3 and 4 use the predicted values on the right-hand side. The slope coefficient is 1.07 without firm fixed effects and 0.38 with firm fixed effects. The coefficient thus drops by almost the same magnitude as for the true values. The estimate with firm fixed effects in column 4 is marginally downward biased, consistent with a small degree of attenuation bias. The bias is, however, economically small. Almost all of the decrease in the slope coefficient due to firm fixed effects is due to the true dynamics, which are driven by the infrequent adjustment of discount rates.

In the simulations underlying Table A17, we have set the parameter Λ to 1.7. We do so because firms move their discount rates more than one-to-one with the cost of capital in the data, whenever they move their discount rate. A natural explanation for this pattern is that increases in the cost of capital arise in part from increases in risk and that firms add higher discount rate wedges (κ) in the presence of increased risk, leading to such a leverage effect. However, this choice of Λ is not important for our results. If we set $\Lambda = 1$, the slope coefficients are smaller, but the relative size of the coefficients is exactly the same. That is, including firm fixed effects continues to reduce the true slope coefficient by 60 percent (as in the data) and the bias arising from our prediction procedure remains modest.

The standard errors reported for the simulations are given by the standard deviation of the parameter estimates across simulations. The standard errors obtained from the simulations continue to reject the hypothesis that the slope coefficient is 1 when controlling for firm fixed effects.

We also confirm that the simulations generate the observed pattern in transmission over time. To this end, Figure A7 shows the simulation equivalent of Figure 4 in the paper. The figure displays the same upward slope in the coefficients, which is driven by the infrequent adjustment of discount rates.

Finally, one may ask what it takes for the slope coefficients not to be lower when using firm fixed effects. To answer this question, we run two additional simulations, one in which the sample period is very long and another one in which discount rates are adjusted frequently (but the sample remains short). In both of these simulations, we find that firm fixed effects have no influence on the slope coefficients. However, the sample length needs to be very long, 500 years or more, for the effect of the fixed effects to disappear. This finding illustrates that the infrequent adjustment of discount rates explains the low slope coefficient in samples that are relatively short.

Appendix F Details on the Model of Adjusted Q

In this section, we derive the relation between adjusted Q and Tobin's Q as well as the effect of discount rates on investment in a model of adjusted Q. The basic model is laid out in Section 6.1. The only modification that we make to the standard Q-model is that we allow for positive discount rate wedges and positive cost of capital wedges. Readers who are only interested in how we use the new data to quantify the model-implied effect of the discount rate on the net investment rate may like to jump straight to Appendix F.3

Appendix F.1 Optimal Investment Rate

We work out the optimal net investment rate and adjusted Q in a model of a firm on a balanced growth path. The profit function $\Pi_t(k_t)$ is homogeneous of degree 1 in k_t, so it can be written as:

$$\Pi_t(k_t) = \Pi_k k_t, \tag{A7}$$

where $\Pi_k > 0$ is a constant. As a result, the value function is homogeneous of degree 1 in k_t and can be written as:

$$V(\upsilon + \kappa, k_t) = (1 + \delta) q k_t, \tag{A8}$$

where q is a constant that measures the marginal value of capital in the eyes of the firm when future cash flows are discounted at rate δ. Hence, q is by definition the adjusted Q on the balanced growth path: $q = Q^{\text{Adjusted}}$.

We can rewrite the model of equation 12 in recursive form by substituting equations A7 and A8 into equation 12:

$$(1+\delta)qk_t = \max_{I_t} \quad \Pi_k k_t - I_t - \Phi(I_t, k_t, \xi) + qk_{t+1}. \tag{A9}$$

Taking the first-order condition for the right-hand side of equation A9 gives the optimal net investment rate, which is also the growth rate of the firm and which we label g to simplify notation going forward:

$$\frac{I_t}{k_t} - \xi = \frac{1}{\phi}(q-1) = g. \tag{A10}$$

Dividing both sides of equation A9 by k_t, while taking the optimal net investment rate g from equation A10 as given, renders an equation for adjusted Q:

$$(\delta - g)q = \Pi_k - \frac{I_t}{k_t} - \Phi(\frac{I_t}{k_t}, 1, \xi). \tag{A11}$$

Appendix F.2 Adjusted Q and Tobin's Q

Equation A11 already contains adjusted Q, the marginal value of capital in the eyes of the firm (i.e., using the discount rate δ). We next derive Tobin's Q, the marginal value of capital in the eyes of financial markets (i.e., using the discount rate $r^{\text{fin.}}$). To do so, we follow an analogous approach to the one we took to derive A11. We again take as given the net investment rate g, which is determined by the firm in equation A10. However, to derive Tobin's Q, we discount future cash flows in equation A9 using $r^{\text{fin.}}$ instead of δ. This then renders:

$$(r^{\text{fin.}} - g)Q^{\text{Tobin}} = \Pi_k - \frac{I_t}{k_t} - \Phi(\frac{I_t}{k_t}, 1, \xi). \tag{A12}$$

We follow previous work and term the inverse of $r - g$ the duration of firm's cash flows, which is observed in financial data as the price-earnings ratio of a firm (e.g., Gormsen and Lazarus 2023). This relation can also be directly derived from the Gordon growth model for asset prices:

$$\text{Dur} = \frac{1}{r^{\text{fin.}} - g}. \tag{A13}$$

We derive the relation between adjusted Q and Tobin's Q by taking the ratio of equations

A11 and A12. We then rewrite the ratio in terms of duration by inserting A13:

$$q = Q^{\text{Tobin}} \frac{1}{\text{Dur}(\upsilon + \kappa) + 1} = Q^{\text{Adjusted}}. \tag{A14}$$

Hence, adjusted Q is a scaled version of Tobin's Q, where the scaling factor depends on the duration of cash flows and wedges.

Appendix F.3 The Effect of the Discount Rate on the Net Investment Rate in the Model of Adjusted Q

We rewrite the firm's choice of optimal net investment rate (which we denote by $g = \frac{I_t}{k_t} - \xi$) by combining equations A10 and A11:

$$g = \delta - \sqrt{\frac{2(\xi + \delta - \Pi_k) + \delta^2 \phi}{\phi}}. \tag{A15}$$

We differentiate A15 with respect to an exogenous shock to the discount rate. This reveals how changes in the discount rate affect the net investment rate:

$$\frac{\partial g}{\partial \delta} = 1 - \frac{1 + \delta\phi}{\sqrt{\phi(2(\xi + \delta - \Pi_k) + \delta^2 \phi)}}. \tag{A16}$$

We can rewrite equation A16 in terms of duration:

$$\frac{\partial g}{\partial \delta} = -\frac{1}{\phi} \times \frac{\text{Dur}(1 + \phi r^{\text{fin.}}) - \phi}{1 + \text{Dur}(\kappa + \upsilon)}, \tag{A17}$$

using the definition of $\text{Dur} = \frac{1}{r-g}$ and replacing g as in equation A15.

We use our new data to measure the objects in equation A16. The average discount rate (of firms that fully account for overhead) in our data is 11.5 percent. The average duration of cash flows of listed US firms, using data from Compustat, is close to 20 years (van Binsbergen 2025). Following Philippon (2009), we assume an adjustment cost parameter typical of the literature of $\phi = 10$. Finally, assuming that the average financial cost of capital is 5.5 percent (Graham and Harvey 2018) and inserting these figures into equation A16, we find that the model-implied effect of the discount rate on the net investment rate is -0.95.

Appendix G The Persistence of Firm Characteristics Over Time

Table A18 displays coefficients from regressions of a future characteristic on the same characteristic averaged over 2000 to 2002. Standard errors are clustered at the firm level and displayed in parentheses.

The first row shows the coefficient from regressing market power in 2005 on market power in 2000-02. The coefficient is 0.88, indicating a strong and statistically significant association between market power in 2000-02 and in 2005. The association is also positive and significant at the end of our sample in 2021, as shown by the coefficient of 0.9 in the second column. There is thus a strong association over time between market power in 2000-02 and market power in later years.

We similarly find significant associations between the financial constraints index in 2000-02 and the index in 2005 (column 3) as well as between the financial constraints index in 2000-02 and the index in 2021 (column 4). Finally, the associations between risk in 2000-02 and risk in 2005 (column 5) as well as between risk in 2000-02 and risk in 2021 (column 6) are also positive and significant. The coefficients on risk are slightly lower than for the other two characteristics. This may indicate that there was more movement in firm-level risk than for other characteristics over our sample period, in particular over the period 2000 to 2005. However, the coefficients are significantly above 0, which indicates that our analysis is informative about the behavior of firms with greater risk through the sample period.

Nonetheless, we also repeat the analysis of Table A13 using the average firm-level risk over the years 2015 to 2021, since this is the period toward the end of our sample during which the discount rate wedge grew by the most. Risk was relatively stable throughout the 2015-21 period: the coefficient is 0.89*** (0.04) when regressing risk in 2021 on risk in 2015. Consistent with Table A13, we find no evidence that firms with higher risk increased their discount rates by more. We prefer using the 2000-02 values in the paper, however, because using averages over this period ensures that the analysis is immune to concerns about reverse causality.