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# Finance, Investment, and Productivity:

*Distillation and Synthesis of TPI Research Programme on Finance*


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## Abstract

This is a synthesis and distillation of The Productivity Institute's research programme on finance, investment, and productivity growth. The four lenses of analysis are: (1) An equilibrium/economist perspective, where investment is undertaken up to the point where the cost of capital equals its marginal return; various measures of the cost of capital are considered. (2) A demand/manager-owner perspective, where a firm owners' objectives can be the constraining side of finance usage and business investment. (3) A supply/financier perspective, where supply of finance is the constraint on investment through its availability or cost; this lens needs further development. (4) A dynamic perspective which investigates how sticky or slow decision-making and lumpy investment projects can affect investment outcomes and productivity growth. All the research uses firm level data to reveal (1) Heterogeneity and dynamic gaps in cost of capital measures relative to some notion of return to capital (e.g. a wide interior margin between cost of capital and return to capital; (2) Asymmetries and non-linearities in investment responsiveness to cost of capital and shocks, by firm size, type of investment, sector and region; (3) Notable constraints on both the demand-side and supply-side that limit the uptake or availability of finance for investment. (e.g. exterior margin constraints); (4) Lags and stickiness between hurdle rates, investment, and productivity. This research implies that policy to promote superior investment outcomes and faster productivity growth is complex and multifaceted.

# Contents

# Executive Summary

Productivity growth is about the transformation of products, processes, and workplace practices. In all three of these contexts, business investment plays a central role, whether that be investment in new ideas, in new locations for expansion, or in technology to change workplaces practices and production.

Business investment and productivity growth increase the potential for the economy to deliver higher living standards. Business investment is not the only or the whole story – public investment and enhanced labour participation and skills are also needed (and are addressed in other work programmes). The objective of this research programme is to take a fresh look at UK investment and the role for finance in supporting it.

The lens for distilling and synthesising this new research builds from the three perspectives that were proposed in the framework paper, *UK Business Investment: Economists, Managers, Financiers* prepared for the first year of the TPI research programme (Mann, 2024)

The equilibrium/economist perspective is the canonical perspective where investment is undertaken up to the point where the cost of capital equals its marginal return. However, the cost of capital, and therefore business investment outcomes, vary according to heterogeneity of firms as well as the macro- and micro-economic environment.

The demand/manager-owner perspective accounts for how firm owners' objectives can affect the relationship between finance and business investment. Under some circumstances, manager-owners might be the constraint yielding less finance demanded and therefore less investment undertaken than would be suggested by the equilibrium/economist perspective.

The supply/financier perspective considers the objectives of financial institutions in the finance and investment equation. These considerations may yield less or more costly finance than might be supplied to support investment than would be suggested by the equilibrium/economist perspective.

Finally, there is a dynamic perspective which investigates how sticky or slow decision-making and lumpy investment strategies or projects can affect the time-series properties of firm behaviours and outcomes and through those channels the evolution of productivity growth.

Research undertakings in this programme focus on the cost of capital and investment, including an assessment of different measures of the cost of capital (debt, equity, weighted average cost of capital (WACC), hurdle). The work investigates how those are related to investment of different types (tangible vs R&D). How the firm's balance sheet evolves when investment is lumpy is relevant. The work shows that investment outcomes vary by firms of different employment size, high-growth designation, productivity, financial constraint, region, and with different ownership structures (particularly considering the family owner).

Macroeconomic environments and policy shocks can be relevant for investment outcomes. All the research papers in this programme use firm-level data, including survey, qualitative, and quantitative.

Heterogeneity is the key finding. There is no 'one-measure fits most' for the cost of capital in econometric research. The relevant cost of capital varies by firm size, location, family ownership, and type and lumpiness of investment. Further, the gaps between different measures of the cost of capital -- for example, the cost of debt vs the hurdle rate – are related to the macro environment and policy. This leads to the observation that investment responsiveness is asymmetrical to the macro environment given firm characteristics.

More broadly there are lags and stickiness between hurdle rates, investment, and productivity. Findings also show that investment responsiveness is non-linear in various firm characteristics. There is a U-shaped relationship between investment and financial constraints, family ownership, and productivity levels.

# 1. Introduction

## Background and context

That UK business investment has underperformed is not a new observation. By various assessments UK business investment has been weak for decades, was particularly sluggish after the Global Financial Crisis, and has slowed further since Brexit and Covid. Slow growth in global demand, reduced competitive pressures, higher uncertainty of various types, underexploited agglomeration and network externalities, inequalities of place, rising financialisation and earnings management, and increased importance of institutional investors are variously cited as culprits holding back business investment.

Business investment is the focus of this programme of The Productivity Institute's research agenda. Productivity growth is about the transformation of products, processes, and workplace practices, and in all three of these contexts, business investment plays a central role, whether that be investment in new ideas, in new locations for expansion, or in technology to change workplaces practices and production.

Business investment and productivity growth increase the potential for the economy to deliver higher living standards. Business investment is not the only or the whole story – public investment and enhanced labour participation and skills are also needed (and are addressed in other research programmes). But the objective of the research in this programme is to take a fresh look at UK investment. The lens for distilling and synthesising this new research builds from the three perspectives that were proposed in the framework paper (Mann, 2024)

## Centrality of investment for productivity growth

Investment is the foundation of potential output growth (which is the capacity to deliver non-inflationary growth); capital deepening (which is the source of higher labour productivity and real wage growth), and innovation (which is the transformation of products, processes, and workplace practices so as to produce more efficiently and effectively). Collectively, capital investment, people skills (the focus of the TPI People programme) and productivity growth are key to an economy's capacity to deliver higher living standards.

### Research objectives and rationale

The relationship between finance and investment, which is the foundation for productivity growth, is the focus of this research programme.

There are several perspectives on how finance is related to private business investment (Mann, 2024).

An equilibrium/economist perspective: This is the canonical economist perspective where investment is undertaken up to the point where the cost of capital equals its marginal return. However, as outlined in the framework paper, even if equilibrium is the perspective, the cost of capital, and therefore business investment outcomes, including by type of business investment such as tangible, intangible, and financial, can vary according to heterogeneity of firms as well as the macroeconomic environment. The heterogeneity of firms has multiple sources, including sector, but also management practices and incentives, as well as

financiers objectives and regulatory regimes. A deeper assessment of these sources of heterogeneity are key aspects of the analysis.

A demand/manager-owner perspective: This is where firm owners' or managers' considerations and behaviours may affect how much and what kind of finance supports business investment, including what type. These considerations and behaviours may yield an outcome whereby there is less finance demanded and therefore less investment undertaken than would be suggested by the equilibrium/economist perspective.

A supply/financier perspective: This is where financial institutions' considerations, including regulatory regimes, may affect how much and what price of finance will be offered to support a firm's investment decisions. These considerations may yield less or more costly finance than might be supplied to support investment than would be suggested by the equilibrium/economist perspective.

Ultimately it is the interplay of the decisions taken by the demand and supply side -- the owner/managers and financiers -- that will yield the amount and cost of financial support for various types of business investment in the economy.

However, irrespective of how much business investment ultimately is financed, the process of deciding on how much, what kind, and cost of financing and associated investment is unlikely to be a smooth-over-time function nor is there likely to be a smooth evolution from investment to productivity growth. Therefore, there is a fourth perspective: how sticky or slow decision-making and how lumpy investment strategies can affect the time-series properties of firm behaviours and outcomes and through those channels productivity growth as well.

A dynamic perspective: Decisions by owner/managers or by financiers can be slow to adjust to the macroenvironment or technological possibilities, or lag in perception of potential investment opportunities. The investment process and outcomes can be lumpy. Since the links between finance, investment, and productivity take time to play out, and are not smooth or linear, this lumpiness can affect the relationship between investment outcomes and firms' balance sheet information, may affect macroeconomic variables, and therefore be relevant for econometric analysis.

The research undertaken in this programme offers insights on these four perspectives.

## Synthesis of findings

Key findings of the research in these programmes, drawing the thread through the four perspectives include:

Heterogeneity and dynamic gaps in cost of capital measures. The findings are clear that there is no 'one-measure fits most' for the cost of capital in econometric research. The relevant cost of capital varies by firm size, location, family ownership, and type and lumpiness of investment. Further, the gaps between different measures of the cost of capital -- for example, the cost of debt vs the hurdle rate – are related to the macro environment. From a research perspective, this means that choosing multiple metrics for the cost of capital across different firm characteristics will be relevant in research design.

Asymmetry in investment responsiveness. Investment responsiveness to positive vs negative policy shocks differs. With negative shocks and flexible hurdle rates, investment contracts. But if hurdle rates are sticky, these negative shocks do not undermine investment. Expansionary shocks, however, elicit similar investment reactions across both hurdle-rate types, indicating upward flexibility but downward rigidity in hurdle rates. From a research perspective, this means that attention to the type of macroeconomic shocks and environment matter, which complicates any policy strategy designed to promote investment for productivity growth.

Non-linearity in investment responsiveness. There is a U-shaped relationship between investment and financial constraints, with smaller and larger firms not experiencing the degree of constraint as mid-sized firms. This U-shape relationship also shows up between family ownership and control and the demand for equity finance. Firms of different productivity levels and different size firms show different elasticities between investment and the cost of capital. Financial constraints operate through different parts of the balance sheet depending on the size of the firm. a U-shaped relationship between. From a research perspective, this means that careful attention to threshold margins for firm characteristics and cost of capital measures matter for research findings, which also generates a more complicated approach to policy.

Lags and stickiness between hurdle rates, investment, and productivity. There is a time-dependent relationship between finance, investment, and productivity. Internal hurdle rates, which affect investment, respond sluggishly to the macroenvironment. Therefore, whether financed internally or externally, raising or accumulating funds necessary to undertake and investment takes time. Then it takes time for the investment to proceed. Finally, it takes time for that investment to show up as productivity growth. From a research perspective, this means that explicit consideration of lag structure in analysis is important, which could affect any policy strategy

Supply side of finance needs more analysis. The focus of this research programme has been on firms' investment responsiveness to various financial measures and macro and micro environmental factors. Understanding why there is a U-shape in financial constraints or why there is an equity financing gap requires more understanding of the supply side of the equation. Fintech could play a role in affecting balance sheet constraints and information constraints. But much more granular analysis is needed.

# 2. Research Questions and Research Design

## Research questions addressed

Cost of capital and investment: This research includes an assessment of different measures of the cost of capital (debt, equity, WACC, hurdle) and how those are related to investment of different types (tangible vs R&D), and by firms of different employment size, high-growth designation, productivity, financial constraint, region. (Xue and Mann, 2026). This research includes a focus on hurdle rates (a measure of the cost of capital, which is influenced by manager/owner considerations); including which firms use hurdle rates, what considerations affect the gap between hurdle rates and the underlying equilibrium cost of capital (Xue and Mann, 2026) and Shah, Bunn and Haskel (2025). The research also considers how the channels of transmission from monetary policy shocks to investment is affected by whether firms use internal funds or external borrowing to support investment (Shah, Bunn and Melolinna, 2025)

Finance and high growth firms: This research evaluates finance and investment at high-growth firms from both the supply and demand perspective. On the supply side, it considers why high-growth firms may not be supplied the equilibrium amount of equity finance. Another paper considers the ownership structure of high-growth firms and evaluates how that ownership structure may yield a lower than equilibrium amount of equity finance being demanded. (Dang, Gao, and Liu, 2025, 2026a,b)

Dynamics of investment: This research compares the investment outcome with the evolution of the firm's balance sheet, hypothesising that investment is lumpy. Therefore the links between finance, investment, and productivity are not likely to be smooth over time. This lumpiness can be reflected in aggregate macro statistics. (Görtz, Tsoukalas, and Walsh, 2026). This research on hurdle rates find that firms adjust hurdle rates only sluggishly, which implies that cost of capital or sales shocks take time to appear in the investment data, potentially creating lags between the drivers of investment and its outcome (Shah, Bunn, Melolinna, 2025b). This research on equity financing and productivity finds that it takes time for investment to be manifest in productivity growth, on account of various lags (Dang, Rui, Liu, 2026b).

## Research design

All the research papers in this research programme use firm-level data, including survey, qualitative, and quantitative. Some data sources are a representative sample of firms, others purport to cover the substantial universe of firms.

Most of the firms in the various samples are unlisted, consistent with the UK population of firms. Even so, finance and investment outcomes for listed vs unlisted are considered by some of the research. In terms of understanding the demand and supply side: Single owner, family ownership, and multinational ownership are considered. More work on the potential implications of concentrated financial institution ownership – financiers and their role on the supply side -- is warranted, as is outlined by Mann (2024) and as noted in the Bank of England's Financial Stability Report (December 2025).

Data sources include: Beauhurst, Companies House, DMP, Moody's/Bureau van Dijk FAME. Gormsen and Huber (2025) for hurdle rates. Time period varies by study, but generally is from

the mid-2000s through end of 2019. Some studies extend the sample through the Covid period, with some focus on the post-Covid higher interest rate environment.

Research methodologies are varied, depending on the hypotheses, but include standard methodologies such as time-series panels, Dynamic Factor Models (DFM), quantile regressions, and propensity score matching.

# 3. Findings and Analysis

## Synthesis of research addressing the equilibrium/economist perspective

### Cost of capital and investment

Several of the research papers in this research programme focus on how a different type, source, or cost of financing affects investment, including different types of investment such as tangible vs intangible.

The research by Xue and Mann (2026) is a comprehensive assessment of how different measures of the cost of capital -- including cost of debt, cost of equity, return on invested capital (ROIC), weighted average cost of capital (WACC), and internal hurdle rates -- affect investment outcomes for both tangible capital (CAPEX) and intangible capital (research and development). Using a sample of 43,000 firms from 2013 to 2022—sliced and diced by employment size, high-growth designation, productivity level, degree of financial constraint, and region -- it offers a detailed perspective on the UK's persistently weak investment performance, during periods of historically low interest rates, heightened economic uncertainty, and changed trade relationship of Brexit.

Shah, Bunn, and Haskel (2025) focus on the recent cycle of tighter monetary policy and higher overall interest rates and explore how the source of financing – internal cash flow vs external debt – affects the investment decision of firms. In contrast to most analysis, which uses indirect indicators like credit spreads or aggregate loan variables to infer credit channel effects, the authors introduce a novel survey instrument – the firms' best estimate of the impact of changes in interest rates on borrowing costs, financing structures, and investment behaviour. They find that external-financed firms are found to face higher baseline costs, show greater sensitivity to rate hikes, and curtail investment more significantly.

Both sets of research find that when firm-level data are used in empirical analysis the cost of capital matters for investment. While this may seem obvious, much research on investment using national-accounts macro data quite frequently has found that interest rates are not a significant determinant of business investment (Mann, 2026) In part, this outcome in macro data is a consequence of using the Central Bank policy rate (or a short-term proxy) as the cost of capital. The research in this research programme finds that the relevant cost of capital varies substantially for firms.

Considering the type of investment as tangible or intangible reveals distinctly different sensitivities. The firm-level analysis over the full time period finds that the cost of debt consistently exhibits a significant and negative relationship with tangible investment, regardless of the specification. For both listed and unlisted firms, a one standard deviation increase in cost of debt reduces tangible investment by about 13% of the average investment

rate. However, intangible investment, as proxied by research and development (R&D), shows little to no response to changes in the various cost of capital measures. R&D investment appears to be driven predominantly by internal cash flow, profitability, and firm-specific strategic considerations rather than borrowing costs or investor return requirements. (Xue and Mann, 2026)

There is quite a bit of heterogeneity, however, in the investment-sensitivity to different measures of the cost of capital. The results consistently show that smaller firms, unlisted firms, and financially constrained firms are more sensitive to changes in the cost of debt. Small firms exhibit nearly triple the investment elasticity relative to very large firms. Larger, more productive, and better-capitalised firms exhibit weaker responses to the cost of debt. Listed firms are more responsive to equity-based cost measures, while unlisted firms are more reliant on debt markets. Cost of debt has no significant effect on high-growth enterprises (HGE) but significantly dampens investment for non-HGEs, , suggesting that high-growth firms, despite their intensive investment needs, are less constrained by debt costs, possibly due to stronger internal cash flows, better investor attention, or preferential access to funding. (See further discussion of HGEs below)

The greater sensitivity of small firms to cost of capital also is shown by the quantile work of Tsoukalas, Görtz, and Walsh (2026). Adverse financial shocks generate even more pronounced dispersion: small and financially constrained firms display significantly negative investment responses, while large firms show no sensitivity, highlighting the differential impact of credit market conditions across the firm distribution.

In the more recent period of rising interest rates, Shah, Bunn, and Haskel (2025) show that firms that rely on external financing report a higher cost of capital than those using internal funds. When borrowing costs increase, firms that depend on external finance reduce investment more sharply compared to internal funders. When the policy rate increases, the cost of external finance rises by more than internal finance; that is, externally financed firms are more policy-rate sensitive. In terms of investment responsiveness, these externally-financed firms curtail investment more significantly. These firms account for approximately 25% of the total effect of monetary tightening on aggregate investment.

Work by Xue and Mann (2026) over the full sample period, considers the differential responsiveness of tangible (CAPEX) vs intangible (R&D) assets. The results highlight the distinct economic and financial characteristics of intangible assets: They are less collateralisable, have uncertain payback periods, and are more likely to be financed through retained earnings than external sources. While Shah, Bunn and Haskel (2025) do distinguish the source of financing (internal vs external), they do not make a distinction between the type of investment.

## Factors other than the cost of capital and investment

Business investment and demand conditions go hand in hand, but there are nuances. Xue and Mann (2026) results show a consistent pattern for both tangible and intangible investment that growth matters for investment. The quantile regressions of Tsoukalas, Görtz, and Walsh (2026) find that larger firms, high-growth companies, and those with younger capital vintages exhibit stronger investment responses to business cycle shocks. High sales-growth firms respond more aggressively to positive shocks, while high-debt firms show greater sensitivity to financial conditions. The Global Financial Crisis revealed a step-down in UK business dynamism: fewer firms made large capacity expansions.

Xue and Mann (2026) explore what factors other than the cost of capital are relevant for investment. Some modest geographical difference is observed, with firms headquartered in London displaying slightly lower sensitivity to capital cost metrics, possibly reflecting better access to financial services and investor networks. (Daams and McCann (2025).

Firms with greater market power, as measured by the Lerner Index, tend to invest less in tangible capital. This finding is consistent with recent evidence that weak competitive pressures reduce the incentive to expand capacity, innovate, or improve productivity. (Xue and Mann, 2026).

The study considers the impact of shocks and uncertainty, including the implementation of Brexit in 2020. After controlling for financing conditions and firm characteristics, a statistically significant decline in both tangible and intangible investment is observed in the post-2020 period. This pattern suggests that heightened uncertainty, regulatory divergence, and exposure to trade and labour-market disruptions exerted downward pressure on investment. (Xue and Mann, 2026 and Bloom et al, 2025) Notably, the decline is most pronounced among larger and internationally exposed firms. Implications of Brexit are also observed in the quantile approach by Tsoukalas, Görtz, and Walsh (2026) The large firms responded immediately to the Brexit referendum, while the smaller firms lagged, suggesting asymmetric adjustment patterns across different types of firms and investment decisions.

## Research on the demand/manager-owner perspective:

Several of the research papers focus on how the behaviour of managers and owners of the firm can affect investment. Görtz, Tsoukalas, and Walsh (2026) asks the general question of whether sluggish UK investment reflects changes in firm behaviour or shifts in the composition of active firms. Considering pre and post GFC, and using inverse probability weighting, they show that for medium and large firms, most of the decline in responsiveness stems from behavioural changes rather than compositional shifts in the sample. For smaller firms, the split is approximately fifty-fifty between changing characteristics and behavioural responses. Other research delves into what might be the underpinning of this outcome.

Focussing on the demand for investment finance, these papers dig deeper into why managers and owners of the firm raise the cost of capital above its equilibrium rate (to a so-called hurdle rate), even considering firm heterogeneity. Two papers evaluate these hurdle rates, which is an internal discount rate that managers use to evaluate investment projects. Research using two sources for hurdle rate – the Decision Market Panel survey and Gormsen and Huber (2025) earnings calls – find that hurdle rates are substantially higher than market-based capital costs, which yields significantly lower investment outcomes – but also that hurdle rates adjust slowly and incompletely to changes in the policy-rate environment. Dang, Rui, Liu (2026a) consider how family ownership creates incentives to either access more, or less, equity to finance investment.

### Hurdle rates and the demand for finance

Xue and Mann (2026) show that the investment outcome of firms that use hurdle rates differs from the whole sample of firms. While the average firm-level WACC in the sample is approximately 6.4%, the mean reported hurdle rate exceeds 10%, with considerable variation across firms. Over the long sample period, hurdle rates rarely changed. In this sample period, during which interest rates were very low, firms appear to maintain elevated internal return benchmarks even when external borrowing costs decline. The empirical

results indicate that hurdle rates have the strongest negative association with tangible investment, with effects substantially larger than those associated with other cost of capital measures.

The different time period of rising interest rates and different sample of firms yields similar conclusions: Shah, Bunn and Melolinna (2025) zero in on the period of tightening monetary policy (2022 and 2024, which is beyond the Xue Mann sample), and use the Decision Maker Panel (DMP) sample set find results that are in the same spirit.

Using new survey evidence from the DMP, these authors find hurdle rates even higher than in the Xue-Mann sample (averaging 16%) but as Xue and Mann also show, DMP hurdle rates adjust sluggishly, even when interest rates are rising. When Bank Rate increased from 0.1% to 5.25% and corporate borrowing costs nearly tripled, the mean hurdle rate rose only slightly, from 15.5% in 2021 to 16.4% in 2024.

In this rising interest rate environment, the sluggish adjustment in hurdle rates may have limited the impact of policy rate increases on investment. First, only about half of firms updated their hurdle rate over the three years of the sample. Second, firms that did adjust passed through only about half of the increase in borrowing costs. That said, delving into the sample further, firms relying on borrowing were more likely to update their hurdle rates, but even for these firms, pass-through was incomplete with less than half of the increase in the policy rate being passed through.

In general, hurdle rates are more common among larger, more productive firms and those using external finance. But why hurdle rates are so much higher than the equilibrium cost of capital – therefore yielding lower investment outcomes -- bears further analysis. Hurdle rates may act as buffers—firms with initially high hurdle rates adjusted less in the rising rate environment. Uncertainty about investment outcomes might warrant such buffers. But a hurdle rate well above the equilibrium cost of capital and that changes infrequently also is consistent with institutional inertia (associated with coordinating multinational plants for example), agency considerations (that is, who in the organisational or financing relationship makes investment decisions) and managerial conservatism in capital budgeting (as a signal regarding fiduciary responsibility). Among firms reporting explicit hurdle rates, over 95% firms are large and listed firms, majority of which operate as multinational enterprises (MNCs)

These insights suggest that addressing UK underinvestment requires understanding not only funding costs but also the microeconomic decision processes inside firms, particularly larger and publicly listed companies where hurdle rates are more prevalent.

## Family ownership and the demand for finance

Hurdle rates are one measure of the demand for financial investment to support business investment. Family ownership and equity fundraising is another lens on how the demand-side of financing affects investment. Dang, Gao, Liu (2026a and b) look at the relationship between family ownership and equity fundraising in high-growth enterprises. This study contributes to the equity-gap debate in entrepreneurial finance by highlighting the influence of owner behaviour in financing decisions. This debate is whether the equity gap exists because firms cannot raise equity or because they choose not to.

The authors integrate agency cost perspectives with socioemotional wealth (SEW) theory to conclude that family ownership exerts a non-linear effect on equity fundraising.

Socioemotional wealth theory suggests that family-owned businesses consider not just economic outcomes but emotional outcomes, such as control and family legacy. Using a comprehensive panel of UK HGEs from 2014 to 2021, they identify an inverted U-shaped relationship between family ownership and equity fundraising, with a turning point just below 40% ownership. This non-linear relationship reflects a shift in the motivations and constraints of family owners. At moderate ownership levels, families balance growth ambitions with long-term legacy goals, aligning with investor interests and reducing agency concerns. In contrast, higher ownership concentrations intensify control-oriented SEW objectives and entrenchment risks, leading to equity aversion.

The integration of economic incentives and behavioural motivations when examining equity financing gap is key to these findings. In quantitative terms, at 50% ownership, the estimated marginal effect is −0.134, corresponding to a 25 percent decrease in equity fundraising for a one standard deviation increase in family ownership. In this range, heightened control considerations, together with increased agency costs, appear to constrain equity issuance. In contrast, at moderate ownership levels, the marginal effect is approximately 0.107, which equates to a 20 percent increase in equity fundraising. Here, the benefits of growth are more closely aligned with family interests, and firms, especially those with high growth potential, may be more willing to exchange some control for the capital required to sustain expansion.

These results both show that for family owners of HGEs, their ownership information is systematically observed and valued by external equity investors. But, on the other hand, they find no evidence that family firms substitute debt for equity at higher ownership levels, suggesting a broader conservative financing posture rooted in control preservation and risk aversion.

Delving deeper, the authors find that Board representation amplifies the negative impact of high family ownership on equity fundraising, while factors such as government grants, macroeconomic uncertainty, and geographic location shape but do not fundamentally alter this relationship.

## Research on the supply/financier perspective:

Firms may want to borrow or raise equity to finance investment. But, financial institutions may not be willing to offer sufficient funds, or those funds may be too costly. Some of the research in this strand investigates the importance of financial constraints on UK investment. More work needs to be done to investigate the dimensions of financial institutions' reluctance to offer funding, which could be regulatory, macro-environmental, informational opacity, and/or policy uncertainty.

### Debt constraints

That financial constraints do matter shows up in Xue and Mann's (2026) comprehensive work already cited. Using the Whited-Wu measure of financial constraints (describe) and dividing the sample into terciles, they find that the relationship between the cost of debt and investment follows a U-shaped pattern: it is strongest among moderately constrained firms, followed by highly constrained ones, and weakest for the least constrained. This aligns with theoretical expectations that moderately constrained firms, large enough to require external financing but not creditworthy enough to secure it cheaply, are most exposed to shifts in debt costs.

When considering heterogeneity by productivity, they find that a higher cost of debt significantly reduces tangible investment among low- and medium productivity firms, while the effect is smaller and statistically insignificant among high-productivity firms. The less productive firms would typically exhibit weaker profitability and lower creditworthiness. The relationship between productivity, credit availability, and cost warrants further analysis.

Another paper in this research strand is by Ozturk, Bunn, and Mizen (2025). This paper develops a new measure of firms' financial constraints using survey data from the UK Decision Maker Panel (DMP) as opposed to balance sheet measures. Using these survey questions, it distinguishes between limited internal funds, restricted external funds, and high cost of finance. This picks up the subjective element to financial constraints in the mind of the survey respondent (typically the CEO or CFO).

Results show that financial constraints based on balance sheet indicators – such as firm size, leverage, liquidity, age, and dividend-paying status—have meaningful predictive power, but the relationship is nuanced by firm size. Among large firms, leverage emerges as the strongest and most consistent predictor of constraint status based on the survey indicators. Firms with higher debt-to-asset ratios are more likely to report financing difficulties, suggesting that indebted firms face tighter borrowing conditions or higher risk premia. For smaller and medium-sized firms, leverage remains informative, but size, liquidity, age, and dividend policies become equally important markers of financing frictions. These firms rely more heavily on internal funds and face greater informational opacity.

The analysis reveals that financial constraints are pervasive -- around two-thirds of firms report at least one type of financial constraint. But what constraint is most important varies with macroeconomic conditions and the effect on investment of changes in constraints is notably asymmetric. In terms of timing and macro conditions, constraints based on the cost of finance respond quickly to interest rate changes (such as associated with a change in monetary policy), while internal finance constraints associated with other balance sheet indicators adjust more slowly, as sales and earnings evolve.

The results show that financially constrained firms respond more strongly to shocks, and these responses are asymmetric: higher interest rates and negative sales conditions have a much larger effects on investment than lower interest rates or positive shocks of comparable magnitude. Further, firms constrained by availability of internal finance respond more to demand shocks than unconstrained firms, which is consistent with internal funds being generated through sales and profits. These results conform to the Xue-Mann finding that cash balances are an important support for investment. Görtz, Tsoukalas, and Walsh (2026) also find this kind of result: adverse financial shocks generate even more pronounced dispersion: small and financially constrained firms display significantly negative investment responses, while large firms show no sensitivity, highlighting the differential impact of credit market conditions across the firm distribution. This systematic heterogeneity and asymmetry highlight the importance of financial frictions in amplifying shocks and shaping firms' investment behaviour.

## Equity finance gaps

Another question relevant for the supply/financier perspective is whether high growth enterprises face limitations on finance that constrain their investment and growth. Deng, Gao, and Lui (2025a) investigate this question.

What is a HGE, why do they matter, and are their financing constraints different? On the one hand, HGEs tend to be small – indeed as SMEs they account for 55% of SME output and 20% of SME workforce. But they contribute £1.45 trillion to the UK economy and employ more than 3.2 million people. These companies are particularly innovative and productive (ScaleUp Annual Report 2024)

SMEs typically follow a pecking order of financing, prioritising internal funds, then debt, and resorting to equity only as a last option due to the higher costs associated with information asymmetry. This has been documented in the previous sections of this research synthesis. HGEs may deviate from this hierarchy however, as their rapid expansion often leads to the early depletion of internal resources and pushes them to their debt capacity limits, making equity financing essential for sustaining growth.

The authors start by estimating equity gaps at the firm level, using a matching strategy. Leveraging a comprehensive dataset of privately held HGEs from Beauhurst covering the period from 2014 to 2021, the authors can quantify an equity gap as the difference between the benchmarks—namely, fundraising companies—and their matched, non-fundraising counterparts. The premise of this method is that matched firms should have a similar demand for equity finance, and the difference in their fundraising reflects the equity gap caused by imperfection on the supply side of finance.

Based on the matching, firms that experience equity gaps make significantly fewer capital investments in the next financial year, most being more pronounced among those with fewer tangible assets. This result regarding the greater sensitivity of HGE investment in intangibles compares to the equilibrium/economist finding that intangibles were not sensitive to varies cost-of-capital measures. But for the HGE sample, the reduction in investment is both statistically and economically significant, with a one-standard-deviation increase in these gaps leading to an estimated 40 per cent decline in investment. The decline in investment persists over time, highlighting the significant implications of the equity funding gap for long-term business investment. The sensitivity of investment to the funding gap persists both before and after key macroeconomic events, such as Brexit and COVID-19

In the cross-sectional analysis, firms with higher asset tangibility are better positioned to secure external financing (as found by Xue and Mann). Sector matters, with firms in industries with limited internal funds or high financing costs reported as major investment constraints, exhibit greater sensitivity to equity gaps. Equity gaps negatively affect labour investment, with a one-standard-deviation increase in equity gaps leading to a 5.9 per cent decline in employment levels. HGEs headquartered in London are less affected by the negative impact of equity gaps, consistent with the fact that London has a deeper capital market and offers broader networking and financing opportunities for HGEs. This result matches that of the equilibrium/economist view. Government grants do not significantly mitigate the relationship between equity gaps and investment, suggesting that they cannot serve as a substitute for equity financing nor be an adequate signal and catalyst for further equity financing.

## Research with a dynamic perspective

Decisions by owner/managers or by financiers can be slow to adjust to the macroenvironment or technological possibilities, or lag in perception of potential investment opportunities. The investment process and outcomes can be lumpy. Since the links between finance, investment, and productivity take time to play out, and are not smooth or linear, this lumpiness can affect the relationship between investment outcomes and firms' balance sheet information, may affect macroeconomic variables, and therefore be relevant for econometric analysis. A number of papers in this research strand assess the importance of these lumps and lags.

### Lumpy investment episodes, business dynamics, and macroeconomic outcomes

Görtz, Tsoukalas, and Walsh (2025) assess the dynamic links between balance sheet indicators of financial adjustment (such as cash holdings, debt, and equity) before, during, and after lumpy adjustment episodes for firms across the full size distribution of firms. Their dataset covers total employment of over 20 million employees in 2019, accounting for about 65 percent coverage of the public and private labour force of Great Britain (excluding Northern Ireland) and 73 percent coverage of private enterprises only (excluding, for example, the NHS). The sample covers years 2005 to 2019 inclusive.

Lumpy adjustment is defined as a large positive spike in investment which would imply an investment rate in excess of 35%. For an episode of capital disinvestment/depressed investment, the investment rate has to fall *below* 0%.

First, they compare the dynamics within the lumpy adjustment window with the same group of firms in normal times when no lumpy adjustment is taking place. Second, they construct a matched control group with similar performance in economic and financial fundamentals before the lumpy adjustment takes place.

Using U.K. firm-level data and a matched-event study approach, they document systematic patterns: (1) Firm-specific fundamentals reflected in Tobin's Q, profitability and TFP are leading indicators of lumpy adjustment. (2) Cash balances lead lumpy adjustments by a year, while debt responds most strongly overall, but with a peak response in the same year as the adjustment. This highlights the importance of firms' access to credit as a critical precursor to expansions in productive capacity. (3) Lumpy contractions in productive capacity follow years where firms reduce cash balances and hold above average levels of debt. During and after contractions, firms rebuild cash and reduce debt growth significantly in a concerted effort to restore financial resources by adjusting their productive operations

Small firms increase cash holdings significantly more than do medium and large firms during lumpy capital expansions. Small firms seem "lumpier" in the sense that the required increases in TFP, EBITDA-assets (earnings before interest, taxes, depreciation, and amortisation-to-assets, a measure of profitability) and output-per-worker preceding a lumpy adjustment are much larger for small firms than for medium or large firms. Small firms run lower debt-to-assets ratios in the run up to investment spikes, and debt-adjustment is much more muted, consistent with small firms being external-finance-constrained due to lack of pledge-able collateral and short credit histories.

The results also are consistent with a different type of time dynamics -- lags along with lumps. It simply takes time to build up cash reserves, lower leverage to safe levels, or build a reputation. Large acceleration events in TFP, the driving force of firm expansion, and spikes in debt growth to fuel productive expansion are also shown to meaningfully alter balance sheets.

Firm investment, business dynamism and macro outcomes are closely related. Quantile regression analysis demonstrates that while the left tail of the investment distribution moves in lockstep with economic conditions, the right tail—representing aggressive expansion—has fallen disproportionately. Considering the specific episode of Brexit, the large firms responded immediately to the referendum, while the small firms adjusted more slowly, suggesting asymmetric adjustment patterns across different types of firms and investment decisions. More generally, the extensive margin—the share of firms undertaking lumpy adjustments—drives aggregate fluctuations far more than the intensive margin—the average size of those adjustments.

## Sticky hurdle rates and dynamic adjustment

The discussion of hurdle rates in the previous section (Xue and Mann, 2026 and Shah, Bunn, and Melolinna (2025) also yields insights relevant for the dynamics of investment. Both authors find that hurdle rates adjust sluggishly to the macroeconomic interest rate environment.

As noted hurdle rates are more common among larger, more productive firms and those using external finance. Firms that rely on debt are more likely to update their hurdle rate, but even for these firms, pass-through of a change in borrowing cost was incomplete: for example, a one percentage point rise in borrowing costs translated into only a 0.37–0.41 percentage point increase in hurdle rates. If the hurdle rate acts as a buffer, then it will adjust more slowly than the macro signals. On the other hand, changes in the population of firms can affect the stickiness of investment response to interest rate changes. A higher share of MNCs (sticky hurdle) or SMEs (highly sensitive to cost of capital) could affect the estimated relationship between cost of capital and investment as it unfolds over time.

Shah, Bunn, Melolinna (2025) links hurdle rate stickiness to monetary policy transmission. Using local projection analysis over 2001–2023, it shows that firms with flexible hurdle rates reduce investment significantly after contractionary policy shocks, while those with sticky rates exhibit muted responses. Expansionary shocks, however, elicit similar investment reactions across both groups, indicating upward flexibility but downward rigidity in hurdle rates. Survey evidence from the tightening cycle corroborates these findings: firms that updated hurdle rates cut investment by around 12%, compared to 7% for non-adjusters. Overall, the study highlights how sticky hurdle rates dampen the responsiveness of business investment to monetary policy, shaping aggregate outcomes and reinforcing asymmetries in policy effectiveness.

## Equity lags to productivity gains

There are also lags between financing, investment, and productivity – none of those are instantaneous responses! Using a large panel of firms incorporated after 2011 and combining financial information from Orbis with equity deal data from Beaufurst, Deng, Gao, and Liu (2025a) document that equity fundraising by UK private firms is followed by a short-term decline in measured productivity. This effect is temporary and dissipates within three

years. The decline is concentrated among firms with high investment intensity and those operating in knowledge-intensive industries. Mechanism tests suggest that the productivity reduction reflects the time lag between equity-financed investment and the timing of revenue realisation.

These findings imply that equity capital enables firms to pursue long-term and intangible projects whose benefits materialise gradually and are not fully captured by static productivity metrics. Consistent with this interpretation, the negative effect dissipates within three years after fundraising. Taken together, our results highlight an essential measurement and policy insight: short-term declines in productivity following equity investment may mask the long-run efficiency gains associated with improved access to patient capital.

# 4. Implications for Policy and Business

## Policy implications: Cost of capital and investment

High borrowing costs for the majority of unlisted firms, elevated internal hurdle rates among larger firms, weak competitive pressures, and persistent macro-political uncertainty jointly constrain investment across the UK corporate sector. Improving investment outcomes is therefore likely to require multi-dimensional interventions, including measures to strengthen SME access to finance, enhance competition, improve transparency around internal capital budgeting practices, and reduce macroeconomic and regulatory uncertainty. By systematically linking multiple cost of capital measures to investment behaviour across a representative sample of UK firms, the research in this strand deepens our understanding of the UK's productivity puzzle and offers a robust empirical foundation for future research.

Additional work underscores the importance of the credit channel within the broader monetary policy framework. Policy rate adjustments do not only influence aggregate investment via direct cost-of-capital effects but also through differential impacts on firms based on their financing structure. The research in this strand suggests that central banks should take this heterogeneity into account, as credit constraints and financing composition amplify and shape policy effectiveness.

Research in this strand combined survey and balance sheet data to bridge proxy-based and direct approaches and offer a granular framework for identifying financially constrained firms and understanding their role in monetary transmission. The findings underscore the importance of heterogeneity and financial frictions in shaping policy effectiveness and highlight the need for richer indicators of financing constraint beyond leverage.

Analysis of hurdle rates shows stickiness, which has implications for monetary policy transmission. Sticky and asymmetric changes in hurdle rates dampen the responsiveness of business investment to monetary policy, reinforcing asymmetries in policy effectiveness.

## Policy implications: Equity and High Growth Enterprises

Taken together, the research in this strand provides a nuanced picture of equity finance in the UK high-growth firm ecosystem, with implications for business investment and productivity. 1) Persistent equity gaps have damaging effects on investment and employment, particularly for firms that are asset-light, regionally disadvantaged, or structurally dependent on equity. 2) Ownership structures, especially family control, play a

crucial role in shaping firms' engagement with equity markets, indicating that not all equity gaps stem from market failure. 3) Further, it is important to note the dynamic perspective – even when equity is raised, its productivity benefits unfold over time, with short-term declines in productivity reflecting investment dynamics rather than poor performance.

For policymakers, these findings underscore the need for a multi-dimensional approach to closing equity gaps, one that expands the supply of patient equity capital, addresses regional imbalances in its availability, but also considers firm-level ownership and governance preferences. For investors, the results highlight the importance of longer time horizons and governance structures. For firm management, the research clarifies the trade-offs among control, growth, and short-term performance metrics in equity finance.

Overall, the evidence suggests that equity finance is essential for unlocking the long-term growth and productivity potential of UK high-growth firms, but only if its dynamic effects and institutional context are fully understood and reflected in policy design and strategic decision-making.

## Policy implications: Lumpy dynamics

The research in this strand carries significant policy implications. Lumpy investment dynamics imply that stimulus policies are more effective during economic expansions than recessions. In booms, positive shocks push more firms further from their desired capital stocks, increasing the probability of lumpy adjustments and thereby raising the share of firms responding to incentives. This state-dependence suggests conventional fiscal multipliers may underestimate stimulus effectiveness in good times while overestimating it during downturns.

Effective policy design requires developing indicators that identify firms likely to have made lumpy adjustments even without intervention, which depends on measuring the distance between actual and desired capital. Policies that reduce adjustment costs or ease financial constraints could have outsized effects by enabling marginal firms to undertake growth-enhancing investments they would otherwise postpone.

# 5. Conclusions and what next from here

All the research in this programme points to the critical role of debt markets, credit conditions, and the macroeconomic environment in shaping investment behaviour in the UK. However, that is only one side of the equation: deeper understanding of the credit decisions by financial institutions, how those vary by size, sector, region, and type of investment as well as how those interact with the financial structure of firms, regulatory environment, and macro conditions is needed. Provision of patient equity capital, including venture capital, private equity and private credit (a form of patient debt) is particularly relevant given the lumpiness of investment, and the lags in it coming to fruition. All told, understanding the supply side of finance needs more in-depth analysis.

However, the demand side can also present a constraint on investment outcomes. Considering how family/owners, including financial actors as owners, evaluate the balance of control vs. growth prospects is needed. Understanding hurdle rates, which firms use them and why; why they are so much higher than market-based cost of capital measures and are sticky and change asymmetrically with financial conditions is important because sticky

hurdle rates dampen the responsiveness of business investment to cost-of-capital measures and reinforce asymmetries in investment outcomes. Analysis through the managerial lens of incentives and behaviours may provide important insights.

Beyond the cost of capital, other characteristics of the environment matter for investment outcomes. Very clearly growth matters: investment is procyclical and therefore can either support growth or hold it back. Competition policy may have a complementary role in promoting productive investment, particularly in sectors characterised by high concentration and barriers to entry. Uncertainty facing firms holds back investment; further assessment of what type of uncertainty would be useful

The findings in this research programme suggest that information barriers both about how much an investment is worth (such as tangible, intangible, lumpy and long-lived) and about the firm and its investment strategy (product, manager, investment type) hold back investment. Financial frictions exhibited through, for example, owner/manager incentives, hurdle rate gaps, and financial intermediaries' assessment, also matter for investment financing decisions and outcomes, and appear to be particularly relevant for size and regions.

Information barriers and financial frictions are two areas where innovations in data-intensive AI and fintech options could narrow the gaps between desired demand and available supply of finance (the interior margin) as well as provide more capital to smaller firms as well as HGEs (the exterior margins). The goal is to reach the theoretical economist/equilibrium model of where investment decisions and outcomes equate the marginal cost and marginal revenue of capital. This equilibrium has to be achieved against the backdrop of the overall environment of growth, competition, and uncertainty.

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# Appendix: Summary of each project

## Cost of Capital and Investment: Evidence from the UK

**Yongyi Xue and Catherine L. Mann (2026)**

This study investigates how the cost of capital affects firm-level investment in the United Kingdom. Using a comprehensive dataset covering more than 43,000 UK firms between 2013 and 2022, the analysis includes both listed and unlisted companies, with unlisted firms accounting for approximately 95% of the sample, capturing a more representative picture of the UK business. It contributes to longstanding policy and academic debates concerning the drivers of the UK's persistently weak investment performance, particularly in historically low interest rates, heightened economic uncertainty, Brexit, and slow productivity growth over the past decade.

The objective of the study is to assess how different components of the cost of capital, including cost of debt, cost of equity, return on invested capital (ROIC), weighted average cost of capital (WACC), and internal hurdle rates, affect firm-level investment in both tangible capital (CAPEX) and intangible capital (research and development). Across the empirical analyses, several patterns emerge.

**Cost of debt is negatively correlated with tangible investment.** A key finding is that the cost of debt consistently exhibits a significant and negative relationship with tangible investment. Across multiple specifications, higher cost of debt is consistently associated with lower capital expenditure. This result is driven primarily by unlisted SMEs, which rely predominantly on bank lending rather than equity markets. For these firms, a one standard deviation increase in cost of debt reduces investment by more than 12% of the mean investment rate. The magnitude is even more pronounced for listed firms, where a similar increase in borrowing costs reduces investment by nearly 14% of the average rate. To strengthen the causal interpretation of the results, the study uses industry-average cost of debt as an instrument. The instrumental variable estimates confirm that increases in the cost of debt have a causal and economically significant negative effect on tangible investment. Taken together, these findings underscore the critical role of debt markets, credit conditions, and the banking system in shaping investment behaviour in the UK.

**R&D investment shows little relationship to cost of capital measures.** In contrast, intangible investment, proxied by research and development (R&D) shows little to unresponsive relationship with the cost of capital measures. R&D investment appears to be driven predominantly by internal cash flow, profitability, and firm-specific strategic considerations rather than borrowing costs or investor return requirements. This asymmetry highlights the distinct economic and financial characteristics of intangible assets. They are less collateralisable, have longer and uncertain payback periods, and are more likely to be financed through retained earnings than external sources. The divergence between tangible and intangible investment is important for UK policy, given the economy's growing reliance on intangible-intensive sectors and the well-documented need to stimulate innovation-led productivity growth.

**Internal hurdle rates are higher and stickier than market-based measures and negatively affect intangible investment** The study then shows that internal hurdle rates,

which represent the discount rates managers use to evaluate investment projects, are substantially higher than market-based capital costs and exert powerful downward pressure on tangible investment. While the average firm-level WACC in the sample is approximately 6.4%, the mean reported hurdle rate exceeds 10%, with considerable variation across firms. Moreover, hurdle rates rarely change over time, even in response to shifts in monetary policy, reflecting their role as internal governance tools for capital rationing and risk management. The empirical results indicate that hurdle rates have the strongest negative association with tangible investment, with effects substantially larger than those associated with other cost of capital measures. Firms appear to maintain elevated internal return benchmarks even when external borrowing costs decline, consistent with institutional inertia, agency considerations, and managerial conservatism in capital budgeting. This behaviour helps explain why UK investment remained subdued during periods of inexpensive external financing, as internal decision rules often determine which projects are ultimately approved. These insights suggest that addressing UK underinvestment requires understanding not only funding costs but also the microeconomic decision processes inside firms, particularly larger and publicly listed companies where hurdle rates are more prevalent.

**Market power negatively affects investment.** The study also investigates that firms with greater market power, as measured by the Lerner Index, tend to invest less in tangible capital. This finding is consistent with recent evidence that weak competitive pressures reduce the incentive to expand capacity, innovate, or improve productivity, implying that competition policy may have a complementary role in promoting productive investment, particularly in sectors characterised by high concentration and barriers to entry.

In addition, the study considers the impact of political shocks, where Brexit represents an additional headwind. After controlling for financing conditions and firm characteristics, a statistically significant decline in both tangible and intangible investment is observed in the post-2020 period. This pattern suggests that heightened uncertainty, regulatory divergence, and exposure to trade and labour-market disruptions exerted downward pressure on investment. Notably, the decline is most pronounced among larger and internationally exposed firms.

**Firm heterogeneity relates to the sensitivity to cost of capital.** The results further document heterogeneity in investment responses across different firm types. The results consistently show that smaller firms, unlisted firms, and financially constrained firms are more sensitive to changes in the cost of debt. In contrast, larger, more productive, and better-capitalised firms exhibit weaker responses. Listed firms are more responsive to equity-based cost measures, while unlisted firms are more reliant on debt markets. Some modest geographical difference is also observed, with firms headquartered in London displaying slightly lower sensitivity to capital cost metrics, possibly reflecting better access to financial services and investor networks. These findings emphasise the importance of disaggregating firm-level heterogeneity.

**Overall picture helps explain UK investment underperformance** Overall, the study provides an explanation for the UK's longstanding investment underperformance. High borrowing costs for the majority of unlisted firms, elevated internal hurdle rates among larger firms, weak competitive pressures, and persistent macro-political uncertainty jointly constrain investment across the UK corporate sector. Improving investment outcomes is therefore likely to require multi-dimensional interventions, including measures to strengthen SME access to finance, enhance competition, improve transparency around internal capital

budgeting practices, and reduce macroeconomic and regulatory uncertainty. By systematically linking multiple cost of capital measures to investment behaviour across a representative sample of UK firms, the study deepens understanding of the UK's productivity puzzle and offers a robust empirical foundation for future research.

## Short Termism and Investment: Evaluation using the Decision Maker Panel

**Krishan Shah, Philip Bunn, and Jonathan Haskel (2025a)**

This paper assesses the role of the credit channel in transmitting the 2022–23 tightening cycle in the UK via firm-level survey data. Prior work—such as Bernanke and Gertler (1995) and Anderson and Cesa-Bianchi (2024)—has relied on indirect indicators like credit spreads or aggregate loan variables to infer credit channel effects. This paper introduces a novel survey instrument – the firms' best estimate of the impact of changes in interest rates on borrowing costs, financing structures, and investment behaviour during the 2022–23 rate-hike cycle.

Three key predictions are examined:

1. **Cost of Capital**: Firms relying on external financing report a higher cost of capital than those using internal funds.
2. **Interest Rate Sensitivity**: Upon increases in the policy rate, these externally financed firms experience larger borrowing cost rises than internally funded firms.
3. **Investment Response**: When borrowing costs increase, firms that depend on external finance reduce investment more sharply compared to internal funders.

The findings strongly support all three predictions. External-financed firms are found to face higher baseline costs, show greater sensitivity to rate hikes, and curtail investment more significantly. Notably, the credit channel is found to account for approximately 25% of the total effect of monetary tightening on aggregate investment.

The novel survey methodology enabled direct insight into firm financing behaviour during tightening. It distinguished between internally and externally financed firms, shedding light on heterogeneity in monetary transmission mechanisms.

This evidence underscores the importance of the credit channel within the broader monetary policy framework. Policy rate adjustments do not only influence aggregate investment via direct cost-of-capital effects but also through differential impacts on firms based on their financing structure. The authors suggest that central banks should take this heterogeneity into account, as credit constraints and financing composition amplify and shape policy effectiveness.

**"Financial Constraints Revisited"** by Ozgen Ozturk, Phillip Bunn, and Paul Mizen (2026):

This paper develops a new measure of firms' financial constraints using survey data from the UK Decision Maker Panel (DMP) as opposed to balance sheet measures. It distinguishes between limited internal funds, restricted external funds, and high cost of finance using survey questions. Unlike traditional approaches that infer constraint status from proxies such as size, leverage, or liquidity, the study observes constraints directly from survey responses. This picks up the subjective element to financial constraints in the mind of the survey respondent (typically the CEO or CFO). It is demonstrated that the subjective measures are related to firm-level balance sheet indicators. Results show that standard

indicators do predict constraint status, but their relevance varies: leverage dominates among large firms, while smaller and medium-sized firms require a richer set of measures, including liquidity and dividend behaviour. Age, often used in prior literature, adds little explanatory power once other variables are considered.

The analysis reveals that financial constraints are persistent—around 60–65% of firms report at least one constraint—and their composition shifts with macroeconomic conditions. Cost-of-finance constraints respond quickly to interest rate changes, while internal finance constraints adjust more slowly. Importantly, constrained firms exhibit stronger and asymmetric investment responses to monetary policy: a one percentage point tightening reduces investment by 7–8%, whereas an equivalent easing raises it by only about 2%. This asymmetry is most pronounced among firms constrained by borrowing costs. The paper also provides evidence that firms constrained by availability of internal finance respond more to demand shocks than unconstrainted firms, again with the investment of constrained firms responding more to negative shocks.

By combining survey and balance sheet data, the paper bridges proxy-based and direct approaches, offering a granular framework for identifying financially constrained firms and understanding their role in monetary transmission. The findings underscore the importance of heterogeneity and financial frictions in shaping policy effectiveness and highlight the need for richer indicators beyond leverage.

**"Sticky hurdles: the dynamics of firm hurdle rates in a tightening cycle"** by Krishan Shah, Philip Bunn, and Marko Melolinna (2025b)

This paper investigates how UK firms adjust investment hurdle rates—the required internal rate of return for capital projects—during the sharp monetary tightening of 2022–23. Using new survey evidence from the Decision Maker Panel (DMP), the authors find that hurdle rates are high (averaging 16%) and adjust sluggishly to rising interest rates. Despite Bank Rate increasing from 0.1% to 5.25% and corporate borrowing costs nearly tripling, the mean hurdle rate rose only slightly, from 15.5% in 2021 to 16.4% in 2024. Adjustment occurred at both the extensive margin (only 52% of firms updated their hurdle rate over two years) and the intensive margin (firms that did adjust passed through only about half of the increase in borrowing costs).

Hurdle rates are more common among larger, more productive firms and those using external finance. Firms relying on borrowing were more likely to update their hurdle rates, but even for these firms, pass-through was incomplete: a one percentage point rise in borrowing costs translated into only a 0.37–0.41 percentage point increase in hurdle rates. Evidence suggests hurdle rates act as buffers—firms with initially high hurdle rates adjusted less—and uncertainty also influenced adjustment behaviour.

The paper links hurdle rate stickiness to monetary policy transmission. Using local projection analysis over 2001–2023, it shows that firms with flexible hurdle rates reduce investment significantly after contractionary policy shocks, while those with sticky rates exhibit muted responses. Expansionary shocks, however, elicit similar investment reactions across both groups, indicating upward flexibility but downward rigidity in hurdle rates. Survey evidence from the tightening cycle corroborates these findings: firms that updated hurdle rates cut investment by around 12%, compared to 7% for non-adjusters. Overall, the study highlights

how sticky hurdle rates dampen the responsiveness of business investment to monetary policy, shaping aggregate outcomes and reinforcing asymmetries in policy effectiveness.

## Equity Gaps, Investment, Ownership Structures, and Productivity in UK High-Growth Firms

**Viet A. Dang, Ning Gao, and Ruicong Liu (2025, 2026a,b)**

This project conducts a series of interrelated studies to examine how equity gaps, ownership structures, and equity financing shape investment behaviour and productivity outcomes among UK private firms, with particular focus on a key business segment: high-growth enterprises (HGEs). Using large-scale firm-level datasets and advanced empirical methods, these studies collectively show that equity finance plays a critical but nuanced role in business investment and firm growth. Insufficient access to equity capital constrains investment and employment, while ownership preferences strongly influence whether firms engage with equity markets. Additionally, the productivity benefits of equity finance tend to materialise over time rather than immediately. These findings have important implications for policymakers, investors, and firm management seeking to address the UK's persistent underinvestment and weak productivity growth.

**Equity gaps and real investment consequences (2025)**

Our first study directly addresses whether equity gaps, defined as firms' unmet demand for external equity finance, have real economic consequences. Focusing on UK HGEs, it develops a transaction-based measure of firm-level equity gaps using a matching approach that compares non-fundraising firms with otherwise similar firms that successfully raised equity. This method isolates equity shortfalls driven by capital market frictions rather than firms' voluntary decisions to avoid equity.

The results provide strong evidence that equity gaps materially constrain firm behaviour. This adverse effect persists over time and across major macroeconomic shocks, including Brexit and COVID-19. It is particularly pronounced among firms with fewer tangible assets, more concentrated ownership, and greater reported financing constraints. Regional disparities are also evident: HGEs headquartered in London are less affected, reflecting deeper and more accessible local capital markets.

A key policy-relevant finding is that government grants do not fully offset the negative investment effects of equity gaps. While public subsidies may alleviate short-term liquidity pressures, they do not substitute for patient equity capital in supporting sustained investment and scaling. This highlights the limits of grant-based interventions and underscores the need for policies that directly address equity market frictions.

**Family ownership and equity fundraising decisions (2026a)**

Our second study shifts attention from supply-side constraints to firm-level decision-making, examining how ownership structure, specifically family ownership, shapes equity fundraising behaviour in HGEs. Family-owned firms account for a substantial share of high-growth businesses in the UK but display considerable heterogeneity in their engagement with external equity markets.

Integrating agency theory with socioemotional wealth (SEW) perspectives, the study identifies a robust inverted U-shaped relationship between family ownership and the likelihood of raising external equity. At moderate levels of family ownership (approximately

40%), family involvement facilitates equity fundraising. In this range, family ownership reduces agency costs by aligning incentives and signalling long-term commitment. At the same time, growth oriented SEW motives encourage owners to accept partial dilution in exchange for access to growth capital.

Beyond this threshold, the relationship reverses. When family ownership becomes highly concentrated, equity fundraising becomes significantly less likely. Control-oriented SEW objectives dominate decision-making, with family owners prioritising autonomy, control, and emotional attachment over growth opportunities. High ownership concentration also raises concerns among external investors about entrenchment risks and the protection of minority shareholders, further discouraging equity investment.

These findings have important implications for how equity gaps are interpreted. Not all observed shortfalls in equity finance reflect market failure. In many cases, particularly among family-controlled HGEs, firms may deliberately avoid equity to preserve control, even if doing so constrains growth. As a result, policies aimed at closing equity gaps must distinguish between supply-side constraints and demand-side factors.

**Equity finance and productivity dynamics (2026b)**

Our third study examines how equity fundraising affects firm-level productivity. Using a difference-in-differences framework, it analyses changes in total factor productivity (TFP) following firms' first external equity issue.

The central finding is that equity fundraising is followed by a statistically significant but temporary decline in measured productivity. Firms experience a reduction in TFP in the years immediately after raising equity, but this effect dissipates within approximately three years. The decline is not uniform: it is most pronounced among firms with high investment intensity and those operating in knowledge-intensive industries, where equity finance is often used to fund intangible assets, organisational capabilities, and innovation.

Channel tests show that this short-term productivity dip reflects a timing mismatch between input expansion and output realisation. Equity finance enables firms to rapidly expand capital, employment, and intangible investments, while revenues and value added take longer to materialise. Inputs therefore rise ahead of outputs, temporarily depressing measured productivity even as long-run productive capacity improves. There is little evidence that the decline reflects inefficiency or value-destroying expansion.

These findings have direct implications for policy evaluation and performance assessment. Short-term declines in productivity following equity investment should not be interpreted as evidence that equity finance is ineffective. Instead, they reflect the dynamic adjustment process associated with growth-oriented investment. Evaluations based on short horizons risk systematically underestimating the long-term productivity benefits of equity finance.

**Overall implications**

Taken together, our studies provide a nuanced picture of equity finance in the UK high-growth firm ecosystem, with implications for business investment and productivity. Persistent equity gaps have damaging effects on investment and employment, particularly for firms that are asset-light, regionally disadvantaged, or structurally dependent on equity. Ownership structures, especially family control, play a crucial role in shaping firms' engagement with equity markets, indicating that not all equity gaps stem from market failure. When equity is

raised, its productivity benefits unfold over time, with short-term declines in productivity reflecting investment dynamics rather than poor performance.

For policymakers, our findings underscore the need for a multi-dimensional approach to closing equity gaps, namely, one that expands the supply of patient equity capital, addresses regional imbalances, and accounts for firm-level ownership and governance preferences. For investors, the results highlight the importance of longer time horizons and governance structures. For firm management, our research clarifies the trade-offs among control, growth, and short-term performance metrics in equity finance.

Overall, our evidence suggests that equity finance is essential for unlocking the long-term growth and productivity potential of UK high-growth firms, but only if its dynamic effects and institutional context are fully understood and reflected in policy design and strategic decision-making.

## Lumpy Investment Dynamics and Business Cycle Implications

**Christopher Görtz, John D. Tsoukalas, Thomas Walsh (2026)**

This summary synthesises findings from two interconnected research projects examining investment behaviour at the firm level and its implications for aggregate economic dynamics. The projects address a fundamental puzzle in modern macroeconomics: how discrete, infrequent firm-level investment decisions (lumpiness) aggregate to drive business cycles and productivity growth.

### Core Research Questions

The research program investigates three critical dimensions of investment behaviour. First, it examines whether and how lumpy firm-level investment decisions combine to generate aggregate business cycle movements. Second, it analyses how the relationship between productivity shocks and investment has evolved, particularly following the Global Financial Crisis. Third, it explores the role of financial constraints and compositional changes in explaining declining business dynamism observed across UK and the USA.

**Declining Business Dynamism in the UK.** Analysis of UK firm-level data reveals concerning trends in post-Global Financial Crisis (GFC) corporate responsiveness to changing economic conditions. The distribution of investment rates shows a depressed right tail after 2008, indicating fewer firms making large capacity expansions. Similarly, total factor productivity growth rates demonstrate compression at both extremes of the distribution, particularly among larger firms with over 100 employees. Most significantly, investment responsiveness to productivity shocks has declined substantially: firms experiencing positive productivity innovations no longer expand capacity to the same extent as they did pre-crisis.

Quantile regression analysis demonstrates that while the left tail of the investment distribution moves in lockstep with economic conditions, the right tail—representing aggressive expansion—has fallen disproportionately. Moreover, the left tail responded immediately to the Brexit referendum, while the right tail lagged, suggesting asymmetric adjustment patterns across different types of firms and investment decisions.

**The Extensive Margin Dominates.** A consistent finding emerges across the research projects: the extensive margin—the share of firms undertaking lumpy adjustments—drives aggregate fluctuations far more than the intensive margin—the average size of those adjustments. Using US Compustat data covering approximately 14,400 public firms from 1981-2022, we decompose lumpy investment into these two components and find that variations in how many firms adjust, rather than how much they adjust, accounts for the bulk of aggregate investment volatility. A similar pattern applies in UK firm level data where the vast majority comprises private firms.

This pattern holds for both capital and labour adjustments. Lumpy hiring events, defined as employment growth exceeding 15%, follow the same dynamics as capital spikes. The synchronisation of these adjustments across firms—when many firms simultaneously decide to invest or hire—creates the clustering that manifests as business cycle movements at the aggregate level.

**Financial Preparation Patterns.** UK data analysis reveals systematic financial preparation ahead of lumpy adjustments. Cash holdings build up one to two years before investment spikes, particularly for medium and large firms. Equity positions strengthen in the year prior to adjustment, while leverage ratios decline, creating financial capacity for subsequent debt issuance during the investment event itself. This preparation is accompanied by increases in labour productivity and total factor productivity that begin before the adjustment and show some persistence afterward, suggesting that lumpy investments represent strategic capacity expansions linked to productivity improvements rather than random timing.

The research employs a novel empirical framework combining Dynamic Factor Models at the firm level with Vector Autoregressions at the aggregate level (DFM-FAVAR). This approach decomposes firm-level variables into common components capturing cross-sectional co-movements and idiosyncratic components specific to individual firms. Time-varying factor loadings allow the model to capture how firm responsiveness evolves over time and varies across firm characteristics.

**Composition Versus Behavioural Change**. A critical methodological contribution addresses whether declining responsiveness reflects changes in firm behaviour or shifts in the composition of active firms. Using inverse probability weighting, we reweight post-GFC observations so their distribution of pre-crisis characteristics matches the pre-GFC sample. Results indicate that for medium and large firms, most of the decline in responsiveness stems from behavioural changes rather than compositional shifts. For smaller firms, the split is approximately fifty-fifty between changing characteristics and behavioural responses, suggesting financial constraints and market conditions bind differently across the firm size distribution.

**Heterogeneous Firm Responses.** The analysis reveals substantial heterogeneity in how different firms respond to aggregate shocks. Larger firms, high-growth companies, and those with younger capital vintages exhibit stronger investment responses to business cycle shocks. Adverse financial shocks generate even more pronounced dispersion: small and financially constrained firms display significantly negative investment responses, while large firms show no sensitivity, highlighting the differential impact of credit market conditions across the firm distribution. Firms are grouped by various characteristics—size, debt growth, sales growth, intangible intensity, and capital vintage age—with responses becoming more pronounced at extreme quantiles. High sales-growth firms respond more aggressively to positive shocks, while high-debt firms show greater sensitivity to financial conditions. This

heterogeneity has important implications for understanding how aggregate shocks transmit through the economy and which firms drive cyclical dynamics.

**Policy Implications**

The research carries significant policy implications. Lumpy investment dynamics imply that stimulus policies are more effective during economic expansions than recessions. In booms, positive shocks push more firms further from their desired capital stocks, increasing the probability of lumpy adjustments and thereby raising the share of firms responding to incentives. This state-dependence suggests conventional fiscal multipliers may underestimate stimulus effectiveness in good times while overestimating it during downturns.

Effective policy design requires developing indicators that identify firms likely to have made lumpy adjustments even without intervention, which depends on measuring the distance between actual and desired capital. Policies that reduce adjustment costs or ease financial constraints could have outsized effects by enabling marginal firms to undertake growth-enhancing investments they would otherwise postpone.

**Conclusion**

This research fundamentally advances our understanding of how microeconomic investment decisions aggregate to macroeconomic outcomes. The consistent finding that the extensive margin dominates provides a crucial micro-foundation for a more complete understanding of the aggregate picture, suggesting that policies and economic conditions affecting the timing and coordination of firm-level adjustments have first-order importance for aggregate dynamics. The documented decline in responsiveness, driven primarily by behavioural changes rather than composition, points to structural shifts in how firms evaluate and execute capacity expansions—shifts with profound implications for productivity growth and business dynamism.