Do Equity Gaps Matter?

Evidence from High-Growth Enterprises' Investment Behaviour

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Abstract

While high-growth enterprises (HGEs) are known to play a major role in driving innovation, productivity and economic growth, the impact of funding gaps on their investment and growth remains underexplored. By analysing a large dataset of UK-based HGEs, we demonstrate that firms facing equity gaps make significantly fewer investments, with the effect being more pronounced among those with fewer tangible assets or more concentrated ownership structures as well as those with reportedly greater capital expenditure constraints. The sensitivity of investment to the funding gap persists both before and after key macroeconomic events, such as Brexit and COVID-19, and remains evident even among firms receiving government grants. Regional disparities also emerge, with firms headquartered in London experiencing less severe impacts. Furthermore, equity gaps exacerbate firms' under-investment tendencies and hinder employment growth, underscoring their detrimental effects on HGEs' performance. Our findings highlight the economic consequences of capital market frictions for these companies, offering critical insights into government policies and corporate strategies aimed at fostering growth.

1. Introduction

There have been persistent concerns about market failures in the provision of equity finance for small- and medium-sized enterprises (SMEs), particularly those with high-growth trajectories (Cosh et al., 2009; Cressy, 2012; Cumming et al., 2019; Cumming & Johan, 2013; Howell, 2020; Wilson et al., 2018).[2] While HGEs and business organisations constantly highlight the equity funding gap, its economic implications remain unclear.[3] Using a large dataset of UK-based HGEs, we investigate the extent to which equity gaps influence firms' investment decisions. Our research is motivated by the fact that business investment, especially in the fastest-growing sectors, is central to firm growth, job creation and economic prosperity (Chiappini et al., 2022; Constantinides et al., 2003; Hervás-Oliver et al., 2021; Modigliani & Miller, 1958).

The UK provides a compelling context for investigating equity financing challenges faced by HGEs due to its well-established entrepreneurial landscape, the economic prominence of these companies, and the country's strong disclosure framework. First, the UK offers a robust ecosystem that strongly supports HGEs, comparing favourably with major economies, including the US, and leading in key sectors such as professional and financial services (Brown & Lee, 2019; HM Treasury & City of London Corporation, 2023). In turn, these HGEs are critical drivers of the UK economy, contributing disproportionately to the country's innovation, employment, and productivity growth (Brown et al., 2017; Du & Temouri, 2015). As highlighted in the recent Scaleup Annual Report (2024), while HGEs account for just 0.6% of the business population, they contribute £1.45 trillion to the UK economy, representing 55%

[2] According to the OECD's definition, an HGE is a company that achieves an average annualised growth rate in employees or turnover of more than 20 per cent per year over three years, with at least 10 employees at the start of the observation period (Source: Eurostat-OECD "Manual on Business Demography Statistics" (2007)). In the UK context, an HGE is often referred to as a scaleup.

[3] Existing literature mainly focuses on listed firms, with evidence showing that restricted access to external equity capital can harm firm performance, especially for firms reliant on sustained investment (e.g., Brown et al., 2009; Carpenter & Guariglia, 2008). In the context of high-growth companies within the SME population, the question of whether and how significantly the impact of the equity gap affects companies' investment is less understood.

of SME output. These companies are also highly innovative and productive, employing more than 3.2 million people and accounting for 20% of the workforce among the SME population.[4] Nevertheless, despite their importance, these firms frequently encounter significant barriers to accessing the external capital required to sustain rapid growth (Cosh et al., 2009; Cressy, 2012; Quas et al., 2022; Wilson et al., 2018). Bridging this funding gap is therefore considered crucial for promoting economic growth and boosting low productivity levels in the UK.[5] Moreover, the UK has a transparent and robust disclosure framework that enables an empirical analysis of privately held high-growth businesses. The Companies Act mandates that public and private firms file detailed financial data with Companies House, providing a comprehensive and accessible dataset for evaluating the performance and financing challenges of HGEs.[6]

How do equity gaps affect HGEs' investment decisions? Previous research argues that 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 (Brav, 2009; Vanacker & Manigart, 2010). However, HGEs may deviate from this hierarchy, 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 (Croce et al., 2013; Duruflé et al., 2017). When market inefficiencies restrict access to equity, these firms face severe financial constraints that hinder investment and expansion (Cosh et al., 2009). Empirical research highlights the role of both liquidity constraints and external equity injections in shaping investment behaviour (Guariglia, 2008; Alperovych et al., 2020),

[4] Source: https://www.scaleupinstitute.org.uk/reports/annual-review-highlights-2024/.
[5] The UK Financing Gap Report, published by the European venture capital firm Lakestar, highlights that scaling up 10,000 new growth firms by 2040 could generate £5–7 trillion in value and potentially triple the UK's GDP growth rate to 2–3 per cent. Source: https://financing-gap.co/unitedkingdom.
[6] The Companies Act 1967 mandated that both private and public companies submit their financial statements annually to the Registrar of Companies House. The Companies Act of 1981 revised this requirement, permitting medium-sized companies to file abbreviated financial statements and allowing small companies to submit only an abbreviated balance sheet, exempting them from filing a profit and loss statement. The Companies Act of 2006 introduced more stringent filing requirements and imposed shorter deadlines, such as requiring private companies to file their annual accounts within nine months.

suggesting that equity gaps act as external shocks, disrupting financial flexibility and strategic decision-making. Overall, given HGEs' reliance on equity capital, we propose that funding constraints due to limited access to external equity reduce their subsequent capital investments.

A key challenge of testing the above hypothesis is accurately estimating the equity gaps facing high-growth companies, especially privately held businesses. Previous research on the economic impact of equity gaps has typically relied on survey data or indirect evidence (Alperovych et al., 2020; Ayyagari et al., 2008; Beck & Demirgüç-Kunt, 2006; Cosh et al., 2009; Cowling & Wilson, 2024; Cressy, 2012; Quas et al., 2022). Most papers focus primarily on debt financing and rarely distinguish between different sources of external funding (e.g., Chiappini et al., 2022). Moreover, few studies differentiate between equity gaps caused by market failures (i.e., a supply-side perspective), the focus of our research, and those arising from firm-specific factors (i.e., a demand-side perspective). This oversight can potentially bias conclusions when assessing the impact of equity gaps on firm investment and performance, especially if these gaps result from corporate owners' reluctance to seek external equity financing, possibly due to concerns about losing control (e.g., Brav, 2009).

To address this potential issue, we first define a company's equity gap as the unmet demand for equity financing. We then apply a propensity score matching (PSM) approach to estimate the "optimal" level of equity that a non-fundraising firm would be expected to raise—similar to a matched fundraising firm—but fails to do so (Wilson et al., 2018).[7] The difference between the estimated and actual fundraising serves as our measure of the firm-level unmet demand for equity, namely, the equity gap. By controlling for various firm, governance, and ownership characteristics in both the PSM and subsequent regressions, we aim to isolate

[7] Previous research indicates that several firm, governance, and ownership factors can significantly affect firms' access to external finance. We include an extensive list of those factors as covariates in the PSM (e.g., Brav, 2009; Vanacker & Manigart, 2010; Vaznyte & Andries, 2019; Wilson et al., 2018). Section 4.1 provides more details.

scenarios where market inefficiencies (i.e., supply-side factors), rather than firms' strategic choices (i.e., demand-side factors), drive the lack of equity finance.

Leveraging a comprehensive dataset of privately held HGEs from Beauhurst covering the period from 2014 to 2021, our analysis suggests that firms experiencing equity gaps make significantly fewer capital investments in the next financial year. 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. These results remain qualitatively unchanged across various robustness checks that address endogeneity concerns and employ alternative model specifications and measures of key variables. Additionally, our longer-horizon tests indicate that the decline in investment persists over time, highlighting the significant implications of the equity funding gap for long-term business investment.

Our cross-sectional analyses further reveal that firms with higher asset tangibility are better positioned to secure external financing (Cosh et al., 2009), thereby reducing the impact of equity gaps on firm investment. In contrast, concentrated ownership exacerbates funding challenges by increasing agency conflicts between incumbent and external investors (Aslan & Kumar, 2012) and heightens information asymmetry (Brav, 2009). Moreover, firms in industries with limited internal funds or high financing costs reported as major investment constraints exhibit greater sensitivity to equity gaps. We also find that, although the effect of equity gaps on firm investment persists both before and after major macroeconomic events, namely Brexit and COVID-19, it varies across regions. 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 (Harrison et al., 2020; Walthoff-Borm et al., 2018). Additionally, while government subsidies can alleviate financial constraints and enhance performance (Chiappini et al., 2022; Colombo et al., 2013), our findings indicate that government grants do not significantly mitigate the

relationship between equity gaps and investment, suggesting that they cannot serve as a substitute for equity financing.

In further analysis, we explore the relationship between equity gaps and other corporate investment outcomes, namely, investment efficiency and labour investment (i.e., employment). Our findings reveal that equity gaps have mixed effects on firms' investment efficiency: they exacerbate firms' under-investment problems, pushing them further away from optimal investment levels while reducing over-investment tendencies. Moreover, equity gaps negatively impact labour investment, with a one-standard-deviation increase in equity gaps leading to a 5.9 per cent decline in employment levels. This finding suggests that the observed reduction in capital investment cannot be attributed to strategic resource reallocation between capital and labour (Benmelech et al., 2021) but instead reflects the broader implications of financial constraints. Overall, our results show that equity gaps constrain not only capital but also labour investment and exert mixed effects on investment efficiency, highlighting their wider adverse impact on HGEs' investment and future growth.

Our paper makes three contributions to the literature. First, we advance the current understanding of equity gaps in privately held high-growth companies by providing new evidence of their economic implications. While existing literature acknowledges the challenges HGEs face in securing adequate equity finance (Alperovych et al., 2020; Berger & Udell, 1998; Cosh et al., 2009; Cressy, 2002; Cumming et al., 2018; Quas et al., 2022; Wilson et al., 2018), direct empirical evidence on the consequences of these equity gaps remains scarce. In particular, previous studies have not quantified the impact of the funding gap on HGEs' investment, with very few attempting to estimate the magnitude of the gap. Our study expands the literature by leveraging Beauhurst's comprehensive data on HGEs and their fundraising activities, as well as employing PSM to estimate firms' equity gaps. As discussed, the matching approach allows us to capture the funding gap caused by capital market frictions (i.e., supply-

side) rather than firms' reluctance to rely on equity finance (i.e., demand-side). Combined with rigorous regression analysis, we provide the first direct evidence that failing to secure adequate equity finance significantly undermines future investments.

Second, our study deepens the understanding of HGEs' growth obstacles by emphasising the critical role of equity finance. Existing research emphasizes the significance of adequate funding in overcoming growth barriers for SMEs, particularly those with strong expansion potential (e.g., Berger & Udell, 1998; Cosh et al., 2009; Cressy, 2002). In the UK, while these companies often rely on debt-based financing (Brown & Lee, 2019; Cowling & Wilson, 2024), equity financing is arguably better suited to their rapid expansion needs (Duruflé et al., 2017). Yet, there is limited empirical evidence establishing the unique role of equity finance among various funding sources and directly linking equity gaps to HGEs' growth outcomes. Our findings address this gap in the literature by demonstrating that equity gaps not only reduce capital investment but also negatively affect employment and impair investment efficiency, particularly by exacerbating under-investment incentives. By analysing the impact of equity gaps on these critical factors of production, our study provides novel evidence that insufficient equity finance significantly constrains overall firm growth and long-term viability.

Third, the study provides relevant policy implications by contributing to the ongoing debate on bridging financing gaps in the UK entrepreneurial landscape.[8] Our findings underscore the need for government intervention to address systemic market inefficiencies in equity financing, which restrict HGEs' access to funding and may have contributed to chronic business underinvestment in the UK. Insufficient equity finance not only limits firms' ability to pursue long-term investments, forcing them into "short-termism"—that is, focusing on

[8] In the UK, addressing the SME finance gap has long been a priority for both the government and research institutions (e.g., Levelling Up Advisory Council, 2024). For further discussion, see Brown and Lee (2019).

shorter-term, lower-risk projects—but also likely exacerbates the UK's "productivity puzzle" by restricting investment in capital expenditures and labour.[9] Given that financing frictions increase with investment horizons, making long-term projects costly for investors and potentially subject to rationing (Milbradt & Oehmke, 2015), expanding the supply of equity financing is crucial. Policies that enhance access to patient, flexible capital will likely be the most effective in addressing this funding gap, fostering HGEs' growth and unlocking long-term business investment.

The rest of the paper is organised as follows: Section 2 reviews the literature on the UK external equity capital market and equity gaps and discusses the economic implications that shape our hypotheses. Section 3 describes the data. Section 4 outlines the research design. Section 5 presents our empirical results. Section 6 concludes.

2. Literature review and hypothesis development

2.1. Literature review

2.1.1. Equity finance for HGEs in the UK

Equity finance is especially important for HGEs due to their greater funding requirements and reliance on external capital (Cosh et al., 2009). Compared to debt financing, equity capital—often referred to as "growth capital" in the literature—is essential for the growth of entrepreneurial firms (Croce et al., 2013; Duruflé et al., 2017). Equity capital enables HGEs to expand beyond what their debt capacity can support, which is typically constrained by limited operational cash flows, a high risk of failure and significant investments in intangible assets (Vanacker & Manigart, 2010). In addition to providing funding, equity investors often

[9] Productivity in the UK has consistently been highlighted as below expectations, often referred to as the "productivity puzzle" (Barnett et al., 2014; Cowling & Wilson, 2024). The HGEs in our sample fall within the 6th to 9th deciles of the productivity distribution, a segment with significant potential for further productivity enhancement (see Appendix Table A1 for more details).

act as catalysts for growth by offering strategic guidance and helping ventures navigate the challenges of scaling (Spigel, 2017).

In the UK, external equity available to HGEs primarily includes VC, private equity (PE), business angels, crowdfunding, accelerators, and other informal VC.[10] Previous literature has demonstrated that equity finance plays a crucial role in fostering economic growth. For example, VC is widely recognised as one of the most suitable financing methods for entrepreneurial firms (Chemmanur et al., 2011; Croce et al., 2013). VC provides critical signalling effects, enhancing the credibility of HGEs and improving their access to additional funding through capital markets and partnerships with investment banks (Sørensen, 2007). Furthermore, partnering with reputable and well-connected VC firms grants HGEs access to extensive networks and industry connections, which can significantly accelerate growth (Bernstein et al., 2016; Lindsey, 2008). In addition to financial resources, VC offers strategic support and expertise to optimise firms' expansion. This includes delivering value-added services such as managerial coaching (Hellmann & Puri, 2002), strategic monitoring to mitigate risks (Bernstein et al., 2016; Kaplan & Strömberg, 2003; Tian, 2011) and operational restructuring to enhance productivity (Bottazzi et al., 2008).

In addition to VC, PE (Wilson et al., 2012), crowdfunding (Buttice et al., 2020; Signori & Vismara, 2018), business accelerators (Bone et al., 2019), and business angels or other informal VC sources (Mason & Harrison, 2000) have also proven valuable in supporting the efficient growth of HGEs.[11] Government equity finance represents yet another significant source of funding. Government VC programmes are typically designed to alleviate financial constraints for HGEs by directly bridging equity gaps (Alperovych et al., 2020; Cumming,

[10] See Drover et al. (2017) for a comprehensive review of entrepreneurial equity financing.

[11] In Appendix Table A2, we provide a detailed breakdown of equity investor types and their corresponding investment amounts for the 2014–2022 period. Drawing on Beauhurst and Capital IQ, we identify 21 investor categories across all equity-backed deals. Aside from those introduced in this section, other investor groups—such as industry companies—participate at significantly lower levels, both in terms of the number of deals and size of the investment, compared with institutional investors.

2007) or by creating a "signalling" effect that attracts private-sector investment (Guerini & Quas, 2016; Lerner, 2002). In the UK, regional government funds also play a key role in supporting equity financing for HGEs (Munari & Toschi, 2015).

2.1.2. Equity gaps for HGEs and structural shortfalls in the UK

There is an ongoing debate about whether SMEs, including those with high growth prospects, can access appropriate equity finance to support their operations and growth (Beck & Demirguc-Kunt, 2006; Berger & Udell, 1998; Cosh et al., 2009; Cressy, 2002; Cumming et al., 2019; Cumming & Johan, 2013; Wilson et al., 2018). Most previous studies argue that a lack of equity, i.e., the funding gap, negatively affects firm performance.[12]

In the UK, equity gaps manifest in an important aspect: industry and regional imbalances, indicating a structural shortfall in providing essential equity finance for HGEs, particularly those operating in less favourable industries or regions. Regarding the industry imbalance, Murray and Lott (1995) show that US VC firms invest nearly three times as much in technology-based, start-up, and early-stage investments as their UK counterparts. They argue that the lack of follow-on finance arises because VCs struggle to assess the time required for these firms to achieve commercial viability. In a subsequent survey, Lockett et al. (2002) find that while the problem has been improved, it has not been fully eliminated. The funding gap persists, particularly at the earliest stages of investment, where seed and start-up financing remain limited.

In addition to industry imbalances, the uneven regional distribution is another significant factor affecting equity gaps. For example, Sunley et al. (2005) identify that the formal VC market in the UK is spatially concentrated in London. The implication is that for

[12] Despite this prevailing view, there is some evidence that many SMEs choose not to seek external finance because they are satisfied with internal funding—i.e., the "contentment hypothesis" (Vos et al., 2007; Brown and Lee, 2019). Nevertheless, these firms may operate with suboptimal funding levels, and whether UK HGEs face equity gaps remains an empirical question.

many HGEs the equity gaps are more of a supply-side than demand-side issue. Empirically, Haeussler et al. (2014) show that in regions located outside the so-called "golden triangle" of London, Oxford and Cambridge, VC funding could be attracted, but only if the entrepreneurs had prior entrepreneurial experience. Recent evidence further suggests these imbalances persist (e.g., British Business Bank, 2019; Wilson et al., 2018). Overall, these findings collectively underscore the structural deficiencies in the UK equity market, which continue to hinder equitable access to essential equity finance for HGEs.

2.1.3. Equity gaps estimation

Previous evidence regarding the economic impact of equity gaps primarily relies on survey data or indirect evidence (Alperovych et al., 2020; Ayyagari et al., 2008; Beck & Demirguc-Kunt, 2006; Cosh et al., 2009; Cowling & Wilson, 2024; Cressy, 2012; Quas et al., 2022). For example, Alperovych et al. (2020) find that well-designed government VC programmes attract additional private-sector investment and enhance total asset growth and innovation output. In their analysis, equity gaps are assumed to be covered by such programmes. Drawing on data collected in a seminar with business leaders, academics and policymakers, Quas et al. (2022) argue that the long-term economic impact of funding gaps includes the potential loss of jobs and negative impacts on innovation, productivity, and economic growth. However, their analysis does not involve estimating the funding gap. While these studies provide useful preliminary evidence on the implications of equity gaps, the difficulty with this approach lies in accurately evaluating the economic impact of the equity funding gap on firm investment outcomes, given that the key independent variable—the funding gap—is not properly estimated.

To address this challenge, an important first step in our analysis is devoted to estimating equity gaps at the firm level, using a matching strategy (see Section 4.1 for more

details). This approach identifies equity gaps as the differences 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 market inefficiencies. Using a similar approach, Lopez-de-Silanes et al. (2018) and Wilson et al. (2018) provide funding gap estimates for SMEs and knowledge-intensive entrepreneurial firms in the growth phase, respectively.

2.2. Hypothesis development

Building on previous work by Myers and Majluf (1984), research on SMEs suggests that these companies tend to follow a pecking order of financing to determine their fundraising activities (Vanacker & Manigart, 2010). Specifically, they prioritise internal funds, followed by debt, and only turn to equity as a last resort due to the higher costs associated with information asymmetry (Brav, 2009). For high-growth companies, however, this pecking order may need to be modified as they typically exhaust internal funds and reach their debt capacity earlier in their growth trajectory, meaning that equity financing becomes the sole viable option to sustain expansion (Croce et al., 2013; Duruflé et al., 2017; Vanacker & Manigart, 2010). When equity financing is unavailable due to deficiencies in the capital market, it is reasonable to infer that these firms will face restricted access to capital and difficulty bridging the funding gap, having exhausted various sources of internal and external financing.

Existing empirical research highlights how access to capital influences the investment behaviour of unlisted companies, whether through internal financial constraints (e.g., Guariglia, 2008) or external equity injections (e.g., Alperovych et al., 2020).[13] Building on both

[13] There has been longstanding interest in the impact of financial constraints on investment in listed companies (e.g., Fazzari et al., 1988; Kaplan & Zingales, 1997; Rauh, 2006).

previous theory and evidence, we argue that equity gaps stemming from capital market inefficiencies act as external shocks, significantly restricting firms' financial flexibility and shaping their investment decisions. This constraint is especially severe for HGEs, whose rapid growth requires funding that exceeds the limits of debt markets, making them highly reliant on equity financing (Cosh et al., 2009). Overall, we develop our central hypothesis as follows:

Hypothesis 1: Equity gaps reduce HGEs' subsequent capital investments.

3. Data

Our analysis focuses on UK-based HGEs established since 2011, leveraging Beauhurst's tracking mechanisms to identify these companies. Beauhurst specializes in tracking UK firms that meet specific triggers indicative of high growth or ambition, namely: 1) Secured equity investment; 2) Secured venture debt; 3) Underwent a management buyout or buy-in; 4) Attended a selected accelerator program; 5) Has been or is a scaleup; 6) Spun out of an academic institution; 7) Was featured in a selected high-growth list; and 8) Accepted a large innovation grant.[14]

We exclude firms established before 2011 for several reasons: First, Beauhurst began systematically reviewing and validating firm profiles in 2011. Including firms incorporated earlier could introduce survival bias, as firms that ceased operations before 2011 would not appear in the dataset. Second, data on firm transactions and financials prior to 2011 are typically unavailable. Third, high-growth episodes in older SMEs often result from equity transactions, such as PE buyouts, rather than reflecting organic investment needs. As a result,

[14] As mentioned in Footnote 2, while the OECD's definition of HGEs based on turnover and employment is useful, it may inadvertently overlook some companies due to data unavailability. For UK firms, accounting exemptions only require them to report their turnover after meeting certain criteria. Likewise, while the number of employees is typically required to be disclosed, in practice, we have observed instances where employment information is missing from Companies House data. In contrast, utilising Beauhurst's comprehensive tracking triggers enables us to identify all HGEs, whether they are emerging or have already achieved high-growth status. Indeed, these triggers are widely used in government reports and analyses of HGEs (Source: OECD-defined High Growth Enterprises in the UK - GOV.UK (www.gov.uk)). In robustness tests, our results hold when using the OECD's definition.

established HGEs may experience extended periods of low growth before entering a high-growth phase, driven by equity transactions rather than underlying business dynamics (Davis et al., 2019). These patterns fall outside the scope of our research and could bias our findings.

We rely on Beauhurst's comprehensive dataset to collect details on equity finance deals among UK HGEs. Beauhurst first retrieves equity investment data from Companies House filings, augmented by proprietary technology. However, 70% of UK equity fundraising deals are undisclosed. Beauhurst uncovers these deals through share allotment forms filed with Companies House, supplemented by manual research. This approach ensures extensive coverage of equity finance transactions. In short, we collect equity finance data from Beauhurst's fundraising records and include only cases with verified, non-missing amounts.

For firms' accounting and finance information, we also use Beauhurst's data, sourced from Companies House. Since HGEs are predominantly small, unlisted firms that are required to file only simplified accounts with Companies House, we cross-check two key firm characteristics, namely total assets and shareholder funds, with the widely used Orbis Historical database to ensure data reliability.[15] If there are discrepancies between the two sources, we exclude these observations to maintain data accuracy.

We implement a series of data filters to further refine our sample. First, we require that key variables for the primary analysis are non-missing. Second, we set a threshold of average inflation-adjusted total assets exceeding £10,000 to exclude micro-entities unlikely to represent meaningful business operations, consistent with standard practices in the literature (e.g., Wilson et al., 2018). Third, we include only firms with complete information on headquarters' location and industry classification to capture regional and sectoral effects.[16] After applying

[15] According to the Companies House Act 2006, if a company meets two (or more) of the following criteria: 1) Annual turnover of £10.2 million or less; 2) Balance sheet total of £5.1 million or less; and 3) No more than 50 employees on average; then they just file a simpler document with Companies House.

[16] We aggregate the regions of Tayside, West of Scotland, East of Scotland, South of Scotland, Aberdeen and Highlands and Islands into a single category, Scotland. Additionally, the industries classification used in the primary analysis is based on the first two digits of the SIC UK 2017 Code.

these filters, our dataset includes 28,108 unique firms and 130,304 firm-year observations from 2014 to 2021. Following the PSM process, the finalized sample comprises 8,668 unique HGEs and 14,276 observations over the same period.

4. Methodology

4.1. Estimating equity gaps

As discussed above, we define equity gaps as the unmet demand for equity funding at the firm level. We estimate this demand using a transaction-based approach,[17] assuming that, on average, HGEs that successfully raise equity funding in a given year have met their equity financing demand, achieving a benchmark level of equity funding. For a given company, the difference between this benchmark and the actual amount of equity finance raised is defined as the equity gap.

To estimate the benchmark equity funding level, we proceed in two steps. First, for each fundraising firm (i.e., an FR firm), we use PSM to match it with a firm from the same year that has not raised any equity funds during the past four years, including the current year (i.e., a non-FR firm). These matched firms share similar characteristics that influence both their incentives to seek equity and their likelihood of attracting external investors, making them equally probable candidates for equity funding. However, due to market inefficiencies, while FR firms meet their funding needs on average, non-FR firms face equity gaps.

To estimate a company's propensity to raise equity funding in the PSM, we use a set of firm-level characteristics suggested by the literature (Cassar, 2004; Cosh et al., 2009; Croce et al., 2013; Wilson et al., 2022). These characteristics include key company fundamentals: firm age (*Age*), age diversity (*Age_div*), an indicator of being audited (*Audit*), bank overdrafts and

[17] In a related study, Wilson et al. (2018) estimate the second equity gap, focusing on knowledge-based companies that have received at least one round of venture capital funding. In our study, we identify equity gaps more broadly. We conduct PSM using all HGEs in the UK for which covariates are available.

long-term liabilities (*Bolt*), cash holdings (*Cash*), total asset growth rate (*Growth*), intangible assets (*Intng*), profit and loss account reserves (*Pl*), firm size (*Size*), trade debtors (*Td*) and trade creditors (*Tc*). Additionally, we consider board characteristics such as board size (*Board_size*), the proportion of directors sharing a common surname (*Common_sur*), the average age of directors (*Dir_age*), the average tenure of directors (*Dir_tenure*), the percentage of female directors (*Female_dir*) and the percentage of foreign directors (*Foreign_dir*). Additionally, we account for firms' regional and sectoral effects by including regional location and industry classification. Further details are provided in Appendix A.

To implement the PSM, we use nearest-neighbour matching with a caliper of 0.01 and without replacement (Balakrishnan, 2014). Although no strict rule exists in the literature for selecting matching parameters, the choice involves a trade-off between bias and efficiency. Given our research objectives, we prioritise matching precision over efficiency, opting for one-to-one matching without replacement. Matches are restricted to observations within the common support of estimated propensity scores to ensure covariate balance between FR and non-FR firms. Post-matching balance checks, summarised in Table 1, confirm that all covariates are well-balanced between FR and non-FR firms.

[Insert Table 1 here]

In the second step, post-PSM, we define a company's benchmark equity funding level in a given year as the median equity funding raised by all FR firms within the same size group. The difference between this benchmark and the firm's actual equity funding gives the firm's equity gap.[18] Based on the Companies Act 2006 definitions, these size groups are determined by the inflation-adjusted total asset value, segregating entities into micro companies (total assets below £316k), small companies (total assets ranging from £316k to £5.1 million),

[18] For a non-FR company, no equity funding is observed, so the equity gap is equal to the benchmark. For an FR company, the equity funding may be lower (or higher) than the benchmark, resulting in a positive (or negative) gap. When the gap is negative, the firm may have raised more equity than optimal—i.e., the firm may have an equity surplus rather than a gap.

medium-sized companies (total assets between £5.1 million and £18 million), and large companies (total assets exceeding £18 million). Consistent with prior studies (Cassar, 2004; Fraser et al., 2015; Guariglia, 2008; Spaliara, 2009), our approach assumes that firms of similar size have comparable equity demands, benchmarking against the median value of equity funding raised in a year, scaled by total assets. Although we use this approach in our baseline analysis, in a robustness check (Section 5.2.3), we consider an alternative where the benchmark is estimated by directly matching each non-FR firm to an FR counterpart in the same year, and subsequently setting it to the equity fundraising ratio of the latter.

4.2. Baseline model specification

In our baseline analysis, we follow Richardson's (2006) methodology and utilise an augmented *q*-theory model to examine the determinants of investment. The model is specified as follows:

$$Invest_{i,t+1} = \beta_0 + \beta_1 * Gaps_{i,t} + \beta_2 * Growth_{i,t} + \beta_3 * Size_{i,t} + \beta_4 * Age_{i,t} + \beta_5 * Cash_{i,t} + \beta_6 * Leverage_{i,t} + Industry\ FE + Region\ FE + Year\ FE + \varepsilon_{i,t}, \quad (1)$$

where $Invest_{i,t+1}$ is total capital investment, calculated as the change in fixed assets from year *t* to year *t*+1, plus depreciation expense, scaled by total assets (Biddle & Hilary, 2006; Colombo et al., 2013). In a robustness check (Section 5.2.3), we follow Michaely and Roberts (2012) and consider an alternative measure based on the fixed assets change ratio without considering depreciation. As discussed above, equity gaps ($Gaps_{i,t}$) are measured as the difference between the benchmark and actual amount of equity fundraising, scaled by total assets. $Growth_{i,t}$, measured as the change in total assets from year *t*–1 to year *t*, divided by total assets in year *t*–

1, captures the current value of a firm's options for future investment (Myers, 1977) and serves as a proxy for growth opportunities.[19]

Our model also incorporates several proxies for financing constraints, which significantly influence firms' investment decisions (Cressy, 2002; Fazzari et al., 1988), namely, firm size ($Size_{i,t}$), measured as the logarithm of inflation-adjusted total assets and firm age ($Age_{i,t}$). We further include cash holdings ($Cash_{i,t}$) and the leverage ratio ($Leverage_{i,t}$), calculated as long-term liabilities divided by the total assets. These factors help control for firms' economies of scale, the degree of information asymmetries, transaction costs, access to capital markets, and risk exposure (e.g., Berger & Udell, 1998; Titman & Wessels, 1988). By including leverage, we account for the possibility that credit markets may serve as a substitute for equity financing (e.g., Kolokas et al., 2022).[20] To ensure robustness, we further include industry, region, and year-fixed effects, which control for time-invariant unobservable factors associated with specific industries, geographic regions, and time periods, respectively.

5. Empirical Results

5.1. Total equity gaps for UK HGEs

In this section, we discuss the key patterns of the equity gaps facing HGEs across the UK. On an aggregate level, the funding gap is determined by two key factors: the number of companies with equity gaps and the (estimated) benchmark equity fundraising ratio. Consistent with our primary approach, we define companies that have not raised any equity financing over

[19] While Tobin's Q is a widely used measure of investment opportunity in the literature, it is unsuitable for unlisted companies, where market value is not directly observable. Consequently, we use total assets growth as a proxy. In previous research examining unlisted companies (Chen et al., 2011), it is conventional to consider both the sales growth rate and the total asset growth rate. However, due to significant missing data on sales (i.e., turnover), we rely on the total asset growth rate alone.

[20] In the baseline analysis, we do not control for hurdle rates, i.e., the required rate of return on new projects that capture capital constraints, due to data limitations. In the UK, these rates are available from the Decision Maker Panel (DMP) survey, for the year 2018. In an unreported robustness check, however, we re-estimate our model using 2018 observations and include the industry-level hurdle rate. The results remain unchanged.

the past four years (non-FR firms) as having equity gaps. The benchmark equity fundraising is defined in Section 4.1, although we have also considered many other alternatives (see Appendix C for more details).

As illustrated in Figure 1, the aggregate equity gap has grown in recent years, driven by both a rising number of companies unable to secure equity finance and an increasing average equity fundraising ratio. The growing number of non-FR firms reflects a broader inability to access equity finance, while the rising fundraising ratio indicates that successful fundraising involves larger amounts. This trend aligns with Mason (2020), who notes a shift in the equity financing landscape towards fewer, larger deals, reflecting a concentration of equity capital in select transactions.

[Insert Figure 1 here]

Table 2 presents the estimated aggregate equity gaps for the population of UK HGEs. The data reveals a consistent rise in equity gaps from 2014 to 2021. Panel A shows that average financing gaps increased from £0.36 million in 2014 to £0.77 million in 2021. Panel B highlights a surge in total financing gaps, from £2 billion in 2014 to £13 billion in 2021. These findings underscore the growing capital demands of HGEs and align with the *Future of Growth Capital* report (ScaleUp Institute, 2020), which estimates an annual £15 billion growth-capital gap in the UK.

[Insert Table 2 here]

To explore regional and industry variations, we examine equity gaps by location and industry classification. Figure 2a shows that the London area has a significantly higher total equity gap than other regions due to the large number of HGEs located there. However, Figure 2b demonstrates that the average equity gap for London-based companies is smaller than that of HGEs in other regions. These results reflect London's stronger access to external equity finance, driven by a high concentration of VC activity and financial institutions (Kacer &

Wilson, 2023). Despite having smaller average gaps, the sheer number of HGEs in London means the total equity gap remains substantial.

[Insert Figure 2 here]

Figure 3 highlights equity gap distributions across the five industries with the largest aggregate gaps. The financial and insurance sector consistently exhibits the largest aggregate and average equity gaps, reflecting its high equity requirements. Detailed distributions of equity gaps by region and industry are provided in Appendix Tables A3 and A4. These results reinforce the importance of controlling for regional and industry effects in our analysis.

[Insert Figure 3 here]

5.2. Impact of equity gaps on investment

5.2.1. Baseline regression

In this section, we examine how equity gaps affect firms' subsequent investment using Equation (1). Table 4 presents the results. The first two columns show that the effect of current equity gaps on investment in the following year is statistically significant at the 1% level and economically substantial. Specifically, a one-standard-deviation increase in equity gaps leads to an approximately 40% reduction in capital investment.[21] This finding supports our central hypothesis, which posits that equity gaps negatively impact the capital investment of HGEs in the subsequent year. Furthermore, this result aligns with existing evidence that equity gaps adversely affect firm performance (Ayyagari et al., 2008; Cosh et al., 2009; Cowling & Wilson, 2024; Cressy, 2012).

In columns (1) and (2) of Table 4, we allow the equity gap variable to take negative values, capturing scenarios where companies experience surplus equity financing relative to

[21] A one-standard-deviation increase in equity gaps results in a change in the dependent variable of $-0.066 \times 0.936 = -0.063$, representing approximately $-0.063 / 0.154 = -40\%$ of its mean value.

their benchmark. The premise of this approach is that these companies may have raised more equity than optimal. In columns (3) and (4), we censor the equity gap variable at zero, assuming away cases where companies may have surpluses. Across all model specifications, our findings remain unchanged, highlighting the robustness of the observed relationship between equity gaps and investment.

Regarding the control variables, the results are generally consistent with previous research. The coefficient on *Growth* is positive and significant at the 1% level in all specifications, indicating that firms with higher asset growth rates are more likely to invest in subsequent years. The negative coefficient on *Size* is consistent with the concept of diminishing marginal returns to investment, whereby larger firms experience lower marginal returns compared to smaller firms with greater growth potential (e.g., Guariglia, 2008). Similarly, the negative and significant coefficient on *Age* at the 1% level reflects the life-cycle theory of firms (Jovanovic, 1982), suggesting that older firms generally have fewer investment opportunities compared to younger firms.

[Insert Table 4 Here]

5.2.2. Addressing endogeneity

Endogeneity concerns in our analysis arise from two main sources. First, equity investors may select investee HGEs based on firm characteristics, meaning that HGEs receiving equity finance are more likely to have favourable growth opportunities (Croce et al., 2013; Wilson et al., 2022). Our PSM procedure alleviates this issue by pairing FR and non-FR companies based on a comprehensive list of firm- and board-level covariates with similar probabilities of raising equity finance.

Nevertheless, unobserved confounders could introduce endogeneity and bias our results. To address this concern, we run regressions with firm fixed effects in columns (1) and

(2) of Table 5 to control for time-invariant (unobserved) firm-specific factors influencing both equity gaps and investment decisions. The results continue to hold. However, time-varying unobserved factors, such as market conditions or firm-specific shocks, could still pose endogeneity challenges. To address these issues, in columns (3) and (4) of Table 5, we use the system GMM estimator (Blundell & Bond, 1998) and estimate a dynamic investment model that accounts for the persistent nature of investment behaviour and intertemporal correlations using lagged differences of endogenous variables as instruments. This approach has been widely adopted in entrepreneurial finance research (Bennett, 2019; Croce et al., 2013) and is considered one of the most suitable methods for addressing dynamics and endogeneity in empirical corporate finance and governance (e.g., Flannery and Hankins, 2013; Wintoki et al., 2012). The results from the system GMM approach confirm that the coefficient on equity gaps remains significantly negative, consistent with the baseline finding and supporting our hypothesis.

[Insert Table 5 Here]

5.2.3. Robustness tests

To ensure the robustness of our findings, we conduct several additional checks, as reported in Table 6. First, we consider an alternative measure of the equity gap, introducing a dummy variable that equals one if the gap is positive and zero otherwise. This alternative measure effectively captures whether a firm faces a hurdle in accessing sufficient equity capital. The results in column (1) indicate that experiencing a (positive) equity gap significantly constrains firm investment, supporting our baseline findings. Second, we examine the sensitivity of our results to the measure of investment. Following Michaely and Roberts (2012), we use the fixed-asset change ratio as an alternative measure; this method does not take into account the role of depreciation, unlike in our baseline analysis. In column (2), the results

remain qualitatively unchanged. Third, we assess whether the observed reduction in investment persists over a longer term, beyond the current one-year horizon. It is important to determine whether financing constraints in the form of equity gaps lead to permanently forgone investments or merely postponed capital expenditures (e.g., Rauh, 2006). To test this, we use two-year and three-year forward fixed-asset investments as the dependent variable. The results in columns (3) and (4) show that the negative impact of equity gaps remains significant over these extended time horizons. This persistence suggests that equity gaps have long-lasting effects on business investment rather than merely reflecting deferred capital expenditures, further highlighting the detrimental impact of a lack of funding on firm viability.

[Insert Table 6 Here]

In the online appendices, we conduct several additional robustness checks to confirm the consistency of our findings. First, in Appendix Tables A5 and A6, we evaluate whether the observed reduction in investment stems from the absence of "value-added" support from equity investors. Prior studies widely explore the "screening" and "value-added" effects in equity investment (e.g., Croce et al., 2013). Using the PSM method, we ensure that firms exhibit comparable pre-fundraising performance, effectively mitigating the "screening" effect. Further analysis shows that the source of equity financing does not significantly influence the reduction in investment, indicating that unmet financing needs, rather than "value-added" effects, drive the observed outcomes.

Second, we consider different time windows to define treated (non-FR) companies. In our main analysis, these firms are classified as treated if they have not engaged in fundraising activities over the past four years (from t–4 to t). In Appendix Table A7, we employ both longer time windows—namely, all past years and the past six years—as well as a shorter time window covering the past three years. The regression results remain consistent across these alternative definitions.

Third, in Appendix Table A8, we test the robustness of our results using an alternative definition of HGEs. Rather than relying on Beauhurst's triggers to classify HGEs, we adopt the OECD definition of HGEs, which requires companies to have an average annualised growth rate (in employees or turnover) of more 20% over three years, with at least 10 employees at the start of the observation period. Reanalysing the data using this definition produces consistent results.

Fourth, we consider an alternative scheme to estimate the benchmark equity funding level required to calculate the equity gap. In Appendix Table A9, instead of using the median equity funding ratio of all (FR) firms in the same size groups as in our baseline analysis, for a non-FR firm we calculate a benchmark using the actual amount of equity raised by a matched FR firm. This leads to a firm-specific benchmark and a firm-specific estimate of the equity gap for each non-FR company. Our results continue to hold under this alternative approach.

Finally, we validate our findings against alternative matching methods by applying entropy balancing rather than PSM to construct the post-matching sample. This method ensures covariate balance in all three moments (i.e., mean, variance and skewness) across the treated and control groups. The results, reported in Appendix Table A10, align with our primary findings, further supporting the robustness of our conclusions.

5.2.4. Cross-sectional analysis

5.2.4.1. Moderating role of access to alternative sources of finance

In this section, we investigate how the ability to raise supplementary sources of capital moderates the impact of equity gaps on investment. The underlying mechanism behind the negative effect of equity gaps stems from HGEs' inability to secure sufficient equity capital in the current period to meet their financing needs. Given their capital-intensive nature, HGEs typically need to pursue alternative sources of funding to bridge these shortfalls. As such, a

firm's access to alternative finance may play a key role in mitigating the adverse effect of equity gaps on the firm's investment.

To proxy for access to external finance, we employ both firm-level and industry-level factors. At the firm level, we consider two measures: asset tangibility and ownership concentration.[22] Asset tangibility captures the proportion of physical assets on the firm's balance sheet, which serve as collateral and reduce lenders' risk perception. Hence, higher tangibility is generally associated with improved access to debt markets by mitigating information asymmetries (Berger & Udell, 1998; Cosh et al., 2009). In contrast, ownership concentration may intensify agency conflicts, either between controlling and minority shareholders or between managers and outside investors, thereby deterring external financing (Aslan & Kumar, 2012; Keasey et al., 2015; Lemmon & Lins, 2003).

Beyond firm-level characteristics, we incorporate industry-level measures of financial constraints using data from the DMP survey.[23] Specifically, we calculate the proportion of firms in each industry that identify either a lack of internal funds or high financing costs as key barriers to capital expenditure in the upcoming year. These survey-based measures proxy for industry-level financing frictions, capturing managerial perceptions of capital access constraints. Unlike firm-level proxies, which reflect observable balance sheet characteristics, these indicators offer insight into perceived barriers to finance at a broader level.

Overall, we hypothesise that firms with limited access to supplementary finance will exhibit a stronger negative investment response to equity gaps, due to low asset tangibility, high ownership concentration, or exposure to industry-wide financial constraints.

[22] Fraser et al. (2015) find that the size, age and ownership structure of an entrepreneurial business are crucial factors affecting its financing decisions. However, we refrain from examining the impact of company size and age because our study focuses on newly incorporated companies, which have limited variation in these characteristics.

[23] The DMP is a large, representative online survey of CFOs from UK firms with 10 or more employees, drawn from the FAME database (Bank of England, 2024). It collects data on recent developments and expectations for sales, prices, employment and investment. The DMP covers private-sector firms of all sizes and industries, and has been used in academic research (e.g., Bloom et al., 2025).

To formally test the moderating effect of accessing alternative sources of finance, we interact the equity gap variable with each of the four financial access proxies, namely, tangibility (*Tangibility*), ownership concentration (*Own_HHI*), and the degree of constraints placed on capital expenditures due to the lack of internal funds (*Intcapex*) and higher costs of finance (*Cofcapex*). Table 7 presents the results of our cross-sectional tests. We find that the negative effect of equity gaps on investment is significantly weaker for firms with higher asset tangibility and significantly stronger for those with more concentrated ownership. Moreover, the interaction terms based on the DMP industry-level measures are also significant and negative: firms in industries where a greater proportion of managers report limited internal funds or high financing costs as major investment constraints display heightened sensitivity to equity gaps. Overall, these results suggest that factors capturing barriers to (alternative) finance exacerbate the adverse effects of equity gaps on business investment, supporting our conjectures.

[Insert Table 7 Here]

5.2.4.2. Further cross-sectional tests: Other moderating factors

In this section, we extend our cross-sectional analysis to examine other non-firm-specific moderators of the equity gaps' impact on investment, including macroeconomic events, geographic location, industry classification and government grants. The results are reported in Table 8. First, we analyse the effects of two major macroeconomic events, namely Brexit and COVID-19, which significantly disrupted the UK economy and financial markets (De Lyon & Dhingra, 2021). Panel A of Table 8 shows that while HGEs experienced lower investment levels during the post-Brexit and post-COVID periods, the interaction terms between these events and equity gaps are statistically insignificant. This finding suggests that the mechanisms through which equity gaps influence firm investment remain persistent, driven by structural factors rather than temporary macroeconomic shocks.

Next, we explore the moderating role of geographic location. Panel B reveals that the negative impact of equity gaps on investment is less pronounced for HGEs headquartered in London. This finding reflects the greater availability of funding options in London, consistent with our previous descriptive analysis and the notion that geographic proximity to institutional investors reduces financial market frictions (De Prijcker et al., 2019; Kim et al., 2022).

In Panel C, we investigate whether the equity gaps' effects vary across industries, focusing on the five industries with the largest aggregate gaps. The interaction terms for these industries are statistically insignificant, indicating that sectoral differences in aggregate financing needs do not systematically influence the observed impact of equity gaps on business investment.

Finally, in Panel D, we examine the role of government grants using two variables: the grant-to-assets ratio and a dummy variable indicating whether a company receives a grant in a year. While government grants positively influence investment levels, consistent with prior research (Colombo et al., 2013), the interaction term between the two grant variables and equity gaps is significantly negative at the 5% level in column (2) and is insignificant in column (4). This finding suggests that firms reliant on government grants may face inherent financing challenges, and such grants fail to effectively bridge their equity gaps to stimulate investment.

Overall, our cross-sectional tests highlight how firm-specific factors, macroeconomic events, geographic location, industry characteristics, and government support interact with equity gaps to shape investment outcomes. While the funding gap's negative impact is robust across various contexts, firms' ability to mitigate this effect depends on their access to external resources and structural advantages. Our findings emphasise the need for targeted policy interventions that address structural capital market inefficiencies and account for firm and contextual heterogeneity.

[Insert Table 8 here]

5.3. Additional analysis

5.3.1. Impact of equity gaps on investment efficiency

While our analysis thus far has demonstrated that equity gaps reduce business investment levels, it has not explored whether this reduction results in more or less efficient investment. Drawing on Hmieleski and Baron (2009) and previous research on the determinants of investment efficiency and inefficiency (Biddle et al., 2009; Brogaard et al., 2019; Chen et al., 2011; Richardson, 2006; Stoughton et al., 2017), we now examine the broader implications of the funding gap, particularly its potential to push firms further from their optimal investment levels. Such inefficiencies may hinder firm growth and strategic positioning.

Firms facing equity gaps might make inefficient investment decisions if they are forced to forgo positive net present value (NPV) projects due to insufficient funding. Given that HGEs typically follow a modified pecking order to set their financial policies (Vanacker & Manigart, 2010), they only seek external equity financing when internal funds fall short of their investment needs. When equity gaps emerge, they prevent firms from pursuing high-return projects, thereby hindering their ability to achieve optimal investment. Nevertheless, the impact of the funding gap on investment efficiency may differ for firms with over-investment tendencies. Entrepreneurs frequently overestimate their capabilities and underestimate risks (Hmieleski & Baron, 2009), which can result in over-investment (Meza & Southey, 1996). Such over-investment can be avoided when firms face equity constraints.

To test these conjectures, we first estimate a firm's investment efficiency. Following the literature (e.g. Biddle et al., 2009), we apply the *q*-theory model to compute HGEs' optimal investment levels as the fitted values from the regression and define investment efficiency as the absolute value of the residual term. The investment model is specified as follows:

$$Invest_{i,t+1} = \beta_0 + \beta_1 * Growth_{i,t} + \varepsilon_{i,t}, \quad (2)$$

where $Invest_{i,t+1}$ represents total investment, calculated as the change in fixed assets from year *t* to year *t*+1, plus depreciation expense, scaled by total assets. $Growth_{i,t}$ is the change of total assets from year *t*–1 to year *t*, divided by total assets in year *t*–1.

We estimate Equation (2) for each industry-year combination, based on the UK SIC 2017 industry codes, for industries with at least 20 observations per year. As discussed, we calculate investment efficiency as the absolute value of the residual term, further defining over-investment based as having positive residuals and under-investment as having negative residuals. Approximately 75% of the sample consists of under-investing firms.

In Table 9, we examine how equity gaps affect firm investment efficiency. In column (1), we regress investment efficiency on equity gaps (*Gaps*) using OLS, focusing on the subsample of under-investing firms (i.e., firms with negative residuals). The coefficient on *Gaps* is significantly positive at the 1% level, indicating that larger equity gaps push these firms further away from their optimal investment, thereby lowering investment efficiency. In column (2), we repeat the analysis for over-investing firms (i.e., firms with positive residuals). The results indicate that larger equity gaps move these firms closer to their optimal investment levels, improving their investment efficiency.

Columns (3) and (4) extend the analysis using a multinomial logit model to predict the likelihood of firms under-investing or over-investing. Specifically, we classify firm-year observations into quartiles based on the magnitude of their residuals from Equation (2). Observations in the bottom quartile (i.e., the most negative residuals) are classified as under-investing, while those in the top quartile (i.e., the most positive residuals) are classified as over-investing. Observations in the middle two quartiles serve as the benchmark group. The results are similar to those reported in columns (1) and (2), showing that firms with larger equity gaps

are significantly more likely to under-invest and less likely to over-invest compared to the benchmark group.

Overall, our findings suggest that equity gaps have mixed effects on HGEs' investment inefficiencies, exacerbating those with under-investment tendencies by pushing them further away from their optimal investment and increasing the likelihood of under-investment in subsequent years. Given the large fraction of under-investing firms in the sample, this evidence underscores the detrimental impact of equity funding shortfalls on these firms' investment outcomes.[24]

[Insert Table 9 Here]

5.3.2. Impact of equity gaps on labour investment

As a final analysis, we examine the impact of equity gaps on firms' labour investment to provide further insights into the link between equity gaps and HGEs' growth, considering that employment is another important factor of production alongside capital. Extant studies have demonstrated that access to external finance can significantly influence firms' employment decisions (Amess & Wright, 2012; Benmelech et al., 2021; Cressy et al., 2007; Spaliara, 2009). However, given the potential interaction between employment and capital investment (Ayyagari et al., 2021), the effect of capital market frictions, in the form of equity gaps, on labour investment remains an open empirical question.

First, building on the literature on the complementarity between capital and labour investment (Alvarez-Cuadrado et al., 2018), HGEs may partially offset capital investment constraints caused by equity gaps by increasing their investment in labour. Given the potentially lower marginal costs associated with labour compared to capital (Spaliara, 2009),

[24] The results are robust to using an alternative approach to estimating the equity gap. Specifically, rather than using size groups to determine the benchmark equity funding, we construct the benchmark directly from matched pairs (see Appendix Table 11).

firms may reallocate resources strategically between the two to sustain growth. Empirically, the presence of equity gaps could lead firms to adjust their input mix, potentially mitigating the negative growth effects of reduced capital investment through increased labour investment (Benmelech et al., 2021). However, a competing hypothesis is also possible. HGEs—especially newly established businesses—may lack the flexibility to reallocate those resources. For such firms, equity gaps not only reduce capital investment but also hinder labour investment (Amess & Wright, 2012; Spaliara, 2009), suggesting that the adverse effects of equity gaps on capital investment may extend to employment, compounding constraints on HGEs' overall growth.

To test these conflicting hypotheses, we measure labour investment using the natural logarithm of the number of employees per company (Behr et al., 2024); in (untabulated) robustness checks, our findings remain unchanged when using the change in employment. Table 10 presents the results. Columns (1) and (2) report the OLS estimates, while column (3) shows the results using the system GMM method. Across the models, we find that equity gaps have a significant and negative effect on subsequent employment. Regarding economic magnitude, the results in column (2) suggest that a one-standard-deviation increase in equity gaps results in a 5.9 per cent decline in employment, suggesting a meaningful impact.

Overall, our findings reveal that equity gaps negatively impact both labour and capital investment, two key inputs in HGEs' production. This dual effect underscores the importance of addressing equity gaps to support HGEs' growth and business viability.

[Insert Table 10 Here]

6. Conclusions

Using a comprehensive dataset of UK HGEs, this study provides direct firm-level evidence of the economic impact of equity gaps. We find that HGEs facing equity funding challenges invest less in both capital and labour, with the majority of firms exhibiting lower

investment efficiency. These effects are robust across various tests and persist even during periods of significant economic disruption, such as Brexit and COVID-19.

Our findings also reveal that firms with characteristics that hamper access to other sources of finance are more affected by equity gaps. Similarly, companies headquartered in London demonstrate greater resilience to the negative effects of these gaps, likely due to better access to financial resources and well-developed networks. However, firms reliant on government grants remain vulnerable to the adverse impacts of funding shortfalls, suggesting that such grants may not effectively substitute for equity finance or bridge the financing gap.

This study highlights the substantial role of equity gaps in constraining HGEs' investment and growth, reinforcing long-standing concerns about their detrimental effects on these firms' performance. Our findings call for further research into the determinants of equity gaps, with a focus on whether different causes of these gaps result in varying firm outcomes. A deeper understanding of the underlying drivers of equity gaps will provide valuable insights for policymakers, enabling the development of targeted strategies to mitigate funding shortfalls and support long-term business investment and growth.

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Figure 1: The evolution of UK HGEs' equity gaps

This figure represents the evolution in total and average equity gaps from 2014 to 2021, using four distinct estimation approaches. For Figure 1a, the left-side *y*-axis denotes the equity gaps in billions, while the right-side *y*-axis indicates the number of HGEs without fundraising in the selected year, in thousands. For Figure 1b, the left-side *y*-axis denotes the financing gaps in millions, while the right-side *y*-axis indicates the number of HGEs without equity fundraising in the selected year, in thousands. We employ a thick line to emphasize the total/average gaps estimated by our primary method. Specifically, we follow the *Companies Act 2006* to divide firms into different size groups and use the HGEs with available fundraisings to calculate the benchmark ratio (i.e., equity fundraising amount to total assets) annually. In our primary analysis, we directly apply this benchmark ratio to determine the optimal equity fundraising for firms in each size band that did not engage in fundraising in the selected year. To gauge the overall equity gap status for all UK HGEs, we extend this benchmark ratio assumption to the pre-matching sample, using the same ratio to compute optimal equity fundraising for each firm. As a result, we derive the annual optimal fundraising amount for each firm that did not conduct fundraising. To ensure the robustness of our analysis, we also calculate equity gaps using three alternative approaches. First, we adopt different size band threshold values proposed by Wilson et al. (2018), calculating the benchmark ratio across the entire pre-matching sample without considering variations over the years, leading to alternative measure 1. Second, we refine this method by incorporating the year-to-year variation of the benchmark ratio, resulting in alternative measure 2. Finally, we revert to our primary method to annually compute average gaps based on the post-matching sample, assuming these average gaps can represent the population average. Consequently, we calculate the total gaps by multiplying the average gaps by the total number of HGEs without any fundraising in the pre-matching sample, resulting in alternative measure 3. To enhance clarity, we only present the yearly evolution in equity gaps using our primary estimation method. All values have been adjusted to real 2022 UK pounds for consistency.

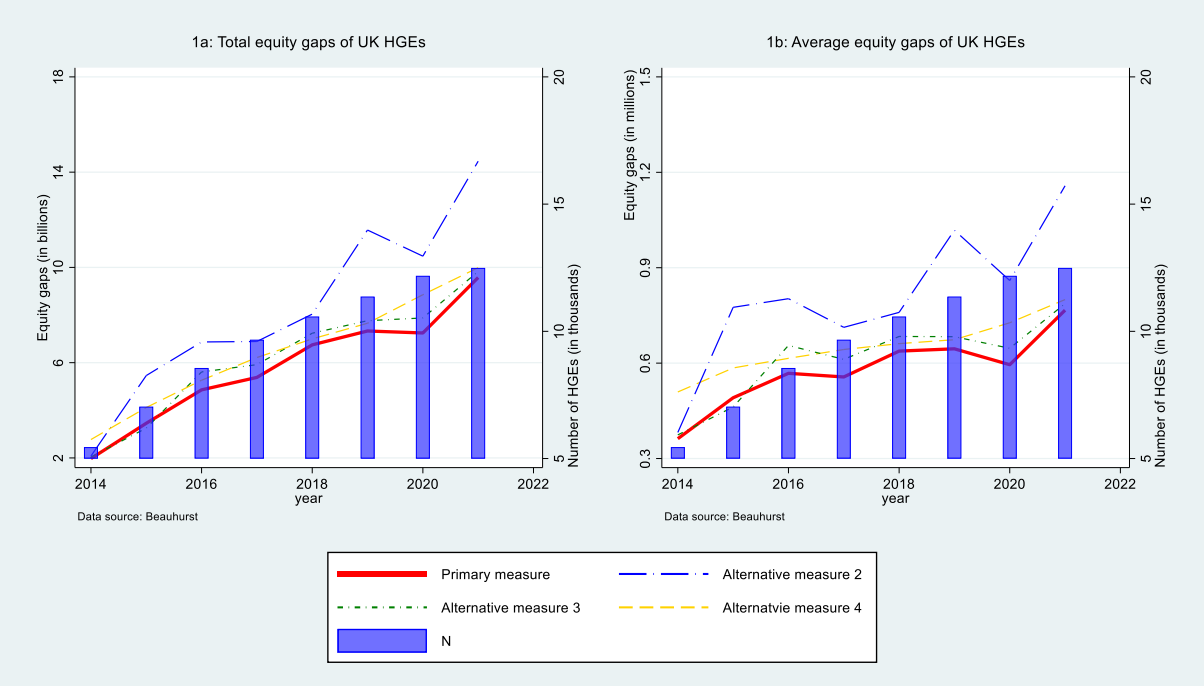

Figure 2. Equity gaps by region

This figure illustrates the variation in total and average equity gaps across different regions from 2014 to 2021. In Panel 2a, the left-side *y*-axis represents total equity gaps (in billions), while in Panel 2b, the left-side *y*-axis shows average equity gaps (in tens of thousands). For clarity, only equity gaps estimated using our primary method are presented for all regions. Specifically, following the *Companies Act 2006*, firms are categorised into different size groups, and the median equity fundraising ratio for each size-year group is used as the benchmark. This benchmark ratio is then applied to determine the optimal equity fundraising for HGEs that did not engage in equity fundraising in the selected year. To assess the overall financing gap for all UK HGEs, the benchmark ratio is extended to the pre-matching sample, calculating optimal equity fundraising for each HGE. Annual total equity gaps and annual average equity gaps by region are then derived based on these calculations. Headquarters' locations, sourced from Beauhurst, are used to classify HGEs into various regions. All monetary values are adjusted to 2022 UK pounds for consistency and comparability.

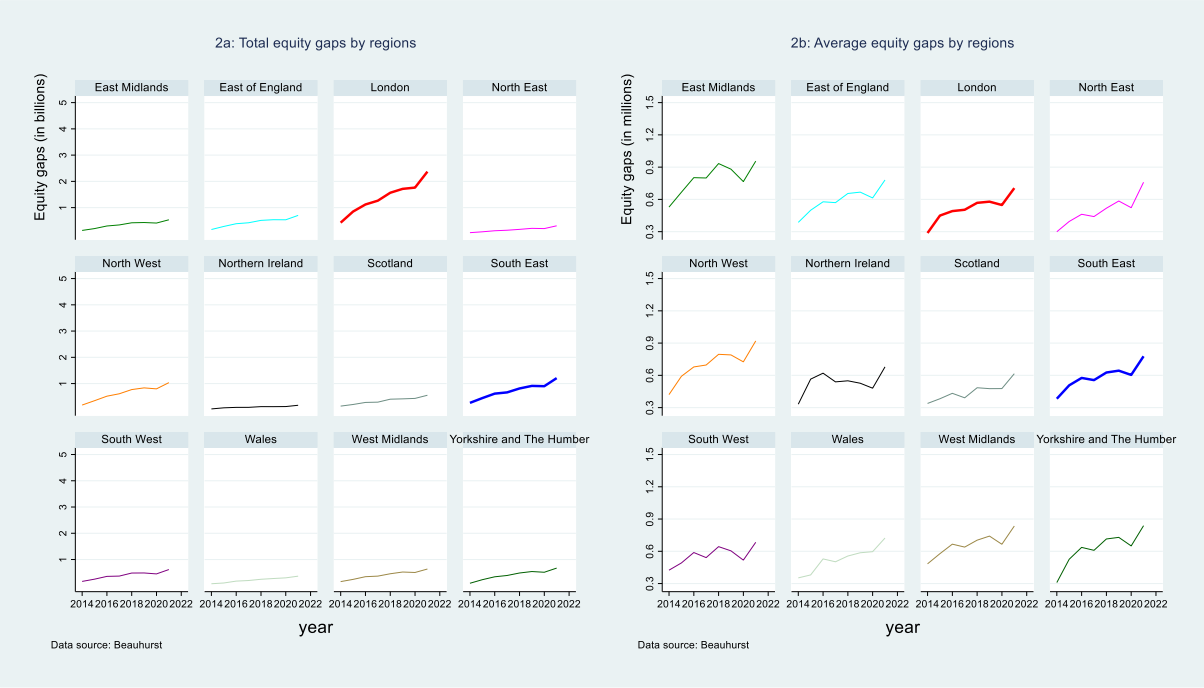

Figure 3. Equity gaps by industry

This figure illustrates the variation in equity gaps across different industries from 2014 to 2021. In Panel 3a, the left-side *y*-axis represents total equity gaps (in billions), while in Panel 3b, the *y*-axis represents average equity gaps (in tens of thousands). For clarity, only the top five industries with the most significant equity gaps, calculated using our primary method, are displayed. The analysis follows the *Companies Act 2006*, categorising firms into different size groups. For HGEs with available equity fundraising data, the annual benchmark ratio is calculated. This benchmark ratio is then applied to estimate the optimal equity fundraising for HGEs that did not engage in fundraising in the selected year. To assess the overall equity gaps for all UK HGEs, the benchmark ratio is extended to the pre-matching sample, allowing for the computation of optimal equity fundraising for each HGE. Based on these calculations, annual total and average equity gaps by industry are derived. Further details on the equity gaps for other industries are provided in the Appendix. All monetary values are adjusted to 2022 UK pounds for consistency and comparability.

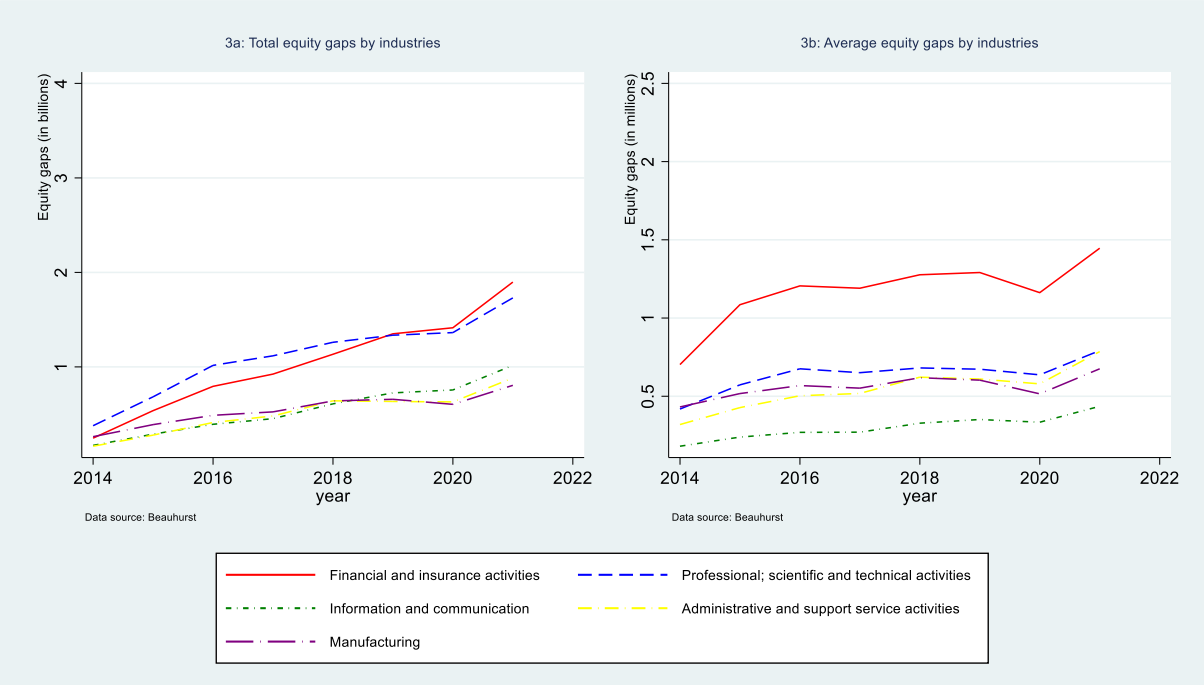

Table 1. Matching fundraising and non-fundraising firms: PSM results

This table presents the balance check results for covariates in the pre- and post-PSM samples, covering the period from 2014 to 2021. We define an "*FR*" dummy for observations with verified equity fundraising amounts that are non-missing and non-zero in the current year, while the "*non-FR*" dummy represents observations without any trackable equity fundraising over the past four years. The covariates used in the matching process include company size (*Size*), measured as the logarithm of total assets adjusted to 2022 prices; company age (*Age*), calculated as the difference between the account date and the incorporation date; intangible assets (*Intng*), expressed as intangible assets divided by total fixed assets; profit and loss account reserve (*Pl*), calculated as the profit and loss account reserve divided by total assets; cash (*Cash*), measured as cash holdings relative to total assets; bank overdraft and long-term liabilities (*Bolt*), expressed as a proportion of total assets; trade debtors (*Td*) and trade creditors (*Tc*), both measured as proportions of total assets; the annual growth rate of total assets (*Growth*); board size (*Board_size*), defined as the total number of directors; the proportion of directors sharing a common surname (*Common_sur*); the mean age of directors (*Mean_age*); the mean tenure of directors (*Mean_tenure*); the percentage of female directors on the board (*Female_dir*); the percentage of foreign directors on the board (*Foreign_dir*); and the coefficient of variation of directors' age (*Age_div*). Additionally, regional and industry fixed effects are included in the logit regression to predict the propensity score. We report the average values for each sub-sample, along with the corresponding *t*-statistics.

	(1)	(2)	(3)	(4)	(5)	(6)
		Pre-matching			Post-matching	
	FR	non-FR	*t-value*	FR	non-FR	*t-value*
Size	12.96	12.86	-4.84***	12.80	12.77	-0.94
Age	5.00	6.01	47.09***	5.04	5.04	0.11
Intng	0.09	0.05	-25.94***	0.09	0.08	-0.50
Pl	-1.42	-0.21	89.88***	-0.89	-0.89	-0.05
Cash	0.34	0.22	-40.35***	0.26	0.26	0.05
Bolt	0.25	0.31	16.46***	0.30	0.31	1.95
Td	0.05	0.10	31.93***	0.06	0.06	-0.84
Tc	0.07	0.06	-6.11***	0.07	0.07	-0.76
Growth	3.36	1.48	-38.99***	2.80	2.91	1.12
Audit	0.08	0.13	17.71***	0.11	0.11	0.03
Board_size	3.71	2.96	-54.67***	3.39	3.42	0.96
Common_sur	0.13	0.31	44.20***	0.17	0.18	0.44
Mean_age	45.97	46.93	11.88***	46.04	46.07	0.19
Mean_tenure	3.63	5.04	75.19***	3.84	3.83	-0.13
Female_dir	0.14	0.22	34.32***	0.16	0.16	0.16
Foreign_dir	0.21	0.12	-35.40***	0.17	0.17	0.14
Age_div	17.66	14.49	-29.18***	16.52	16.36	-0.88
N		56,891			15,936	

Table 2. Evolution of equity gaps by year

This table presents the evolution of firms' equity gaps using four distinct methods. First, we follow the *Companies Act 2006* to categorise HGEs into size groups and calculate the annual benchmark fundraising ratio based on observations with available fundraising amounts. Our primary method applies this benchmark ratio to estimate the optimal fundraising amounts for non-FR HGEs in each year and extends it to the entire UK HGE population to compute total equity gaps. To ensure the robustness of the analysis, we adopt three alternative approaches. The first (*Gaps_alt.1*) calculates average equity gaps annually from the post-matching sample and assumes these averages represent the population, with total gaps derived by multiplying the average gap by the number of non-FR HGEs. The second (*Gaps_alt.2*) uses size band thresholds proposed by Wilson et al. (2018) to compute the benchmark ratio across the full sample without accounting for annual variations. The third (*Gaps_alt.3*) refines this by incorporating year-to-year variations in the benchmark ratio. Panel A reports firm-level average equity gaps using all methods, while Panel B presents total equity gaps for the full UK HGE population, calculated after identifying non-FR firms based on annual fundraising activity. Panel C reports total equity gaps using the pre-matching sample, where covariates used in the PSM process are non-missing. Panels B and C also display the number of non-FR firms (N) in each year. All data are sourced from Beauhurst, with nominal values converted to 2022 real UK pounds (in millions). Estimated gaps are winsorised at the 1st and 99th percentiles to reduce the impact of extreme values.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	2014	2015	2016	2017	2018	2019	2020	2021
Panel A: Average equity gaps								
Gaps	£ 0.36	£ 0.49	£ 0.57	£ 0.56	£ 0.64	£ 0.65	£ 0.60	£ 0.77
Gaps_alt.1	£ 0.38	£ 0.78	£ 0.80	£ 0.71	£ 0.76	£ 1.02	£ 0.86	£ 1.16
Gaps_alt.2	£ 0.37	£ 0.46	£ 0.66	£ 0.61	£ 0.68	£ 0.68	£ 0.65	£ 0.79
Gaps_alt.3	£ 0.51	£ 0.58	£ 0.62	£ 0.64	£ 0.66	£ 0.67	£ 0.73	£ 0.80
Panel B: Aggregate equity gaps for the population of UK high-growth companies								
Tot_Gaps	£ 2,268	£ 4,165	£ 6,174	£ 7,084	£ 9,261	£ 10,303	£ 10,520	£ 13,858
Tot_Gaps_alt.1	£ 2,391	£ 6,576	£ 8,725	£ 9,070	£ 11,031	£ 16,262	£ 15,200	£ 20,928
Tot_Gaps_alt.2	£ 2342	£ 3,918	£ 7,126	£ 7,788	£ 9,931	£ 10,911	£ 11,435	£ 14,226
Tot_Gaps_alt.3	£ 3187	£ 4,960	£ 6,686	£ 8,183	£ 9,603	£ 10,761	£ 12,852	£ 14,459
N	6,257	8,480	10,869	12,728	14,521	15,973	17,679	18,078
Panel C: Aggregate equity gaps for the pre-matching sample								
Tot_Gaps	£ 1,975	£ 3457	£ 4,861	£ 5,382	£ 6,749	£ 7,331	£ 7,248	£ 9,575
Tot_Gaps_alt.1	£ 2,082	£ 5,459	£ 6,869	£ 6,891	£ 8,038	£ 11,571	£ 10,472	£ 14,459
Tot_Gaps_alt.2	£ 2,039	£ 3,253	£ 5,610	£ 5,917	£ 7,237	£ 7,764	£ 7,878	£ 9,829
Tot_Gaps_alt.3	£ 2,774	£ 4,117	£ 5,264	£ 6,217	£ 6,998	£ 7,657	£ 8,854	£ 9,990
N	5,447	7,039	8,557	9,670	10,582	11,365	12,180	12,490

Table 3. Descriptive statistics of the matched sample

This table presents descriptive statistics for the variables used in the analysis, based on UK HGEs from 2014 to 2021. Panel A includes descriptive statistics for the variables used in the primary analysis: *Inv_fa* represents scaled fixed asset investment, calculated as the change in fixed assets from year *t* to *t+1* plus depreciation in year *t+1*, scaled by total assets; *Gaps* denotes scaled equity financing gaps, measured as the difference between the estimated and actual equity fundraising amounts, scaled by total assets; *Gaps_censored* represents equity financing gaps where negative values are replaced with zero; *Growth* indicates the total asset growth rate; *Size* is the natural logarithm of inflation-adjusted total assets, with total asset value (*Ta*) reported in millions for reference; *Age* is reported as both the natural logarithm of a firm's age and its raw age value; *Cash* represents cash holdings scaled by total assets, and *Leverage* is the ratio of long-term liabilities to total assets. Panel B reports descriptive statistics for variables used in the additional analyses: *Inv_far* is the fixed asset change ratio, calculated as the change in fixed assets from year *t* to *t*+1 divided by fixed assets in year *t*; *Gaps_dummy* is a binary variable equal to one if *Gaps* is positive and zero otherwise. *Tang* represents tangible fixed assets as proportions of total fixed assets; Ownership concentration is measured using the Herfindahl-Hirschman Index (*Own_HHI*) and the log-odds ratio of the shareholdings of the top five shareholders (*La5*), following Demsetz and Villalonga (2001); *Grants* refers to annual grants received by firms, scaled by total assets. *Inv_residual* represents the absolute value of the residual from the optimal investment model and serves as a measure of investment efficiency. To examine the impact of equity gaps over different investment horizons, we calculate cumulative fixed asset investments over 2-year (*Inv_fa_2yr*) and 3-year (*Inv_fa_3yr*) periods. Finally, *Emp* denotes the natural logarithm of the number of employees.

	N	Mean	Std. Dev.	Min	Q1	Median	Q3	Max
Panel A: Variables used in primary analysis								
Inv_fa	14,276	0.154	0.446	-0.191	-0.003	0.005	0.092	2.284
Gaps	14,276	0.383	0.936	-2.184	0.004	0.566	1.354	1.527
Gaps_censored	14,276	0.620	0.552	0	0.004	0.566	1.354	1.527
Growth	14,276	2.921	6.271	-0.502	-0.003	0.407	1.882	22.525
Size (in log form)	14,276	12.688	2.12	6.131	11.440	12.744	14.045	18.606
Ta (in millions)	14,276	3.754	18.077	0	0.093	0.342	1.258	150.315
Age (in log form)	14,276	1.528	0.384	0.693	1.099	1.609	1.792	2.303
Age	14,276	4.965	1.946	2	3	5	6	11
Cash	14,276	0.264	0.314	0	0	0.113	0.476	1
Leverage	14,276	0.366	1.154	0	0	0.001	0.222	8.756
Panel B: Variables used in additional analysis								
Inv_far	12,410	1.897	7.038	-0.973	-0.199	-0.008	0.625	39.559
Gaps_dummy	14,276	0.752	0.432	0	1	1	1	1
Tang	12,410	0.650	0.443	0	0.059	1	1	1
Own_HHI	13,554	0.436	0.260	0.071	0.246	0.366	0.511	1
La5	14,276	-0.531	3.302	-6.811	-2.442	0	0	9.211
Grants	14,276	0.094	0.518	0	0	0	0	4.214
Inv_residual	14,255	19.286	29.305	0.430	6.807	9.901	16.804	148.864
Inv_fa_2yr	10,929	0.456	1.293	-0.313	-0.002	0.028	0.273	6.858
Inv_fa_3yr	7,965	0.884	2.487	-0.391	0	0.062	0.513	13.312
Emp (in log form)	11,104	2.241	1.151	0.693	1.386	1.946	2.890	6.172
Emp	11,104	23.525	62.844	1	3	6	17	478

Table 4. The impact of equity gaps on investment

This table presents the results of analysing the effect of equity gaps on investment, using data from 2014 to 2021. The analysis is based on the post-matching dataset, restricted to observations where all variables used in the primary analysis are non-missing. The dependent variable is fixed asset investment, calculated as the change in fixed assets from year *t* to *t*+1, plus depreciation in year *t*+1, scaled by total assets. The key independent variable, equity gaps (*Gaps*), represents the difference between the benchmark and actual annual equity fundraising amounts, scaled by total assets. Specifically, following the *Companies Act 2006*, firms are categorised into different size groups, and the median equity fundraising ratio for each size-year group is used as the benchmark. Columns (3) and (4) present regression results where negative gaps are replaced with zero (*Gaps_censored*). Control variables include company size (*Size*), measured as the natural logarithm of inflation-adjusted total assets; firm age (*Age*); cash holdings (*Cash*), calculated as total cash holdings scaled by total assets; and leverage (*Leverage*), defined as total long-term liabilities divided by total assets. All independent variables are measured in year *t*. Standard errors are clustered at the firm level and are reported in parentheses. Statistical significance is denoted by ***, **, and * for the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
Gaps	-0.066***	-0.066***		
	(0.006)	(0.006)		
Gaps_censored			-0.104***	-0.104***
			(0.01)	(0.01)
Growth	0.003***	0.003***	0.003***	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)
Size	-0.047***	-0.047***	-0.054***	-0.054***
	(0.003)	(0.003)	(0.003)	(0.003)
Age	-0.05***	-0.052***	-0.054***	-0.055***
	(0.011)	(0.011)	(0.011)	(0.011)
Cash	-0.009	-0.007	-0.011	-0.009
	(0.013)	(0.013)	(0.013)	(0.013)
Leverage	0.003	0.003	0.004	0.004
	(0.005)	(0.005)	(0.005)	(0.005)
Cons	0.907***	0.922***	1.043***	1.06***
	(0.05)	(0.066)	(0.056)	(0.071)
Industry FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Region FE	N	Y	N	Y
N	14,276	14,276	14,276	14,276
R-squared	0.09	0.09	0.08	0.08

Table 5. Results using firm fixed effects and system-GMM methods

This table examines the impact of equity gaps on investment using firm fixed effects and system-GMM methods. The analysis is based on the post-matching dataset, restricted to observations where all variables used in the primary analysis are non-missing. The dependent variable is fixed asset investment, calculated as the change in fixed assets from year *t* to *t*+1, plus depreciation in year *t*+1, scaled by total assets. The key independent variable, equity gaps (*Gaps*), represents the difference between the benchmark and actual annual equity fundraising amounts, scaled by total assets. Specifically, following the *Companies Act 2006*, firms are categorised into different size groups, and the median equity fundraising ratio for each size-year group is used as the benchmark. The first two columns present regression results with firm and year-fixed effects. The subsequent analysis applies the system-GMM method, incorporating lagged investment as one of the independent variables to address potential endogeneity. Columns (2) and (4) present regression results where negative gaps are replaced with zero (*Gaps_censored*). Control variables include company size (*Size*), measured as the natural logarithm of inflation-adjusted total assets; company age (*Age*); cash holdings (*Cash*), calculated as total cash holdings scaled by total assets; and leverage (*Leverage*), defined as total long-term liabilities divided by total assets. All independent variables are measured at year *t*. For the system GMM analysis, we report the *p*-values for AR1, AR2 and Hansen-*J* tests separately. The standard errors, clustered at the firm level, are presented in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
	OLS		Sys-GMM	
Gaps	-0.058***		-0.03***	
	(0.009)		(0.009)	
Gaps_censored		-0.08***		-0.049***
		(0.017)		(0.017)
Growth	0.004***	0.004***	-0.005*	-0.005*
	(0.001)	(0.001)	(0.003)	(0.003)
Size	-0.146***	-0.152***	-0.031***	-0.034***
	(0.01)	(0.01)	(0.005)	(0.005)
Age	0.065	0.071	-0.053**	-0.056***
	(0.064)	(0.064)	(0.021)	(0.021)
Cash	0.129***	0.126***	0.062**	0.061**
	(0.03)	(0.031)	(0.027)	(0.027)
Leverage	0.002	0.003	0.013	0.014
	(0.009)	(0.009)	(0.011)	(0.011)
Lagged Inv_fa			0.079**	0.08**
			(0.039)	(0.039)
Cons	1.854***	1.956***	0.555***	0.628***
	(0.12)	(0.128)	(0.076)	(0.087)
Firm FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
N	14,276	14,276	3,815	3,815
R-squared	0.14	0.14		
AR1 (*p-value*)			0.011	0.012
AR2 (*p-value*)			0.061	0.061
Hansen-J (*p-value*)			0.808	0.834

Table 6. Robustness tests using alternative measures

This table presents robustness tests on the relationship between equity gaps and investment, utilizing the same sample as the primary analysis. In Column (1), the dependent variable is fixed asset investment, calculated as the change in fixed assets from year *t* to year *t+1*, plus depreciation in year *t+1*, scaled by total assets. To examine the robustness of the equity gaps measure, an alternative measure of equity gaps, *Gaps_dum*, is used as the main independent variable, defined as a dummy variable equal to 1 if equity gaps are present and 0 otherwise. Columns (2) to (4) employ alternative measures for the dependent variable. In Column (2), the dependent variable is the fixed asset change ratio, calculated as the change in fixed assets from year *t* to year *t*+1, scaled by fixed assets. Columns (3) and (4) extend the analysis to longer investment horizons, calculating cumulative fixed asset investments over 2-year (*Inv_fa_2yr*) and 3-year (*Inv_fa_3yr*) periods to examine the sustained impact of equity gaps. The primary independent variable (*Gaps*) represents the difference between estimated and actual annual fundraising amounts, scaled by total assets. Control variables include company size (*Size*), measured as the natural logarithm of inflation-adjusted total assets; company age (*Age*); cash holdings (*Cash*), scaled by total assets; and leverage (*Leverage*), calculated as total long-term liabilities divided by total assets. All independent variables are measured at year *t*. The standard errors, clustered at the firm level, are presented in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
	Alt. gaps measure	Alt. Inv measure	Alt. Inv horizons	
Dep var	Inv_fa	Inv_far	Inv_fa_2yr	Inv_fa_3yr
Gaps_dum	-0.106***			
	(0.010)			
Gaps		-0.768***	-0.144***	-0.228***
		(0.096)	(0.019)	(0.043)
Growth	0.002***	0.088***	0.005**	0.001
	(0.001)	(0.015)	(0.002)	(0.005)
Size	-0.041***	-0.427***	-0.193***	-0.432***
	(0.003)	(0.043)	(0.01)	(0.024)
Age	-0.053***	-0.812***	-0.119***	-0.171*
	(0.011)	(0.186)	(0.038)	(0.09)
Cash	-0.015	1.591***	-0.006	-0.101
	(0.013)	(0.27)	(0.046)	(0.104)
Leverage	0.005	0.003	0.023	0.05
	(0.005)	(0.084)	(0.019)	(0.044)
Cons	0.91***	7.077***	3.255***	6.801***
	(0.066)	(0.892)	(0.225)	(0.486)
Industry FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Region FE	Y	Y	Y	Y
N	14,276	12,410	10,929	7,965
R-squared	0.08	0.04	0.13	0.16

Table 7. Cross-sectional analysis

This table reports the results of a cross-sectional analysis examining how access to alternative sources of finance moderates the relationship between equity gaps and investment. We measure access to finance using two firm-level factors, namely, asset tangibility (*Tangibility*), defined as the ratio of tangible assets to total assets, and ownership concentration (*Own_HHI*), measured using the Herfindahl-Hirschman Index based on equity ownership shares. We also include two industry-level indicators of financial constraints derived from the DMP survey: the industry-level sensitivity of capital expenditure to internal finance (*Intcapex*) and to the cost of finance (*Cofcapex*). To assess the moderating effects of these characteristics, interaction terms are constructed between each characteristic and the main independent variable (*Gaps*), which is defined as the difference between estimated and actual annual fundraising amounts, scaled by total assets. Control variables include company size (*Size*), measured as the natural logarithm of inflation-adjusted total assets; company age (*Age*); cash holdings (*Cash*), scaled by total assets; and leverage (*Leverage*), calculated as total long-term liabilities divided by total assets. All independent variables are measured at year *t*. The standard errors, clustered at the firm level, are presented in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
Gaps	-0.080***	-0.045***	0.031	-0.002
	(0.014)	(0.011)	(0.046)	(0.030)
Tangibility	-0.036***			
	(0.012)			
Gaps*Tangibility	0.027*			
	(0.015)			
Own_HHI		0.098***		
		(0.022)		
Gaps* Own_HHI		-0.057**		
		(0.025)		
Intcapex			1.262	
			(0.955)	
Gaps* Intcapex			-0.212**	
			(0.100)	
Cofcapex				1.722*
				(0.918)
Gaps* Cofcapex				-0.170**
				(0.079)
Controls	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Region FE	Y	Y	Y	Y
N	12,410	13,554	14,040	14,040
R-squared	0.07	0.09	0.09	0.09

Table 8. Further cross-sectional analysis

This table presents additional cross-sectional analyses exploring how Brexit, COVID-19, regional and industry-specific effects, and government grants influence the relationship between equity gaps and investment. To capture the impact of major macroeconomic events, we construct two time dummy variables: "*Brexit*" equals 1 for years after 2016, and "*Covid*" equals 1 for years after 2019. To examine regional effects, we include two location-based dummy variables: "*London*" is set to 1 if firms' headquarters are in London, and "*SE*" equals 1 for firms headquartered in the Southeast region. Industry effects are explored using the UK SIC 2017 classification. "*Top5*" is a dummy variable equal to 1 for companies in the top five industries with the largest aggregate equity gaps. "*KI*" is a dummy variable equal to 1 for firms operating in knowledge-intensive industries, such as high-tech knowledge-intensive services, knowledge-intensive financial services, and knowledge-intensive market services. In the final panel, we analyse the role of government grants. The variable "*Grants*" represents the annual grants received by companies, scaled by total assets, while "*Grants_dum*" is a dummy variable equal to 1 if a company received grants in the selected year. To assess the moderating effects of these factors, interaction terms are constructed between each factor and the main independent variable (*Gaps*). Interaction terms between equity gaps and these grant variables are included to assess their combined effect. The dependent variable is scaled fixed asset investment, calculated as the change in fixed assets from year *t* to year *t*+1, plus depreciation in year *t*+1, scaled by total assets. The main independent variable, "*Gaps*", measures the difference between estimated and actual annual equity fundraising amounts, scaled by total assets. Control variables include company size (*Size*), measured as the natural logarithm of inflation-adjusted total assets; company age (*Age*); cash holdings (*Cash*), scaled by total assets; and leverage (*Leverage*), calculated as total long-term liabilities divided by total assets. These control variables are measured at year *t*. The standard errors, clustered at the firm level, are presented in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
Panel A: Effects of Brexit and COVID-19 on equity gaps				
Gaps	-0.066***	-0.074***	-0.070***	-0.074***
	(0.006)	(0.013)	(0.007)	(0.013)
Brexit * Gaps		0.01		0.005
		(0.014)		(0.015)
Covid * Gaps			0.013	0.012
			(0.011)	(0.012)
Brexit	-0.018*	-0.035***		-0.02
	(0.011)	(0.013)		(0.014)
Covid	-0.036***		-0.045***	-0.040***
	(0.008)		(0.009)	(0.010)
Controls	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y
Region FE				
N	14,276	14,276	14,276	14,276
R-squared	0.09	0.09	0.09	0.09
Panel B: Regional variation in the impact of equity gaps				
Gaps	-0.078***	-0.065***	-0.066***	-0.080***
	(0.008)	(0.006)	(0.006)	(0.009)
London * Gaps	0.027**			0.028**
	(0.011)			(0.012)
SE * Gaps		-0.008		0.006
		(0.017)		(0.018)
London	-0.034***		-0.028***	-0.038***
	(0.010)		(0.008)	(0.010)
SE		0.001	-0.015	-0.018
		(0.015)	(0.012)	(0.015)
Controls	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y

Year FE	Y	Y	Y	Y
N	14,276	14,276	14,276	14,276
R-squared	0.09	0.09	0.09	0.09
Panel C: Industry-specific effects on the impact of equity gaps				
Gaps	-0.067***	-0.067***	-0.078***	-0.076***
	(0.006)	(0.006)	(0.013)	(0.009)
Top5 * Gaps			0.013	
			(0.014)	
KI * Gaps				0.015
				(0.011)
Top5	-0.024***		-0.030**	
	(0.009)		(0.012)	
KI		-0.025***		-0.031***
		(0.008)		(0.010)
Controls	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Region FE				
N	14,276	14,276	14,276	14,276
R-squared	0.07	0.08	0.07	0.08
Panel D: Moderating role of government grants				
Gaps	-0.067***	-0.063***	-0.066***	-0.066***
	(0.006)	(0.006)	(0.006)	(0.006)
Grants * Gaps		-0.022**		
		(0.01)		
Grants_dum * Gaps				-0.007
				(0.019)
Grants	0.023**	0.033**		
	(0.011)	(0.014)		
Grants_dum			0.033**	0.035*
			(0.016)	(0.018)
Controls	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Region FE	Y	Y	Y	Y
N	14,276	14,276	14,276	14,276
R-squared	0.09	0.09	0.09	0.09

Table 9. The impact of equity gaps on investment efficiency

This table examines the relationship between equity gaps and investment efficiency, employing the framework developed by Biddle et al. (2009) and a q-theory model to estimate firms' optimal investment levels. Specifically, we perform an investment regression on the pre-PSM matching sample and classify the resulting residuals into four quartiles based on their magnitude. The middle two quartiles serve as benchmarks, while the top quartile (highest positive residuals) represents the over-investing group, and the bottom quartile (most negative residuals) defines the under-investing group. Observations are categorised into over-investing and under-investing groups based on the residual sign. First, we regress the absolute value of the residuals on the same set of regressors used in the primary model, separately for each group, with the results presented in columns (1) and (2). Next, we employ multinomial logit analysis to evaluate the likelihood of firms being classified as over-investing or under-investing, with results reported in columns (3) and (4). The primary independent variable (*Gaps*) represents the difference between estimated and actual annual fundraising amounts, scaled by total assets. Control variables include company size (*Size*), measured as the logarithm of inflation-adjusted total assets; company age (*Age*); cash holdings (*Cash*), scaled by total assets; and leverage (*Leverage*), calculated as total long-term liabilities divided by total assets. All control variables are measured at year *t*. To facilitate interpretation, we compute the marginal effect of *Gaps* for multinomial logit analysis. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
	OLS		Multinomial logit	
	Under-investing	Over-investing	Under-investing	Over-investing
Gaps	0.286***	-5.773***	0.089***	-0.201***
	(0.074)	(0.859)	(0.028)	(0.023)
Growth	0.192***	0.406***	0.052***	0.023***
	(0.014)	(0.135)	(0.004)	(0.004)
Size	0.004	-8.806***	0.039***	-0.052***
	(0.036)	(0.414)	(0.014)	(0.011)
Age	-0.269	-5.487**	-0.200***	-0.266***
	(0.184)	(2.416)	(0.071)	(0.066)
Cash	-3.346***	-2.276	-1.541***	-0.627***
	(0.178)	(2.915)	(0.084)	(0.069)
Leverage	0.125**	1.262	0.039*	-0.006
	(0.051)	(0.891)	(0.020)	(0.019)
Cons	17.783***	152.931***	0.480	2.095***
	(1.018)	(11.068)	(0.398)	(0.348)
Marginal effect of Gaps			0.028***	-0.046***
Industry FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Region FE	Y	Y	Y	Y
N	10,789	3,466	14,255	14,255
R-squared	0.20	0.21	0.09	0.09

Table 10. The impact of equity gaps on labour investment

This table analyses the relationship between equity gaps and labour investment, using the finalized sample from 2014 to 2021. The dependent variable is the logarithm of the number of employees in year *t*+1. The primary independent variable, equity gaps (*Gaps*), measures the difference between estimated and actual annual equity fundraising amounts, scaled by total assets. Control variables include company size (*Size*), measured as the logarithm of inflation-adjusted total assets; company age (*Age*); cash holdings (*Cash*), scaled by total assets; and leverage (*Leverage*), defined as total long-term liabilities divided by total assets. All independent variables are measured at year *t*. Industry, year, and region fixed effects are included in the specifications reported in columns (1) and (2). To address potential endogeneity concerns, we apply the system GMM method, with the corresponding results presented in column (3). Standard errors, clustered at the firm level, are presented in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. For system GMM analysis, we also report the *p*-values for AR1, AR2 and Hansen-J tests separately.

	(1)	(2)	(3)
	OLS		Sys-GMM
Gaps	-0.064***	-0.063***	-0.087***
	(0.008)	(0.008)	(0.017)
Growth	-0.008***	-0.008***	0.009***
	(0.001)	(0.001)	(0.003)
Size	0.352***	0.353***	0.011
	(0.008)	(0.008)	(0.028)
Age	0.09***	0.083***	-0.097***
	(0.030)	(0.029)	(0.028)
Cash	0.171***	0.188***	0.034
	(0.031)	(0.031)	(0.027)
Leverage	0.058***	0.059***	-0.02**
	(0.009)	(0.009)	(0.010)
Lagged Lemp			0.952***
			(0.066)
Cons	-1.97***	-2.12***	0.248
	(0.148)	(0.190)	(0.241)
Industry FE	Y	Y	N
Year FE	Y	Y	Y
Region FE	N	Y	N
Firm FE	N	N	Y
N	11,104	11,104	2,777
R-squared	0.48	0.48	
AR1 (*p-value*)			0.001
AR2 (*p-value*)			0.578
Hansen-J (*p-value*)			0.821

Appendix

Appendix A: Variable definitions and supplementary tables

Variable	Description
Panel A: Covariates used in the PSM	
Age	The logarithm of the firm's age, where firm age is calculated as the difference between the accounting date and the incorporation date.
Age_div	The coefficient of variation of directors' ages, calculated as the standard deviation of directors' ages divided by their mean age.
Audit	An indicator of being audited, equal to 1 if the company has been audited and 0 otherwise.
Bolt	Bank overdrafts and long-term liabilities, scaled by total assets.
Board_size	The total number of directors on the board.
Cash	Cash holdings, scaled by total assets.
Common_sur	The proportion of directors sharing a common surname.
Dir_age	The mean age of directors.
Dir_tenure	The mean tenure of directors.
Female_dir	The percentage of directors who are female.
Foreign_dir	The percentage of directors who are foreign nationals.
Growth	The annual growth rate of deflated total assets.
Intng	Intangible assets, scaled by total assets.
Pl	Profit and loss account reserves, scaled by total assets.
Size	Firm size, calculated as the logarithm of total assets deflated to 2010 prices.
Td	Trade debtors, scaled by total assets.
Tc	Trade creditors, scaled by total assets.
Panel B: Variables used in primary empirical analysis	
Age	The logarithm of the firm's age, where firm age is calculated as the difference between the accounting date and the incorporation date.
Cash	Cash holdings, scaled by total assets.
Gaps	Equity gaps, measured as the difference between the estimated equity fundraising amount and the actual equity fundraising amount, scaled by total assets.
Gaps_censored	Censored equity gaps, where negative values of "Gaps" are replaced with zero.
Growth	The annual growth rate of total assets.
Inv_fa	Fixed asset investment, calculated as the change in total fixed assets from year t to year t+1, plus depreciation in year t+1, scaled by total assets in year t.
Leverage	The ratio of total long-term liabilities to total assets.
Size	Firm size, calculated as the logarithm of total assets deflated to 2010 prices.
Panel C: Variables used in other analysis	
Brexit	Binary variable equal to 1 for years after 2016, capturing the impact of Brexit.
Cofcapex	Proportion of "Yes" responses to the following Decision Maker Panel survey question, aggregated by industry: "Is the cost of finance likely to (wholly or partly) constrain the capital expenditure of your business over the next year?" This variable is available only for 2023–2024 and is assumed to remain constant over time within each industry.
Covid	Binary variable equal to 1 for years after 2019, capturing the impact of the COVID-19 pandemic.
Gaps_dum	Binary variable equal to 1 if a firm has positive equity financing gaps; otherwise, it equals 0. The grants information is sourced from Beauhurst.
Grants	Annual government grants received by firms, scaled by total assets. Data on grants is collected from Beauhurst.
Intcapex	Proportion of "Yes" responses to the following Decision Maker Panel survey question, aggregated by industry: "Is internal finance likely to (wholly or partly) constrain the

	capital expenditure of your business over the next year?" This variable is available only for 2023–2024 and is assumed to remain constant over time within each industry.
Inv_fa_yr2	Fixed asset investment projected over the next 2 years.
Inv_fa_yr3	Fixed asset investment projected over the next 3 years.
Inv_far	The growth rate of total fixed assets from year *t* to year *t*+1.
KI	Binary variable equal to 1 for firms operating in knowledge-intensive industries. Knowledge-intensive industries include high-tech knowledge-intensive services, knowledge-intensive financial services, and knowledge-intensive market services. These classifications follow the ONS's broad industry group definitions: High-tech Knowledge Intensive Services (SIC codes 59, 60, 61, 62, 63, 72), Knowledge Intensive Financial Services (SIC codes 64, 65,66) and Knowledge Intensive Market Services (SIC codes 50, 51, 69, 70, 71, 73, 74, 78, 80). Industry effects are explored using the UK SIC 2017 classification.
Lemp	Labour investment, measured as the logarithm value of the number of employees.
London	Binary variable equal to 1 if firms' headquarters are in London.
Own_HHI	Ownership Herfindahl-Hirschman Index calculated at the firm-year level, based on ownership information sourced from Orbis Historical ownership tables.
SE	Binary variable equal to 1 for firms headquartered in the Southeast region of the UK.
Tangibility	Asset tangibility, measured as the ratio of tangible assets to total assets.
Top5	Binary variable equal to 1 for firms operating in the top five industries with the largest aggregate equity gaps. These industries include: 1) Financial and insurance activities; 2) Professional; scientific and technical activities; 3) Information and communication; 4) Administrative and support service activities; 5) Manufacturing.

Table A1. Productivity distribution of HGEs in the UK

This table reports the decile distribution of productivity measures for HGEs in the UK, based on Orbis Historical data from 2015 to 2021. Labour productivity is measured using two value-added metrics: *Va_emp* (gross profit per employee) and *Va_empr* (gross profit per unit of total employee-related costs). Total factor productivity (TFP) is estimated using three approaches: *TFP_OP* (Olley & Pakes, 1996), *TFP_LP* (Levinsohn & Petrin, 2003), both corrected following Ackerberg, Caves, and Frazer (2015), and *TFP_Wrdg* (Wooldridge, 2009). All productivity measures are ranked annually into deciles.

	N	Mean	Std.	Min	P25	Med	P75	Max
Panel A: Productivity distribution of Beauhurst firms								
Va_emp	11,656	5.471	2.782	1	3	**6**	8	10
Va_empr	9,806	5.379	2.810	1	3	**5**	8	10
TFP_OP	11,656	5.735	2.758	1	4	**6**	8	10
TFP_LP	11,656	5.745	2.757	1	4	**6**	8	10
TFP_Wrdg	11,656	5.645	2.664	1	3	**6**	8	10
Panel B: Productivity distribution of sample HGEs								
Va_emp	533	5.615	2.769	1	3	**6**	8	10
Va_empr	379	5.227	2.677	1	3	**5**	7	10
TFP_OP	533	5.495	2.861	1	3	**6**	8	10
TFP_LP	533	5.574	2.813	1	3	**6**	8	10
TFP_Wrdg	533	5.298	2.880	1	3	**5**	8	10

Table A2. Distribution of equity investor types and investment amounts

This table summarizes the distribution of equity investor types and their corresponding investment amounts for deals conducted between 2014 and 2022. The first column categorises investor types primarily based on Beauhurst's investor profiles. When an investor's profile includes only a name without a specified type, Capital IQ is used to supplement the classification. Investors lacking any type of information are excluded from the analysis. Since Beauhurst provides only the investor's name and its participation in each deal and do not specify individual investment proportions, we assume equal contribution from all co-investors. Under this assumption, each investor's share of a deal's total funding is calculated as the total investment amount divided by the number of participants. These values are then aggregated by investor type. The second column reports the number of unique investor–deal pairs. Finally, the table consolidates the information at the fund level, presenting both the total equity investment amounts and the average investment values.

Investor Type	N	Total (in millions)	Average (in millions)
Angel Network	1,958	999	0.51
Asset Management	57	1,090	19.12
Bank	90	788	8.76
Business Angel(s)	3,330	4,260	1.28
Central Government	726	990	1.36
Charity/Not-for-profit company	124	161	1.30
Commercialisation Company	465	1,220	2.62
Corporate	622	2,380	3.83
Crowd funding	3,495	2,260	0.65
Devolved Government	814	457	0.56
Family Office	123	367	2.98
Other types - CapitalIQ	1,712	8,790	5.13
Institutional Investors - CapitalIQ	6,009	28,500	4.74
Local and Regional Government	723	273	0.38
Management participation	135	255	1.89
Merchant Bank	42	227	5.40
Private Equity and VC	9,924	24,000	2.42
Private Investment Vehicle	516	781	1.51
Sovereign Wealth Fund	2	697	348.50
Specialist Lender	28	121	4.32
University	246	246	1.00

Table A3. Regional equity gaps in the UK

This table presents the status of equity gaps across UK regions, based on our primary measure. In line with the guidelines of the *Companies Act 2006*, HGEs are categorised into size groups. Using firms with equity fundraising, we compute an annual benchmark ratio. This benchmark ratio is then applied to calculate the optimal equity fundraising for firms without funding in the selected year. To evaluate the overall equity gap status for all UK HGEs, we extend the benchmark ratio to the pre-PSM sample, using it to estimate the optimal equity fundraising amount for each firm. Annual equity gaps are calculated for each region based on the headquarters locations of firms. The total equity gaps (*TG*) are expressed in millions for each region. The percentile value of total equity gaps (*TG%*) represents the annual percentage distribution of equity gaps across regions. The number of firms without equity fundraising (*N*) indicates the count of HGEs without fundraising in the respective year. The average equity gaps (*AG*) reflect the mean equity gap in millions for each region. Regions are sorted by their average equity gaps in 2021, from largest to smallest, to enhance readability.

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		2014	2015	2016	2017	2018	2019	2020	2021
Northwest	TG	£ 76	£ 276	£ 319	£ 403	£ 634	£ 599	£ 671	£ 900
	TG%	9.02%	12.00%	10.70%	11.48%	12.24%	11.71%	11.78%	11.32%
	N	155	246	337	424	521	581	637	698
	AG	£ 0.49	£ 1.12	£ 0.95	£ 0.95	£ 1.22	£ 1.03	£ 1.05	£ 1.29
West Midlands	TG	£ 82	£ 163	£ 212	£ 237	£ 341	£ 363	£ 389	£ 579
	TG%	9.71%	7.10%	7.11%	6.75%	6.59%	7.09%	6.83%	7.29%
	N	120	193	245	284	335	397	412	463
	AG	£ 0.69	£ 0.85	£ 0.87	£ 0.84	£ 1.02	£ 0.91	£ 0.94	£ 1.25
East Midlands	TG	£ 52	£ 159	£ 180	£ 223	£ 318	£ 319	£ 355	£ 455
	TG%	6.20%	6.91%	6.04%	6.35%	6.14%	6.24%	6.24%	5.72%
	N	97	151	197	240	278	309	351	374
	AG	£ 0.54	£ 1.05	£ 0.92	£ 0.93	£ 1.14	£ 1.03	£ 1.01	£ 1.22
Yorkshire and The Humber	TG	£ 40	£ 184	£ 195	£ 253	£ 387	£ 375	£ 412	£ 581
	TG%	4.77%	7.99%	6.55%	7.19%	7.47%	7.34%	7.24%	7.31%
	N	109	177	258	322	388	427	460	512
	AG	£ 0.37	£ 1.04	£ 0.76	£ 0.78	£ 1	£ 0.88	£ 0.9	£ 1.13
Southeast	TG	£ 140	£ 280	£ 393	£ 471	£ 688	£ 674	£ 801	£ 1,068
	TG%	16.47%	12.18%	13.18%	13.39%	13.29%	13.18%	14.06%	13.44%
	N	238	363	487	594	705	805	921	1015
	AG	£ 0.59	£ 0.77	£ 0.81	£ 0.79	£ 0.98	£ 0.84	£ 0.87	£ 1.05
London	TG	£ 188	£ 613	£ 734	£ 872	£ 1,299	£ 1,266	£ 1,462	£ 2,134
	TG%	22.23%	26.64%	24.58%	24.81%	25.10%	24.75%	25.68%	26.84%
	N	461	710	936	1,165	1,361	1,562	1,853	2,106
	AG	£ 0.41	£ 0.86	£ 0.78	£ 0.75	£ 0.95	£ 0.81	£ 0.79	£ 1.01
Northeast	TG	£ 16	£ 44	£ 92	£ 114	£ 155	£ 164	£ 177	£ 253
	TG%	1.92%	1.89%	3.07%	3.26%	3.00%	3.21%	3.11%	3.19%
	N	53	89	120	158	191	210	248	261
	AG	£ 0.31	£ 0.49	£ 0.76	£ 0.72	£ 0.81	£ 0.78	£ 0.71	£ 0.97
East of England	TG	£ 76	£ 187	£ 257	£ 279	£ 404	£ 390	£ 401	£ 559
	TG%	9.00%	8.12%	8.59%	7.94%	7.80%	7.62%	7.04%	7.03%
	N	157	247	332	389	452	499	530	594
	AG	£ 0.49	£ 0.76	£ 0.77	£ 0.72	£ 0.89	£ 0.78	£ 0.76	£ 0.94

Scotland	TG	£ 48	£ 95	£ 185	£ 211	£ 279	£ 324	£ 336	£ 471
	TG%	5.62%	4.14%	6.20%	6.01%	5.39%	6.33%	5.90%	5.93%
	N	119	210	265	327	384	434	484	511
	AG	£ 0.4	£ 0.45	£ 0.7	£ 0.65	£ 0.73	£ 0.75	£ 0.69	£ 0.92
Wales	TG	£ 37	£ 69	£ 119	£ 132	£ 208	£ 216	£ 241	£ 303
	TG%	4.35%	3.02%	3.98%	3.75%	4.03%	4.21%	4.23%	3.81%
	N	79	117	160	192	249	286	306	330
	AG	£ 0.47	£ 0.59	£ 0.74	£ 0.69	£ 0.84	£ 0.75	£ 0.79	£ 0.92
Northern Ireland	TG	£ 18	£ 49	£ 65	£ 60	£ 95	£ 79	£ 89	£ 148
	TG%	2.09%	2.15%	2.17%	1.72%	1.84%	1.55%	1.56%	1.86%
	N	34	60	72	87	109	128	144	163
	AG	£ 0.52	£ 0.82	£ 0.9	£ 0.69	£ 0.88	£ 0.62	£ 0.62	£ 0.91
Southwest	TG	73	181	234	258	368	346	361	498
	TG%	8.62%	7.86%	7.83%	7.34%	7.11%	6.77%	6.34%	6.26%
	N	143	229	296	367	405	458	534	578
	AG	£ 0.51	£ 0.79	£ 0.79	£ 0.7	£ 0.91	£ 0.76	£ 0.68	£ 0.86

Table A4. Equity gaps by industry

This table presents the total equity gaps by industry, classified according to UK SIC 2007 codes. For each industry, we report the estimated equity gaps in millions based on our primary measure. Following the guidelines of the *Companies Act 2006*, HGEs are categorised into various size groups. Using firms with equity fundraising, an annual benchmark ratio is calculated and applied to estimate the optimal fundraising for firms without funding in the selected year. To assess the overall equity gap status for all UK HGEs, the benchmark ratio is extended to the pre-PSM sample and used to calculate the optimal equity fundraising amount for each firm. Using these estimates, annual equity gaps are calculated for each industry. The table includes the total equity gaps (TG) expressed in millions, the percentage value of total equity gaps (TG%) for each industry, the number of HGEs (N) without equity fundraising in the given year, and the average equity gaps (AG) in millions for each industry. All equity gaps have been adjusted to 2022 UK pounds for consistency. Panel A lists the top five industries with the largest average equity gaps in 2021 (distinct from Figure 3, which highlights the top five industries with the largest total equity gaps), while Panel B reports data for all other industries.

		(1) 2014	(2) 2015	(3) 2016	(4) 2017	(5) 2018	(6) 2019	(7) 2020	(8) 2021
Panel A: Top 5 industries with the largest average equity gaps in 2021									
Financial and insurance activities	TG	£ 275	£ 637	£ 941	£ 1,350	£ 1,520	£ 1,790	£ 1,910	£ 2,600
	TG%	13%	15%	16%	17%	16%	18%	18%	18%
	N	389	554	772	944	1,101	1,318	1,508	1,620
	AG	£ 0.71	£ 1.15	£ 1.22	£ 1.43	£ 1.38	£ 1.36	£ 1.27	£ 1.60
Activities of extraterritorial organizations and bodies	TG	£ 18	£ 37	£ 54	£ 64	£ 75	£ 76	£ 60	£ 84
	TG%	0.86%	0.85%	0.92%	0.82%	0.81%	0.75%	0.56%	0.59%
	N	24	42	56	60	73	75	71	72
	AG	£ 0.77	£ 0.88	£ 0.96	£ 1.07	£ 1.02	£ 1.02	£ 0.85	£ 1.16
Construction	TG	£ 115	£ 209	£ 258	£ 305	£ 390	£ 406	£ 410	£ 518
	TG%	5.39%	4.82%	4.39%	3.91%	4.22%	3.99%	3.80%	3.65%
	N	268	321	371	399	437	443	460	456
	AG	£ 0.43	£ 0.65	£ 0.70	£ 0.76	£ 0.89	£ 0.92	£ 0.89	£ 1.14
Electricity; gas; steam and air conditioning supply	TG	£ 8	£ 29	£ 37	£ 44	£ 48	£ 42	£ 38	£ 37
	TG%	0.36%	0.67%	0.63%	0.56%	0.52%	0.42%	0.36%	0.26%
	N	16	21	27	27	37	35	36	34
	AG	£ 0.47	£ 1.38	£ 1.37	£ 1.61	£ 1.31	£ 1.21	£ 1.07	£ 1.10
Transportation and storage	TG	£ 31	£ 76	£ 92	£ 125	£ 140	£ 147	£ 138	£ 186
	TG%	1.44%	1.76%	1.56%	1.60%	1.51%	1.44%	1.28%	1.31%
	N	63	84	106	124	140	156	161	169
	AG	£ 0.49	£ 0.91	£ 0.86	£ 1.01	£ 1.00	£ 0.94	£ 0.86	£ 1.10
Panel B: All other industries									
Mining and quarrying	TG	£ 13	£ 14	£ 12	£ 22	£ 21	£ 25	£ 17	£ 23
	TG%	0.60%	0.33%	0.21%	0.28%	0.23%	0.25%	0.15%	0.16%
	N	9	12	12	17	19	26	26	22
	AG	£ 1.43	£ 1.19	£ 1.03	£ 1.26	£ 1.12	£ 0.98	£ 0.64	£ 1.04
Water supply; sewerage; waste management and remediation activities	TG	£ 19	£ 26	£ 35	£ 37	£ 54	£ 52	£ 45	£ 55
	TG%	0.87%	0.60%	0.60%	0.47%	0.58%	0.51%	0.42%	0.39%
	N	30	39	46	52	61	57	61	63
	AG	£ 0.62	£ 0.67	£ 0.77	£ 0.71	£ 0.88	£ 0.91	£ 0.74	£ 0.87

Real estate activities	TG%	£ 40	£ 103	£ 122	£ 155	£ 170	£ 198	£ 192	£ 255
	N	1.86%	2.38%	2.08%	1.99%	1.84%	1.95%	1.78%	1.80%
	AG	93	113	139	173	203	227	237	257
	AG	£ 0.43	£ 0.91	£ 0.88	£ 0.90	£ 0.84	£ 0.87	£ 0.81	£ 0.99
Agriculture forestry and fishing	TG	£ 12	£ 16	£ 18	£ 25	£ 31	£ 39	£ 36	£ 42
	TG%	0.57%	0.38%	0.31%	0.33%	0.34%	0.39%	0.34%	0.29%
	N	23	28	34	52	50	65	66	65
	AG	£ 0.53	£ 0.59	£ 0.53	£ 0.49	£ 0.63	£ 0.60	£ 0.55	£ 0.64
Activities of households as employers undifferentiated goods	TG	£ 0.2	£ 1	£ 2	£ 5	£ 4	£ 2	£ 3	£ 6
	TG%	0.01%	0.03%	0.03%	0.06%	0.05%	0.02%	0.03%	0.04%
	N	3	5	6	8	10	8	9	9
	AG	£ 0.06	£ 0.23	£ 0.30	£ 0.63	£ 0.43	£ 0.29	£ 0.32	£ 0.63
Professional; scientific and technical activities	TG	£ 422	£ 899	£ 1,250	£ 1,610	£ 1,790	£ 1,920	£ 2,050	£ 2,610
	TG%	19.79%	20.75%	21.27%	20.65%	19.36%	18.86%	19.02%	18.38%
	N	1,009	1,397	1,831	2,123	2,377	2,597	2,849	2,930
	AG	£ 0.42	£ 0.64	£ 0.68	£ 0.76	£ 0.75	£ 0.74	£ 0.72	£ 0.89
Administrative and support service activities	TG	£ 192	£ 380	£ 525	£ 704	£ 884	£ 892	£ 966	£ 1,310
	TG%	9.00%	8.77%	8.93%	9.03%	9.56%	8.76%	8.96%	9.23%
	N	594	779	1,005	1,159	1,338	1,414	1,526	1,528
	AG	£ 0.32	£ 0.49	£ 0.52	£ 0.61	£ 0.66	£ 0.63	£ 0.63	£ 0.86
Wholesale and retail trade / repair of motor vehicles and motorcycles	TG	£ 188	£ 324	£ 461	£ 590	£ 708	£ 741	£ 804	£ 1,040
	TG%	8.82%	7.48%	7.84%	7.57%	7.66%	7.28%	7.46%	7.33%
	N	572	750	956	1,075	1,184	1,306	1,432	1,470
	AG	£ 0.33	£ 0.43	£ 0.48	£ 0.55	£ 0.60	£ 0.57	£ 0.56	£ 0.71
Accommodation and food service activities	TG	£ 97	£ 184	£ 236	£ 302	£ 349	£ 363	£ 330	£ 448
	TG%	4.56%	4.25%	4.02%	3.87%	3.78%	3.57%	3.06%	3.16%
	N	224	338	400	455	518	546	576	584
	AG	£ 0.43	£ 0.54	£ 0.59	£ 0.66	£ 0.67	£ 0.66	£ 0.57	£ 0.77
Manufacturing	TG	£ 286	£ 533	£ 625	£ 815	£ 943	£ 1,020	£ 1,040	£ 1,380
	TG%	13.41%	12.30%	10.63%	10.46%	10.20%	10.02%	9.65%	9.72%
	N	692	929	1,111	1,291	1,445	1,609	1,826	1,845
	AG	£ 0.41	£ 0.57	£ 0.56	£ 0.63	£ 0.65	£ 0.63	£ 0.57	£ 0.75
Human health and social work activities	TG	£ 80	£ 137	£ 194	£ 249	£ 316	£ 361	£ 385	£ 473
	TG%	3.73%	3.16%	3.30%	3.19%	3.42%	3.55%	3.57%	3.33%
	N	286	385	468	541	603	650	704	694
	AG	£ 0.28	£ 0.36	£ 0.41	£ 0.46	£ 0.52	£ 0.56	£ 0.55	£ 0.68
Other service activities	TG	£ 40	£ 76	£ 108	£ 142	£ 175	£ 207	£ 219	£ 321
	TG%	1.86%	1.76%	1.84%	1.82%	1.89%	2.03%	2.03%	2.26%
	N	144	188	251	296	357	392	428	442
	AG	£ 0.28	£ 0.41	£ 0.43	£ 0.48	£ 0.49	£ 0.53	£ 0.51	£ 0.73
Public administration and defence; compulsory social security	TG	£ 1	£ 3	£ 3	£ 4	£ 9	£ 9	£ 10	£ 11
	TG%	0.03%	0.06%	0.05%	0.05%	0.10%	0.09%	0.09%	0.08%
	N	4	7	8	8	8	10	12	12
	AG	£ 0.18	£ 0.37	£ 0.38	£ 0.49	£ 1.13	£ 0.92	£ 0.85	£ 0.91
	TG	£ 241	£ 510	£ 726	£ 1,010	£ 1,330	£ 1,570	£ 1,780	£ 2,390

Information and communication	TG%	11.30%	11.77%	12.35%	12.96%	14.39%	15.42%	16.52%	16.83%
	N	1,171	1,658	2,197	2,656	3,121	3,513	4,036	4,205
	AG	£ 0.21	£ 0.31	£ 0.33	£ 0.38	£ 0.43	£ 0.45	£ 0.44	£ 0.57
Arts; entertainment and recreation	TG	£ 30	£ 87	£ 123	£ 147	£ 177	£ 184	£ 201	£ 219
	TG%	1.41%	2.02%	2.09%	1.89%	1.91%	1.81%	1.87%	1.54%
	N	119	172	235	267	304	310	367	359
	AG	£ 0.25	£ 0.51	£ 0.52	£ 0.55	£ 0.58	£ 0.59	£ 0.55	£ 0.61
Education	TG	£ 26	£ 50	£ 56	£ 91	£ 109	£ 134	£ 141	£ 190
	TG%	1.23%	1.16%	0.95%	1.16%	1.18%	1.32%	1.31%	1.34%
	N	123	165	209	244	283	324	337	347
	AG	£ 0.21	£ 0.30	£ 0.27	£ 0.37	£ 0.39	£ 0.41	£ 0.42	£ 0.55

Table A5. Propensity-score matching results for various sources of equity finance

This table presents the balance check results for four PSM analyses based on different constructions of *FR* and *non-FR* groups. The "*FR*" group consists of observations with verified equity fundraising amounts that are non-missing and non-zero in the current year, while the "*non-FR*" group includes observations without any trackable equity fundraising within the past four years. The Beauhurst database identifies specific fund participants in each equity deal; however, since specific proportions for each fund are not disclosed, equity deals involving multiple funds are split into different groups based on their respective investors. Columns (1) to (3) analyse *FR* and *non-FR* firms based on equity finance from investors with a low probability of providing post-investment value-added activities, such as "bank," "central government," "charity/not-for-profit company," "commercialisation company," "corporate," "crowdfunding," "devolved government," "family office," "local and regional government," "management participation," "merchant bank," "private investment vehicle," "sovereign wealth fund," "specialist lender," and "university." Columns (4) and (5) focus on equity finance from investors with a high probability of providing post-investment value-added activities, such as "angel network," "business angels," "private equity and venture capital," and "asset management." Using indicator variables from the Beauhurst equity fundraising datasets, equity deals are classified as follow-on or initial investments, with Columns (7) to (9) focusing on follow-on equity deals and Columns (10) to (12) on non-follow-on equity deals. Equity deals lacking the required information are excluded from the analysis. The covariates used in the matching process are consistent with those described in the primary section, and the table reports average values for each sub-sample along with their corresponding t-statistics.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Non-value-added equity investment			Value-added equity investment			Follow-on equity investment			Initial equity investment		
	FR	non-FR	*t-value*	FR	non-FR	*t-value*	FR	non-FR	*t-value*	FR	non-FR	*t-value*
Size	13.07	13.05	-0.38	13.31	13.27	-0.45	13.69	13.67	-0.13	13.07	13.04	-0.49
Age	5.17	5.19	0.29	5.09	5.12	0.36	5.82	5.88	0.50	4.98	4.99	0.15
Intng	0.10	0.11	0.70	0.09	0.11	1.21	0.11	0.10	-0.64	0.09	0.09	-1.04
Pl	-1.55	-1.51	0.48	-1.41	-1.44	-0.32	-1.72	-1.66	0.45	-1.41	-1.48	-1.12
Cash	0.35	0.34	-0.53	0.40	0.40	-0.26	0.37	0.36	-0.19	0.37	0.37	0.04
Bolt	0.26	0.26	0.03	0.21	0.24	1.61	0.24	0.25	0.59	0.24	0.26	1.39
Td	0.05	0.05	0.48	0.05	0.05	-0.03	0.06	0.06	-0.57	0.05	0.05	0.01
Tc	0.08	0.07	-0.70	0.07	0.08	0.93	0.10	0.08	-1.08	0.07	0.07	0.61
Growth	2.13	2.20	0.58	2.52	2.35	-1.15	1.50	1.55	0.32	2.50	2.44	-0.49
Audit	0.08	0.08	-0.75	0.11	0.10	-0.63	0.10	0.10	-0.10	0.10	0.09	-0.16
Board_size	3.72	3.75	0.44	4.00	4.04	0.57	4.10	4.08	-0.20	3.82	3.82	0.06
Common_sur	0.15	0.15	-0.26	0.12	0.12	0.20	0.11	0.13	0.66	0.15	0.16	0.94

Mean_age	45.18	44.90	-0.90	45.59	45.61	0.06	46.59	46.66	0.13	45.02	45.07	0.20
Mean_tenure	3.75	3.80	0.75	3.49	3.51	0.44	4.11	4.14	0.37	3.53	3.52	-0.26
Female_dir	0.15	0.16	0.66	0.14	0.14	-0.73	0.13	0.14	0.69	0.15	0.15	0.91
Foreign_dir	0.19	0.20	0.50	0.18	0.18	-0.17	0.19	0.19	0.08	0.18	0.19	0.65
Age_div	18.13	17.65	-1.14	19.10	19.18	0.17	19.01	18.66	-0.52	18.47	18.60	0.36
N		2910			2182			1066			3874	

Table A6. Robustness tests: treated group construction with different equity sources

This table presents the robustness tests by repeating the primary analysis using various equity gaps estimations based on the four post-matching samples introduced in Table A1. Columns (1) and (2) estimate equity gaps using equity financing from investors with a low probability of providing post-investment support, such as "bank," "central government," "charity/not-for-profit company," "commercialisation company," "corporate," "crowdfunding," "devolved government," "family office," "local and regional government," "management participation," "merchant bank," "private investment vehicle," "sovereign wealth fund," "specialist lender," and "university." Columns (3) and (4) estimate equity gaps using equity financing from investors with a high probability of providing post-investment support, such as "angel network," "business angels," "private equity and venture capital," and "asset management." Columns (5) and (6) focus on follow-on equity investments, while Columns (7) and (8) focus on initial equity investments. Equity deals lacking required information are excluded. The key independent variable, equity gaps (*Gaps*), is calculated for each post-matching sample, and a censored variable (*Gaps_censored*) is constructed by replacing negative gaps with zero. The dependent variable is scaled fixed asset investment, calculated as the change in fixed assets from year *t* to *t*+1, plus depreciation in year *t*+1, scaled by total assets. Control variables include company size (*Size*), measured as the logarithm of inflation-adjusted total assets; firm age (*Age*); cash holdings (*Cash*), calculated as total cash holdings scaled by total assets; and leverage (*Leverage*), defined as total long-term liabilities divided by total assets. All independent variables are measured at year *t*, and standard errors are clustered at the firm level. Statistical significance is denoted by ***, **, and * for the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Non-value-added equity investment		Value-added equity investment		Follow-on equity investment		Initial equity investment	
Gaps	-0.042***		-0.037***		-0.084**		-0.041***	
	(-0.010)		(-0.012)		(-0.033)		(-0.008)	
Gaps_censored		-0.047***		-0.043***		-0.084**		-0.045***
		(-0.012)		(-0.013)		(-0.033)		(-0.011)
Controls	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Region FE	Y	Y	Y	Y	Y	Y	Y	Y
N	2,114	2,114	1,764	1,764	800	800	3,084	3,084
R-squared	0.09	0.09	0.12	0.12	0.14	0.14	0.09	0.09

Table A7. Robustness tests: treated group construction with different periods

This table presents a post-matching covariate balance check and robustness tests for three alternative constructions of the treated group. The treated group is represented by the "*FR*" dummy, which takes a value of 1 for observations with verified, non-missing, and non-zero equity fundraising amounts in the current year. To define the control group ("*non-FR*"), we employ three distinct criteria: (1) firms with no equity fundraising activity prior to the current year, (2) firms with no equity fundraising activity from year *t*−5 to year *t*, and (3) firms with no equity fundraising activity from year *t*−2 to year *t*. Each criterion is used to construct a separate treated group for PSM. The covariates used in the matching process include company size (*Size*), measured as the logarithm of total assets adjusted to 2022 prices; company age (*Age*), calculated as the difference between the account date and the incorporation date; intangible assets (*Intng*), expressed as intangible assets divided by total fixed assets; profit and loss account reserve (*Pl*), calculated as the profit and loss account reserve divided by total assets; cash (*Cash*), measured as cash holdings relative to total assets; bank overdraft and long-term liabilities (*Bolt*), expressed as a proportion of total assets; trade debtors (*Td*) and trade creditors (*Tc*), both measured as proportions of total assets; the annual growth rate of total assets (*Growth*); board size (*Board_size*), defined as the total number of directors; the proportion of directors sharing a common surname (*Common_sur*); the mean age of directors (*Mean_age*); the mean tenure of directors (*Mean_tenure*); the percentage of female directors on the board (*Female_dir*); the percentage of foreign directors on the board (*Foreign_dir*); and the coefficient of variation of directors' age (*Age_div*). Regional and industry fixed effects are also included in the logit regression to estimate propensity scores. The table reports average values for each sub-sample and corresponding t-statistics. Panel B presents the primary analysis conducted on three new post-matching samples. Each sample reflects one of the treated group constructions, with gaps estimation and primary analysis replicated accordingly. In Columns (1) and (2), treated firms are required to have no equity fundraising prior to the current year. Columns (3) and (4) focus on firms with no equity fundraising from year *t*−5 to year *t*, while Columns (5) and (6) use the horizon from year *t*−2 to year *t*. The main independent variable, equity gaps (Gaps), is calculated for each post-matching sample. Additionally, we construct a censored variable (Gaps_censored) by replacing negative gaps with zero. The dependent variable is scaled fixed asset investment, calculated as the change in fixed assets from year *t* to *t+1*, plus depreciation in year *t+1*, scaled by total assets. Control variables include company size (*Size*), measured as the natural logarithm of inflation-adjusted total assets; firm age (*Age*); cash holdings (*Cash*), calculated as total cash holdings scaled by total assets; and leverage (*Leverage*), defined as total long-term liabilities divided by total assets. All independent variables are measured at year *t*. Standard errors are clustered at the firm level and are reported in parentheses. Statistical significance is denoted by ***, **, and * for the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: Post-matching balance checks									
	Before Year *t*			Year *t*-5 to Year *t*			Year *t*-2 to Year *t*		
	FR	non-FR	*t-value*	FR	non-FR	*t-value*	FR	non-FR	*t-value*
Size	12.76	12.75	-0.47	12.77	12.77	0.12	12.81	12.81	-0.15
Age	4.94	4.92	-0.72	4.97	4.99	0.58	5.09	5.10	0.32
Intng	0.08	0.08	0.19	0.08	0.08	0.02	0.08	0.09	1.08
Pl	-0.76	-0.72	1.79	-0.78	-0.78	0.24	-1.03	-1.02	0.18
Cash	0.26	0.25	-1.04	0.26	0.26	0.08	0.27	0.27	-0.79
Bolt	0.29	0.29	0.21	0.29	0.30	1.44	0.30	0.31	1.32
Td	0.06	0.06	1.28	0.06	0.06	0.43	0.06	0.06	0.04
Tc	0.06	0.06	0.72	0.06	0.06	0.03	0.07	0.07	0.75
Growth	3.34	3.53	1.54	3.17	3.17	-0.03	2.50	2.61	1.38
Audit	0.11	0.11	-0.11	0.11	0.11	0.52	0.11	0.10	-0.32
Board_size	3.35	3.38	0.95	3.38	3.41	1.15	3.43	3.46	1.08
Common_sur	0.18	0.17	-0.84	0.18	0.17	-0.46	0.17	0.16	-0.84
Mean_age	45.81	45.65	-1.1	45.86	45.87	0.07	46.01	46.08	0.47
Mean_tenure	3.8	3.75	-1.73	3.81	3.82	0.31	3.86	3.87	0.77
Female_dir	0.16	0.16	-1.29	0.16	0.16	-0.23	0.16	0.15	-0.14
Foreign_dir	0.17	0.17	-0.13	0.17	0.17	0.59	0.18	0.18	0.45
Age_div	16.32	16.22	-0.53	16.28	16.44	0.81	16.54	16.54	0.03
N		14,350			14,690			17,312	

Continued Table A7

Panel B: Baseline results based on new post-matching sample

	(1)	(2)	(3)	(4)	(5)	(6)
	Before Year *t*		Year *t*-5 to Year *t*		Year *t*-2 to Year *t*	
Gaps	-0.056***		-0.055***		-0.056***	
	(0.006)		(0.006)		(0.005)	
Gaps_censored		-0.091***		-0.083***		-0.084***
		(0.010)		(0.010)		(0.008)
Growth	0.002***	0.002***	0.002**	0.002**	0.003***	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Size	-0.049***	-0.057***	-0.048***	-0.054***	-0.040***	-0.046***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)
Age	-0.034***	-0.036***	-0.049***	-0.052***	-0.059***	-0.061***
	(0.011)	(0.011)	(0.012)	(0.012)	(0.010)	(0.010)
Cash	0.007	0.005	-0.002	-0.003	-0.018	-0.017
	(0.014)	(0.014)	(0.014)	(0.014)	(0.011)	(0.011)
Leverage	-0.002	-0.001	0	0.001	0.002	0.003
	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)
Cons	0.941***	1.073***	0.934***	1.047***	0.869***	0.975***
	(0.069)	(0.075)	(0.068)	(0.074)	(0.058)	(0.062)
Industry FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Region FE	Y	Y	Y	Y	Y	Y
N	12,981	12,981	13,240	13,240	15,481	15,481
R-squared	0.09	0.08	0.085	0.08	0.08	0.08

Table A8. Analysis of scale-up enterprises

This table provides an additional analysis of "Scale-up" enterprises within our finalised sample. According to the OECD definition, a "Scale-up" is an enterprise with an average annualised growth in employee numbers exceeding 20% per year over a three-year period, starting with at least ten employees. Additionally, in alignment with the *Commission Implementing Regulation (EU) No. 439/2014*, we also use a 10% growth threshold. Incorporating the *ScaleUp Institute*'s approach, we assess firms' performance over a five-year period. If a firm meets the threshold within the last five years, it is classified as a "Scale-up" for the selected year, even if it does not meet the criteria in the current year. To reflect this classification, we construct an indicator variable, *Scaleup*, to denote whether HGEs qualify as scale-ups in the selected year. Additionally, we introduce an interaction term to analyse whether being scale-ups influences our primary findings. The dependent variable is scaled fixed asset investment, calculated as the change in fixed assets from year *t* to *t*+1, plus depreciation in year *t*+1, and scaled by total assets. The main independent variable, financing gaps (*Gaps*), represents the difference between estimated and actual annual fundraising amounts, scaled by total assets. Negative gaps are replaced with zero in columns (2) and (4), and the corresponding regression results are reported. Control variables include company size (*Size*), measured as the natural logarithm of inflation-adjusted total assets; firm age (*Age*); cash holdings (*Cash*), measured as total cash scaled by total assets; and leverage (*Leverage*), calculated as total long-term liabilities divided by total assets. All control variables are measured at year *t*. Standard errors are clustered at the firm level and reported in parentheses. Statistical significance is denoted by ***, **, and * for the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
	Average annualised growth rate greater than 10%		Average annualised growth rate greater than 20%	
Gaps	-0.066***		-0.066***	
	(0.006)		(0.006)	
Gaps_censored		-0.104***		-0.104***
		(0.010)		(0.010)
Scaleup	0.103***	0.118***	0.117***	0.130***
	(0.022)	(0.020)	(0.026)	(0.022)
Scaleup * Gaps	-0.078*		-0.100*	
	(0.046)		(0.059)	
Scaleup * Gaps_censored		-0.104***		-0.120***
		(0.040)		(0.043)
Controls	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Region FE	Y	Y	Y	Y
N	14,276	14,276	14,276	14,276
R-squared	0.09	0.08	0.09	0.08

Table A9. Robustness tests: benchmark selection for equity gaps analysis

This table presents the results of robustness tests to assess whether the benchmark selection for optimal equity fundraising amounts biases our findings. In the primary analysis, the benchmark is based on size groups. To test for potential bias, we use the equity fundraising amounts of *FR* firms as the benchmark for the matched *non-FR* firms and calculate their equity gaps. All other methodological steps follow the primary analysis. We continue to report the effects of equity gaps on investment using data from 2014 to 2021. The analysis is conducted on the post-matching dataset, which is restricted to observations with no missing values for the variables used in the primary analysis. The dependent variable is scaled fixed asset investment, calculated as the change in fixed assets from year *t* to *t*+1, plus depreciation in year *t*+1, scaled by total assets. The key independent variable, financing gaps (*Gaps*), represents the difference between estimated and actual annual equity fundraising amounts, scaled by total assets. Control variables include company size (*Size*), measured as the natural logarithm of inflation-adjusted total assets; firm age (*Age*); cash holdings (*Cash*), calculated as total cash holdings scaled by total assets; and leverage (*Leverage*), defined as total long-term liabilities divided by total assets. All independent variables are measured at year *t*. Standard errors are clustered at the firm level and are reported in parentheses. Statistical significance is indicated by ***, **, and * for the 1%, 5%, and 10% levels, respectively.

	(1)	(2)
Gaps	-0.018***	-0.017***
	(0.004)	(0.004)
Growth	0.002***	0.002***
	(0.001)	(0.001)
Size	-0.043***	-0.042***
	(0.003)	(0.003)
Age	-0.057***	-0.058***
	(0.011)	(0.011)
Cash	-0.009	-0.007
	(0.013)	(0.013)
Leverage	0.006	0.006
	(0.005)	(0.005)
Cons	0.851***	0.864***
	(0.049)	(0.066)
Industry FE	Y	Y
Year FE	Y	Y
Region FE	N	Y
N	14,276	14,276
R-squared	0.07	0.07

Table A10. The impact of equity gaps on investment using the entropy balancing method

This table presents the analysis of the effects of equity gaps on investment, using data from 2014 to 2021. The entropy balancing method is employed to estimate the main independent variable, financing gaps (*Gaps*), which represents the difference between estimated and actual annual fundraising amounts, scaled by total assets. More details about the entropy balancing method are provided in Appendix B. The dependent variable is scaled fixed asset investment, calculated as the change in fixed assets from year *t* to *t*+1, plus depreciation in year *t*+1, scaled by total assets. Columns (3) and (4) present regression results where negative gaps are replaced with zero, creating the censored variable (*Gaps_censored*). Control variables include company size (*Size*), measured as the natural logarithm of inflation-adjusted total assets; firm age (*Age*); cash holdings (*Cash*), calculated as total cash scaled by total assets; and leverage (*Leverage*), defined as total long-term liabilities divided by total assets. All independent variables are measured at year *t*. Standard errors are clustered at the firm level and are reported in parentheses. Statistical significance is denoted by ***, **, and * for the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
Gaps	-0.111***	-0.114***		
	(0.008)	(0.008)		
Gaps_censored			-0.104***	-0.104***
			(0.01)	(0.01)
Growth	0.002*	0.002*	0.003***	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)
Size	-0.133***	-0.133***	-0.054***	-0.054***
	(0.005)	(0.006)	(0.003)	(0.003)
Age	-0.069***	-0.071***	-0.054***	-0.055***
	(0.011)	(0.011)	(0.011)	(0.011)
Cash	-0.009	-0.007	-0.011	-0.009
	(0.013)	(0.013)	(0.013)	(0.013)
Leverage	0.003	0.003	0.004	0.004
	(0.005)	(0.005)	(0.005)	(0.005)
Cons	0.907***	0.922***	1.043***	1.06***
	(0.05)	(0.066)	(0.056)	(0.071)
Industry FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Region FE	N	Y	N	Y
N	14,276	14,276	14,276	14,276
R-squared	0.09	0.09	0.08	0.08

Table A11. Robustness tests: reassessing the impact of equity gaps on investment efficiency

This table presents the results of robustness tests to assess whether the benchmark selection for optimal equity fundraising amounts biases the analysis of the impact of equity gaps on investment efficiency. In this approach, the equity fundraising amounts of *FR* firms are used as the benchmark for matched *non-FR* firms, and equity gaps are calculated accordingly. All other methodological steps remain consistent with the primary analysis. The table examines the relationship between equity gaps and investment efficiency, utilising the framework developed by Biddle et al. (2009) and a q-theory model to estimate firms' optimal investment levels. Specifically, an investment regression is performed on the pre-PSM matching sample, and the residuals are classified into four quartiles based on their magnitude. The middle two quartiles serve as benchmarks, while the top quartile (highest positive residuals) identifies over-investing firms, and the bottom quartile (most negative residuals) defines under-investing firms. Observations are categorised into over-investing and under-investing groups based on the sign of the residuals. First, the absolute values of the residuals are regressed on the same set of explanatory variables used in the primary model, separately for the over-investing and under-investing groups, with results presented in columns (1) and (2). Next, multinomial logit analysis is employed to assess the likelihood of firms being classified as over-investing or under-investing, with results reported in columns (3) and (4). The primary independent variable, equity gaps (*Gaps*), represents the difference between estimated and actual annual fundraising amounts, scaled by total assets. Control variables include company size (*Size*), measured as the logarithm of inflation-adjusted total assets; firm age (*Age*); cash holdings (*Cash*), scaled by total assets; and leverage (*Leverage*), calculated as total long-term liabilities divided by total assets. All control variables are measured at year *t*. To aid interpretation, the marginal effect of *Gaps* is calculated for the multinomial logit analysis. Statistical significance is denoted by ***, **, and * at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
	OLS regression		System GMM	
	Under-investing	Over-investing	Under-investing	Over-investing
Gaps	0.243***	-0.892	0.063***	-0.113***
	(0.064)	(0.902)	(0.024)	(0.025)
Growth	0.192***	0.37***	0.052***	0.023***
	(0.014)	(0.135)	(0.004)	(0.004)
Size	-0.019	-8.665***	0.032**	-0.043***
	(0.035)	(0.420)	(0.013)	(0.011)
Age	-0.245	-6.162**	-0.196***	-0.286***
	(0.184)	(2.434)	(0.072)	(0.066)
Cash	-3.356***	-2.391	-1.544***	-0.626***
	(0.178)	(2.925)	(0.084)	(0.069)
Leverage	0.11**	1.563*	0.033	0.006
	(0.051)	(0.876)	(0.020)	(0.019)
Cons	18.042***	152.613***	2.002***	0.586
	(1.010)	(11.069)	(0.349)	(0.395)
Marginal effect of gaps			-0.027***	0.018***
Industry FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Region FE	Y	Y	Y	Y
N	10,789	3,466	14,255	14,255
R-squared	0.20	0.19	0.09	0.09

Appendix B: Entropy balancing

In our primary analysis, we primarily rely on PSM techniques. However, PSM has limitations, including potential information loss during the matching process and sensitivity of matching outcomes to model specifications. To further validate the robustness of our findings, we employ entropy balancing (EB) as a supplementary method to mitigate confounding effects and potential selection biases.

Developed by Hainmueller (2012), entropy balancing offers an alternative to traditional matching techniques by reweighting control group observations to achieve covariate balance. Hainmueller and Xu (2013) provide a Stata command (*ebalance*) to implement this method, and McMullin and Schonberger (2020) offer a detailed discussion of its theoretical underpinnings.

As part of this robustness check, we replicate the covariates used in our PSM procedure, focusing on the determinants of equity finance raising. EB adjusts the control group weights to ensure covariate balance with the treatment group within each year. We follow the default convergence tolerance of 0.015 and a maximum of 20 iterations. To enhance covariate balance beyond the first moment, we impose third-order moment constraints (mean, variance, and skewness) for all covariates.[25] This ensures the reweighted control group aligns closely with the treatment group across multiple statistical moments.

With the derived weights for the control group, we proceed with the gap estimation process, similar to our primary analysis. Unlike the original process, we compute scaled equity fundraising annually based on the reweighted control group. We calculate the weighted median as the benchmark for each size band and year, ensuring the EB-derived weights are rescaled to sum to 1 within each size band and year. Using these recalculated financing gaps for the treated group, we replicate our primary analysis.

[25] For 2014, algorithm does not converge within specified tolerance after setting the highest order of moment constraints to 3. As a result, the post-matching sample starts from 2015.

The results confirm the consistency of our findings, demonstrating that the equity gaps' impact on investment remains robust across the alternative matching approach. Detailed results from this analysis are presented in Appendix Table A10.

Appendix C: Estimating the total equity gaps

Primary method: following the guidelines of the *Companies Act 2006*, we categorise HGEs with equity fundraising in the post-matching sample into four size groups. For each size group, we calculate the annual median value of the equity ratio, which serves as the benchmark ratio. Using this benchmark, we estimate the optimal equity fundraising amount for all HGEs without equity fundraising, based on their company size.

Alternative method 1: in this approach, we calculate the average equity gaps at the firm level using the post-matching sample. Assuming these average equity gaps are representative of all high-growth companies, we multiply the calculated average equity gap by the total number of companies without equity fundraising. This provides an aggregate estimate of total equity gaps.

Alternative method 2: building on the size band thresholds proposed by Wilson et al. (2018), we compute a benchmark ratio across the post-matching sample, disregarding year-on-year variations. Using this benchmark ratio, we follow the primary method to estimate the optimal equity fundraising amount for all high-growth companies without equity fundraising, based on their company size.

Alternative method 3: to refine the calculations, this method incorporates year-to-year fluctuations in the benchmark ratio. By adjusting for temporal variations, it improves upon Alternative Method 2 while maintaining the same underlying framework for estimating equity fundraising needs.