Investment and competition over the business lifecycle

CMA Microeconomics Unit

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Contents

1. Introduction

1.1 The CMA is committed to supporting the UK government's growth mission, including unlocking innovation, stimulating investment and increasing business confidence. As part of this commitment, last year we launched a new growth programme out of the CMA's Microeconomics Unit, exploring the drivers of, and barriers to, growth. We are also engaged in public policy work (for example in support of the government's modern industrial strategy), as well as ongoing, extensive engagement with the business and investment community – particularly in strategically critical sectors of the UK economy.

1.2 This review of the existing academic literature (summarising over 200 studies from an initial selection of roughly 300) examines an important piece of the puzzle – the relationship between competition and investment across the different stages of a firm's lifecycle. We hope the findings will inform and support valuable discussions.

1.3 It is published alongside a policy discussion paper that focuses specifically on the scale-up phase – exploring how competition policy, in conjunction with other policy tools, can support firms as they scale up in the UK.

1.4 Through the remainder of the year, we will be gathering further evidence on the relationship between competition and investment (in particular scaling up), both to support more effective advice to government and to help us consider where we can most effectively exercise our own powers. As part of this, we are launching a programme of engagement with a wide range of stakeholders, including businesses, investors, think tanks, academics, and the policy community.

1.5 In early 2026, we intend to publish a report developing the themes raised in the policy discussion paper and this literature review, responding to the feedback received, and setting out the findings from new research by the CMA's Microeconomics Unit. Together, this work programme forms part of our support for the UK government's growth mission and modern industrial strategy.

1.6 **If you would like to meet with us to discuss these issues, including through workshops and roundtables, please contact us at publicpolicy@cma.gov.uk. We would also be keen to receive any feedback, views and evidence in writing.**

2. Executive summary

2.1 Investment is a key channel to raise labour productivity, gross domestic product, and ultimately welfare. The need to boost private investment in the UK is particularly acute: a large body of research argues that "capital shallowing" (that is, insufficient investment) plays a larger role in explaining the UK's faltering growth record since at least 2008 than in comparable economies.

2.2 Competition plays an important role in creating incentives for businesses to invest, meaning it is valuable for any government keen to increase private-sector investment to understand this relationship and how to leverage it.

2.3 Establishing the exact nature of the relationship between competition and investment is not straightforward. Over their lifecycle, firms invest capital from a range of sources to achieve a variety of ends, meaning there are in fact a multitude of relationships to understand, rather than one.

2.4 In this review of the existing literature, which largely draws on data from the United States (given a relative dearth of UK-specific studies), we begin to explore the relationship between competition and investment at each stage of a firm's lifecycle. We consider separately the impacts of competition among providers of finance, as well as in input and product markets. We then go on to look at the role of competition in international markets, as well as considering the different financing and exit options for firms and how they impact competition and investment.

The firm lifecycle

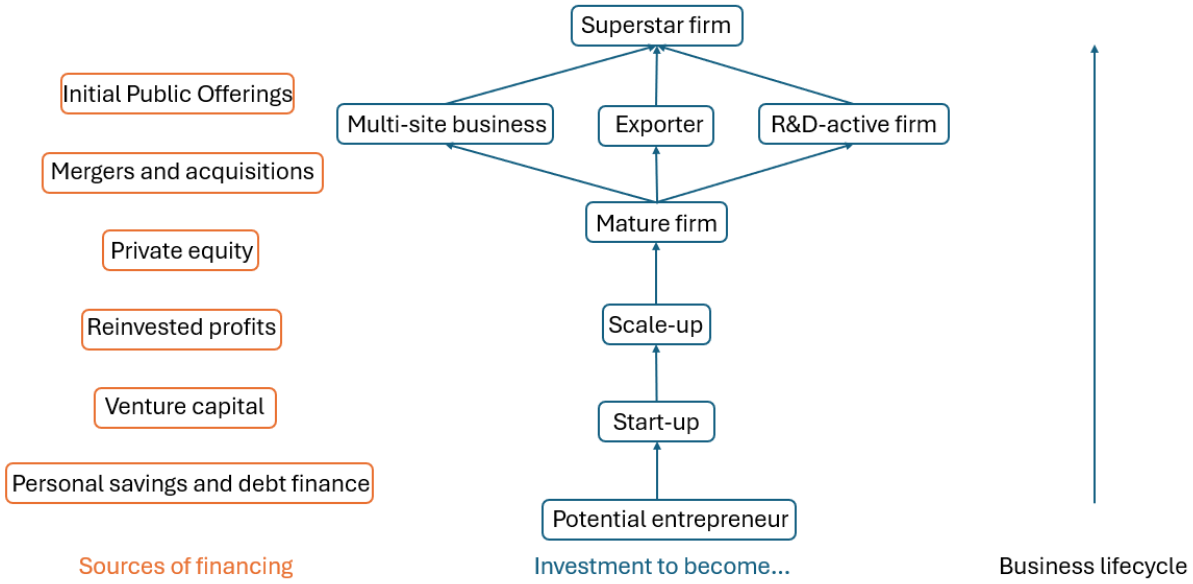
2.5 Figure 1 sets out the stages of the firm's lifecycle, and the different finance sources available to firms across these stages.

2.6 Over the lifecycle, competition can affect investment in two ways: by changing the *constraints* on investment (for instance, where competition in financial markets increases the overall supply of funds) and by changing the *incentives* to invest (for instance, when competition pushes a firm to invest in product innovation).

2.7 Early in the business lifecycle, the evidence suggests that the greatest impact competition has is on easing the *constraints* on investment. As firms mature and can access more diverse financing channels, *incentives* become relatively more important.

Figure 1: Investment stages and sources of financing over the business lifecycle

Source: Authors' own.



Start-ups

2.8 **Insights from the existing literature**: There are significant constraints on the financing required to establish new ventures. Some of these constraints give rise to a pure inefficiency, in that the new ventures which miss out on investment are no lower in "quality" than those that do receive investment.

2.9 **Implications for policymakers**: Policies to increase the supply of start-up capital do not necessarily involve "diminishing returns" (in the sense that the ventures which would benefit from such policies would be lower quality). The benefits of increasing the supply of capital manifest not just in the creation of new ventures, but in the dynamic impact start-ups can have on the incentives for incumbents to invest in innovation.

2.10 **Areas for further research:** Further research could provide UK-specific evidence on the "lost potential" resulting from the financial constraints facing start-ups.

Scale-ups

2.11 **Insights from the existing literature:** The availability of venture capital is key to allowing start-ups to scale up. A denser market for venture capital expands access to financing and shifts market power from funders to

founders. Despite this, studies describe how venture capital is often still concentrated, regionally and in specific industries (including via a “herding dynamic” between investors). Although the UK performs well compared to European economies in the amount of venture capital funding it invests relative to GDP, it lags the US, especially for later funding rounds.

2.12 **Implications for policymakers:** Where regulations make it harder to raise venture capital (for example, unclear or unduly burdensome rules that discourage investors), competition among venture capital firms decreases because it is more onerous or less attractive for them to operate. In this diminished pool of investors, market power shifts from start-ups to funders and thus reduces the size and number of viable scale-ups. The location of financing clusters will determine which firms are likely to receive funding.

2.13 **Areas for further research:** Further research could shed light on what drives venture capital to concentrate in particular industries and locations, and the role of government policy in shaping this.

Established firms

2.14 **Insights from the existing literature:** Market power can distort input and output markets, but whether this reduces overall investment depends on both how market power interacts with other market distortions, as well as the sources of market power. For example, if market power stems from rising returns to scale, even as markets become more concentrated, aggregate investment may rise. Conversely, if market power derives from anti-competitive behaviour, it is less likely to result in increased aggregate investment. Market power can lead to misallocation (that is, capital is directed away from its most productive use) as well as lowering overall investment. Reduced market dynamism can also result in inputs being “locked up” in less productive firms.

2.15 **Implications for policymakers**: Market-specific competition knowledge is important to understand which levers will likely raise investment. In general terms, market dynamism is an important force to release investment, so that it can be used more productively elsewhere.

2.16 **Areas for further research:** Further research could highlight under which conditions market power is likely to alleviate or exacerbate the effect of other market frictions on investment and quantify the importance of “zombie firms” for UK investment.

Potential superstar firms

2.17 Because of steep fixed costs, only a small percentage of UK firms are active in international markets or engage in formal innovation investment, such as internal research and development (R&D). However, the firms that *do* account for a disproportionate share of turnover, employment and investment in the economy. We have examined two key issues which underpin the investments necessary for firms to become potential "superstar firms": (1) international trade and investment, and (2) investment in innovation.

International trade and investment

2.18 **Insights from the existing literature:** The evidence shows that, in general, firms which engage in trade tend to invest more, due to two effects. First, firms who are likely to invest more are more likely to engage in trade (a *selection* effect). Second, trading activity *causes* some firms to undertake additional investment. However, careful studies of the impact of trade on investment show a more complex relationship. How exposure to foreign trade affects innovation and investment depends on the nature of the exposure and the characteristics of the firm. For example, certain studies suggest that foreign competition can incentivise firms to invest in both process and product innovation, but the benefits tend to accrue to firms with higher initial productivity and greater export potential. This implies that foreign competition need not always lead to a rise in overall domestic investment.

2.19 With respect to foreign direct investment (FDI), we can distinguish between "greenfield" investment in new activity and the acquisition of existing firms. Existing research finds that greenfield FDI causes higher investment, innovation and productivity rates. For cross-border acquisitions, emerging research suggests that innovation investments tend to increase, but perhaps predominantly in the country of the *acquirer*, not the target.

2.20 **Implications for policymakers:** Increasing competition by increasing the exposure of domestic industries to trade can have complex effects on domestic investment. Care should be taken if using associations between trade and investment observed in the aggregate, in setting trade policies with a sectoral focus. In considering how policy can attract FDI, policymakers should consider carefully the types of FDI most likely to contribute to raising long-run domestic investment.

2.21 **Areas for further research:** Further research on specific channels through which export and import competition in input and output markets shape

domestic investment could help shed light on how different trade policies could impact investment in different sectors of the economy. Given the UK's large service trade share, studies on service trade would be particularly helpful.

Investment in innovation

2.22 **Insights from the existing literature:** Theoretically, competition can have competing effects on innovation, by affecting incentives ex ante and ex post, via efficiencies and externalities. The bulk of the empirical evidence now suggests that if firms have market power, an increase in horizontal competition reducing their market power generally raises innovation. This overall relationship however masks large differences between industries and markets and by the type of innovation investment considered. Competition can also affect who is likely to invest and the types of innovation they focus on. Some research suggests that smaller challenger firms may be more likely to introduce disruptive new products, rather than improving existing varieties. Several studies find that while large firms dominate R&D spending, most of them introduce incremental innovations and are lacking in *drastic* innovations.

2.23 **Implications for policymakers:** Given the differences in how competition affects innovation in different markets**,** better market-specific evidence is crucial for considering the application of competition policy as a tool of the modern industrial strategy in the eight growth-driving sectors of the industrial strategy. In calibrating government policies to support innovations (such as R&D subsidies or tax credits) it is important to consider how competition will shape the type of innovation firms will pursue.

2.24 **Areas for further research:** Given the importance of understanding market-specific innovation and competition factors, more industry studies on the eight growth-driving sectors of the UK's new modern industrial strategy would be helpful to policymakers.

Ownership and sources of finance

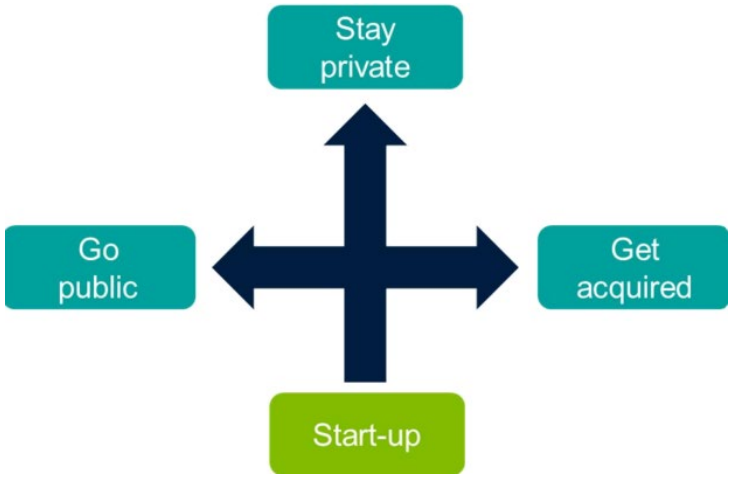
2.25 In addition to examining how competition affects investment outcomes, we also review the available evidence on how different types of financing affect competition. We look at three specific types of ownership and financing that can directly influence competition: the role of private equity, the decision of private firms to go public, and the role of mergers and acquisitions.

2.26 Understanding different sources of finance is interwoven with understanding competition and investment across the lifecycle, given the

changes firms typically go through in how they finance themselves. Figure 2, taken from Duruflé, Hellman and Wilson (2017) shows that changes in the source of financing can be considered as a "crossroads" for many start-ups, scale-ups and growing firms considering how to progress their journey.

Figure 2: The "crossroads" facing start-ups

Source: Duruflé, Hellman and Wilson (2017).



Private equity

2.27 **Insights from the existing literature:** Private equity (PE) funds become relevant as a source of financing for some firms after their initial growth stage. The share of PE- backed companies in the UK has increased over time. The overall impact of private equity ownership on investment is nuanced. This is because according to existing research, private equity funds generally pursue two broad kinds of strategies: at cash-constrained targets, they tend to increase investment; at well-financed businesses, they tend to cut investment to bring down costs. Existing research also suggests they are sensitive to market conditions, competing fiercely in competitive markets and building market power in uncompetitive ones.

2.28 **Implications for policymakers**: Understanding the business model and the strategies private equity funds are likely to pursue in particular markets is key to help increase overall investment.

2.29 **Areas for further research:** Whether PE funds generally enter markets that are *more* or *less* competitive than the average is an important and underexplored question for understanding their impact on overall investment.

Going public

2.30 **Insights from the existing literature:** Studies based on US evidence record a fall in the number of publicly listed companies, due to fewer new listings and the de-listing of previously listed firms. UK data suggests similar trends. Different studies provide different explanations for these trends in the US. Explanations proposed include increasing economies of scale due to technological change and the possibility that challengers which might have listed in the past are now acquired by incumbents. Which of these theories is more likely to hold is still subject to debate. Regardless, studies describe the important contribution going public can make to market dynamism. Studies indicate that firms which go public are more innovative, provide greater competitive pressure on incumbents, and play an important role in the process of creative destruction.

2.31 **Implications for policymakers**: A fall in public listings may have complex causes, but evidence on the relative performance of firms which "go public" compared to peers suggests it should be a cause for concern from the perspective of investment and productivity regardless.

2.32 **Areas for further research:** Given the focus of existing research on US evidence, developing a better understanding of the drivers of UK listing trends would be valuable. By the same token, developing UK evidence on the comparative performance between firms which go public, and firms which remain in private hands (controlling for other factors) could inform government policy to encourage firms to go public as part of their lifecycle.

Mergers and acquisitions

2.33 Successful founders now more frequently exit by selling their companies privately to other firms, rather than going public. Given this trend, it is crucial to understand how this development path affects investment.

2.34 **Insights from the existing literature:** Most horizontal mergers do not cause harm to investment because markets remain sufficiently competitive. Indeed, an emerging strand of research has focused on the role played by the prospect of a future acquisition in encouraging entrepreneurs and encouraging investment. Acquisitions can represent an "exit route" for entrepreneurs who may then go on to start another business. There is evidence that "serial entrepreneurs" (that is, entrepreneurs that have successfully started multiple businesses) are able to grow larger, more productive and more resilient firms. On the other hand, so-called "killer acquisitions" (acquisitions with the purpose to shut down a potential competitor) will tend to decrease overall investment.

2.35 In the presence of market power, existing research finds that horizontal mergers on average decrease innovation, although much depends on the existing market structure and the overlap in investment projects between acquirer and the target. Horizontal mergers can also affect the direction and scope of innovation, but the net impact of these changes is often more ambiguous. Studies find that vertical mergers can have positive impacts on innovation, but effects are both industry- and merger-specific.

2.36 **Implications for policymakers**: Given the complex impacts of mergers on investment, a statutory framework for merger control which allows a careful examination of the likely impacts of a given transaction on competition should support an objective of boosting aggregate investment.

2.37 **Areas for further research:** Further research could shed light on vertical and platform mergers, where investment impacts appear to be more case-specific. Given the role of entrepreneurial talent in supporting business dynamism, there would be value in understanding in more detail the pro-competitive effects of different "exit routes" for entrepreneurs.

Key open questions

2.38 The relationship between competition and investment reflects many different types of investment over a firm's lifecycle, and many different types of competition. As a result, previous reviews of this relationship have often found inconclusive or conflicting results about its direction, strength and statistical significance. By looking at the evidence through the lens of investment needs over the lifecycle, this review draws out clearer lessons from the many active research strands on investment and competition.

2.39 Despite this wealth of evidence, some important open questions remain. For the UK specifically, policymakers need to know more about the barriers to scaling up. In ongoing work, the CMA Microeconomics Unit is working to address this gap.

2.40 Additionally, as noted above, we do not currently know to what extent the theories drawn upon to explain the decline in US initial public offerings can also help explain the UK's analogous trend. This is a crucial evidence gap for understanding the health of "UK plc", an area of obvious and longstanding policy interest.

2.41 More generally, we need a better understanding of what drives the large differences across studies in the size, significance and sometimes direction of the innovation-competition relationship. We therefore welcome both more industry- and market-specific academic studies, and more

synthesising meta-reviews, with particular attention to vertical mergers, the purpose of specific investments and competition in the market for finance (such as through venture capital or private equity).

2.42 Finally, given evidence that corporate governance and norms in UK equity markets build short-termism into the system (for instance, in the 2012 Kay Review), how corporate governance and norms interact with competitive pressures (including in the market for corporate control) is a question deserving further study.

2.43 How competition shapes investment is a key question for policymakers. This is particularly true in the UK, where underinvestment relative to peers is a key factor in its relative growth underperformance (CMA, 2025a).

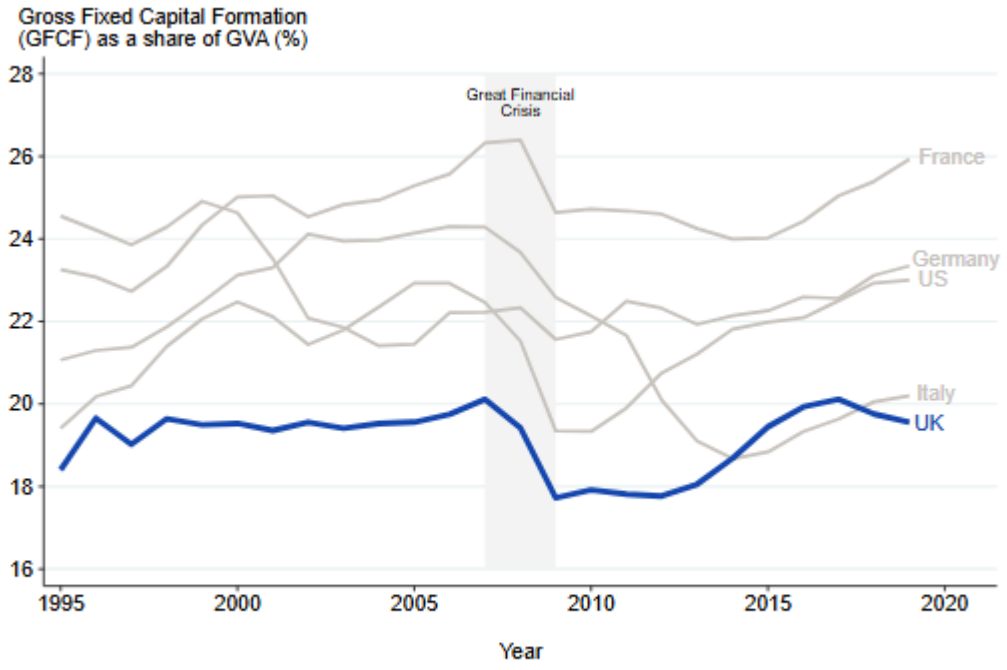
2.44 This literature review has used the lens of key decisions over a firm's lifecycle to bring additional clarity to how competition affects both the *constraints* and the *incentives* for investment. We hope further work on the open questions outlined in this section can help policymakers design markets and incentives that harness competitive forces in the pursuit of more, and better targeted, investment.

3. Investment and competition over the business lifecycle

3.1 Growth is the UK government's key mission. Investment is key to growth, and as Figure 3 shows, a persistent source of UK underperformance when compared to international peers (CMA, 2025a). Riley, Rincon Aznar and Samek (2018) and Valero and Van Reenen (2024) among others argue that capital shallowing (that is, a lack of investment) has played a larger role in the UK's flagging productivity performance than in peer economies. It is well understood that to deliver its growth plans, the government will therefore have to find a way to increase investment rates.

Figure 3: UK investment lags peer countries

Source: CMA (2025a).



Gross Fixed Capital Formation (GFCF) as a share of Gross Value Added (GVA) (%) (1995-2019). Calculated using real GFCF and GVA volumes with 2015 reference prices. Included countries: France, Germany, Italy, United Kingdom and United States. Source: ***EUKLEMS INTANProd database*** (1995-2019).

3.2 A large body of empirical research has established that competition drives growth, both by sharpening incentives to improve productivity within firms, and by allowing more productive firms to expand and take market share from less productive ones (CMA, 2025b). It would seem reasonable to assume that part of the observed productivity increase from increased competition is down to capital deepening resulting from higher investment. But both the theoretical and the empirical evidence are much less clear on this point.

3.3 In theoretical terms, the discussion about the impact of competition on firms' investment is often framed as a tension between two opposing viewpoints. Schumpeter (1942) argued that in the presence of market power, more of the innovation rents accrue to the innovator as profits, and that therefore the anticipation of post-innovation market power means monopolists should be *more* likely to invest and innovate. Arrow (1962) on the other hand argued that the prospect of losing existing monopoly rents would make monopolists *less* likely to innovate. Monopolists cannibalise *existing* profit when they innovate; new entrants do not, and therefore have stronger incentives to disrupt existing markets.[1] As a result, even in simple theoretical models of investment (like Schmutzler, 2013), it is difficult to disentangle the relationship between competition and investment.

3.4 Empirically, studies come to conflicting conclusions about the economy-wide relationship between investment and competition. Gutiérrez and Philippon (2017a) for instance link rising US corporate profits and declining investment rates to barriers to entry which they argue have increased industry concentration. Crouzet and Eberly (2019) instead argue that any observed link between investment and concentration may flow from the former to the latter, rather than the other way around.[2]

3.5 Covarrubias, Gutiérrez and Philippon (2020) argue that the relationship between competition and investment is industry specific. They distinguish between "good" (or pro-competitive) and "bad" (or anti-competitive) industry concentration, both of which might be tied to the well-documented rise in intangible investment. Therefore, they argue that only by looking at the entirety of the empirical evidence through the lens of a theoretical model can researchers distinguish between the two.

3.6 The CMA's own State of UK Competition report 2024 similarly finds no clear relationship between investment and measures of market power (CMA, 2024b). This is because the question is ill-defined:

3.7 "Investment" covers any attempts by firms or their owners to fund activities or purchases that generate long-term benefits. This can take many forms. Businesses can invest in physical or intangible capital to cut other types of costs (like labour, energy or materials) or complement existing inputs. They can invest in innovation activities or formal R&D to increase their product

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[1] As Shapiro (2012) and others have noted, the two theories are not necessarily in conflict as they refer to competitive conditions at different points in time: Arrow focuses on the degree of market power in a market *before* innovation takes place, while Schumpeter examines how market power *after* the innovation shapes incentives to innovate.

[2] Bessen and Wang (2024) and Olmstead-Rumsey (2022) make broadly similar arguments.

range or production efficiency. They might even invest directly in acquiring other businesses, either to increase scale economies or remove a competitor.

3.8 "Competition" can also present in different ways. There can be competition in input, output or financial markets, each of which can affect investment differently at different stages of the business lifecycle. The nature of competition will also vary significantly between markets. For example, in some settings there will be a stronger focus on competing *within* the market, whereas in others the focus is instead on firms competing *for* the market.

3.9 The complexity of the concepts on either side of the relationship – competition and investment – means the average relationship between them is inevitably muddled, and not particularly informative for policymaking. To understand the impact of competition on investment, we need to consider how they interact in different settings.[3]

3.10 Finally, competition may not only affect investment, but investment can in turn affect competition. To understand how the former relationship works, we therefore need to disentangle it carefully from the latter. This means that in some passages of this review, we will refer to studies that focus on how investment affects competition, where we think this might help clarify the overall picture.

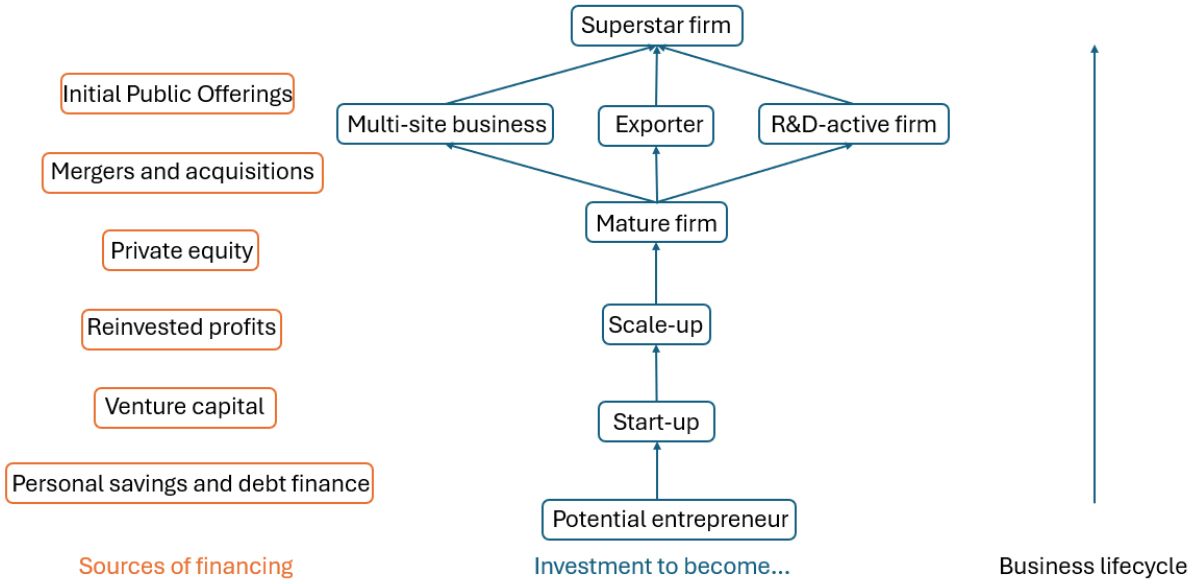
3.11 To bring greater clarity to the question "Does competition increase investment?", we endeavour to be precise about the terms we use and take the typical lifecycle of a business as the organising principle.

3.12 Figure 4 shows the stages of a firm's lifecycle. An entrepreneur may start a business through a combination of debt and equity, then scale up with reinvested earnings, the help of angel investors or venture capital (VC), through "seed" and subsequent funding rounds (called Series A, Series B and so on). As the firm grows, it will likely invest in some capital (tangible capital like plants or machinery or intangible capital like software and branding) that allows it to produce more with less or expand the range of products it sells.

[3] Conceptual and measurement issues further complicate the picture: for instance, much investment (and a significant part of the UK's investment shortfall) takes place in the public sector, where markets play a less important role (CMA, 2025a). Even for the private sector, many studies are conducted at the industry rather than the market level (where competition takes place) and therefore conflate competition and technology explanations.

Figure 4: Investment stages and sources of financing over the business lifecycle

Source: Authors' own.



3.13 A small but growing percentage of firms will be acquired by a private equity (PE) fund at some point.[4] Some firms may pass through the hands of several PE investors. Particularly successful businesses may go public in an initial public offering (IPO) and be listed on a stock exchange. Before or after going public, they may be a party in a merger or acquisition (M&A). A small number of very successful businesses will eventually make investments to sell their goods and services abroad or invest with the purpose of undertaking innovation in a structured way, including formal research and development (R&D).

3.14 Competition takes different forms at each of these stages. As firms move through their lifecycle journey, the relative importance of competition for capital, for labour inputs and in output markets may wax and wane and may lead to different investment outcomes. For instance, competition in output markets may spur firms to invest more to capture the market or dampen the incentive to invest in the first place. Competition among funders, such as venture capital firms, may affect how the surplus created by investment is shared, and therefore how profitable investment is for the businesses concerned. Competition in skilled labour markets may shape a

[4] According to Bansraj and Stromberg (2025), private equity now accounts for 10% of UK private-sector revenue.

firm's incentive to acquire other businesses, for instance with the goal to "acquihire" key employees (Bar-Isaac, Johnson and Nocke, 2024).

3.15 We examine competition at each investment step of this lifecycle: what does the market typically look like? How is investment affected by more competitors in the product market? The input markets? The market for finance? What form does investment at this stage usually take?

3.16 A helpful prism through which to look at the evidence throughout is to consider through what channel competition affects investment at different stages of the business lifecycle. Competition can act on the *constraints* that firms willing to invest face (for instance, the supply of financing available through financial intermediaries) or on the *incentives* of firms who have the means to invest (for instance, by lowering or raising the return on investment). As we show below, existing research finds that the former channel is more important for firms early on in their lifecycle, while the latter gains importance as they mature.

3.17 This review thus offers a way to reconcile some seemingly conflicting findings on the relationship between investment and competition (for instance, by disentangling the investment incentives due to international trade for exporters and domestic firms exposed to foreign competition), and highlights questions and lifecycle stages for which the existing evidence is not sufficient to draw firm conclusions. Throughout, we supplement the review of existing research findings with up-to-date, descriptive evidence about the UK business population. We hope this allows readers to understand how relevant existing findings (most of which are US-focused) are for the UK context.

4. Start-ups: investing in new ventures

Insights from existing literature: There are significant constraints on financing investments to establish new ventures. Some of these constraints give rise to a pure inefficiency, in that some of the new ventures which miss out on investment are no lower in "quality" than those that do receive investment. Additionally, there is evidence that the presence of innovative start-ups increases investment at existing incumbent firms. For instance, one recent study finds that traditional finance firms facing disruptive Fintech challengers subsequently were more likely to file additional patents themselves.

Implications for policymakers: Policies to increase the supply of start-up capital do not necessarily involve "diminishing returns" (in the sense that the ventures which would benefit from such policies are lower quality).

Areas for further research: Further research could provide UK-specific evidence on the "lost potential" resulting from the financial constraints facing start-ups.

4.1 The first step in a business' lifecycle is the decision of a potential entrepreneur to start a new venture. The UK has seen a decline in the relative importance of young firms (those less than five years old, a proxy for start-ups) since the Great Financial Crisis (GFC). Figure 5 shows that both the employment share and turnover share of young firms has fallen over time, and, despite rebounding in the late 2010s, remains several percentage points below the pre-GFC level. Start-ups thus seem to be contributing relatively less to the UK economy than they used to.

Financing constraints for potential entrepreneurs

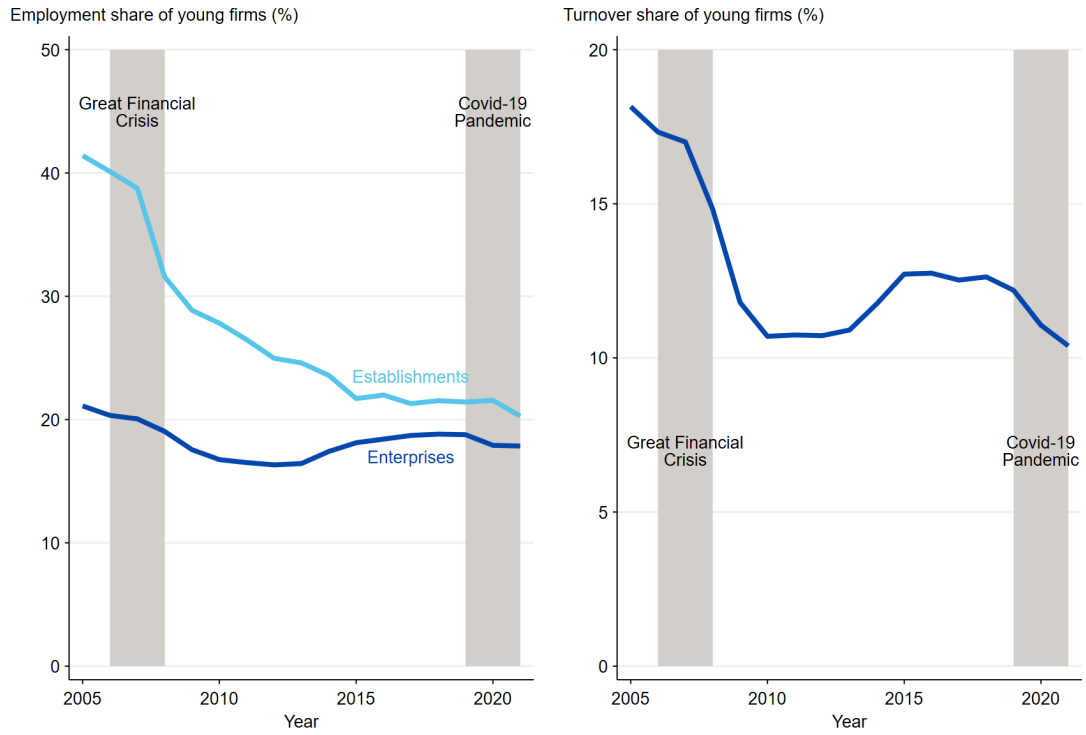
4.2 The lifecycle of a startup can be divided into five stages, with investor risk decreasing and the scale of investment required increasing along the way. Over this part of the lifecycle, access to finance can come from different sources.

4.3 At the earliest stages (pre-seed and seed) startups can generate finance from personal sources, angel investors and pre-seed or seed-stage venture capital. The emergence of accelerators and incubators across the world has increased the fundraising options available to startups and allowed

entrepreneurs to raise the capital required to experiment and build their first product (Arnold, Claveres and Frie, 2024).

Figure 5: Employment and turnover shares of young UK firms have declined

Source: CMA (2024b). Enterprises refer to legal business units and may consist of more than one establishment.



Employment and turnover share of enterprises and establishments younger than 5 years old. Age of enterprises and establishments estimated using the year of first appearance on the *Longitudinal Business Database*. Calculations exclude Standard Industrial Classification (SIC) sectors: A, B, D, E, K, L, O, P, Q, T, U. Data from the *Longitudinal Business Database* (2005-2021).

4.4 In the mid- and late stages, startups usually raise capital through a capital intermediary. In the US, the late-stage private equity market has grown significantly. The aggregate amount of private equity capital invested in venture capital backed startups raising a Series C or higher round was $14.2 billion in 2002, rising to $80 billion in 2019. Venture capital has been the traditional source of this finance, but private equity funds and traditional public market investors such as mutual funds and hedge funds are increasingly also investing in startups at this stage (Ewens and Farre-Mensa, 2022).

4.5 At the final stage, investors seek a return on their investments and exit typically through an acquisition by a larger firm, by a private equity firm or through a stock market listing. However, the increased supply of late-stage private capital in the US means that many late-stage startups have less need to go public to keep growing. As a result, firms are now less likely to

go public and when they do, they are older and have raised more private capital than they would have in the 1990s (Ewens and Farre-Mensa, 2022).

4.6 At the start-up stage, investment needs tend to be small, but so are the funds of the would-be entrepreneurs (often out-of-pocket). Which potential start-ups become reality therefore often has less to do with how productive they could be, and more with how financially constrained the founders are. Kerr and Nanda (2009) summarise the existing literature on financing constraints and entrepreneurship. Overall, the literature finds deep capital markets promote the entry and growth of new firms and increase the propensity of individuals to start new businesses. Studies here (as elsewhere) in this review are predominantly US-focused, with very little empirical evidence for the UK. Where comparative studies exist, they tend to find that the UK lags the US but compares well to other European countries.

4.7 Small entrepreneurial ventures are plagued by asymmetric information issues. Financial intermediaries are often unable to evaluate them effectively, resulting in many unfunded projects. Access to local finance is therefore important: the intermediaries that are best able to overcome the costs of screening and monitoring these ventures are often local. For example, venture capital firms are more likely to fund entrepreneurs located closer to them (Kerr and Nanda, 2009). Kerr and Nanda summarise studies of US branch banking deregulation and conclude that increased competition between banks facilitated the provision of cheaper credit and the better allocation of capital to new projects.

4.8 The UK has likewise seen reforms to its banking landscape that have increased access to lending. While after the Great Financial Crisis the four largest traditional banks accounted for 90% of SME lending, non-traditional "challenger" banks are now responsible for 60% of it.

4.9 Chodorow-Reich, Nenov, Santos and Simsek (2024) use data on the stock market holdings of Norwegian households to show that when household wealth increases, individuals are more likely to become entrepreneurs, especially those of moderate wealth (for whom a 20% increase in stock market wealth means a 20% increase in their probability to become entrepreneurs). Several additional pieces of evidence in this study suggest that this increase is likely due to a relaxing of financial constraints: for instance, the increase in stock-market wealth for affected individuals is passed through completely to firm equity, and the increase in wealth increases the profitability of the resulting firms.

Funding constraints and entrepreneur quality

4.10 An important policy question in the context of financial constraints is whether additional funding will draw in mostly entrepreneurs of lower quality. Several studies examine this question across many different settings and generally find that this is not the case. For instance, Bacher, Fagereng, Ring and Wold (2024) study what happened when the capital requirement to start a limited corporation in Norway was lowered from $17,000 to $5,000. New incorporations roughly doubled, with no apparent impact on the quality of the new startups (as measured either by entrepreneur characteristics or firm survival, productivity or growth rates).

4.11 The increase in incorporation, coupled with evidence that the post-reform entrants generally hold fewer assets, suggests that there are significant financial barriers to entrepreneurship. The would-be entrepreneurs held back by these financial barriers do not seem to be less productive on average. Therefore, there does not seem to be a quality-quantity trade-off here, but rather a pure inefficiency. Other studies that reach similar conclusions include Sedlacek and Sterk (2019), Neira and Singhania (2022) and Bhandari, Kass, May, McGrattan and Schulz (2024).

4.12 Finally, there is evidence that the presence of start-ups may affect the incentives of incumbents to innovate. Caragea, Cojoianu, Dobri, Hoepner, Peia and Romelli (2023) study the financial services sector in the early 2000s and show that increased financial technology (FinTech) innovations by firms outside the financial sector led to more subsequent innovation by incumbents. Using machine-learning algorithms to identify Fintech-related patents, the authors find that start-ups account for 13% of patent applications in the sector. When the ratio of patents by start-ups over incumbents increases by one standard deviation over the previous four years, financial incumbents are then 0.2% more likely to file a patent themselves. For reference, financial firms in the sample hold about three patents on average, so this is a small but non-negligible effect.

Labour markets restrictions and entrepreneurship

4.13 Some employment contract clauses, so-called “restrictive covenants” like non-compete agreements, restrict the ability of workers to join or start new businesses.[5] While this can induce businesses to invest more in human

[5] CMA (2024a) finds that restrictive covenants are common in the UK, with about one quarter of surveyed employees covered by one. Readers interested in the wider impacts of non-compete clauses may be interested in the recent review by Starr (2023).

capital formation, it can prevent potential entrepreneurs from starting a business. Therefore, in the presence of restrictive covenants, labour market power can reduce entry and investment by potential entrepreneurs.

4.14 Jeffers (2023) finds that stronger enforceability of non-compete agreements leads to a decline in total employee departures, driven predominantly by workers in knowledge-intensive industries. Strong non-compete enforceability discourages knowledge workers from leaving to start or join small new firms. At the same time, enforceability leads to higher investment by firms more dependent on specialised human capital. Overall, Jeffers (2023) identifies a trade-off between encouraging entry of new firms and investment at existing firms: knowledge-intensive and publicly held firms invest around $2 million in capital for every foregone entrant.

4.15 Whether this increased investment leads to overall better innovation outcomes, is still subject to debate: Johnson, Lipsitz and Pei (2023) argue that despite higher investment where non-compete enforceability is higher, the reduced knowledge diffusion means that overall innovation is lower. Additionally, Xiao (2022) argues that non-competes shift innovation from more valuable *explorative* innovation to less valuable *exploitative* innovation.

4.16 Overall, financing is a significant constraint for would-be entrepreneurs, even potentially productive ones. Competitive markets for finance and talent raise investment at this stage. Just as importantly, investment at this stage can also increase competition: by enabling new firms to enter the market and thereby challenge incumbents.

5. Scale-ups: beyond the start-up

Insights from existing literature: The availability of venture capital is key to allowing start-ups to scale up. A denser market for venture capital expands access to financing and shifts market power from funders to founders. Despite this, venture capital is often still concentrated, regionally and in specific industries.

Implications for policymakers: Where regulations make it harder to raise venture capital (for example unclear or unduly burdensome rules that discourage investors), competition among venture capital firms decreases because it is more onerous or less attractive for them to operate. In this diminished pool of investors, market power shifts from start-ups to funders and thus reduces the size and number of viable scale-ups. The location of financing clusters will determine which firms are likely to receive funding.

Areas for further research: Further research could shed light on what drives venture capital to concentrate in particular industries and locations, and the role of government policy in shaping this.

5.1 Many newly created businesses fail within the first year of their life (Haltiwanger, Jarmin and Miranda, 2008; Haltiwanger, Jarmin and Miranda, 2009). Of those remaining, the vast majority stay small, in both employment and turnover terms (DBT, 2024). However, a small number of start-ups eventually invest in capital and grow into what are called "scale-ups" or "high-growth firms" (Schreyer, 2000), growing employment or turnover by 20% or more for several years in a row.

5.2 In reviewing relevant studies, we find that access to finance is a key binding constraint on investment at this stage, preventing many potentially productive businesses from reaching sufficient scale. Therefore, competition *among* finance providers matters: by making finance cheaper, and expanding access beyond narrow industries and regions, competition among finance providers can increase investment at the scale-up stage.

Scale-up ecosystems and the role of venture capital

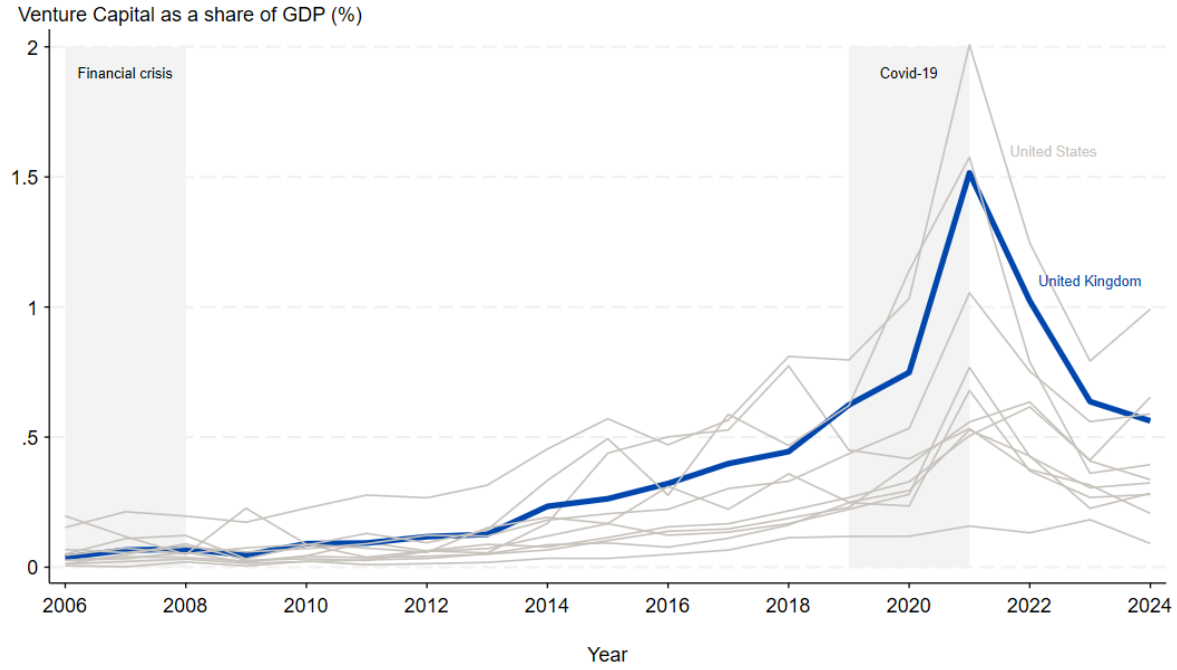
5.3 Duruflé, Hellman and Wilson (2017) define scale-ups as businesses that have progressed beyond the exploratory phase, have found their core product and market segment and are now entering a phase of significant market penetration.

5.4 Access to finance plays an important role in allowing firms to scale up. At the scale-up stage, firms require larger amounts of finance and thus typically seek investments from a capital intermediary. Traditionally, they have approached venture capital which, beyond access to finance, also provides firms with knowledge, advice and networks to help them grow (Arnold, Claveres and Frie, 2024).

5.5 Venture capital firms invest in high-growth firms in exchange for equity over a five- to ten-year horizon. Venture capital firms gather funds from institutional and wealthy individual investors and seek a return on their investment by selling the venture to a corporate acquirer or through a public equity markets sale. Venture capital tends to be associated with the most innovative and highest-growth companies in the economy.[6]

Figure 6: Venture capital investment is a large and growing share of UK GDP

Source: Authors' calculations.



Venture capital investment as a share of GDP across multiple countries from 2006 to 2024. Other countries include Canada, China, France, Germany, India, Ireland, Netherlands, Japan, Switzerland and United States. Datasources: Venture capital investment data from Dealroom, accessed in May 2025. GDP data from World Bank.

5.6 Figure 6 plots domestic venture capital investment as a share of GDP for a range of countries, with the UK highlighted in dark blue. There are three important takeaways. First, venture capital investment has become increasingly important for financing investment. Second, the UK has always

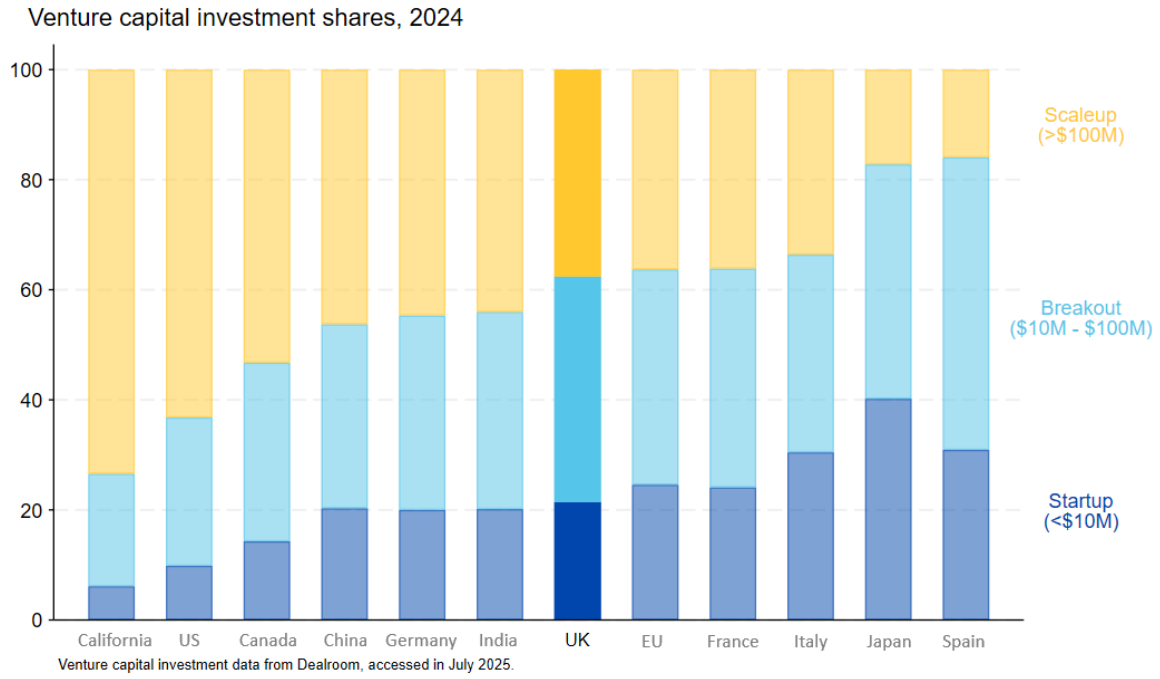
[6] Despite fewer than 0.5% of US founded firms receiving venture capital financing (Puri and Zarutskie, 2012), venture backed firms constitute nearly half of initial public offerings (IPOs) in the United States (Janeway, Nanda and Rhodes-Kropf, 2021).

been close to the top of the pack in relative terms and has narrowed the gap with the US, the global leader in venture capital markets over the last ten years. Finally, although there was a sharp rise during the pandemic, this was both due to an increase in the absolute value of venture capital investment in a low-interest environment (EIB, 2024) and depressed GDP.

5.7 OECD data from 2007 to 2014 shows that in the US about two thirds of all venture capital is invested at later stages (that is, for scale-ups) compared to less than half in Europe (Duruflé, Hellmann and Wilson, 2017). In Figure 7, we calculate how VC investment in 2024 is split among start-ups (firms valued below $10m), break-outs (valued between $10m and $100m) and scale-ups (valued over $100m) across a range of economies. Our calculations confirm that US VC investment is tilted towards scale-ups. In California, over 73% of VC funding goes to firms valued at more than $100M. By contrast, VC investment in the UK is more evenly split between break-outs and scale-ups.

Figure 7: Scale-up funding accounts for a smaller share of venture capital investment in the UK than in the US

Source: Authors' calculations from Dealroom data.



5.8 This difference in capital availability has significant economic consequences. Using European data, Ambrosio, Brasili and Niakaros

(2021) find that increasing venture capital investment by 0.01% of GDP predicts an 18% increase in the number of scale-ups.[7]

5.9 Duruflé, Hellman and Wilson (2017) investigate how scale-ups are financed in the US, Europe and Canada and identify public policies to improve the scale-up ecosystem. According to their calculation, US venture capital relative to GDP over the period 2007 to 2014 was four times its Canadian equivalent, and eight times its EU equivalent. Duruflé, Hellman and Wilson highlight that the US' relative advantage is built on stronger financial markets, including for venture debt, and likely first-mover advantages: it takes time to build a scale-up ecosystem.

Factors concentrating the supply of venture capital

5.10 Janeway, Nanda, and Rhodes-Kropf (2021) review the evidence on the real-economy effects of venture capital investment, particularly through the types of business funded, which can in turn shape the trajectory of wider innovation. One key insight the authors emphasise is how geographically concentrated venture capital investments can be, with funding predominantly going to industries and types of businesses which are located near VC hubs (such as Silicon Valley in the US). Funded companies are often innovation-based and involve some aspects of technology. Typical examples come from the information and communications technology and service sectors (Duruflé, Hellman and Wilson, 2017).

5.11 What is less clear is what is driving this concentration (Janeway, Nanda and Rhodes-Kropf, 2021). It could be demand-driven (that is, a lack of good investment opportunities elsewhere) or supply-driven (for instance, due to information or financing frictions). Selecting startups and supporting them through their lifecycle is time- and skill-intensive. As a result, the venture capital industry tends to be "people-centric" and thus concentrated in regional clusters (Crisanti, Krantz, Lo Sordo, Pavlova and Signore, 2023).

5.12 Early-stage financing is characterised by a high degree of asymmetric information associated with small entrepreneurial ventures. Additionally, the outcomes of product innovation and new technologies are uncertain. The intermediaries best able to overcome the costs of screening and monitoring these ventures are often local (Kerr and Nanda, 2009). Furthermore, venture capital financing is typically staged across several rounds, with early-stage investors relying on later-stage investors to finance a startup

[7] For comparison, Figure 6 shows that venture capital accounts for about 0.5% of UK GDP in 2024.

through to an exit. Early-stage investors may therefore try and predict ventures that are likely to be funded by later-stage capital. This herding dynamic can contribute to the concentration of venture capital investment in certain industries (Janeway, Nanda and Rhodes-Kropf, 2021).

5.13 Arnold, Claveres, and Frie (2024) similarly comment on the tendency for scale-up ecosystems to concentrate in certain regions. They write: "Cities or regions where many different parts of the ecosystem cluster together play a central role, which also means that hub-and-spokes networks are vital. Innovation thrives on agglomeration effects, both in terms of generating ideas and in financing and developing them."

Bargaining power in the scale-up financing ecosystem

5.14 It is commonly accepted that financial constraints are important for young firms. What causes these constraints is less clear. One possibility existing research has explored is the existence of regulatory barriers, which not only restricts supply, but in the process also shifts bargaining power from founders to funders.

5.15 For instance, Chen and Ewens (2021) examine the impact of the Volcker Rule in the US, which restricted the ability of banks to become limited partners in venture capital funds, thus limiting the availability of start-up funding. Venture capital funds whose exposure to the new rule was one standard deviation higher saw an 18% decrease in fund size, and a 10% decrease in the probability of raising future funds. Chen and Ewens argue that these changes had tangible knock-on effects for young firms: those financed by affected VCs raised less capital and their valuations were lower. Overall, a lower supply of financing shifted bargaining power from start-ups to VCs, and start-ups moved away from affected states.

5.16 Ewens and Farre-Mensa (2022) argue that financing for young US firms has changed dramatically over the past twenty years, with entrepreneurs now relying much more on private rather than publicly-traded equity. This increase in private equity seems to have shifted bargaining power towards founders, as entrepreneurs who have raised venture capital retain 30% more equity in the firm and are more likely to control the board. In the authors' view, this change in entrepreneurial finance is due in part to the five-fold growth in late-stage private equity markets. Much of this late-stage capital is provided by non-traditional start-up investors such as private equity funds, mutual funds, and hedge funds.

5.17 The authors argue that three structural changes in the financial environment are responsible for this increase in private equity among late-

stage start-ups and scale-ups. First, regulatory changes have made it easier for venture capital and PE funds to raise capital. Second, institutional investors such as university endowments and pension funds have shifted their investments towards VC and PE funds. Finally, mutual funds and hedge funds have entered the private equity market, providing further capital. On the demand side, Ewens and Farre-Mensa argue that the greater bargaining power founders enjoy vis-à-vis investors at the time of their exit decision, and the increased disclosure costs stemming from the rising importance of intangibles such as R&D investment are likely partially responsible for the shift from public to private equity.

5.18 Howell, Parker and Xu (2025) examine how venture capital managers raise funds and document a regulatory trade-off: protecting uninformed investors by limiting arms-length fundraising comes at the cost of increasing entry costs into VC, and therefore lower financing ability for potential scale-ups. Howell, Parker and Xu also stress the importance of personal networks in fundraising, even when fund managers are allowed to advertise publicly.

5.19 Overall, the availability of venture capital is key to allowing start-ups to scale up. A denser market for venture capital expands access to financing and shifts market power from funders to founders. Despite this, venture capital is often still concentrated, regionally and in specific industries, and no country to date comes close to matching the depth of US venture capital markets.

6. Competition and investment in growing firms

Insights from existing literature: Market power can distort input and output markets, but whether this reduces overall investment depends on how market power interacts with other market distortions as well as the sources of market power. For example, if market power stems from rising returns to scale, even as markets become more concentrated, aggregate investment may rise. Conversely, if market power derives from anti-competitive behaviour, it is less likely to result in increased aggregate investment. Market power can lead to misallocation (that is, capital is directed away from its most productive use) as well as lowering overall investment. Reduced market dynamism can result in inputs being "locked up" in less productive firms.

Implications for policymakers: Market-specific competition knowledge is important to understand which levers will likely raise investment. In general terms, market dynamism is an important force to release investment, so that it can be used more productively elsewhere.

Areas for further research: Further research could highlight under which conditions market power is likely to alleviate or exacerbate the effect of other market frictions on investment and quantify the importance of "zombie firms" for UK investment.

6.1 As firms progress beyond their scale-up phase, there are various levers they can pull to try to expand and become more productive. They may seek to reduce costs, expand into new markets, improve existing offerings, or reorganise their production. All these levers, however, demand increased investment of some type.

6.2 In this chapter, we summarise the existing evidence on how and where competition and market power affect these levers or create barriers to expansion, focusing on market power in (1) financial markets (for instance, market power held by financial institutions lending to firms), (2) input markets (for instance, market power in labour markets) and (3) output markets (that is, market power when selling products or services).

Market power in financial markets

6.3 Even beyond the start-up and scale-up phase, competitive conditions in financial markets play an important role in fostering firm growth. Love and Martinez Peria (2012) for instance use firm-level data from 53 countries over the period 2002 to 2010 to show that when there is less competition among banks, as measured by higher values of the Lerner index (a standard measure of market power), this reduces firms' access to finance.

6.4 Where access to finance is limited, not all firms have equal chances to grow. Innovative UK firms, defined as those which introduced a new product to the market within the last year, are more likely to apply for finance but *less* likely to receive funding than non-innovative firms (Lee, Sameen and Cowling, 2015). UK firms that self-describe as having underinvested relative to their target investment are more likely to say they had trouble accessing finance (Bora, Cottell, Karmakar, King, Nyamushonongora and Sengul, 2024). In general, smaller and younger firms tend to have reduced access to all types of finance (Hadlock and Pierce, 2010). Outside the UK, Alfaro, Bloom and Lin (2024) argue that access to finance interacts with uncertainty to dampen investment. As their study shows, while all US firms respond to uncertainty by cutting investment, this response is most pronounced among financially constrained firms. Taken together, these studies suggest that market power in financial markets can distort the allocative efficiency of investment.

Market power in input markets

6.5 When market frictions (such as market power) distort price signals in input markets, market outcomes will be inefficient. These distortions can depress overall investment and lead to resource misallocation across firms. While the impact of other input market frictions on investment has been studied extensively,[8] we know relatively less about the impact of input market power.

6.6 Jungerman (2023) investigates the relationship between labour market power and firms' investment in human capital through costly on-the-job training. Estimating a theoretical model using French employer-employee data, Jungerman finds that the dynamic human-capital investment effects

[8] See, for instance, David, Hopenhayn and Venkateswaran, (2015) on information frictions, Pellegrino and Zingales (2017) on loyalty-based hiring and Acemoglu, Manera and Restrepo (2020) on tax distortions.

of labour market power (through less on-the-job training) account for a significant share of the overall welfare loss from market power.[9]

6.7 By contrast, two recent studies identify cases where input market power allowed firms to overcome *other* market frictions (for instance, by internalising externalities), thereby increasing investment. Méndez and Van Patten (2022) study the long-term impact of the United Fruit Company on local infrastructure investment in Costa Rica over the 20th century. They argue that because the company had a local labour monopoly, it had the incentive to attract and retain a sizeable workforce, including by building schools, roads and hospitals. Rubens (2025) explores the mechanisation of the 19th-century US coal industry. Using a rich dataset on mine-level production, he shows that local labour market power allowed mines to overcome the investment holdup problem and therefore invest more and mechanise faster.

6.8 Rhodes, Zhou and Zhou (2025) consider a digital platform's market power over data, another type of input, when competing with many single-product firms over both price and quality investments. Key to the model is the platform's ability to use data collected in one market to enhance quality investment in another. Depending on the investment efficiency of the platform, it either prices aggressively to generate more data, or invests in quality and keeps prices high. The paper thus highlights that market power over data, a complement to investment, can affect investment incentives. Overall investment also depends on investment incentives for rival firms, which in turn depend on access to data and to the platform itself.

Market power in output markets

6.9 Market power in product markets may limit firms' opportunities to expand in a variety of ways: firms may use retained profits to acquire would-be competitors (Cunningham, Ederer and Ma, 2021), consumers may be locked in due to bundling or network effects (Lee, 2017), or incumbents may spend their profits on lobbying activities to shift regulation in their favour (Cowgill, Prat and Valetti, 2024). Even if market power were always the byproduct of productive, innovative firms expanding their market share, it could in theory still blunt the incentives for growth and investment for incumbents and potential competitors.

[9] A static model that does not account for the human capital investment channel underestimates welfare losses by half for low-skill workers and by an order of magnitude for high-skill workers (Jungerman, 2023).

6.10 Consequently, there is conflicting empirical evidence on how market power affects investment and expansion. Miller (2025) summarises findings from many industry studies, concluding that rising cost markups (a common measure of market power) are associated with reduced costs or quality upgrading (that is, moving to a higher value-added version of a good), which is driven by technological change, and often coincides with greater economies of scale. The latter may lead to fewer firms in equilibrium and higher markups, but not necessarily reduced investment.[10]

6.11 On the other hand, Gutierrez and Philippon (2017b) find that investment is lower in sectors with more concentration and more common ownership. Although not ideal proxies for market power, there is nascent evidence that higher common ownership may decrease competition and increase markups (Azar, Schmalz and Tecu, 2018; Banal-Estañol, Seldeslachts and Vives, 2022). Taken together, these studies suggest that the *driver* of market power matters for how we should expect it to affect investment: where market power comes from economies of scale, it may raise investment (even as concentration increases); where market power comes from uncompetitive conduct, we might expect overall investment to fall.

6.12 The overall economic environment may matter too. Jiang, Kim, Nofsinger and Zhu (2013) study the relationship between corporate investment and competition in the context of Chinese manufacturing, from 1999 to 2010. They conjecture that because firms in this environment faced extraordinarily high growth rates, competition would unambiguously increase investment as firms compete to capture a growing market. Consistent with this hypothesis, the authors find a negative relationship between industry concentration and firm investment. Larger firms and those more at risk of losing market share to competitors increase investment more than the average in response to intensifying competition.

Policy choices, market power and investment

6.13 Sometimes, monetary, fiscal and regulatory policies can have unintended secondary effects on competition in ways which in turn affect aggregate investment. Over the last fifteen years, policymakers have become particularly concerned about the emergence of so-called “zombie” firms: that is, low-productivity firms that under normal competitive conditions would be driven out of the market but are kept alive by unintended effects of certain policies (Alburquerque and Iyer, 2024; Banerjee and Hoffman,

[10] For the UK, CMA (2024b) likewise finds some evidence of increasing scale economies across the economy.

2022). These firms depress overall productivity growth, investment and employment because they lock up factors of production (for instance, land, labour and capital) which could be more productively used elsewhere.

6.14 McGowan, Andrews and Millot (2018) examine data from OECD countries between 2003 and 2013 and find that a higher share of capital invested in zombie firms is associated with less new investment in productive firms, and less capital reallocation. Similarly, Albuquerque and Iyer (2024), studying firm-level data from 68 countries between 2002 and 2022, document a rise in the share of zombie firms, particularly following the Financial Crisis and the pandemic, and find that zombie firms may crowd out investment at non-zombie firms in the same industry.

6.15 Liu, Mian and Sufi (2022) argue that low interest-rate environments can influence market structure (and hence investment and productivity) more broadly. In their theoretical model, low interest rates benefit dominant firms relatively more by lowering their capital costs, thereby entrenching market power. In the empirical part of their paper, the authors find some support for this theory. Industries more exposed to low interest rates experienced a greater rise in concentration, less entry and slower productivity growth. Likewise, Gopinath, Kalemli-Özcan, Karabarbounis and Villegas-Sanchez. (2015) provide evidence that declining interest rates combined with financial frictions can lead to misallocation towards high net-worth firms that are not necessarily more productive.

6.16 Hsieh and Klenow (2009) demonstrate that this misallocation of resources across firms matters for aggregate outcomes and is an important contributor to cross-country productivity differences. Reallocating capital and labour to equalise marginal products across firms to the degree observed in the US would raise manufacturing productivity by 30 to 50% in China and 40 to 60% in India. This suggests that capital *misallocation* may be as much a problem as low aggregate investment. Hsieh and Klenow investigate sources of this misallocation, such as state-ownership and licensing policies and find some evidence that policies play an important role (perhaps alongside input market distortions).[11]

6.17 Finally, an interesting open question is to what extent competition can mitigate the effects of other policies on investment. In one of the few existing studies to currently address this question, Wen, Lee and Zhou (2022) investigate how fiscal policy uncertainty affects corporate innovation

[11] Earlier pioneering work by Olley and Pakes (1996), focusing on the liberalisation of the US telecom industry between 1974 and 1987, showed that competition can be a key force in correcting these misallocations.

investment in the Chinese energy sector. They find that while in general policy uncertainty lowers innovation investment (in line with other studies), strong product market competition mitigates the extent of this decrease.

6.18 Overall, market power can distort input and output markets, but whether this reduces investment on aggregate is less clear. This depends on both how market power interacts with other market distortions as well as the sources of market power: technology or anti-competitive behaviour. Finally, a still underexplored question is how competition mitigates how other factors (such as fiscal and monetary policy) affect aggregate investment.

7. Investing in innovation and R&D

Insights from existing literature: the theoretical relationship between innovation and competition is ambiguous: competition may push firms to innovate *ex ante* but *ex post* firms need to be able to secure some profits for innovation to make financial sense. The bulk of recent empirical evidence suggests that horizontal competition generally raises innovation. This overall relationship however masks large differences between industries and markets and between different kinds of innovation investment.

Different kinds of firms are likely to invest in different types of innovation. Some research suggests that smaller firms may have a comparative advantage in introducing new products, rather than improving existing varieties, while large firms dominate R&D spending, but often introduce incremental (rather than drastic) innovations.

Implications for policymakers: Given the differences in how competition impacts innovation in different markets**,** better market-specific evidence is crucial for considering the application of competition policy as a tool of the industrial strategy in the eight growth-driving sectors. In calibrating government policies to support innovations (such as R&D subsidies or tax credits) it is important to consider how firm characteristics will affect the type of innovation firms will pursue.

Areas for further research: More UK-specific studies on innovation in the growth-driving sectors of the industrial strategy, and more research on disruptive innovations, would be helpful.

7.1 Innovation investments stand out from other types of investment (such as investment in physical or human capital) in the breadth and depth of the available research on the subject. This reflects the fact that innovation is fundamental to technological progress, the ultimate long-term driver of sustained economic growth. Because various innovations (unlike many other investment assets) are to some degree or another non-rivalrous and non-excludable, they also pose specific economic challenges.

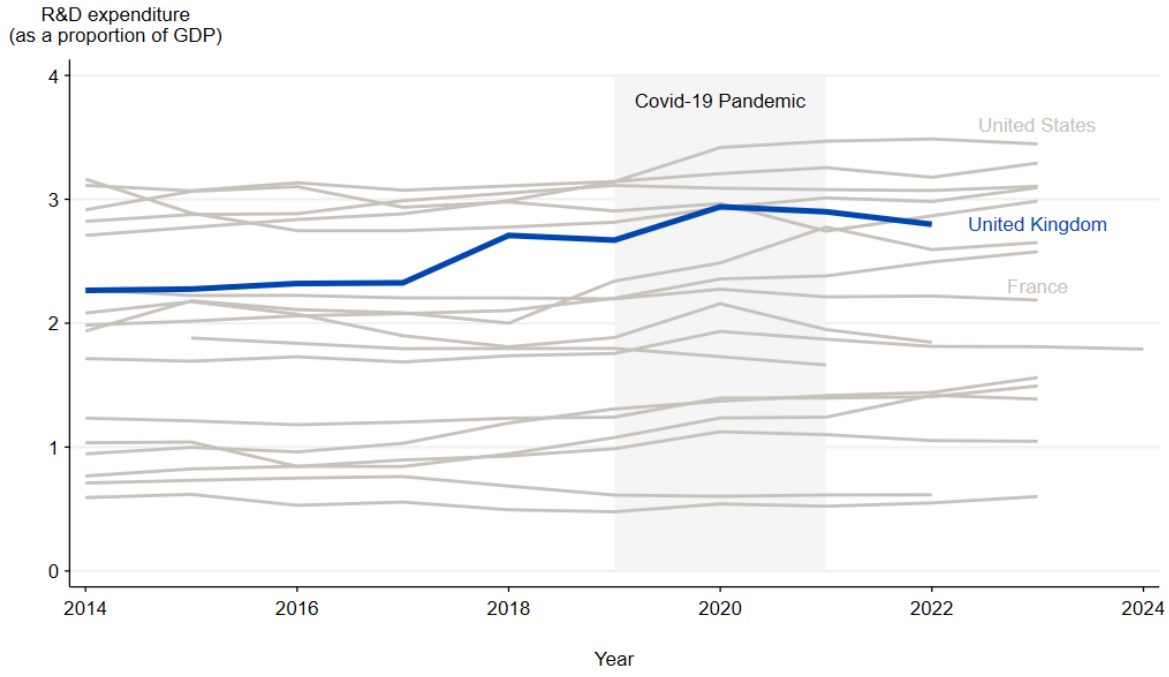
7.2 It is widely accepted that incentives for innovation provided by the private market are too low due to knowledge externalities and spillovers. In other

words, the social return to innovation cannot be fully captured by a firm or individual, so privately provided R&D will likely be too low, both theoretically and empirically (Bloom, Schankerman and Van Reenen, 2013; Dechezleprêtre, Einiö, Martin, Nguyen and Van Reenen, 2022).

7.3 Overall, the UK invests a high proportion of GDP in R&D activity, and this rose between 2016 to 2022.[12] However, as Figure 8 shows, it still sits behind various peer economies, such as Germany, Japan, and the US.

Figure 8: R&D expenditure in the UK has risen as a share of GDP in recent years, but remains behind several peer countries

Source: Authors' calculations.



Other countries include: Argentina, Australia, Austria, Canada, China, Croatia, Denmark, Finland, Germany, Iceland, Lithuania, Poland, Singapore, South Africa and Spain. Source: *OECD Main Science and Technology Indicators* (2014-2024)

The "inverted U" in theory and practice

7.4 In theory, competition can have opposing effects on innovation. Innovation incentives often arise from the wish to "escape competition" (Aghion, Harris, Howitt and Vickers, 2001). This effect is counterbalanced by competition eroding post-innovation rents; as a result, the expectation of vigorous competition *post-innovation* may discourage R&D.

[12] It is worth noting that ONS methodological improvements to the BERD survey have led to a substantial rise in R&D expenditure estimates, see here and here for details.

7.5 These two forces are behind the famous conjecture that the relationship between competition and innovation may be shaped like an inverted U: increasing at first but eventually decreasing (Kamien and Schwartz, 1974; Aghion, Bloom, Blundell, Griffith and Howitt, 2005). This work has spawned a large body of empirical research to test it (Tingvall and Poldahl, 2006; Peneder and Wörter, 2013; Correa and Ornaghi, 2011; Huang, 2023).

7.6 The seminal empirical study of the "inverted U" relationship is that of Aghion, Bloom, Blundell, Griffith and Howitt (2005). Analysing *UK* firms from 1973 to 1994 and data on industry innovation from the *US* patent office, they find that patent counts rise with the Lerner Index until around 0.95 and fall thereafter. Furthermore, when industries are more "neck-and-neck" (that is, the productivity gap between frontier firms and laggards is smaller), innovation is higher at all levels of competition, and the inverted U steeper on both sides.[13] Aghion and coauthors (and later, similar work) study this U-shaped relationship at the industry level only, rather than within specific markets. This makes it difficult to disentangle incentive effects from broader cross-industry variation in production technologies.

7.7 Not all industry-level studies find evidence of the inverted U. Correa (2012) tries to replicate the findings of Aghion and coauthors and does not find an inverted U even in the same data. Instead, Correa finds a positive relationship between competition and innovation in the first decade and no relationship in the second. This structural break can be explained by a change in the US patenting system (Correa, 2012).[14] In a different context, Correa and Ornaghi (2011) provide more evidence against the inverted U for public US manufacturing firms between 1980 and 2003. In this sample, competition is positively associated with both patenting and productivity growth. By contrast, Hashmi (2013) finds that increased industry-level competition in the US is associated with *less* innovation for publicly traded US manufacturing firms between 1974 and 2000.

7.8 Outside the US and UK, there is plenty of evidence supporting the inverted U. For instance, Peneder and Wörter (2013) find a clear inverted U for Swiss firms across 28 industries between 1999 and 2008. Palikot (2023) confirms inverted-U patterns for both process and product innovation across 15 European countries between 2006 and 2008. Further evidence for the inverted U is found in the Netherlands (Polder and Veldhuizen,

[13] The idea behind "neck-and-neck" is that where firms have similar productivity levels, they compete fiercely with each other (van der Wiel, 2010; Hashmi, 2013).

[14] Specifically, Correa argues that the introduction of the US Court of Appeals for the Federal Circuit in 1982 led to a significant change in the likelihood of US patents being approved that explains the structural break.

2010) and South Africa (Aghion, Braun and Fedderke, 2008). Some evidence is less robust, such as in Japan where the relationship is dependent on model specification (Yagi and Managi, 2013). Askenazy, Cahn and Irac (2008) provide evidence that the inverted U is present in French firms, but it becomes flatter as the relative cost of R&D rises and disappears for small firms. In Swedish data, Tingvall and Poldahl (2006) find an inverted U when competition is measured via the Herfindahl Hirschman Index (a measure of concentration) but not when measured via more common price-cost margins.[15]

Industry studies of competition and innovation

7.9 Because competition and technology are difficult to disentangle at the aggregate level, research by industrial and competition economists tends to instead focus on individual markets or industries. This choice allows them to model and measure investment and competition more accurately but raises questions of wider representativeness. Often studies focus on markets where large, up-front R&D costs play an important role.

7.10 In the US cement industry, Miller, Osborne, Sheu and Sileo (2023) find evidence of high fixed costs and low marginal costs, resulting in both high markups and economies of scale. The high fixed costs are in part due to a more fuel-efficient and flexible technology – the so-called "precalciner kiln" – whose adoption was shaped by input prices and competitive conditions (Macher, Miller and Osborne, 2021). Investment in precalciner kilns was positively associated with *fewer* nearby competitors: a negative relationship between competition and innovation investment.

7.11 By contrast, Collard-Wexler and De Loecker (2015) find evidence of decreased scale and lower markups over time in the US steel industry. They observe substantial productivity growth in an industry driven by process innovation, in this case over the period 1972 to 2002 due to the so-called "minimill" technology. Despite the introduction of a new technology with high fixed costs, this homogenous-product industry experienced different trends to those found by Miller, Osborne, Sheu and Sileo (2023). Miller (2025) offers a reconciliation which is baked into the technology's

[15] Le, Le and Vo (2020) argue that it might be the *threat* of product-market competition that drives innovation, in addition to the existing level of competition, and find evidence of this channel for a sample of US manufacturing firms from 1997 to 2009. The relationship between product-market threats and innovation is even higher in more competitive markets.

name: the typical minimill operates at a much smaller scale than the previous production process, allowing more firms to exist in equilibrium.

7.12 Focusing on high-tech industries, Goettler and Gordon (2011) estimate a dynamic oligopoly model of the US microprocessor duopoly of Intel and AMD and find that counterfactually, Intel would increase its innovation in product quality in the absence of a competitor, although higher prices would lead to an overall reduction in consumer surplus.[16] Igami and Uetake (2019) study the Hard-Disk Drive (HDD) industry from 1996 to 2016. They suggest that innovation rises as the industry becomes more competitive, but rather than an inverted U, innovation rates plateau at around four firms and flatten substantially. Together, these four studies highlight the importance of understanding the scale of the underlying technology for disentangling the competition-innovation relationship.[17]

7.13 Most studies of this relationship rely on identifying cross-market differences in the competitive environment not related to other drivers of innovation, which is challenging. Sometimes policy changes can act as a "natural experiment" and help disentangle the competition-innovation relationship.

7.14 For example, Bell System was a vertically integrated US telecoms firm which controlled 85% of the local telephone market, the same share in long-distance services, and 82% of the telephone equipment sector (Watzinger and Schnitzer, 2022). It was the largest firm in the US in 1974 and a well-known leader in innovation. Bell was broken up following an antitrust lawsuit.[18] This breakup provides a useful setting to examine how the amount and type of innovation evolves in response to a sharp change in the competitive environment, in an industry at the technological frontier.

7.15 Following the breakup, Watzinger and Schnitzer (2022) find a significant increase in patenting in US telecoms, especially in technologies in which Bell was operating. Bell's own patenting decreased but was more than offset by competitors. Crucially, the number of high-quality and impactful patents was not affected: that is, it was not the case that Bell produced the best innovations, and its restructuring led to more, but poorer-quality, ideas.

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[16] The finding is driven by the durable nature of microprocessors, which means that the existing stock of products competes with future innovations (Goettler and Gordon, 2011). This underscores once again the importance of understanding the technology underlying a particular market or industry.

[17] See Cohen (2010) for a review of earlier studies on the importance of scale for formal innovation activities.

[18] The change was not completely unanticipated as the case was filed in 1974 and ended in 1982 (Watzinger and Schnitzer, 2022).

Finally, Watzinger and Schnitzer document an increase in the range of topics patented, as competitors explored new areas of research.

Innovation investment and property rights

7.16 Intellectual property rights are an important policy tool to encourage investments in innovation. They prevent the dissemination of certain types of knowledge (Arrow, 1962) but when designed well can balance appropriability of innovation rents with only temporary competition distortions (Nordhaus, 1969).

7.17 Stronger innovation protection may encourage innovation in sectors with large technology gaps (Acemoglu and Akcigit, 2012). When patents are not enforced, firms may choose to invest in R&D likely to result in ideas which are hard to copy (Moser, 2005). However, stringent patents may stifle innovation by reducing competitive pressure on firms to innovate further. This was the case for the Human Genome Project, for which intellectual property law reduced follow-on scientific research in the range of 20 to 30% (Williams, 2013).

7.18 Exploiting a degree of randomness in the invalidation of US patents, Galasso and Schankerman (2015) find that the removal of patents boosts cumulative innovation in subsequent years, particularly in technology and medical instruments but not in pharmaceuticals. This finding is mostly driven by small firms innovating following ideas from large firms that are no longer protected and therefore assumes an existing stock of knowledge. Long-term dynamics may be quite different and are worth further study.

Competition and the type of investment

7.19 Firms not only choose how much to invest in innovation, but also what type of innovation to pursue. A first distinction is between *product* innovation (that is, the introduction of new varieties) and *process* innovation (that is, innovation that reduces the cost of production). Competition can force laggard firms to invest in leading technologies more rapidly (Acemoglu and Akcigit, 2012) and encourage firms to focus on process innovations rather than on new products (Igami and Uetake, 2019). A number of studies find that while large firms dominate R&D spending, most of them introduce incremental innovations and are lacking in “drastic” innovations (Baumol, 2004; Garcia-Macia, Klenow and Hsieh, 2019).

7.20 Whether firms engage in product or process innovation also depends on industry characteristics (Flach and Irlacher, 2018). For example, the level of

product differentiation affects cannibalisation (from product innovation) and spillover effects across production lines (from process innovation).

7.21 A second important distinction is between *external* and *internal* innovation. The former corresponds to new product introductions, while the latter involves improving *existing* products. Akcigit and Kerr (2018) argue that incentives for each type of innovation depend on firm size and quantify the substantial role of small firms in driving innovation. Smaller firms have a comparative advantage in external innovation due to their stronger incentives to enter new markets, and large firms' lower innovation intensity.

7.22 Finally, competition and market structure can affect the *direction* of innovation (not simply its magnitude) in ways that may or may not be socially optimal. This is important for the design of policies such as R&D subsidies (Hanlon, 2012; Acemoglu, Aghion, Bursztyn and Hemous, 2012). The theoretical argument for R&D subsidies is that R&D has large positive externalities and is therefore undersupplied. Bloom, Schankerman and Van Reenen (2013) use R&D tax cuts to investigate R&D spillovers for US firms between 1981 and 2001. They find that technology spillovers (which benefit similar firms) dominate business-stealing spillovers (which harm rival firms). They calculate that the social return to R&D substantially outweighs the private return, implying significant under-investment.

7.23 Rising rewards for R&D encourage entry and raise competition among innovating firms. More competitive markets for R&D can encourage too much investment in the "low-hanging fruit", such as repurposed drugs, rather than true breakthrough innovations, because firms do not internalise how their innovation affects the payoffs to future inventions which may be partial substitutes. In more competitive R&D environments, firms are unlikely to be able to protect profits for long and may thus prioritise projects that yield quick profits. Therefore, even policies which on the surface look "technologically neutral" (that is, they do not seem to favour a specific direction of R&D) may substantially affect the direction of innovation when firms behave strategically (Bryan, Lemus and Marshall, 2022). An excessive focus on short-term profits can likewise direct innovation away from projects with the highest long-term benefit (Budish, Roin and Williams, 2015; Bryan, Lemus and Marshall, 2022).

7.24 Finally, patents can protect firms once an innovation has been created, but they cannot protect problems yet to be solved. As a result, even in a world where *after* an invention the private and social value of innovations are aligned, there may be too much R&D in some areas and too little in others, as firms cannot efficiently coordinate on what problems to attempt to solve (Bryan and Lemus, 2017; Hopenhayn and Squintani, 2021).

7.25 Despite theoretical ambiguities, empirically the latest evidence now suggests that in settings with market power, horizontal competition generally raises innovation. This overall relationship however masks large differences between industries and markets and by the type of innovation investment considered. As a result, better market-specific evidence is crucial, particularly in sectors of government interest, such as the eight "growth-driving" sectors in the government's modern industrial strategy.

8. International trade and foreign direct investment

Insights from existing literature: The evidence shows that, in general, firms which engage in trade tend to invest more, due to two effects. First, firms who invest more are more likely to engage in trade (a *selection* effect). Second, trading activity *causes* some firms to undertake additional investment. However, careful examination of the impact of trade on investment reveals a more complex relationship. The effect of import competition on innovation and investment depends on industry and firm characteristics, and the relative strength of the distinct channels through which firms are affected. For example, certain studies suggest that foreign competition can incentivise firms to invest in both process and product innovation, but the benefits tend to accrue to firms with higher initial productivity and export potential. This implies that import competition need not always lead to a rise in overall investment.

With respect to foreign direct investment (FDI), we can distinguish between “greenfield” investment in new firms, facilities or ventures; and the acquisition of existing firms. Existing research finds that greenfield FDI causes higher investment, innovation and productivity rates, whilst emerging research seems to suggest that to the extent that cross-border mergers increase innovation, the increase tends to happen predominantly in the country of the acquirer.

Implications for policymakers: Increasing competition by increasing the exposure of domestic industries to trade can have complex effects. Care should be taken to think about the different mechanisms when setting trade policies. In considering how policy can attract FDI, policymakers should consider carefully the types of FDI most likely to contribute to raising long-run investment.

Areas for further research: Understanding the factors producing conflicting results on the relationship of international competition to investment should help shed light on how different trade policies could impact investment in different sectors of the economy**.**

8.1 Access to international markets is an important aspect of the competition-investment relationship for three reasons. First, to become exporters and compete effectively internationally, firms often need to have invested

substantial capital. As a result, the small minority of UK firms that export look fundamentally different from those firms that do not. Exporting firms are larger, more productive, more skill-intensive and pay higher wages (Bernard, Jensen, Redding and Schott, 2007). This is a *selection* effect.

8.2 Second, exposure to competition from abroad is often an important determinant of firms' capital investment decisions. Trade exposure can affect domestic firms' incentives to invest through three channels: (1) *market size* raises potential profits for exporters, potentially increasing incentives to invest; (2) *export competition* may push investment in either direction (in similar ways to domestic competition); (3) *input competition* through foreign sourcing may complement or substitute domestic innovation for domestic firms exposed to it (Geng and Kali, 2021).

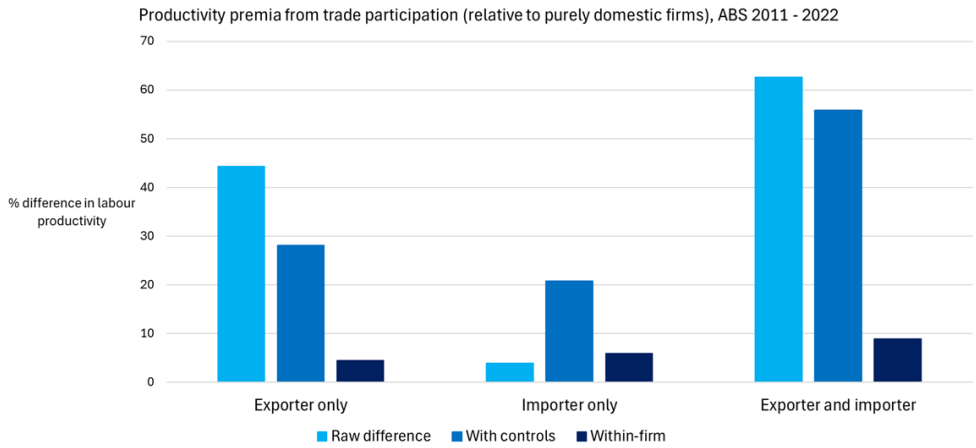
8.3 Finally, foreign direct investment (FDI), whether in the form of "greenfield" investment in new ventures or cross-border M&A activity, is an important source of capital. This chapter reviews existing studies on all three topics.

Increased trade is associated with higher investment

8.4 Firms that engage in trade are generally bigger and more productive. For instance, Figure 9 shows that UK firms that import and export are around 63% more productive than similar domestic-only businesses (Jones and Palmou, 2025). However, most of this productivity premium is explained by *selection* effects. In other words, firms that trade are already substantially more productive before they engage in trade. Focusing on firms that switch from non-traders to traders, the productivity premium shrinks to under 10%.

Figure 9: UK firms that trade are more productive than those that do not

Source: Jones and Palmou (2025).



Percentage differences in log labour productivity (gross value adder per worker) for firms engaging in trade and those that do not, from Jones and Palmou (2025). Data from the *Annual Business Survey (2011 - 2022)*. Controls are firm size, age, region, foreign ownership and industry by year. Event-study estimates consider the within-firm effect of moving from a non-trading firm to a trading firm.

8.5 Another area of debate is the role of firm characteristics in shaping how trade benefits productivity and investment. An older strand of research argues that firms differ in important ways that affect trade and productivity (Melitz, 2003), but empirical studies of trade-induced competition on investment have not produced consistent findings. Some studies suggest that the positive impact of trade changes falls mostly on large, productive firms, while the negative impact falls more on low-productivity or less profitable firms. Dhingra (2011) argues that foreign competition may depress profit margins and thus product innovation among productive domestic firms, while the least-productive exporters may innovate more, since selection-induced exit reduces the degree of competition they face. Earlier work by Boone (2000) argues the opposite. Which firms benefit may also depend on the relative impact of trade on returns to investing, absorptive capacity and market size (Lileeva and Trefler, 2007; Fernandes and Paunov, 2010; Aghion, Bergeaud, Lequien, Melitz and Zuber, 2022).

Disentangling the channels of the trade-investment relationship

8.6 Despite well-known selection effects, there is evidence that increased trade exposure can raise firm-level productivity and innovation, through market size and both export and import competition (for instance, Bustos, 2011). Bøler, Moxnes and Ulltveit-Moe (2015) find that R&D induces foreign input sourcing and that access to inputs from abroad encouraged innovation among Norwegian manufacturers. The first mechanism works through R&D raising expected future profits, which in turn increases the return to foreign inputs. The second mechanism operates through lower (foreign) input costs

raising the return to R&D. Together, lower costs and higher expected profits can create a positive R&D feedback loop.

8.7 Additionally, there is evidence that exporting itself boosts R&D through learning or network formation (Baldwin and Gu, 2004). A review by Keller (2009) highlights the strong evidence of technology spillovers from importing (for instance, Topalova and Khandelwal, 2011). They argue geographical proximity remains crucial, even in a world of digital communication. Labour movement across firms may also facilitate these knowledge spillovers (Poole, 2013). However, Aw, Roberts and Xu (2009) contend that these channels are far less important than any direct effect.

8.8 Peters, Roberts and Vuong (2018) argue that exporting raises the benefit to investing in R&D, because the payoff to either product or process innovation is greater in export markets than domestically. This increased payoff can create a feedback loop whereby exporting raises the value of R&D which in turn boosts productivity growth, leading to dynamic gains from trade (Lileeva and Trefler, 2007).

8.9 There is evidence that R&D investment responds positively to trade exposure across a range of countries. Studies find that innovative activity responds differently for more- and less-productive firms, through multiple channels: quality upgrading (Fernandes and Paunov, 2010; Medina, 2015), patenting, R&D intensity (Gorodnichenko, Svejnar and Terrell, 2016), process innovation (Alvarez and Robertson, 2004) and product innovation (Goldberg, Khandelwal, Pavcnik and Topalova, 2008).

8.10 The channels of market size and competition effects are difficult to disentangle. Evidence from Chinese manufacturing firms between 2000 and 2006 suggests the scale effects of trade on innovation are positive while competitive pressures are negative (Lim, Trefler and Yu, 2018). Additionally, trade-induced competition can affect domestic market structure by incentivising scale through mergers. This can boost investment in R&D but also lead to higher markups. Initial levels of competition may then matter for overall outcomes (Stiebale and Vencappa, 2022).

8.11 The selection effect into exporting makes it difficult to pin down how exporting causally affects investment. Trade liberalisation episodes provide a good opportunity to do so, as they are arguably unrelated to other factors influencing a particular firm's propensity to export. Bustos (2011) for instance studied the sharp reduction in Brazilian tariffs on Argentinian firms from 1991 to 1995, which led to a quadrupling of Argentina's exports to Brazil and a large increase in expenditure on technology adoption. Similarly, Canadian manufacturing firms were induced to export by US tariff

cuts (Lileeva and Trefler, 2007). This led to higher productivity, more product innovation and increased investment in manufacturing information systems, but only for low-productivity businesses. The most productive firms were unaffected, as would be expected if exports and investment are complementary: Once it becomes profitable to export, this also raises the returns to investing in new technologies. By contrast, Pavcnik (2000) leverages Chile's trade liberalisation in the late 1970s and early 1980s and finds no boost to exporter productivity. She shows that exporters already had to be more productive to compete abroad.

8.12 A broader analysis of the so-called "Great Liberalisation" of trade in the 1990s, across 60 countries, attempts to identify the relationship using differential firm-level exposure to tariff changes (Coelli, Moxnes and Ulltveit-Moe, 2016). The authors find that the reduction in tariffs had a large positive effect on innovation, as measured by patenting, with no negative effect on proxies of innovation *quality* (such as patent citations).

8.13 Alternative approaches to pin down exporting effects have been explored, such as matching and instrumental variables. For instance, Damijan, Kostevc and Polanec (2008) find that Slovenian manufacturing firms are more likely to introduce product or process innovations once they export. Bratti and Felice (2012) show that Italian manufacturing firms that exported in 2000 are, all else equal, about 14 percentage points more likely to subsequently introduce product innovations compared to non-exporters.

Investment impacts of large trade changes

8.14 Much of recent research literature has focused on evaluating large changes to trade, such as the so-called "China shock" popularised by Autor, Dorn and Hanson, Pisano and Shu (2020). There is evidence that these changes affect competition and investment in nuanced ways, via their substantial impacts on both import and export markets.

8.15 There are two important studies which arrive at conflicting results on the impact of Chinese import competition on firm investment. While Bloom, Draca and Van Reenen (2015) find a positive effect on IT and R&D investment, Autor, Dorn, Hanson, Pisano and Shu (2020) find a negative impact on R&D investment and patents. There are three potential avenues, supported by other studies, to reconcile these conflicting results. First, they differ in the setting under study. While Bloom, Draca and Van Reenen focus on twelve EU countries, Autor Dorn, Hanson, Pisano and Shu look at the US. It may therefore simply be the case that US manufacturing firms respond differently to Chinese competition than EU firms. This could for instance be due to comparative advantages in different areas of

manufacturing in the US and EU, differences in managerial capabilities across regions, or contrasting initial levels of domestic competition.

8.16 Second, the response of investment and innovation to large trade shocks might be non-linear: under some circumstances, a little bit of additional competition can boost investment, but too much may squeeze profit margins, pushing some firms to exit and others to invest less. Chakravorty, Liu, Tang and Zhao (2022) for instance find such an inverted-U pattern when studying Chinese import competition and US patents.

8.17 Finally, it could be that different types of innovation are differently affected by trade-induced competition. Yang, Li and Kueng (2017) find that Chinese import competition raises product innovation in Canadian firms but reduces process innovation. They conjecture that the relatively larger, older US manufacturing firms analysed by Autor, Dorn, Hanson, Pisano and Shu (2020) engage in more process innovation, while the smaller, younger European firms in Bloom, Draca and Van Reenen (2015) may mostly pursue product innovation.

8.18 Separating competition in the output and input markets (both potentially important channels) allows for a more rounded evaluation of how trade affects innovation. Aghion, Bergeaud, Lequien, Melitz and Zuber (2024) show that increased Chinese competition in output markets reduced innovation for French firms, especially those that were low productivity. On the other hand, increased input competition had a positive or null effect.

Foreign direct investment, trade and competition

8.19 In addition to international trade (international access to product markets), some firms may also be the recipients of foreign direct investment (FDI, via international access to capital markets). Existing research has focused on two policy-relevant questions: is the observed difference in investment at foreign-owned businesses caused by FDI, or do foreign buyers simply select investment-intensive targets? And are cross-border mergers and greenfield investments (that is, a new venture started abroad) equally effective in raising investment?

8.20 Two seminal papers find conflicting evidence on the impact of cross-border mergers on target innovation. Guadalupe, Kuzmina and Thomas (2011) attempt to disentangle selection and M&A effects, using data on a sample of 2,800 Spanish manufacturing firms between 1990 and 2006. They find evidence of both selection (FDI targets already innovate more before an acquisition) and of increased innovation investment after the acquisition, controlling for the likelihood of acquisition via propensity score matching.

8.21 Stiebale and Reize (2008) similarly study the effect of cross-border mergers on innovation activity and outcomes, using a sample of about 16,000 German SMEs over the period 2002 to 2007. After accounting for selection in acquisitions, they find that both the likelihood of engaging in innovation and average R&D expenditures at the acquired firms fall significantly. Innovation *output* (measured as either the number of process and product innovations, or the sales share of innovative products) does not increase post-acquisition, suggesting limited knowledge spillovers. Contrary to Guadalupe, Kuzmina and Thomas, Stiebale and Reize thus do not find evidence of increased innovation from cross-border mergers.

8.22 Stiebale (2016) broadens the lens compared to these early contributions by studying around 60,000 European firms and roughly 1,000 cross-border mergers. Stiebale finds an increase in the number of innovations at the merged firms, consistent with Guadalupe, Kuzmina and Thomas (2011). However, this is driven by an increase in innovations by inventors based in the *acquirer*'s country and a decrease in innovation by inventors based in the *target*'s country. Innovation is relocated from the target's country to the acquirer's country (that is, firms conduct high-value innovation activities at their new, joint headquarters). This divergence between target and acquirer innovation is particularly pronounced for highly innovative firms.

8.23 Finally, a key question is how much cross-border mergers increase rather than replace existing investment. Harms and Méon (2012) document across a sample of 127 countries over the period 1990 to 2010 that greenfield FDI is associated with significantly more subsequent growth than cross-border mergers and acquisitions. They argue that this is because part of the M&A payment accrues to previous owners as a rent, rather than increasing the target country's capital stock. This suggests that greenfield investment may be better at increasing capital and productive capacity than cross-border M&A deals.

8.24 Ahern (2025) provides a summary of recent economics and finance research on cross-border mergers. He identifies two strands of arguments for why some firms choose cross-border mergers, and others greenfield investments. According to one strand of research, the decision between greenfield investments and cross-border mergers hinges on a trade-off between efficiency and market power. A greenfield investment introduces a new firm into the market, raising competition. Greenfield investments often also benefit from the superior technology of their international parent company. A cross-border merger on the other hand allows the acquirer to benefit from existing market power but may saddle the firm with a less efficient production setup. According to the other strand of research, the decision instead depends on the acquirer's intangible capital, and the

degree of local knowledge required to compete effectively (with greenfield investments more likely when one or the other is low). Empirically, Ahern concludes that on average cross-border acquisitions are more likely when competitive advantages are low and intangible capital is less important.

8.25 Overall, studies on trade and FDI suggest that the effect of import competition on innovation and investment depends on the size of the trade opening, firm characteristics, and the relative strength of the distinct channels through which firms are affected. Foreign competition can incentivise firms to invest in both process and product innovation, but the benefits tend to accrue to firms with higher initial productivity and greater export potential. This implies that import competition need not always lead to a rise in overall investment. Cross-border mergers tend to involve more productive targets, but whether they causally increase productive capital in the target country is unclear. Accordingly, studies find that greenfield investment is associated more strongly with subsequent growth in the target country than cross-border mergers.

9. The role of private equity in competition and investment

Insights from existing literature: The share of private equity-backed companies in the UK has increased over time. The overall impact of private equity ownership on investment is mixed. This is because according to existing research, private equity funds generally pursue two broad kinds of strategies: at cash-constrained targets, they tend to increase investment; at well-financed businesses, they tend to cut investment to bring down costs. Existing research also suggests they are sensitive to market conditions, competing fiercely in competitive markets and often seeking to expand market power in uncompetitive ones.

Implications for policymakers: Understanding the strategies private equity funds are likely to pursue in particular markets is key when trying to increase overall investment.

Areas for further research: Whether PE funds generally enter markets that are *more* or *less* competitive than the average is an important and underexplored evidence gap to understand the impact of PE on overall investment.

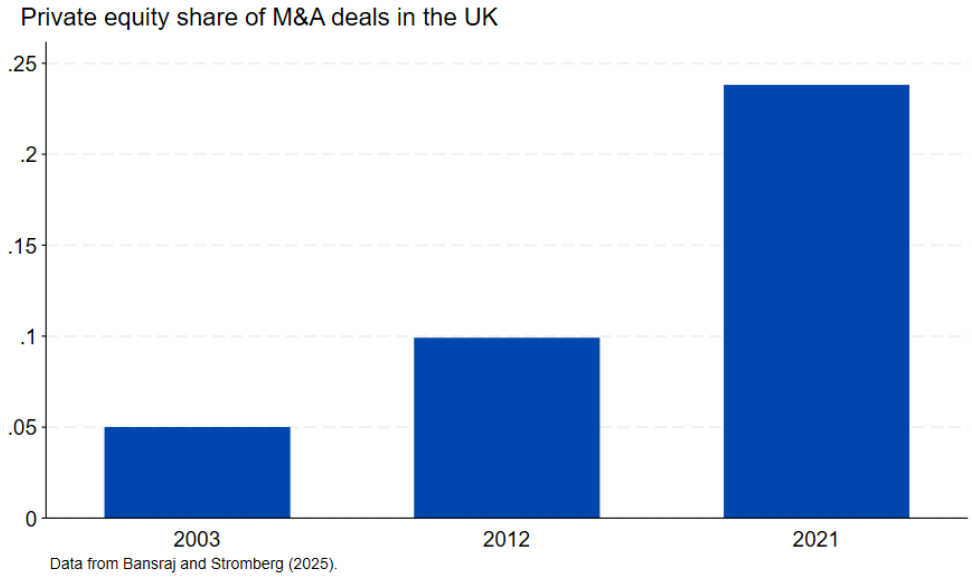
9.1 Private-equity (PE) ownership constitutes a small but growing share of the UK economy. In 2017, PE-backed companies accounted for roughly 10% of the revenue-based market share in the UK (Bansraj and Strömberg, 2025). In some sectors, such as healthcare or hospitality the figure is even higher (standing at 20% and 14% respectively). In addition, PE accounts for a growing share of the M&A market: 24% of M&A transactions, according to the same authors (see Figure 10).

9.2 Since reporting requirements are less stringent for private firms than public firms (Morris and Phalippou, 2024), we know comparatively less about the extent of private equity ownership (especially across the whole economy), and its overall impact on investment.

9.3 The evidence in the rest of this section suggests that private equity funds pursue a range of strategies across their acquisitions, with diverse impacts on investment. Depending on market conditions, they can therefore often act as an amplifier for the relationship between investment and competition. PE-backed firms compete fiercely in competitive markets and build market power in less competitive ones; they invest in cash-constrained, productive firms and cut costs and investment in well-financed targets.

Figure 10: Private equity activity has steadily increased in the UK since 2003

Source: Bansraj and Strömberg (2025).



How do private equity funds approach investment?

9.4 A large body of research since Jensen (1989) has argued that private-equity involvement improves business operations, either by "trimming fat" (reducing spending on non-crucial items) or by investing and scaling up productive but inefficiently small businesses (Gompers, Kaplan and Mukharlyamov, 2016). Overall, existing studies find the effect on investment levels at affected firms to be ambiguous.

9.5 Davis, Haltiwanger, Handley, Jarmin, Lerner, and Miranda (2014) match establishment-level employment data in the US Longitudinal Business Database (built from the US Census of Manufacturing) to deal-level data. They find that while private equity acquisitions lead to greater employment losses at shrinking or exiting establishments, they lead to greater employment gains at growing establishments. In addition, acquired firms build more new, "greenfield" establishments and engage in more follow-on acquisitions and divestitures. Where they close plants, those plants are more likely to be in the lower tail of the productivity distribution. Where they open plants, they tend to appear in the upper tail instead. In other words, private equity on average accelerates both the rate of job creation and job destruction and leads to reallocation of inputs to more productive uses.

9.6 In follow-up work, the same authors use the same underlying data to investigate the *variation* in outcomes in more detail. They find that when a previously *publicly*-owned firm is bought out by PE, employment over the

next two years shrinks on average by an additional 13%. In contrast, previously *privately*-owned firms acquired by PE grow by an additional 13% post-buyout. Resulting productivity gains are large on average, particularly when the buyout happens during periods of tight financial conditions. However, the study finds that not all private-equity groups are alike in their mix of strategies. Those that tend to more aggressively pursue the expansion of their portfolios show less employment growth at acquired companies.

9.7 Gompers, Kaplan, and Mukharlyamov (2016) complement the prevailing quantitative view on PE strategies by interviewing 79 private equity investors with a joint $750bn in assets under management. PE investors view themselves as adding value predominantly by growing firms under management, rather than by reducing costs, and claim to invest meaningful resources to accomplish this goal. By applying cluster analysis to the responses, the authors find three broad types of strategies: restructuring the finances of the acquired firm, restructuring its governance, or restructuring its operations.

9.8 Bernstein (2022) compares the advantages of public and private equity and concludes that PE-backed firms can pursue more innovative projects but are limited in their growth by a generally higher cost of capital. As a result, there may be complementarities between public and private equity markets, with private equity creating a need for commercialisation via public equity, and public equity creating a demand for innovation via private equity.

9.9 Borell and Heger (2013) explore how a buy-and-build strategy (sometimes referred to as “add-on” or “roll-up” acquisitions), a common strategy among private equity funds, can create value as one example of efficiency-increasing PE investments. By combining companies that are low-value and low-capacity utilisation with others that are high-value and high-capacity utilisation, PE firms increase total capacity utilisation in the industry. The authors test this hypothesis using a sample of roughly 850 buy-and-build acquisitions in the EU between 2000 and 2008. They find that a high-performing firm (the “platform”) is key to this strategy, but that successful buy-and-build strategies require better capacity utilisation across acquired firms, not simply the removal of excess capacity in the industry.

9.10 Hammer, Knauer, Pflucke, and Schwetzler (2017) compile a sample of over 9,500 buyouts and almost 5,000 add-on acquisitions in 86 countries and find that add-ons are both more likely and more successful where the PE firm in question is more experienced (particularly with M&As) and has

reputational capital. Loose financial conditions and moderately concentrated markets are also associated with more add-on acquisitions. Firms involved in add-on acquisitions are more likely to be involved in secondary buyouts. Often, the secondary buyer will in turn continue the add-on strategy.

9.11 Together, these studies suggest that the impact of private equity on investment at targeted companies is ambiguous, but that where profitable opportunities to invest exist, PE funds will pursue them. Individual PE fund characteristics matter, but the same fund may pursue different strategies based on market characteristics, indicating that policymakers need market-level knowledge to understand likely investment impacts.

Industry-level differences in private-equity investment

9.12 An additional strand of the research focuses on the effect of private equity investments on investment and competition in specific markets. These studies find nuanced and market-specific impacts on investment, and often but not always a decrease in the intensity of competition. This decrease in competition may in turn have knock-on effects on investment in affected markets more generally.

9.13 Fracassi, Previtero and Sheen (2020) examine the impact of private equity acquisitions on consumer goods firms. While they do not directly measure investment, they find an increase in retail sales of 50% driven by geographical expansion and new product introduction (which both suggest increased investment). Additionally, they find suggestive evidence that this expansion is driven by a loosening of financial constraints.

9.14 Gandhi, Song and Upadrashta (2025) examine PE-backed nursing homes and find that they are more responsive to competitive conditions than their non-PE backed peers: they price more aggressively than competitors in competitive markets, and exploit market power more in uncompetitive ones. When regulators introduced a policy that made it easier for consumers to compare facilities, PE-backed nursing homes also responded more strongly. The study thus echoes some of the cross-economy findings in Davis, Haltiwanger, Handley, Jarmin, Lerner, and Miranda (2014) in suggesting that private equity ownership predominantly increases the *responsiveness* to market conditions, and reallocation across the economy.

9.15 Ewens, Gupta and Howell (2022) study the sharp rise in private equity-owned local newspapers in the US, rising from 2% in 2002 to 23% in 2019. They find that private equity funds target newspapers with higher advertising rates, that are members of chains, or with relatively low

circulation. In their sample, PE acquisition leads to a fall in local policy reporting on average, a rise in national news, but a fall in total articles published. This is accompanied by a fall in employment of permanent staff, but not of interns and freelancers. Print circulation declines, but digital circulation rises. Newspaper exit also falls. Again, these results are consistent with reallocation and a change to the business model in target companies.

9.16 Austin (2022) examines mergers of PE-backed firms in US residential real estate and finds that increased PE-ownership increases prices and rents but also leads to an increase in investment in home improvement, as rising market values relax owners' credit constraints across the affected neighbourhood. At the same time, PE-backed firms are more likely to challenge tax assessments, lowering the passthrough of these investment gains to the public purse.

9.17 Singh, Reddy and Zhu (2024) study the lifecycle of PE acquisitions of physician practices. In a sample of over 800 acquisitions in disciplines with the largest number of PE acquisitions between 2016 and 2020, over half of the acquisitions result in an exit within three years from acquisition, almost in all cases (98%) due to a secondary buyout. Before exiting, PE firms increased the number of physician practices at the average firm by almost 600%. By contrast, a review article of private equity ownership in healthcare markets by Borsa, Bejarano, Ellen and Bruch (2023) finds PE ownership to be associated with lower investment in nurses employed at the relevant healthcare facilities.

9.18 Overall, the existing evidence is quite nuanced and suggests that private equity can act as an amplifier for the relationship between investment and competition. This is because according to existing research, private equity funds generally pursue two broad kinds of strategies depending on the target company: they tend to increase investment at cash-constrained, productive businesses and tend to cut investment at well-financed businesses to bring down costs and increase returns. Existing research also suggests they are sensitive to market conditions, competing fiercely in competitive markets and exploiting market power in uncompetitive ones. Whether they generally enter markets that are *more* or *less* competitive than the average is an important open research question.

10. Going public: changing trends in initial public offerings

Insights from existing literature: Studies based on US evidence document a fall in the number of publicly listed companies in recent years, due to fewer new listings and the de-listing of previously listed firms. Different studies provide different explanations for these trends. These include greater economies of scale encouraging mergers rather than scaling independently through a listing, or that firms which might have listed in the past are now acquired by incumbents. Whether the fall in public listings is due to technological factors or anti-competitive behaviour by incumbents is still open for debate. Either way, studies describe the important contribution going public can make to market dynamism. A number of studies indicate that firms which go public are more innovative, provide greater competitive pressure on incumbents, and play an important role in the process of creative destruction.

Implications for policymakers: A fall in public listings may have complex causes, but evidence on the relative performance of firms which go public compared to peers suggests it should be a cause for concern from the perspective of investment and productivity.

Areas for further research: Given the particular focus of research on US evidence, developing a stronger understanding of the drivers of listing trends in the UK would be valuable. By the same token, UK evidence on the comparative performance between firms which go public, and firms which remain in private hands (controlling for other factors) could inform government policy to encourage firms to go public as part of their lifecycle.

10.1 Going public has traditionally been a key step in the lifecycle of the economy's most productive firms, by allowing them to raise large amounts of capital to invest, while remaining independent and able to compete with existing incumbents.

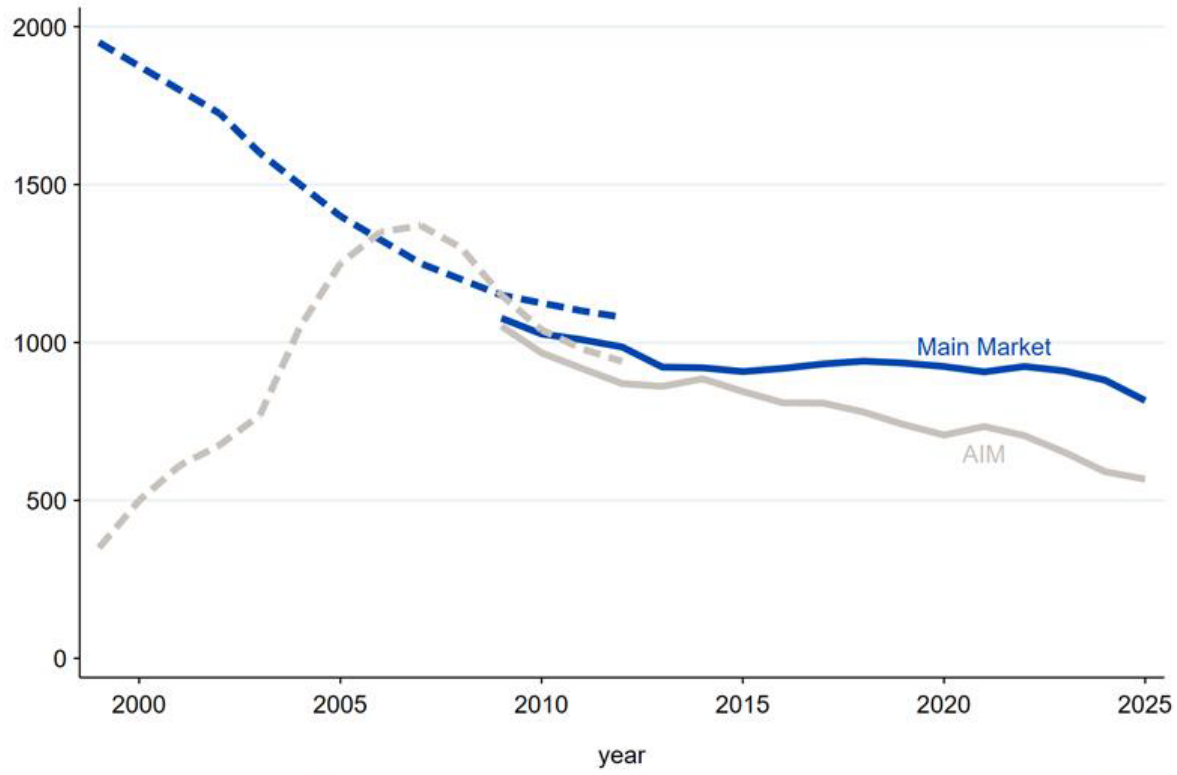
10.2 A growing number of studies have however documented the falling number of public listings in the US. Doidge, Karolyi and Stulz (2017) attribute about half of this gap relative to the 1996 peak to fewer new listings, and the other half to more de-listings. The rise in de-listings is driven by an increasing number of acquisitions, both relative to the past and to other

countries. The fall in public listings cannot easily be explained by general market conditions and has been particularly acute for small firms.

10.3 Figure 11, extending a time series in the Kay report on UK equity markets (Kay, 2012), shows that public listings have also been falling in the UK, though the fall has been less precipitous than in the US.

Figure 11: Listings have also been falling in the UK

Source: Kay (2012) **and authors' calculations.**



Number of listed UK companies in the London Stock Exchange Main Market and Alternative Investment Market (AIM). Data underlying the dashed series (1999-2012) have been extracted from *Kay (2012)*, while those underlying the solid series (2009-2025) are from the *London Stock Exchange Main Market factsheet, January 2009 - January 2025* and the *London Stock Exchange AIM factsheet, April 2025.*

What accounts for the fall in public listings?

10.4 Kahle and Stulz (2017) emphasise that the fall in US public listings has gone hand in hand with changes in the nature of listed firms. They are now older, larger, less profitable and concentrated in different industries. They also invest less in physical assets and more in R&D, and structure their finances differently. The remaining publicly listed firms also differ in their relationship with their shareholders from past listed firms. Institutional shareholders (such as investment funds) now own more than half of the shares in large listed firms. Firms pay out a higher share of profits to shareholders than they used to but are more likely to do so through share buybacks than dividends.

10.5 Gao, Ritter and Zhu (2013) and Ederer and Pellegrino (2023) both document a secular decline in the number of US initial public offerings (IPOs). Gao, Ritter and Zhu (2013) pit two hypotheses for this shift against each other: first, the fall may be driven by "regulatory overreach", extensive regulation of both financial markets and the ecosystem of underwriters needed to facilitate IPOs. Second, they conjecture that the fall in IPOs may be driven by rising economies of scale, which make selling to another, larger company in the same industry more profitable. They do not consider the possibility of anti-competitive consolidation.

10.6 Based on a broad set of evidence, they largely reject the former hypothesis and consequently side with the latter. For instance, post-IPO profitability has only fallen for small firms (suggesting that size is important), and changes to regulatory practices have not reversed the overall trend (casting doubt on a regulation-based explanation). There has also not been an increase in US IPOs abroad, and trends are similar for European countries, suggesting that any drivers are unlikely to be specific to the US.

10.7 Ederer and Pellegrino (2023) focus on the shift in exit strategies of venture capital-backed startups and posit a third, anti-competitive, explanation. When previously these startups mostly led to initial public offerings (IPOs), they now predominantly end in acquisitions. Those companies that do still go through an IPO are much more productive than in the past. Under some relatively mild assumptions about free entry, this implies that the opportunity costs to going public (given by the profits from a potential acquisition) have increased over time. This rise in start-up acquisitions, Ederer and Pellegrino argue, has measurably lowered the exposure to product market competition for the dominant companies responsible for many of those same acquisitions, compared to the recent past.

Competitive implications of the fall in public listings

10.8 The fall in IPOs matters because they contribute to industry competition. Hsu, Reed and Rocholl (2007) show empirically that the share price of listed competitors falls following a successful IPO in their industry and rises upon the withdrawal of one, suggesting that investors believe a well-financed competitor will lower incumbents' profits. Competitor firms that are less highly leveraged, more productive and those that engage in more R&D generally fare better in response to an IPO in their industry and are more likely to still be in business three years later. This indicates that IPOs contribute to the process of creative destruction, allowing innovative newcomers to invest and outcompete less productive incumbents.

10.9 Empirically, there is some evidence that IPOs happen in waves (Pastor and Veronesi, 2005; Batnini and Hammami, 2015). Why might this be the case? Chemmanur and He (2011) suggest that in industries with a significant chance of a positive productivity shock, even firms that do not need the extra capital may go public to take advantage of the lower cost of capital and expand their market share. In equilibrium, these incentives can lead to merger waves even in the absence of an industry-wide productivity increase. Firms going public during merger waves will on average be less productive than those going public outside of waves but hold larger cash reserves. This suggests that some IPO investment may not be socially efficient. Testing the data on a sample of about 6,500 US IPOs, the authors find empirical support for both the assumptions of the model (companies that go public do on average increase their market share) and the predictions it yields (for instance, productivity is higher for firms going public "off-wave", or earlier in the wave).

10.10 Aghamolla and Thakor (2021) find evidence of similar dynamics in a setting that allows them to identify more precisely direct competitors. They focus on the pharmaceutical industry, which allows them to classify firms as direct competitors if their products target the same disease. They find evidence that competitors going public increases the chance that a firm will go public itself. This increase is not driven by "hot markets" or other common shocks and is stronger in more competitive markets.

10.11 IPOs may also alter the behaviour of the firms going public themselves. Bernstein (2015) shows that US firms that go public change their innovation strategy, by comparing them with firms that readied themselves to go public, but due to stock market changes in the preparation phase ultimately decided against it. While the number of patents at newly public firms stays constant, the novelty of innovations (as measured by patent citations) declines by 50%, skilled innovators leave and those that remain become less productive. To make up for these changes, newly public companies hire new talent and acquire external innovations. Bernstein therefore concludes that IPOs, traditionally seen as a channel for more productive investment, can lead to investment misallocation issues of their own.

10.12 A recurring theme in this literature is the selection into IPOs. Pástor, Taylor and Veronesi (2009) model the decision to go public as learning about the profitability of private firms. The key trade-off in the model is between the diversification benefits of going public and the loss of control it entails. The model predicts a drop in firm profitability after the IPO, and that this drop is larger in the presence of more volatility. Both predictions are borne out in the data for a sample of roughly 7,000 US firms.

10.13 Chemmanur, He and Nandy (2009) likewise examine the universe of US manufacturing firms and find consistent evidence that firms go public at the peak of their productivity cycle, suggesting that there are important timing effects. Firms that go public are also more productive, bigger and more capital-intensive, grow faster and compete in more competitive industries than those that stay private, even after controlling for access to private financing. Bessels and Bittelmayer (2008) find that pre-IPO innovation performance is predictive of post-IPO returns in a sample of German firms, suggesting some persistent performance characteristics.

10.14 Overall, research finds conclusive evidence of a fall in IPOs in the US. We compile data for the UK and find evidence of a similar, though less precipitous fall. Whether the fall in US public listings is due to technological factors or anti-competitive behaviour by incumbents is still open for debate and matters for how this change has affected overall investment. The fall in listings may harm competition regardless of its causes. IPOs also influence the type and amount of innovation by newly-public firms regardless of why they decide to go public in the first place.

11. Mergers, acquisitions and the incentive to invest

Insights from existing literature: Most mergers, including most horizontal mergers, do not cause harm to investment because markets remain sufficiently competitive. Indeed, an emerging strand of research has focused on the role played by the prospect of a future acquisition in encouraging entrepreneurs and thus investment. Acquisitions can represent one possible exit route for entrepreneurs, and serial entrepreneurs are crucial in growing larger, more productive firms, which are less likely to exit than other firms. On the other hand, so-called "killer acquisitions" (acquisitions with the purpose to shut down a potential competitor) will tend to decrease overall investment.

In the presence of market power, existing research finds that horizontal mergers, on average, decrease innovation, although much depends on the existing market structure and the overlap in investment projects between acquirer and the target. Horizontal mergers can also affect the direction and scope of innovation, but the net impact of these changes is often ambiguous.

Research suggests that vertical mergers can have positive impacts on investment, but effects are both industry- and merger-specific.

Implications for policymakers: Given the complex impacts of mergers on investment, a statutory framework for merger control which allows a careful examination of the likely impacts of a given transaction on competition should support an objective of boosting aggregate investment.

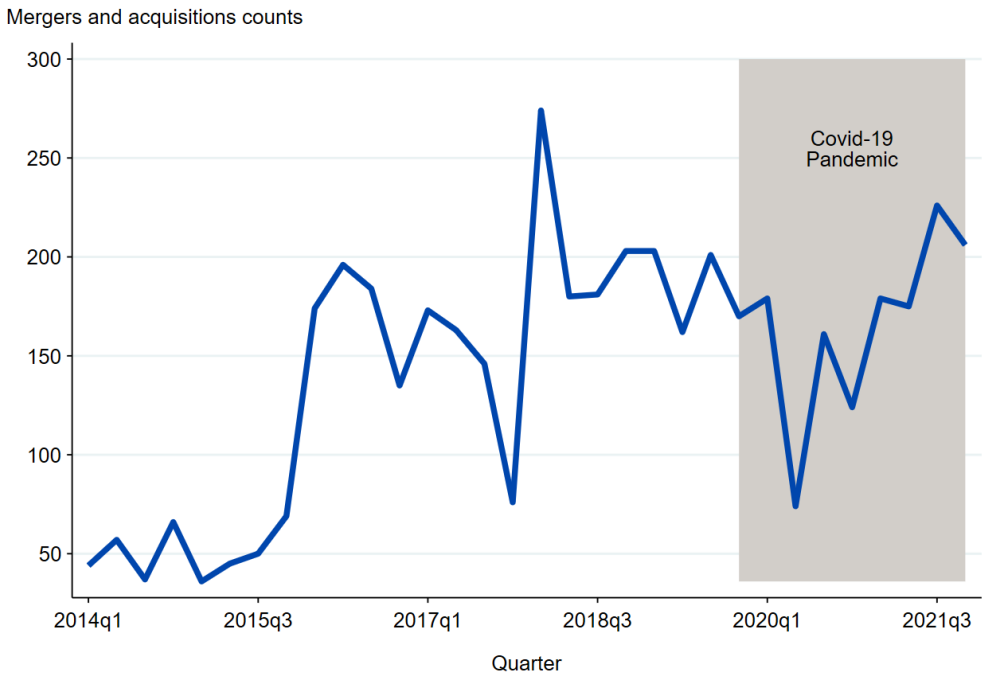
Areas for further research: Further research could shed light on vertical and platform mergers, where innovation and investment impacts appear to be more case-specific. Given the role of entrepreneurial talent in supporting business dynamism, there would be value in understanding in more detail the pro-competitive effects of different "exit routes" for entrepreneurs.

11.1 Mergers and acquisitions can alter the incentive of firms to invest, or to do so efficiently. Equally importantly, the prospect of a future merger or acquisition may influence current incentives of a firm to invest, for instance in "entry-for-buyout" scenarios.

11.2 According to the Office for National Statistics' M&A survey, UK merger and acquisition activity above transaction values of £1m has risen since 2014, from around 50 per quarter to around 200 pre-pandemic (see Figure 12). Care however needs to be taken with these figures, as they represent only a small proportion of total UK mergers.

Figure 12: UK M&As with values above £1m have risen over the past decade

Source: CMA (2024b).



Quarterly counts of UK mergers and acquisitions. Calculations exclude Standard Industrial Classification (SIC) sectors: A, B, D, E, K, L, O, P, Q, T, U. Data from the *Mergers and Acquisitions Survey* (2014 Q1-2021 Q4)

"Entry-for-buyout", killer acquisitions and common ownership

11.3 Ownership structures produce competing incentives to invest and innovate. Most horizontal mergers do not cause harm because markets remain sufficiently competitive. Cross-industry mergers (Azar and Vives, 2025; Eisfeld, 2024) or "entry-for-buyout" incentives in technology-intensive industries (Phillips and Zhdanov, 2012) are examples where investment is boosted by M&A. Additionally, it may be that this additional "exit option" for startups provides a necessary safety net to take on risky R&D investments, especially when fixed costs are large (Bisceglia, Padilla, Perkins and Piccolo, 2021).

11.4 But when mergers increase market concentration (Stiebale and Szücz, 2019), raise common ownership within an industry (Azar, Schmalz and Tecu, 2018), or if the acquired rival's project portfolio is "too close" to the

acquirer (Cunningham, Ederer and Ma, 2021), the evidence suggests this can reduce incentives to invest in innovation. For instance, there is evidence that acquisitions can be used to "kill" rivals and reduce future competition (Cunningham, Ederer and Ma, 2021). This may also reduce venture capital funding to startups, especially in sectors where network effects are important (Kamepalli, Rajan and Zingales, 2022).

11.5 Another motivation for acquisitions may be to poach highly productive employees from a rival. This practice, called "acquihiring", may be socially undesirable in circumstances where it grants the acquirer monopsony power (Bar-Isaac, Johnson and Nocke, 2024) or raises job volatility (Benkert, Letina and Liu, 2025). However, research on this topic is still sparse and quite recent compared to other areas in the literature.

11.6 Common ownership occurs when large investors have shares in firms within the same industry, potentially softening incentives to compete. In such settings, maximising shareholder value involves placing some weight on the profits of rival firms (Backus, Conlon and Sinkinson, 2021). To the extent that rising common ownership is driven by diversified index funds (Azar, 2020; Hill, 2020), the effect on competition depends on the impact on inter- and intra-industry ownership. The former has been found to put downwards pressure on prices, while the latter does the opposite (Azar and Vives, 2025).

11.7 Common ownership may induce increased competitive behaviour via an inter-sector externality. This means that cross-industry ownership internalises the positive spillover to other industries when one sector expands (Azar and Vives, 2021). For example, investment in artificial intelligence may make software development or pharmaceutical R&D easier. Therefore, if AI companies and software developers (or medical research companies) share common owners, the internalisation of this positive externality may encourage additional investment in artificial intelligence. In the absence of common ownership, the positive externalities across industries may be ignored.

11.8 Some empirical studies investigate how common ownership affects competition. A study of US airlines estimates that ticket prices are approximately 3% to 5% higher on the average route than would be the case under separate ownership (Azar, Schmalz and Tecu, 2018). However, the relationship between common ownership and innovation is more complicated. They are positively correlated when innovation spillovers are large, as measured by similarity in patents. But this positive relationship is offset by product market proximity, and can turn negative (Antón, Ederer, Giné and Schmalz, 2024).

Horizontal mergers and innovation

11.9 In the presence of market power, a merger between competitors affects innovation incentives through at least three channels identified in the literature: (1) merger-specific efficiencies like knowledge-sharing or resource-pooling in R&D; (2) the elimination of duplicative, parallel investment;[19] and (3) higher profits pre- and post-innovation arising from reduced competition. The first effect always boosts innovation, the second always reduces innovation, and the direction of the third is ambiguous (due to the usual Schumpeter-Arrow dynamics).

11.10 Critical to how M&A influences firm innovation activity is the type of innovation (incremental vs disruptive), the strategic intent of the acquirer (how it affects investment project portfolios), and the alignment or overlap of innovation activities in the acquirer and acquired. Furthermore, mergers may not only affect the quantity of innovation but also its direction (Moraga-González, Motchenkova and Nevrekar, 2022).

11.11 Existing research has taken two complementary approaches to studying these questions. Some of the studies summarised here (such as Malek, Newham, Seldeslachts and Veugelers, 2024; and Brot-Goldberg, Cooper, Craig, Klarnet, Lurie and Miller, 2024) have focused on very narrow markets; for instance, anti-diabetic pharmaceuticals or US hospitals. This has the advantage of providing clear and accurate market definitions, and often quite precise innovation *outcomes*. However, focusing on a very narrow market raises the question of how applicable the findings are across the economy. Other studies (for instance, Szücs, 2013; and Berger, Calligaris, Greppi and Kirpichev, 2025) look across a broad range of countries and industries. This ensures wider validity, but at the cost of less accurate competition and innovation measures. However, while individual studies sometimes disagree in their conclusions, we do not find a systematic difference in the competition-innovation relationship between narrow and broad studies.

11.12 Although the total effect of these incentives is theoretically ambiguous, many existing empirical findings from ex-post horizontal merger evaluations find negative effects on innovation investment and outcomes (Ornaghi, 2009; Haucap, Rasch and Stiebale, 2016; Malek, Newham, Seldeslachts and Veugelers, 2024, Morzenti, 2022). There is some research finding positive effects, but typically such studies cannot distinguish horizontal

[19] This duplication stems from a negative innovation externality between rivals: rival firms cannot coordinate on investment, whereas the merged firm can.

mergers from vertical ones or include cross-border M&A activity (for instance, Guadalupe, Kuzmina and Thomas, 2011; Stiebale, 2016). Averaging across these conceptually quite different mergers can muddle results substantially.

11.13 The following studies give a sense of the impacts estimated across the literature. Using European mergers data, Stiebale and Szücs (2022) find a 9.4% decline in tangible investment post-merger on average, and a 6.6% decline in patents. Also looking at European firms, Haucap, Rasch and Stiebale (2016) find acquired firms in pharmaceuticals see a substantial 48.5% fall in R&D expenditure, and rival firms also see a 17% reduction in this type of investment. Szücs (2013) looks at mergers across 25 countries that were notified to the US Federal Trade Commission or the European Commission. They find that both acquirer and acquired firms see a sharp drop in R&D intensity post-merger, relative to similar matched firms.

11.14 Malek, Newham, Seldeslachts and Veugelers (2024) find that, on average, M&As in the anti-diabetic market raise the probability of target project termination relative to non-acquired projects. However, they do find positive effects on R&D for a subset of mergers where acquirers and targets work on projects which are technologically similar. This subset of deals is associated with increased patenting, consistent with technological efficiencies between the product portfolios.

11.15 In the US pharmaceutical industry between 1989 and 2010, Cunningham, Ederer and Ma (2021) find that R&D projects acquired where there was an overlapping drug in any existing project of the acquiring firm are 28.6% less likely to be continued in the development process compared to drugs that are not acquired. Recent work by the OECD qualitatively replicates these findings economy-wide for 60 countries between 2001 and 2021, finding that start-up targets in M&A deals tend to be highly innovative and technologically close to the acquirer pre-acquisition, with significant decreases in post-acquisition patenting activity (Berger, Calligaris, Greppi and Kirpichev, 2025).

11.16 When the success of innovative projects is highly uncertain, they will fail with a high probability regardless of merger activity. This makes it difficult to ascertain when projects were acquired with the *intent* of shutting them down. Furthermore, so-called “killer acquisitions” may incentivise small firms to innovate more as it raises the probability of acquisition and hence provides an exit strategy, albeit one where some innovation is lost ex post (Bisceglia, Padilla, Perkins and Piccolo, 2021; Fons-Rosen, Roldan-Blanco and Schmitz, 2021; Phillips and Zhandov, 2012; Rasmusen, 1988).

11.17 There is also evidence of reduced product variety and quality post-merger (Berry and Waldfogel, 2001; Ashenfelter, Hosken and Weinberg, 2013; Atalay, Sorensen, Sullivan and Zhu, 2024; Li, Mazur, Park, Roberts, Sweeting and Zhang, 2022). The evidence is not dispositive, as some studies also find positive effects, typically where regulation and business practices prevent substantial price rises (Gugler and Szüczs, 2023; Argentesi, Cervone, Duso and Marrazzo, 2021) or there was limited competition ex-ante (Chen and Gayle, 2019; Doi and Ohashi, 2021).

11.18 In addition, M&A activity may reduce *duplication* of innovative activity (Letina, 2016), although duplication is a natural outcome of competition in the market for innovation and new ideas (Bryan, Lemus and Marshall, 2022).

11.19 Incentives to acquire innovative firms depend on the type of innovation they produce. Frésard, Hoberg and Phillips (2019) argue that when firms are in a high-R&D sector (structurally, or by maturity of the technological landscape), they are less likely to merge vertically, because acquirers will find it difficult to provide adequate innovation incentives to the target. When an industry is patent-intensive, vertical mergers are more likely, as potential targets have already legally protected their innovation rents.

11.20 Lefouili and Madio (2025) provide an exhaustive recent review of the wider literature on innovation investment effects of horizontal mergers. They, too, highlight the complexity of the competition-investment relationship. The authors distinguish between three distinct types of investment studied by economists: investments in new products, cost-reducing investments, and quality-enhancing investments. Different types of investment are affected differently by mergers and acquisitions. Because the externalities created by different types of investments differ, the effects of internalising them through a merger are also different.

11.21 Lefouili and Madio (2025) argue that the prospect of acquisition may offer an innovative entrant incentives to invest in entering the market when entry may not be profitable without the prospect of acquisition. However, incumbents can have incentives to stifle competition by acquiring emerging competitors and halting their innovative projects. This practice is usually considered anticompetitive because its sole objective is to reduce future competition. Therefore, allowing the acquisition of innovative entrants yields conflicting effects on competition and innovation. Much of the theoretical literature in this area aims to establish conditions under which the net effect is either positive or negative. Empirical results on the competition-investment relationship are mixed, and firm size and sector-

specific characteristics are important in determining the effect of competition on investment.

11.22 Lefouili and Madio (2025) argue that competition agencies are live to the issue of investment, and cite for instance the European examples of Medtronic and Covidien (2014), Novartis and GSK (2015), and Pfizer and Hospira (2015) in the pharmaceutical and medical device sector, as well as those between Dow and Dupont (2017), Bayer and Monsanto (2018), and Bayer and BASF (2018) in the agricultural products industry. These cases were all ultimately cleared with remedies that the authors argue broadly revealed an intent by competition authorities to increase innovation investment (such as divestment of R&D capacity to preserve innovation incentives).

11.23 In the UK, the CMA's recent *Vodafone/Three* merger decision went one step further, by obtaining specific investment commitment from the parties to increase competition between mobile network operators in the long term. The CMA found that some pro-competitive efficiencies were likely to arise from the merger between the UK's third- and fourth-largest mobile network operators, including from the parties' planned investments into network infrastructure. However, it also found that the efficiencies were unlikely to outweigh the harm to competition, including because the merged entity's incentives to deliver on the scale of the investments planned may potentially be reduced post-merger. To address this concern, the CMA accepted binding commitments from the merging parties to lock in their proposed investments to roll out a combined 5G network across the UK, alongside short-term measures to protect retail and wholesale customers.

Vertical mergers can raise investment

11.24 Most existing studies focus on the relationship between horizontal consolidation and investment outcomes. By contrast, the impact of vertical consolidation on investment incentives has received far less attention to date. Perhaps this reflects the insight that vertical mergers, as mergers of complements (not substitutes) involve positive externalities between parties and might therefore be expected to raise investment. Two recent theoretical studies and a small number of empirical studies provide new, concrete evidence on the topic.

11.25 D'Annunzio, Russo and Shekhar (2024) study theoretically the impact of vertical integration in the advertising technology market on quality investments in content creation. In the model they propose, vertical integration increases investment in content quality at the consolidated provider and reduces it at the (non-integrated) competitor. This is because

investment in quality raises the number of multi-homing customers, which in the model (by assumption) benefits the integrated provider and harms the stand-alone competitor. Whether vertical integration raises investment overall depends on the relative returns to scale of both firms, and the share of consumers predominantly consuming content from each. Ultimately, the overall impact of vertical integration on quality investment is an empirical question. Nonetheless, the paper makes clear the circumstances under which vertical integration would raise investment.

11.26 Cestone, Gao, Li and Mao (2025) do not study mergers per se, but investigate how artificial intelligence (AI) investment in the same supply chain is affected when data-sharing is made more difficult. They find that AI investment is higher at both directly affected firms and linked firms in the same supply chain when data access is easier, and particularly so for the most innovative upstream firms. This suggests that vertical mergers which facilitate data-sharing could similarly increase AI investment.

11.27 A few studies have also studied the empirical effects of vertical mergers in specific industries. Ciliberto (2006) studies vertical consolidation between US hospitals and physicians and finds an increase in investment compared to non-consolidated hospitals, particularly in markets where population coverage increases. Hansman, Hjort, Léon and Teachout (2020) show that quality upgrading is an important determinant of vertical integration in the Peruvian fishmeal industries. Similarly, Gil and Warzynski (2010) find evidence that vertical integration in the US videogame industry leads firms to produce higher-quality games.

11.28 Finally, Zhang and Tong (2021) compare successful vertical US mergers across US industries with vertical mergers that were announced but not successfully completed and find that vertical integration both increases innovation overall and changes the type of innovation firms pursue.

Software acquisitions and innovation

11.29 Given the substantial role the technology sector has played in recent years in both innovation and investment, acquisitions by technology companies and digital platforms have been a very active area of recent research (see, for instance, Letina, 2016; Gugler, Szücs and Wohak, 2025; Dijk, Moraga-González and Motchenkova, 2024). Studies have focused on the characteristics of the target firms in these acquisitions, and what, if anything, we can say about their impact on overall innovation.

11.30 Research shows that software industries account for a disproportionate share of horizontal mergers in the US (Wollmann, 2019). Software

industries are unusual due to the importance of network effects, data creation and collection, and dual-sided markets. Nascent empirical evidence in the tech sector (Eisfeld, 2024; Affeldt and Kesler, 2021) suggests that large technology firms typically acquire younger and more consumer-facing firms. While they discontinue half of acquired apps, they shift the strategy of continuers towards free-but-data-intensive applications.

11.31 For the UK, the CMA-commissioned Lear (2019) report finds that over the period 2008 to 2018, Amazon, Google and Facebook on average conducted twenty-five acquisitions per year between them. Targets were generally four years old or younger and often supplied complementary products or services to the acquirer (suggesting ecosystem features) rather than being horizontal competitors. Both the age of the targets and the ecosystem aspect make it potentially more difficult for competition authorities to assess the likely competitive impacts ex ante.

11.32 Gugler, Szücs and Wohak (2025) find that the effect of software acquisitions on innovation and investment differs substantially before and after 2010. Before 2010, the effect on innovation (as measured by patent citations) and on investment by venture capital in similar startups was negative. After 2010, the effect on innovation is positive, and the effect on venture capital investment dampened (though still negative). The authors argue that this change is likely due to patent and product portfolios of the largest tech firms becoming more similar over time, thus intensifying competition between them. This is consistent with findings by Jin, Leccese and Wagman (2022) documenting that large technology firms often make acquisitions in overlapping markets (implying some level of competition between them) and often expand into adjacent markets (again suggesting ecosystem features).

11.33 By contrast, Affeldt and Kesler (2021) investigate innovation of apps which compete with apps acquired by large platforms and find a reduction in innovation in these competitor apps. More research is necessary for a full understanding of how technology mergers and acquisitions affect ex-ante and ex-post investment decisions (in size, direction and type).

Acquisitions and serial entrepreneurs

11.34 Where an acquisition provides an exit route for founders and investors, understanding how those individuals make use of their exit, can help us understand the overall impact of an acquisition (the same is true of an exit facilitated via an IPO).

11.35 De Vera, Feliz, Karmakar and Sedlacek (2024) use rich Portuguese administrative data to understand the role of "serial entrepreneurs": entrepreneurs that own multiple firms over their lifetime. Firms owned by serial entrepreneurs are larger, more productive, grow faster, contribute more to overall employment and productivity growth and are less likely to exit than other firms. These patterns hold even for the first firm of serial entrepreneurs, suggesting that they reflect entrepreneur ability, and not simple luck or path dependence. Other studies find similar results for Denmark (Shaw and Sorensen, 2019) and Texas (Lafontaine and Shaw, 2014). Whether entrepreneurs add more to aggregate investment and productivity by remaining at their existing venture or a future one is still an open question empirically, although evidence on learning effects (for instance, Lafontaine and Shaw, 2014) may favour the latter.

11.36 Theoretically, Hellmann and Thiele (2022) argue that the *nature* of the acquirer can also matter for the decision to scale up or be acquired. In a model of cohorts of entrepreneurs, the presence of foreign buyers raises demand for start-ups and consequently both the number of start-ups and of acquisitions. Whether this is socially desirable depends on learning effects and brain drain among serial entrepreneurs. This suggests the possibility that the nature of the acquirer may matter more broadly, which poses important questions for future research.

11.37 Overall, there is consensus that in the presence of market power, horizontal mergers can decrease innovation, depending on both the existing market structure and the overlap in investment projects between acquirer and target. In many settings it is not only incumbent investment that falls, but also entry and hence long-run growth and innovation. In addition to the *level* of innovation the direction and scope may also be affected, but the net impact of these more subtle changes is ambiguous in most settings. Evidence on the impacts of vertical and platform mergers (as well as the role of common ownership) on innovation is more positive and seems to be strongly industry- and merger-specific.

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