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Long-Run Trends in Corporate Investment and Leverage in the UK: A Decomposition*

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Abstract

Since the 2008 Global Financial Crisis, the UK has experienced persistently weak productivity and corporate investment alongside a sustained decline in corporate leverage. We use a large annual panel of UK firms drawn from the FAME database to document and decompose these long-run trends over 2006–2023. Our productivity results confirm earlier evidence of weak growth and widening differences between leading firms and the rest, while extending the firm-level analysis through 2023 and to finance and insurance. Across productivity, investment, and leverage, we distinguish common time effects affecting incumbent firms from compositional effects associated with firm entry and exit. Productivity weakness after 2016 is primarily observed within incumbent firms. The investment slowdown is likewise concentrated after 2016 and driven mainly by declining investment intensity within firms. For leverage, compositional changes account for an important part of the decline around the Global Financial Crisis, whereas subsequent deleveraging occurs primarily within incumbent firms.

Keywords: UK economy, FAME, firms, leverage, investment, productivity
JEL codes: D22, E32, G32, L25

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1 Introduction

Since the 2008 Global Financial Crisis (GFC), the UK corporate sector has been characterised by three notable and closely related trends. Productivity has remained stagnant or declining, corporate investment started at a low level before declining markedly after 2016, and corporate leverage has fallen steadily over much of the post-crisis period. These developments stand out relative to other G7 economies and occurred despite an extended period of historically low interest rates and continued technological change. Understanding how these trends evolved across firms, whether they reflect common factors affecting all firms or changes in the composition of the corporate sector, is important for assessing the UK's post-crisis economic performance.

Using Bureau van Dijk's FAME database (Financial Analysis Made Easy), this paper provides new firm-level evidence on the evolution of productivity, corporate investment and leverage in the UK between 2006 and 2023. We study the dynamics of these outcomes through four distinct macroeconomic epochs: the years immediately before and after the GFC (2006–2009), the subsequent period of fiscal consolidation (2010–2015), the period of uncertainty following the UK's vote to leave the European Union (2016–2019), and the economic disruption associated with the Covid-19 pandemic and subsequent energy crisis (2020–2023). Using our new firm-level evidence, we first document trends in firms' assets, liabilities, output, investment, and leverage, and show that the relevant aggregate series are aligned with national-accounts evidence where comparable measures are available. We then focus on our three main outcomes, decompose aggregate trends into common time effects affecting incumbent firms from compositional changes associated with firm entry and exit, and examine how these patterns differ across sectors and firm sizes.

The FAME database is particularly well suited to this analysis. It provides a broad panel of public and private incorporated firms and combines profit-and-loss, cash-flow, and balance-sheet information with detailed ownership links. These features allow us to follow investment, liabilities, assets, and leverage jointly, identify the highest UK entity within a corporate group, avoid double-counting subsidiaries, and retain firms that subsequently

cease operating or reporting. The resulting panel therefore supports an analysis of both within-firm changes and selection through entry and exit.

There is a large existing literature analysing the causes of weak UK productivity growth since the financial crisis (Goodridge et al., 2018; Goodridge and Haskel, 2023) including studies using company accounts data (De Loecker et al., 2022). Our productivity results confirm the central conclusions of this literature, documenting weak productivity growth since the GFC and a widening upper tail of the firm productivity distribution. We update and extend this analysis by providing evidence up through 2023 and by broadening the scope of productivity analysis using accounts data to include not only manufacturing and the real economy but also services and finance and insurance.

In contrast, there is very little literature analysing trends in investment and leverage using micro-data. Our results begin to fill these gaps. Our investment results show low and declining investment with a clear downturn after 2016. The decline is even larger after controlling for permanent differences across firms. The post-2016 downturn is therefore driven mainly by a common reduction in investment intensity within all incumbent firms. Compositional changes partially offset this fall because firms with lower investment rates became more likely to exit. The common decline is present across all firm sizes but is largest among large firms. There is some recovery in investment after the Covid-19 shock, but, this recovery is limited and is primarily due to further changes in firm composition.

Our leverage results display a different pattern. During the GFC, changes in firm composition account for most of the initial decline in average leverage. Then, between 2010 and 2016, common time effects explain most of the further decline, while the contributions of entering and exiting firms offset one another over the period as a whole. After 2016, the net contribution of composition is again close to zero: entering firms have lower leverage, while incumbent firms have higher leverage relative to firms that exit. The continued decline in leverage is therefore primarily a common aggregate shift affecting all incumbent firms rather than the result of a changing firm population.

The paper relates most directly to three strands of literature. The first strand documents the UK's slow productivity growth after the GFC and its relationship with sectoral

reallocation, capital shallowing, and widening differences between firms (Barnett et al., 2014b; Patterson et al., 2016; Goodridge et al., 2018; Pessoa and Van Reenen, 2014; De Loecker et al., 2022; Coyle and Mei, 2023; Goldin et al., 2024). Our productivity evidence confirms and updates these patterns.

The second strand studies the weakness of UK business investment, including the role of Brexit-related uncertainty. Several recent papers use survey evidence on firms' investment intentions to quantify the effects of Brexit on investment and productivity by comparing firms with different exposure to the shock (Bloom et al., 2019, 2025a). Our analysis places the post-2016 decline in a longer firm-level perspective and shows how common time effects, firm composition, and firm size contribute to the observed investment path.

The final strand studies corporate balance sheets and deleveraging following the GFC (e.g. Barnett et al., 2014a; Kalemli-Özcan et al., 2022). Kalemli-Özcan et al. (2022) exploit a matched firm–bank–sovereign database covering European firms around the 2008–12 crisis. Using variation in bank balance-sheet weakness induced by sovereign-risk exposures, they find that financial leverage accounts for approximately 60% of the observed post-crisis investment decline. We document the longer-run decline in UK corporate leverage through 2023 and distinguish changes within incumbent firms from those associated with the entry and exit of firms with systematically different leverage.

The remainder of the paper is structured as follows. The remainder of this section provides international and UK macroeconomic context. Section 2 describes the FAME data and presents summary trends for the UK corporate sector. Section 3 analyses and decomposes the long-run trends in productivity, investment, and leverage. Section 4 concludes. Additional validation and robustness exercises are reported in the Appendix.

1.1 International context

To place the UK experience in a broader perspective, Figure 1 compares developments in productivity, investment, and corporate debt across G7 economies since 2000. Vertical dashed lines demarcate the four macroeconomic epochs used throughout the paper.

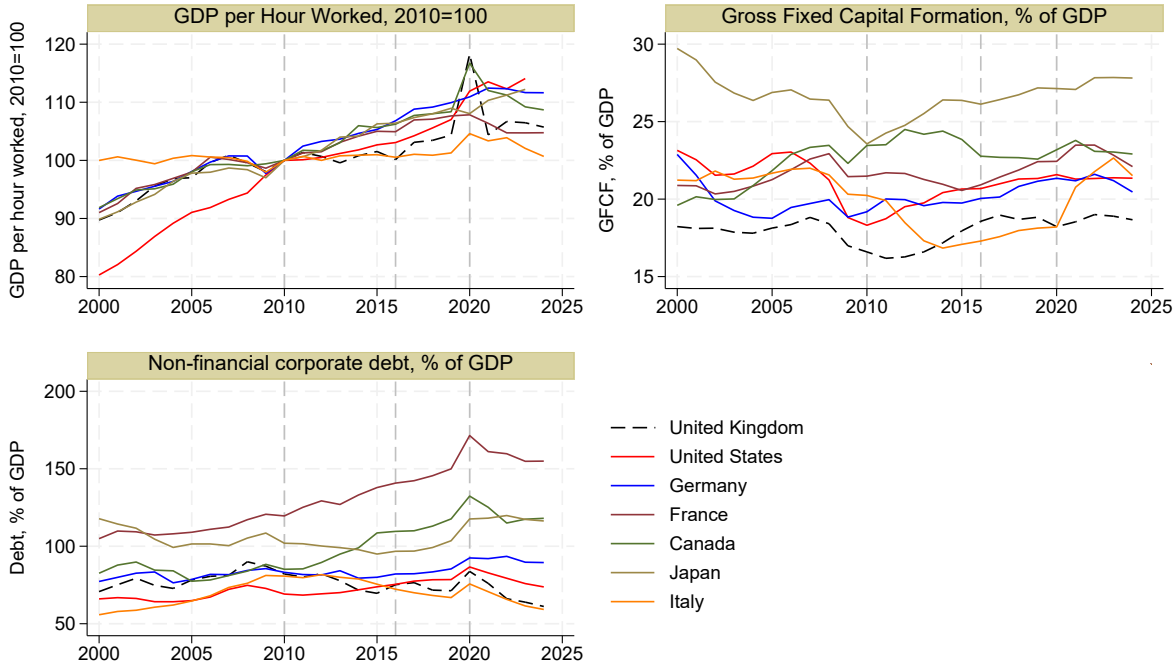
The top-left panel reports labour productivity, measured as GDP per hour worked and indexed to 2010=100. All G7 economies experienced a slowdown after the GFC, but the UK and Italy stand out for particularly weak post-crisis performance. This well-established UK productivity slowdown provides background for our analysis of firms' incentives to invest. Section 3.1 uses the FAME data to confirm and update the existing firm-level evidence.

The top-right panel reports gross fixed capital formation as a share of GDP. Throughout 2010 - 2025, the UK investment rate is lower than that of all other countries. Across all countries, investment rates decline during the GFC before subsequently recovering post-2010. The UK stands out in having stagnant investment particularly post-2016. Section 3.2 uses FAME data to investigate the corporate sector contribution to this trend in more detail.

Finally, the bottom-left panel shows corporate debt as a percentage of GDP. While corporate debt rises after the GFC in countries such as the United States, Canada, and France, it declines in the UK and Italy from 2008 to around 2015, remains broadly flat for several years, and falls again after the pandemic. UK corporate debt was not particularly high prior to the GFC. It was roughly in the middle of the pack. So, UK corporate debt levels were not obviously at unsustainably high rates. Instead, the UK combines persistently low investment with low and declining corporate indebtedness. Section 3.3 analyses this trend in more detail.

Taken together, these comparisons motivate the paper's focus on productivity, investment and leverage. Low and declining productivity potentially explain low investment. Low and declining investment suggests either low returns on investment or high costs of capital or both. By decomposing trends in these macroeconomic variables using firm-level microdata, we document the extent to which these important macroeconomic trends are driven by common aggregate factors versus the entry and exit of individual firms.

Figure 1: G7 comparisons: productivity, investment and debt



Notes: Real GDP per hour is converted from domestic currencies to USD using Purchasing Power Parity exchange rates and expressed at constant 2020 prices.

Source: GDP per hour worked data are from the OECD Productivity Database. Debt data are from the IMF Global Debt Database. Gross fixed capital formation data are from OECD National Accounts at a Glance.

1.2 UK context

To interpret the firm-level trends that follow, we divide the time period covered by our sample into four macroeconomic epochs, each roughly capturing a unique macroeconomic environment characterised by different combinations of demand, financing conditions, uncertainty, regulation, and government support. These four episodes provide an organising framework and their timing helps us interpret the decompositions in Section 3. The historical context associates movements in productivity, investment, and leverage with plausible economic mechanisms and our firm-level analysis establishes whether those movements can be attributed to common factors affecting all incumbent firms or to changes in the population of firms.

1.2.1 Global Financial Crisis, 2006–09

The UK entered the GFC as one of the world's most financially open economies, with a large banking sector heavily exposed to wholesale funding markets and structured credit products. Following the freezing of global interbank and wholesale funding markets in August 2007 (Brunnermeier, 2009; Gorton, 2010), credit conditions tightened sharply (Ivashina and Scharfstein, 2010). UK GDP fell approximately 6.1% from peak to trough (Office for National Statistics, 2017; Bean, 2010). In response, the Bank of England cut the bank rate to a then unprecedented 0.5% by March 2009 (Bank of England, 2009) and introduced large-scale asset purchases under its quantitative easing programme (Joyce et al., 2011). The government took partial or full ownership of Northern Rock, Royal Bank of Scotland, and Lloyds Banking Group (HM Treasury, 2009; Laeven and Valencia, 2013). UK government debt increased from less than 40% of GDP in 2007 to 70% of GDP in 2010 (Office for Budget Responsibility, 2025). At the same time, firms faced a simultaneous demand shock stemming from collapsing domestic and global demand, and a credit supply shock as banks tightened lending standards and increased spreads on corporate borrowing (Campello et al., 2010). These forces placed substantial pressure on corporate balance sheets and contributed to a sharp decline in investment and employment during the crisis.

1.2.2 Fiscal consolidation, 2010–15

The coalition government elected in May 2010 implemented a programme of fiscal consolidation aimed at eliminating the structural deficit within a single parliament (Office for Budget Responsibility, 2010). Fiscal policy tightening was primarily achieved through reductions in public spending rather than tax increases. Current public expenditure declined as a share of GDP, public investment was reduced substantially, and central government grants to local authorities were cut sharply over the subsequent spending review period (Institute for Fiscal Studies, 2019). These measures formed part of a broader fiscal adjustment following the large budget deficits that emerged after the Global Financial

Crisis (Blanchard and Leigh, 2013). For firms, fiscal consolidation reduced public-sector demand (important for many service industries), kept nominal wage growth subdued through public-sector pay freezes that exerted spillover pressure on private-sector wages, and maintained a climate of balance-sheet repair rather than expansion.

During this period, the UK also comprehensively overhauled its financial regulatory framework, combining domestic institutional reforms with the implementation of internationally agreed Basel III standards. The Prudential Regulation Authority and the Financial Conduct Authority were created by the 2012 Financial Services Act. New regulations were imposed, including stricter minimum capital requirements, a countercyclical capital buffer, a leverage ratio requirement, a liquidity coverage ratio, and annual stress testing. These measures increased the cost of capital and imposed greater restrictions on banks' ability to make loans.

1.2.3 Brexit, 2016–19

The June 2016 referendum result introduced a prolonged period of uncertainty about the UK's future trading relationship with the European Union. Research using the Bank of England's Decision Maker Panel estimated that Brexit uncertainty reduced aggregate UK business investment by around 11% over 2016–19 (Bloom et al., 2019).[1] The formal end of the transition period on 31 December 2020 introduced new non-tariff barriers with the EU, and trade volumes with the bloc relative to other partners fell materially in the first half of 2021 (Du et al., 2024).

1.2.4 Covid-19 and energy crisis, 2020–23

The pandemic caused UK GDP to contract by 11% in 2020, with particularly severe impacts in hospitality, retail, and transport. The government's fiscal response was unprecedented in peacetime: the Coronavirus Job Retention Scheme (furlough) supported around 11 million employee jobs; the Bounce Back Loan Scheme (BBLS) and Coro-

[1] In an update of this paper, Bloom et al. (2025a) find that Brexit led to a fall in investment by between 12-18% by 2025

navirus Business Interruption Loan Scheme (CBILS) extended around £80 billion of government-backed lending; and a range of sectoral support grants were provided. These pandemic measures substantially altered corporate balance sheets (raising liabilities via BBLS/CBILS) and suppressed firm exit below its counterfactual level, potentially sustaining some firms that would otherwise have failed.

This was then followed by a sharp increase in energy prices, in the wake of Russia's invasion of Ukraine in 2022. This led to consumer prices rising at their fastest rate for over 40 years, the bank rate to increase from 0.1% in 2021 to 5.25% in 2023, and government debt to exceed 90% of GDP. Increased inflation and interest rates put considerable strain on company finances, which was reflected in the highest number of company insolvencies for 30 years in 2023 (The Insolvency Service, 2025).

The four episodes have very different macroeconomic characteristics suggesting very different expected patterns in firm-level outcomes. The GFC combined a demand contraction with a credit-supply shock; fiscal consolidation prolonged weak demand while tighter financial regulation encouraged balance-sheet repair; Brexit raised uncertainty and the option value of delaying investment; and the pandemic support schemes simultaneously increased borrowing and reduced firm exit before inflation and higher interest rates placed renewed pressure on balance sheets. These distinctions guide our interpretation of breaks in the aggregate and within-firm series and of changes in the contributions of entering and exiting firms. We next describe the data used to measure those margins.

2 Data

2.1 FAME database

Our main dataset is FAME (Financial Analysis Made Easy), produced by Bureau van Dijk. FAME contains firm-level information on public and private companies registered at Companies House in the UK and Ireland. It combines balance-sheet, profit-and-loss, and cash-flow information with employment, industry classification, and detailed information

on corporate structure and ownership. The ownership files identify direct and indirect shareholders, subsidiaries, business groups, ultimate owners, and multinational structures. The underlying company filings are harmonised by Bureau van Dijk into a consistent format, providing broad coverage of incorporated firms relative to survey-based datasets.

These features make FAME especially useful for the analysis in this paper. Our central outcomes—investment, liabilities, assets, and leverage—draw directly on firms' cash-flow statements and balance sheets and can be followed jointly within the same firm over time. The ownership information allows us to define, for each firm, the relevant UK business-group unit and avoid double-counting activity recorded both in parent and subsidiary accounts. In addition, our sample records all firms, including those that are no longer active, which is essential for separating changes within incumbent firms from changes associated with entry and exit.

For the questions we study, FAME is a better option than surveys like the Annual Business Survey (ABS). The ABS is designed to measure production in the UK economy and has important advantages for variables such as intermediate inputs and for constructing nationally representative aggregates. It includes the population of the largest firms but only a stratified sample of smaller firms. By contrast, FAME's broad coverage of all incorporated firms including inactive firms combined with detailed information on ownership links, balance-sheet and cash-flow variables make it better suited to constructing the long firm panel required for our analysis of investment, leverage, and firm composition. In summary, the two sources are complementary. The ABS is particularly valuable for production and national-accounts measurement while FAME is particularly valuable for tracing corporate balance sheets and financing outcomes through time as we do.

2.1.1 Data cleaning

We focus on UK "parent firms" (defined below) observed at least once over the period 2006–2023. Our working dataset is constructed at the firm-year level and includes information on total and net assets, current and long-term liabilities, turnover (revenue), EBITDA, total wage bill, number of employees, and capital expenditure (investment). We

restrict the sample to firms with 10 or more employees and complete cleaned balance-sheet information (total assets, current and long-term liabilities, and shareholders' funds).

To ensure a consistent unit of observation and to avoid double-counting within corporate groups, we conduct our analysis at the level of the corporate group. For each corporate group, in each year, we define the parent firm to be the firm at the highest level of the business group within the UK. Thus for large corporate groups, our units of observation will typically be the consolidated accounts for the highest level UK based firms within the corporate groups as these accounts reflect the activities of subsidiaries. For independent firms, our units of observation will simply be the annual accounts published with Companies House. In each year, we match every firm to its UK parents and then exclude all firms that are subsidiaries of other UK firms. The resulting sample in each year consists of all independent firms, all firms that are the highest UK entity within a group but are not global ultimate owners (e.g. firms with a foreign parent), and firms that are global ultimate owners of their respective corporate groups.

We aim to provide a comprehensive analysis of the UK corporate sector. In contrast, much of the previous literature has focused only on manufacturing firms, typically excluding services, quasi-public sectors, and finance and insurance (De Loecker et al., 2022). While there are good economic and statistical reasons to treat these non-manufacturing sectors separately, we choose not to omit them because these sectors account for a substantial share of UK economic activity. Services and finance together make up around 80% of UK economic output (Office for National Statistics, 2025). Moreover, understanding financial sector trends in investment and leverage is crucial since the financial sector, by definition, plays a predominant role in intermediating the supply and demand of capital.

To simplify exposition, we present results for four broad sets of firms; the total economy which provides an aggregate view of the total economy and three broad subsectors which provide a more fine grained level of analysis. We label the four categories: *total*, which includes all firms in the sample; *real economy*, covering goods-producing sectors; *services*, comprising a broad range of service activities; and *finance and insurance*. Detailed category definitions, including the SIC codes, are provided in Appendix A.

One limitation of FAME is that the availability of financial variables depends on statutory reporting requirements, which differ by firm size and change over time. In particular, variables derived from the profit and loss account are less consistently reported for smaller firms. There is also a change in coverage and in accounting conventions over our sample period: the availability and definition of some variables, such as turnover and EBITDA, change noticeably from around 2010 onwards. These changes, in part, were due to changes in filing practices and the introduction of standardised electronic reporting. In addition, regulatory changes implemented from 2016 raised the thresholds defining small firms and expanded the scope for simplified reporting, affecting the availability of detailed financial information for smaller firms in later years.

We have cleaned the data to account for these issues as best as possible but some issues remain. For example, measures for gross value added and turnover prior to 2010 are inconsistent across firms. For this reason, for these variables, we restrict our analysis to 2010 and after. Further details of these data issues and how we address them are provided in Appendix A.

Finally, we implement a number of data cleaning procedures to ensure internal consistency and accuracy. In particular, we verify that balance sheets satisfy the accounting identity that assets equal liabilities plus equity. In some cases, we manually correct the FAME database using information obtained from original company filings published with Companies House. We also address some industry classification issues that arise because some parent firms are classified as holding companies or activities of head offices even though the groups they control are predominantly active in other sectors. For example, in the FAME data, Shell PLC is classified under SIC70 (i.e. activities of head offices) despite the main activity of its subsidiaries being the extraction and processing of oil and gas. For cases such as this, where a parent firm is classified as SIC 70 but its textual descriptions indicate a substantive operational focus in another sector, we reclassify firms based on the detailed textual descriptions of the groups' business activities. Specifically, we use the gpt-4o-mini model, accessed via the OpenAI API, to analyse firms' business descriptions and propose alternative SIC classifications, which are then evaluated using

pre-specified decision rules. Further details on the reclassification procedure, data construction and cleaning, and data validation are provided in Appendix A.

To provide consistent measures of real economic activity, we deflate all series except wages using the UK GDP deflator. For wages, we deflate using the Consumer Price Index (CPI) to reflect the real value for workers. All values, when expressed in monetary terms, are expressed in real terms using constant 2024 prices.

2.1.2 Sample representativeness

In the past, single 'vintage' downloads of longitudinal data from Bureau van Dijk's ORBIS data (of which FAME is the UK component) were incomplete, as they did not include firms that had stopped reporting for a certain number of years. This led to a survivorship bias which undermined their representativeness (Kalemli-Özcan et al., 2015). For this reason, past studies (e.g. De Loecker et al. (2022)) have used ORBIS's Historical Product, which links different vintages of the data using firm identifiers to create a representative panel.

Our sample of FAME data, downloaded in batches in 2025/26, does not suffer from this issue because we were able to download all firms, including those that no longer exist. Figure B.1 in Appendix B shows that the number of firms in our data (before sample selection) closely tracks both the number of firms reporting information to Companies House over time, and is also similar to the number of firms in the ORBIS Historical Product data used in De Loecker et al. (2022) for the years their study covered.

Table B.1 details the number of firms in our sample by size and industry. The total number of firms increases from 43,528 in 2006 to 57,320 in 2023, with no sharp discontinuities in either total annual counts or counts by firm size that might indicate large changes in reporting requirements.

2.2 Relationship with national accounts

National accounts data and company accounts data are not identical. They are collected for different purposes. There are four main differences. First, company accounts data

relates to firms *registered* in the UK. Many of these firms have substantial overseas operations whose employment, investment and turnover are also recorded in their accounts data. In contrast, national accounts data cover business activity taking place in the UK. We searched through the FAME database, the open web, and many alternative sources for information sufficient to measure the UK share of global economic activity. While information on the UK share of activity can be found for some firms, currently, it is not feasible to systematically identify the UK share of activity for all firms. As a result, some measures of UK economic activity might be overstated in our data.[2] When possible, we compare time series trends in our data to trends in national accounts data and show that they are aligned.

Second, our measure of total assets includes financial assets in addition to the physical and intangible capital measured in national accounts. Financial assets are not included in national accounts definitions of the corporate sector capital stock. This is a definitional distinction, and the appropriate measure depends on the question of interest. The narrower national accounts measure is well suited to studying the accumulation of productive capital, whereas our broader measure is useful for tracking firms' total investment activity, including acquisitions of financial assets and other businesses. It is also the relevant balance-sheet denominator for studying leverage, since financial as well as non-financial assets may support firms' borrowing and capacity to repay. Finally, including financial assets is essential when studying the financial sector, since financial assets constitute a large share of financial sector firms' assets. Excluding them would provide a highly incomplete picture of balance-sheet size and leverage.

Third, the definition of investment in firm-level financial accounts differs from the definition of business investment reported in the national accounts, although, as we show in the Appendix Figure B.3, the quantities track each other quite closely. In particular, to measure investment, we use the net outflow of cash for investment activities from firms' cash flow statements. This measure includes both the net costs of acquiring physical

[2]Our data do include the UK operations of overseas firms. Foreign firms that establish a physical presence in the UK must file accounts with Companies House. For these firms, the accounts of the top-level UK parent do record their UK activity.

capital and intangible assets (such as patents and licences) and the net proceeds from the acquisition of other business and subsidiaries and financial assets. In contrast, business investment as measured in the national accounts only includes net capital expenditure on physical capital and intangible assets. Importantly, it does not include net acquisitions of financial assets, subsidiaries or other companies. In national accounts, such transactions are treated as changes of ownership rather than the accumulation of capital.

A final difference between our analysis and national accounts is that we deflate our series using the GDP deflator, rather than quantity-specific deflators. Another option would be to apply industry-specific deflators from the national accounts. This would however mean that each industry's contributions to aggregate or average trends would be expressed in different units, requiring us to make a decision about how to aggregate changes across industries. Moreover, industry-level deflators are not published for all of the quantities we use. Finally, as we have discussed the measures we are using do not correspond exactly to national accounts concepts, which complicates the interpretation of deflated quantities. For reasons of transparency, we therefore apply a common deflator to all series.

2.3 Summary trends

We report summary trends for net and total assets, liabilities, turnover and gross value added. These results allow us to understand how the broad stock of assets and debt in the economy and sector-level output have evolved over the four macroeconomic stress episodes arising over the 18 years covered by our sample.

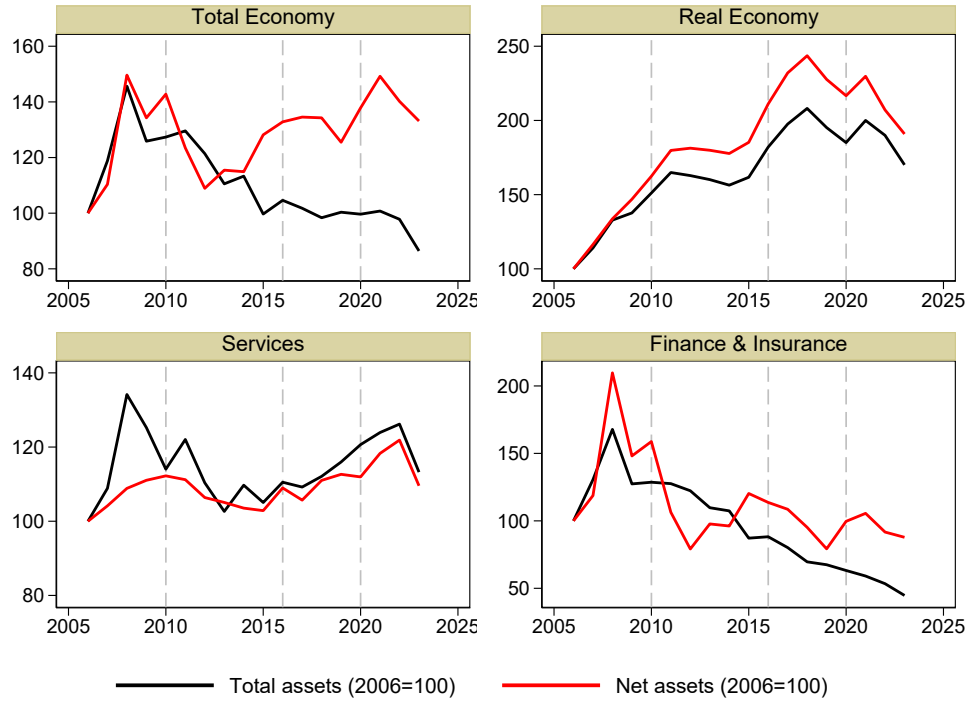
2.3.1 Assets

Total assets measure the total value of capital controlled by the firm. Components include buildings and machinery, inventories, cash, receivables, intangible assets, and financial assets. Net assets measure total assets minus current (i.e. short-term) liabilities. These indicate the firm's buffer against insolvency and the equity financing of the firm, and so

shed light on solvency, financial risk, and capital structure.

Figure 2 plots mean real total assets (GDP-deflated, index 2006 = 100) and mean real net assets (total assets minus current liabilities) by broad industry group over 2006–2023. Dashed vertical lines mark the boundaries between the four macroeconomic epochs.

Figure 2: Total and net assets



Notes: Annual unweighted mean across firms within sector, deflated by the UK GDP deflator and indexed to 2006.

Source: Authors' calculations using FAME.

Both total and net assets grew strongly in the pre-crisis period 2006-2008, reflecting the credit expansion of 2004–07. This growth was shared across all sectors. The GFC was followed by a sharp divergence in asset growth across sectors. In the real economy, both total and net assets continued to grow after the GFC, levelled out, then grew during the fiscal consolidation period, before falling after 2017. During the growth period, net assets grew faster than total assets.

In contrast, in the finance and insurance sectors, the GFC produced a sharp fall in net assets, likely driven by write-downs of financial instruments. After the crisis, total assets

declined steadily from 2008 to 2023, whereas net assets levelled out after 2012.

Asset growth in the services sector was somewhere in between these two extremes. Total assets fell strongly after the GFC before growing moderately from 2013 to 2022. Net assets followed a long, slow moderate wave of growth, decline, and growth, resulting in moderate net growth over the period.

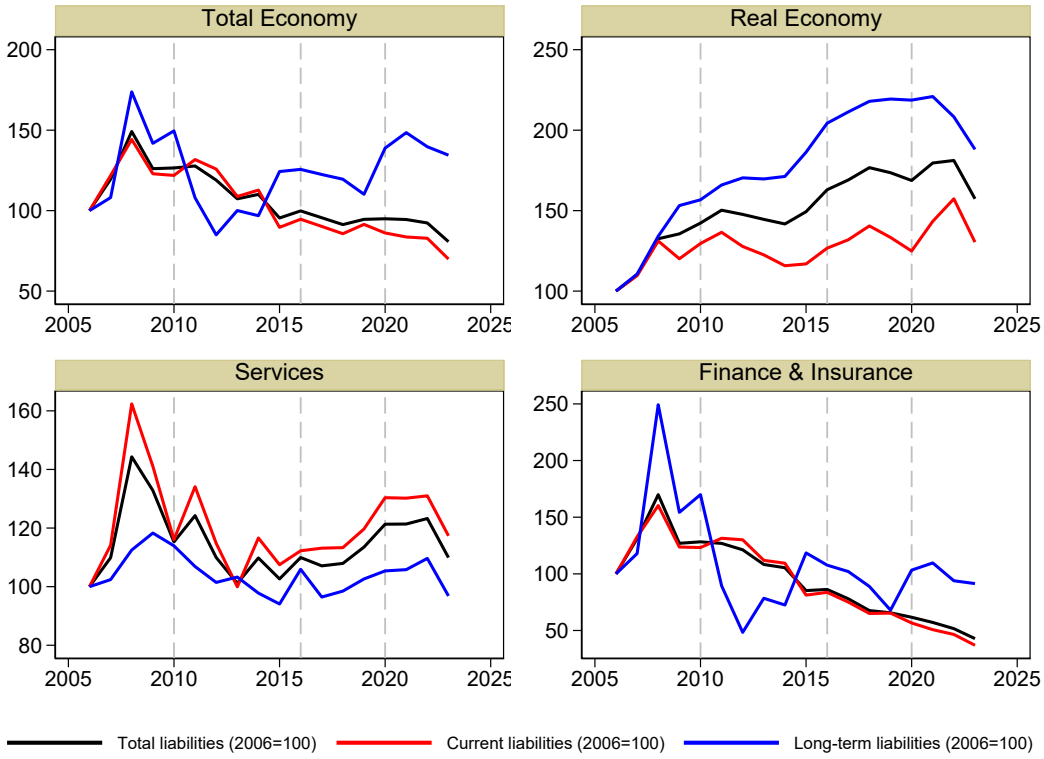
Overall, the finance and insurance sector, which accounted for 76% of total corporate assets at its peak in 2008, shrank to 65% while the real economy and services sectors increased from 10% to 14% and from 14% to 21%, respectively.

2.3.2 Liabilities

Current liabilities measure the short-term liabilities of firms. These are liabilities that must be repaid within one year. The level of current liabilities can be used to understand the extent to which firms are liquidity-constrained. Long-term liabilities reflect the long-term solvency of firms. In some cases, these arise from firms' net pension liabilities. In other cases, they arise in capital-intensive industries to finance large capital expenditures with stable long-term cash flows.

Figure 3 plots the evolution of total UK corporate liabilities by sector. As with assets, there are important differences across sectors. Both current and long-term liabilities increased sharply in all sectors from 2006-2008. In finance and in services, current liabilities increased 60% in this period, while long-term liabilities increased 150% in the financial sector. These large increases were followed by large falls as debts were written down. By 2015, liabilities in these sectors were back to their 2006 levels. After this, liabilities in the finance and insurance sector continued to decline so that liability levels in this sector were 50% of their 2006 levels by 2023. In contrast, in the services sector, after 2015, long-term liabilities remained flat while current liabilities grew moderately.

Figure 3: Corporate liabilities by sector



Notes: Liabilities deflated by the UK GDP deflator and indexed to 2006. Current liabilities are liabilities falling due within 12 months.

Source: Authors' calculations using FAME.

The real economy behaved very differently. Liabilities only grew about 30% in the GFC. After the GFC, current liabilities largely remained flat throughout the period while long-term liabilities grew strongly. By the start of the Covid-19 period, long-term liabilities in the real economy were more than 100% higher than in 2006. In part, this may have reflected a long period of low interest rates following the GFC. However, it also raises questions about how corporations will finance that debt now that the period of low interest rates has ended.

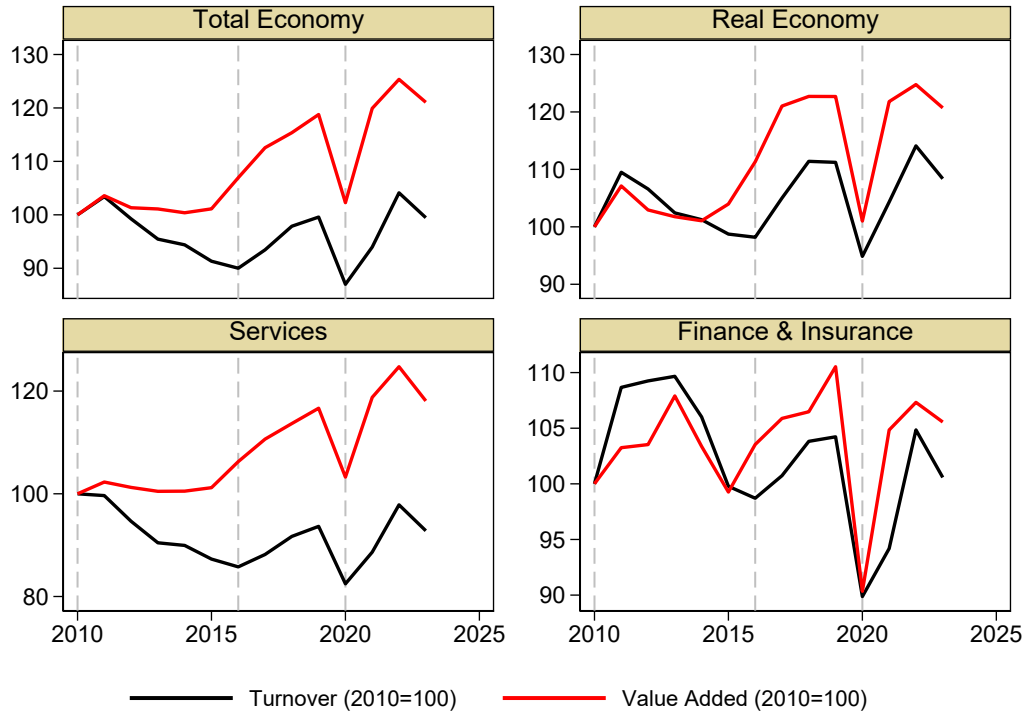
2.3.3 Turnover and gross value added

Figure 4 shows how real turnover and gross value added evolved from 2010-2023. For turnover and gross value added, data prior to 2010 are inconsistently measured across

firms and so are not reported. One can see that output of the total economy, as measured by turnover, declined by 10% from 2010 to 2016, before recovering by 2020, crashing during Covid-19 and recovering post-Covid-19. By the end of the sample period, output was back to its starting point in 2010. Patterns within subsectors showed some deviations from this aggregate trend, with the real economy fluctuating and showing net growth of 5–10% and finance and insurance also fluctuating and showing some net growth of a few percent.

Gross value added performs better over the sample period, showing roughly 20% growth over the sample period despite the large temporary downturn caused by the Covid-19 pandemic. Both services and the real economy demonstrated gross value added growth of close to 20% while growth in gross value added in finance and insurance was less than 10%.

Figure 4: Turnover and gross value added by sector



Notes: Turnover (revenue) and gross value added (wage bill plus EBITDA) deflated by the UK GDP deflator and indexed to 2010. Data prior to 2010 are inconsistent across firms and so are not reported.

Source: Authors' calculations using FAME.

3 Long-run trends in productivity, investment, and leverage

The previous section documented the evolution of firms' assets, liabilities, turnover, and gross value added. We now examine long-run trends in productivity, investment, and leverage within a common framework, comparing their timing against the four macroeconomic epochs described in Section 1.2. For each outcome, we first describe differences across sectors and provide some details about the distribution across firms. We then analyse the time series behaviour of each outcome, decomposing the time series behaviour into common aggregate factors that affect all firms in the same way and compositional effects that reflect changes in the population of firms. To do this, we compare time series effects obtained from an OLS regression with time series effects obtained from a firm fixed effect model. That is, we compare time series effects from the following two models:

$$y_{it} = \delta_t^{OLS} + \varepsilon_{it} \tag{1}$$

$$y_{it} = \delta_t^{FE} + \gamma_i + \varepsilon_{it}. \tag{2}$$

The time series effects from model (1) measure how the average outcome varies over time. The changes in the average outcome reflect both changes in the composition of firms and the impacts of aggregate factors that affect all firms in the same way. The time series effects from model (2) measure the impacts of aggregate factors after controlling for changes in the population of firms. The fixed effects in the model remove idiosyncratic firm-level effects. The difference between the two time series captures the impact of changes in firm composition.

We further decompose the the difference between these two sets of time effects into components attributable to entrants and to incumbent (continuing) firms. To do this, let E_t be the set of entrant firms in period t, let I_t be the set of incumbent firms, and let N_t

be the number of active firms in year t. We then decompose the compositional effect:

$$\delta_t^{OLS} - \delta_t^{FE} = \frac{\sum_{i \in E_t} \gamma_i + \sum_{i \in I_t} \gamma_i}{N_t}. \tag{3}$$

The two terms on the right are the period t components due to entrants and incumbent firms, respectively. The sum of the two components is the total compositional effect. This decomposition enables us to understand the extent to which changes in firm composition can be explained by entry and exit of firms.

3.1 Productivity

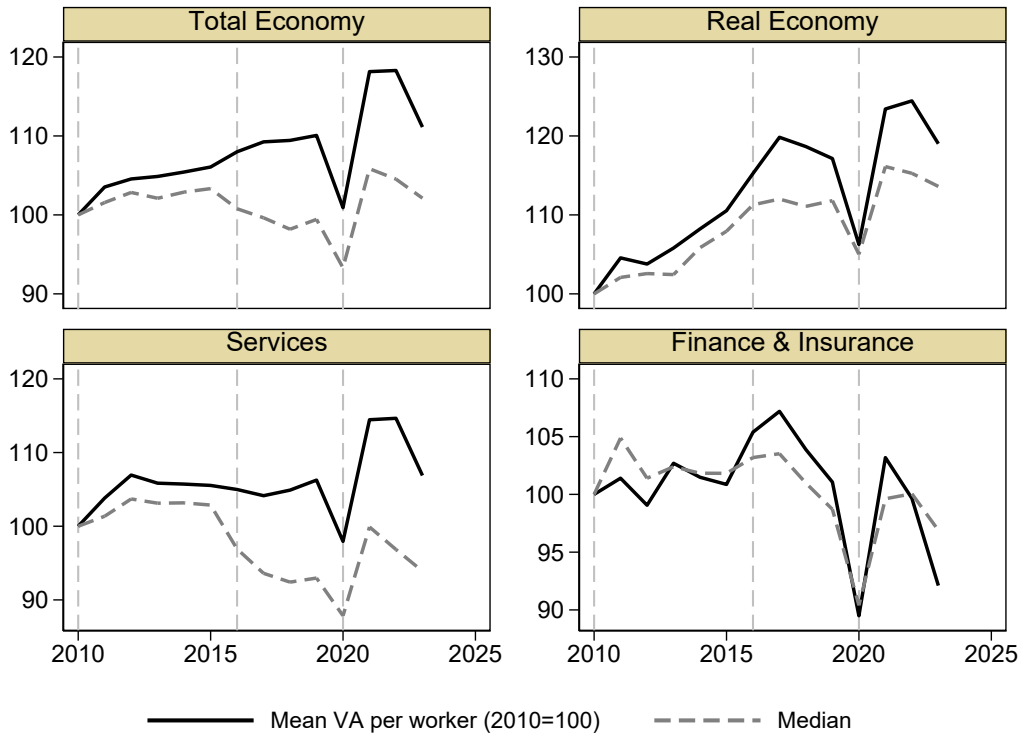
The slowdown in UK productivity growth following the Global Financial Crisis is well established. Aggregate and industry-level studies attribute it principally to weaker capital deepening and slower TFP growth rather than to a reallocation of activity towards less productive industries (Goodridge et al., 2018; Goodridge and Haskel, 2023). Firm-level work also documents widening differences between firms and the tendency of firms at the productivity frontier to pull away from the rest of the distribution (De Loecker et al., 2022).

In this section, we document that the FAME panel confirms the principal results of this literature. We then update that literature by providing evidence through 2023 and extend the literature by providing evidence on services and the financial sector, two sectors that are ignored by much of the previous literature.

Figure 5 reports mean and median labour productivity, measured as real gross value added per worker. It confirms the broad weakness of productivity growth after the financial crisis, while revealing substantial differences across sectors. In services, median productivity was flat until 2015 and then declined, with only a partial recovery after the Covid-19 trough. The real economy experienced moderate growth up to 2015, followed by stagnation and then a strong rebound in 2022–23. In finance and insurance, productivity weakened over much of the period. The divergence between mean and median productivity, particularly in services, indicates that the limited gains were concentrated among a

relatively small group of firms.

Figure 5: Gross value added per worker by sector



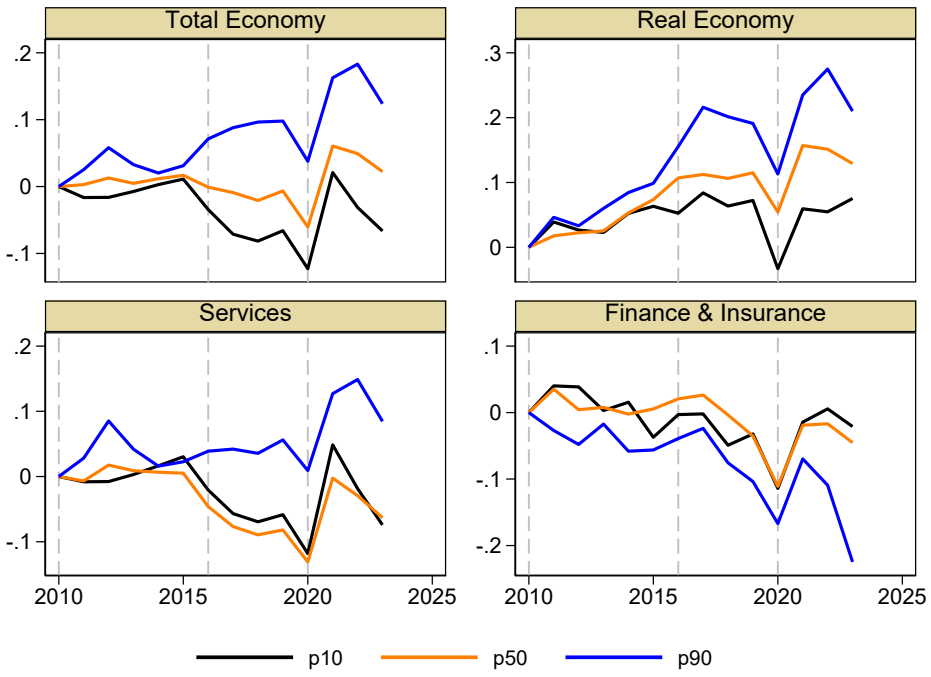
Notes: Mean and median gross value added per worker, deflated by the UK GDP deflator and indexed to 2010. The series start in 2010 because accounting changes affecting some sectors make earlier estimates unreliable.

Source: Authors' calculations using FAME.

The distributional evidence in Figure 6 confirms and updates the pattern documented by De Loecker et al. (2022). In services, the 90th percentile continues to pull away from the median after 2016, while productivity in the lower half of the distribution declines. Growth is more broadly distributed in the real economy, although it remains stronger at the top. Finance and insurance, which was not covered by their analysis, follows a different path: productivity declines across much of the distribution and particularly at higher percentiles. Thus, the post-2016 data extend rather than overturn the earlier evidence of widening differences between frontier firms and the rest.

We next examine whether the aggregate path reflects common aggregate factors affecting all incumbent firms or changes in the composition of the firm population. Figure 7 compares year effects from pooled regressions with estimates that include firm fixed

Figure 6: Dispersion of log gross value added per worker



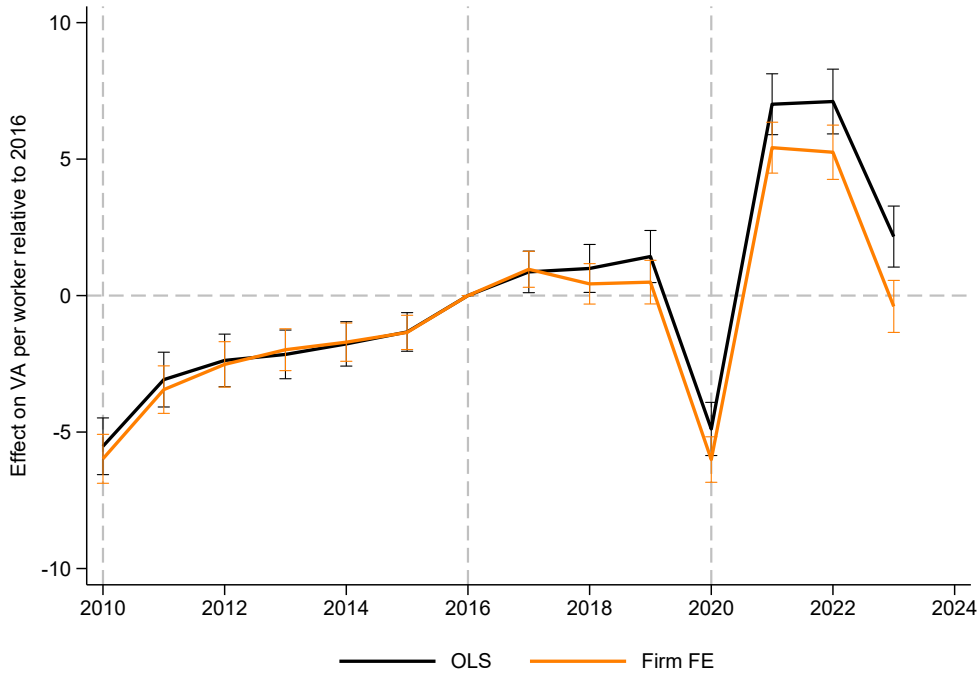
Notes: For each sector, the figure plots the 10th, 50th, and 90th percentiles of log gross value added per worker. Values are deflated using the UK GDP deflator and indexed to zero in 2010.
Source: FAME.

effects. Labour productivity rises between 2010 and 2016, stagnates from 2016 to 2019, falls sharply during Covid-19, and only partly recovers thereafter. The two estimates remain close, especially before 2017, showing that changes in firm composition account for little of the overall path.[3] Starting in 2017, changes in firm composition do start to play a more important role. From 2017 to 2019, average gross value added per worker increased from 0.9 to 1.4 percentage points above its 2016 level. This increase was entirely driven by compositional effects as the trend in aggregate productivity as measured by the firm FE model was negative.

Figure 8 separates the gap between the estimated year effects between the OLS and fixed effect specifications into the contributions of incumbent and entering firms. Before 2017, relatively productive entrants and the exit of relatively unproductive firms made offsetting contributions. After 2017, entrants were somewhat less productive than incumbent firms, but the exit of low-productivity firms continued to raise measured aggregate

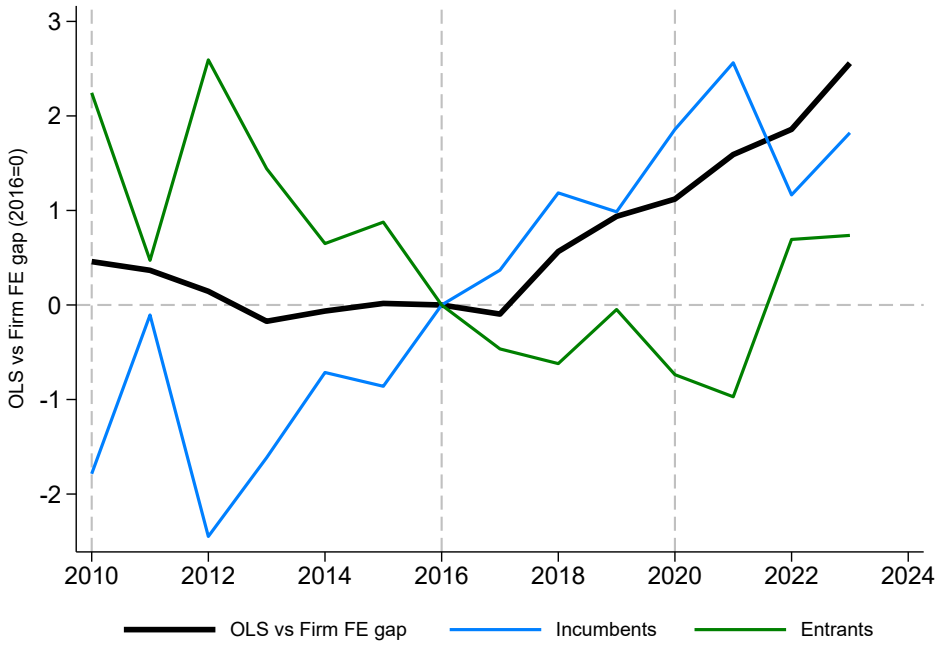
[3]Using log gross value added per worker yields similar results.

Figure 7: Decomposition of gross value added per worker



Notes: Estimated year effects for gross value added per worker relative to 2016 from pooled OLS regressions (black) and firm fixed effects regressions (orange). Vertical lines show confidence intervals. Gross value added is the sum of the wage bill and EBITDA.
Source: Authors' calculations using FAME.

Figure 8: Value added per worker: incumbent and entering firms

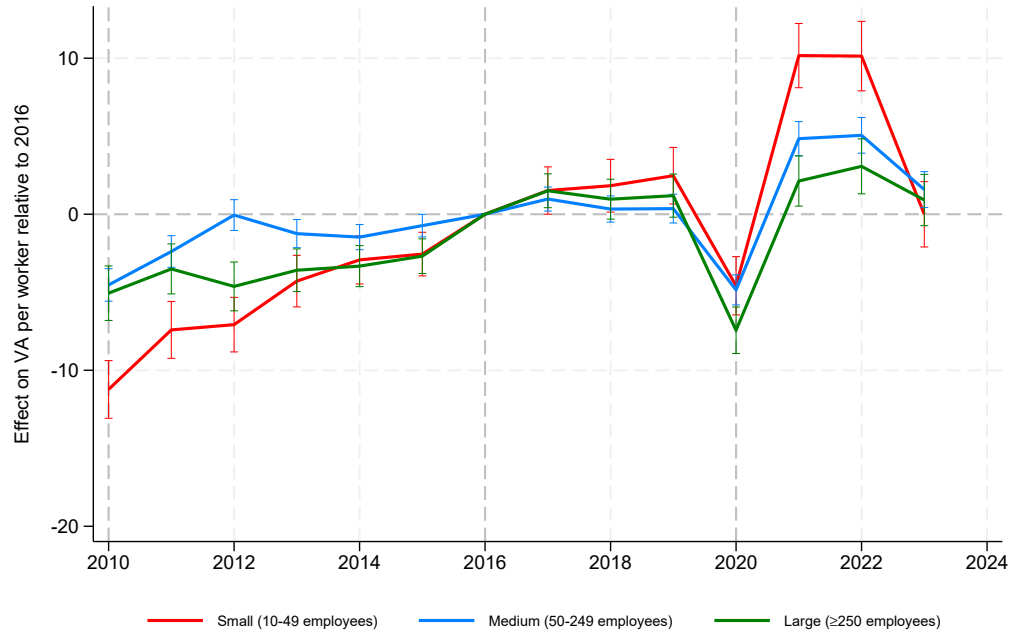


Notes: The black line shows the gap between pooled and firm fixed effects estimates in Figure 7. The blue and green lines show the contributions associated with incumbent and entering firms.
Source: Authors' calculations using FAME.

productivity. This compositional shift led to an increase in aggregate gross value added per worker up to 2019. After 2019, the compositional trends continued but were swamped by large productivity swings due to Covid and post-Covid changes.

Figure 9 points to a heterogeneous pattern in gross value added per worker across firm sizes. Small firms experienced the strongest improvement over 2010–2019, while large firms also increased their gross value added per worker, particularly between 2010 and 2017. Medium-sized firms, however, remained broadly stable over most of the period.

Figure 9: Gross value added per worker by firm size



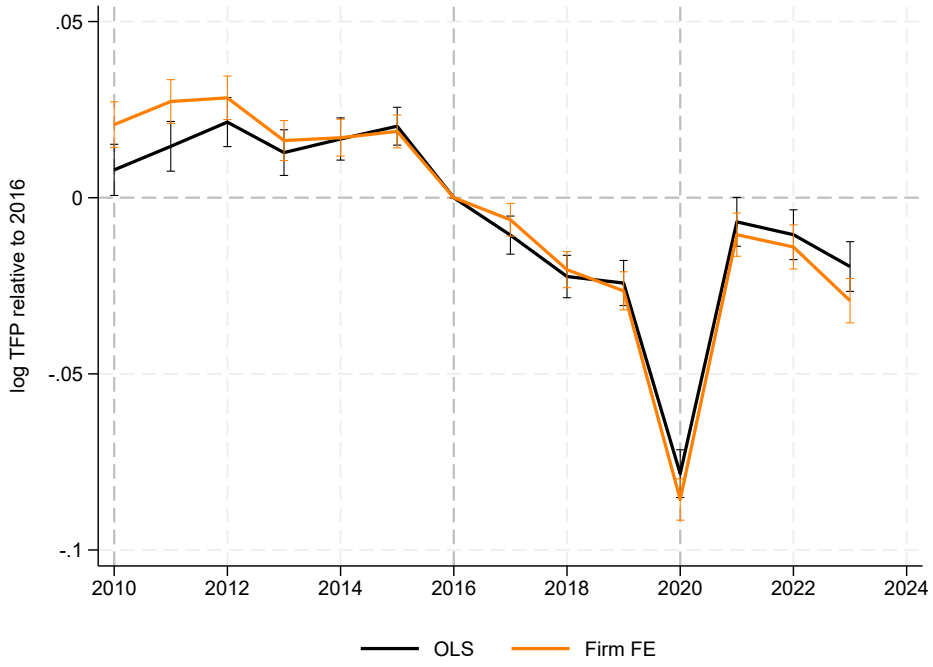
Notes: Estimated year effects for gross value added per worker relative to 2016 from firm fixed effects regressions by firm size. Vertical lines show confidence intervals.
Source: Authors' calculations using FAME.

Gross value added per worker reflects both capital intensity and underlying efficiency. To identify efficiency effects only, Figure 10 presents a proxy for TFP obtained from regressions of log gross value added on log total assets, log employment, and year indicators. The fixed effects specification additionally controls for permanent differences between firms.[4]

The TFP proxy is relatively stable in the first half of the sample, declines after 2015,

[4]Gross value added is the sum of the wage bill and EBITDA. Observations with non-positive gross value added are excluded because its logarithm is undefined.

Figure 10: TFP based on gross value added



Notes: Estimated year effects from regressions of log gross value added on log total assets, log employment, and year indicators. The black line reports pooled OLS estimates; the orange line additionally includes firm fixed effects. Both are relative to 2016, with confidence intervals shown by vertical lines.
Source: Authors' calculations using FAME.

falls sharply during the pandemic, and recovers only partially. Pooled and fixed effects estimates again remain close; if anything, the slightly weaker fixed effects series after 2016 implies that the exit of low-productivity firms masks part of the deterioration among incumbent firms. This is qualitatively consistent with Goodridge et al. (2018) and Goodridge and Haskel (2023), who find that slower TFP growth, alongside weaker capital deepening, accounts for much of the UK's post-crisis productivity slowdown.[5]

Overall, the FAME evidence confirms the established finding of weak UK productivity growth and the widening gap between leading firms and the rest. The evidence extends the existing literature in three ways: it updates the firm-level evidence through Brexit, Covid-19, and the energy crisis; it extends the scope of the analysis to include services, finance and insurance alongside the real economy; and it shows that the post-2016 weakness remains after accounting for entry, exit, and permanent differences between firms. This

[5]Relatedly, Bloom et al. (2025b) find that for the Covid-19 period, falls in 'within-firm' changes in TFP were offset by 'between-firm' reallocation towards more productive firms.

last result also provides a useful point of comparison for the investment and leverage decompositions that follow.

3.2 The slowdown in corporate investment

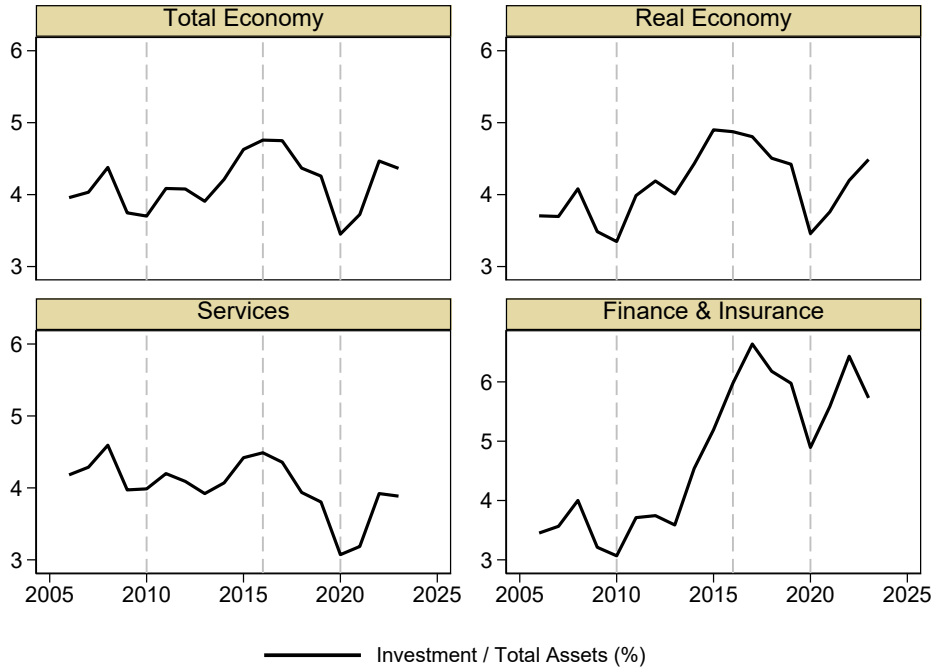
We next document the weakness of corporate investment from 2006-2023. Although aggregate corporate investment increased in level terms between 2006 and 2023, the investment rate, measured as investment relative to total assets, was broadly stagnant over extended periods and declined markedly after 2016. This pattern is consistent with low productivity growth and weak expected returns to capital, but it is harder to reconcile with a period of very low interest rates and continuing technological change. Here we document and decompose this slowdown in UK investment.[6]

Figure 11 shows that the aggregate dynamics conceal substantial sectoral heterogeneity. In services, the investment rate was relatively stable until around 2016, after which it fell from 4.5% to around 3% by 2020, before recovering only partially after the pandemic. In the real economy, by contrast, the investment rate rose steadily from 2010 to 2016-2017, reaching a local peak just before the Brexit slowdown, and then declined through the late 2010s and into the Covid-19 shock. Finance and insurance display the most pronounced cyclical pattern, with a strong increase in investment rates up to 2017, followed by a sharp reversal. In all sectors, the pandemic induced a large temporary contraction in 2020, followed by a rebound in 2021–23. These patterns indicate that the post-2016 slowdown is not simply a continuation of post-crisis weakness from the GFC, but rather reflects a distinct shift in investment behaviour in the later part of the sample.

To disentangle aggregate trends from changes in firm composition, Figure 12 compares average investment rate year effects to average investment rate year effects after taking out firm fixed effects. This decomposition yields several broad results. First, during the GFC, after accounting for firm fixed effects, the aggregate investment rate declined by about 1 percentage point. This decline was largely offset by changes in firm composition. Second,

[6] As already discussed in Section 2, our measure of investment is based on firms' reported cash outflows from investing activities and therefore captures a broader concept than national-accounts business investment, although Appendix Figure B.3 shows that the aggregate series track each other closely.

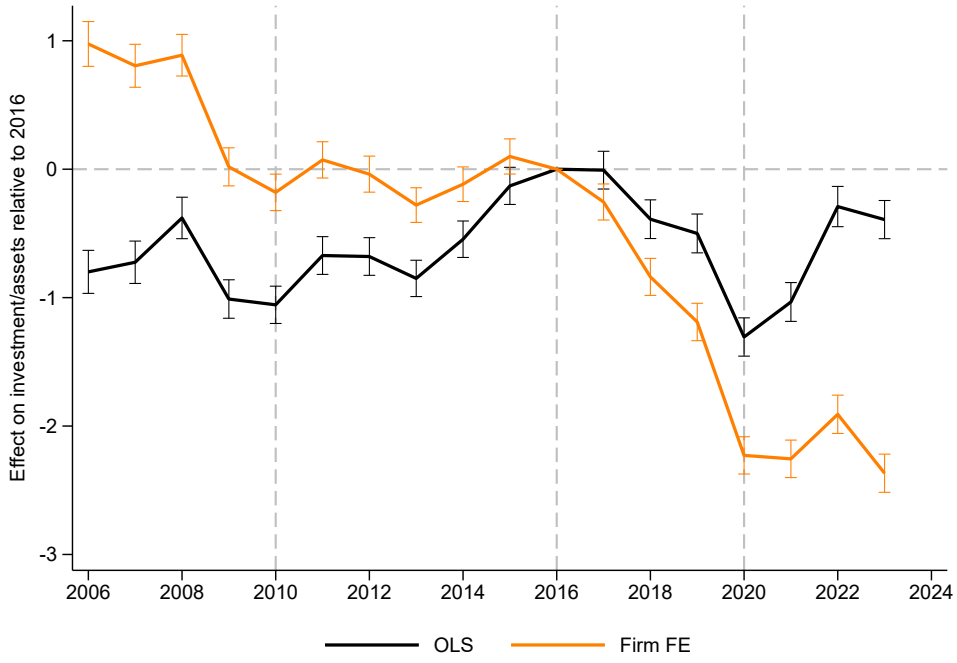
Figure 11: Investment ratio by sector



Notes: For each sector, the figure shows the average of the ratio of investment to assets. This is the investment rate.

Source: Authors' calculations using FAME.

Figure 12: Investment rate decomposition



Notes: The figure shows estimated year effects for the investment rate relative to 2016 from pooled OLS regressions (black line) and firm fixed effect regressions (orange line). Vertical lines show confidence intervals. The investment rate is measured as investment divided by total assets.

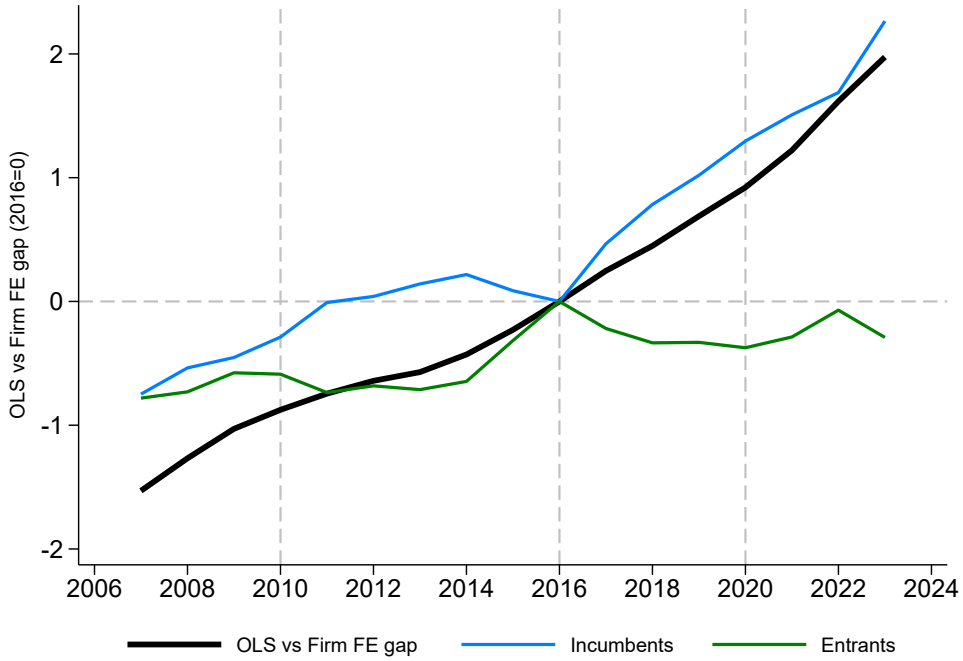
Source: Authors' calculations using FAME.

during the fiscal consolidation period, the fixed-effects-adjusted series remains broadly flat while the raw average increases. The observed rise in the investment rate during the early-to-mid 2010s was driven primarily by shifts in the composition of firms towards those with structurally higher investment rates, rather than by an increase in aggregate investment intensity. Third, and most importantly, this pattern changes sharply after 2016. The fixed effects series declines by around 2 percentage points between 2016 and 2020, while the raw mean falls by roughly half as much. The post-2016 slowdown is therefore fundamentally an aggregate phenomenon affecting all firms, only partially offset by compositional effects. Finally, after Covid-19, the fixed effect series remained flat while compositional changes caused the average to increase, indicating a partial recovery in the average investment rate driven primarily by shifts in firm composition rather than a rebound in common trends.

Figure 13 provides further insight by decomposing the compositional effects into contributions from incumbent and entering firms. During the GFC, both incumbent and entering firms exhibit below-average investment rates, implying that exiting firms were relatively high-investment firms. In the fiscal consolidation period, entrants continue to invest less than average, while incumbent firms contribute little to compositional changes. After 2016, however, the nature of selection changes. Investment rates of entrants move closer to the average, while incumbent firms account for most of the positive compositional effect. This reflects the increasing exit of low-investment firms rather than unusually strong investment by new entrants. Thus, while compositional changes mitigate the aggregate decline in investment after 2016, they do not overturn the underlying reduction in investment intensity within firms.

These findings clarify the nature of the UK investment slowdown. Most of the decline is driven by common factors affecting firms and is not explained by shifts in firm composition or by the entry of low-investment firms. Instead, incumbent firms themselves appear to have reduced their investment intensity. A natural explanation for this pattern is provided by the weak productivity dynamics documented in Section 3.1. In standard frameworks, investment depends on the expected marginal product of capital. The stag-

Figure 13: Investment rate: incumbents vs entrants



Notes: The black line shows the gap between OLS and firm fixed effects from Figure 12. The blue and green lines show the respective contributions of incumbents and entering firms to this gap. The investment rate is measured as investment divided by total assets.

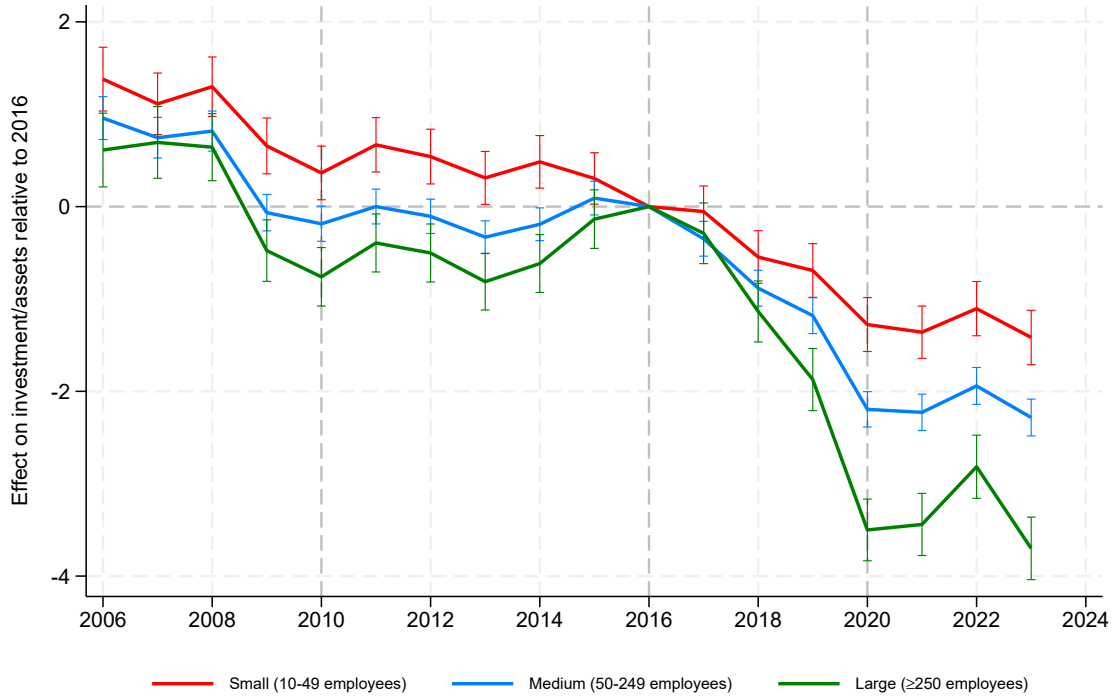
Source: Authors' calculations using FAME.

nation of median productivity, combined with gains concentrated among top-performing firms, implies that for a large fraction of firms the expected return to expanding the capital stock was low. Weak productivity growth can therefore help explain why investment remained low despite favourable borrowing conditions, particularly for firms outside the upper tail of the productivity distribution.

At the same time, the timing of the post-2016 decline points to an additional role for uncertainty. The sharp fall in the firm-level investment rate coincides closely with the Brexit referendum and the subsequent period of prolonged uncertainty regarding the UK's future trading arrangements (Bloom et al., 2019, 2025a). The fact that the decline is driven primarily by common factors is consistent with models in which heightened uncertainty common to all increases the option value of waiting and delays investment.

Figure 14 shows that the broad dynamics of investment are similar across firm sizes, with declines during the GFC, relative stability during fiscal consolidation, and a pronounced fall after 2016. However, the magnitude of the post-2016 decline varies substan-

Figure 14: Investment rate by firm size



Notes: The figure shows estimated year effects for investment rate relative to 2016 from regressions including firm fixed effects by different firm sizes (small, medium, large). Confidence bands are shown with vertical lines. The investment rate is measured as investment divided by total assets.
Source: Authors' calculations using FAME.

tially. Large firms experience the sharpest reduction in investment rates. Relative to 2016, the fall approaches 4 percentage points for large firms, compared with roughly 2 percentage points for medium-sized firms and around 1 percentage point for small firms. This heterogeneity is consistent with the uncertainty-based explanation, as larger firms are more exposed to international trade and policy risk and therefore more sensitive to changes in the external environment.

Overall, the evidence suggests that the main break in UK investment behaviour occurs after 2016 and is driven primarily by a decline in investment intensity within incumbent firms, only partially offset by compositional changes and followed by a relatively weak recovery after the Covid-19 shock.[7]

An alternative explanation for the observed investment dynamics is that financial frictions, such as liquidity constraints or debt overhang, limited firms' ability to invest. Even

[7]Similar patterns emerge when investment is measured per worker rather than relative to assets.

in a low-interest-rate environment, high leverage or restricted access to finance may have depressed investment. In the next section, we examine the evolution of corporate leverage in detail and assess whether changes in firms' balance sheets are consistent with this interpretation.

3.3 Corporate deleveraging

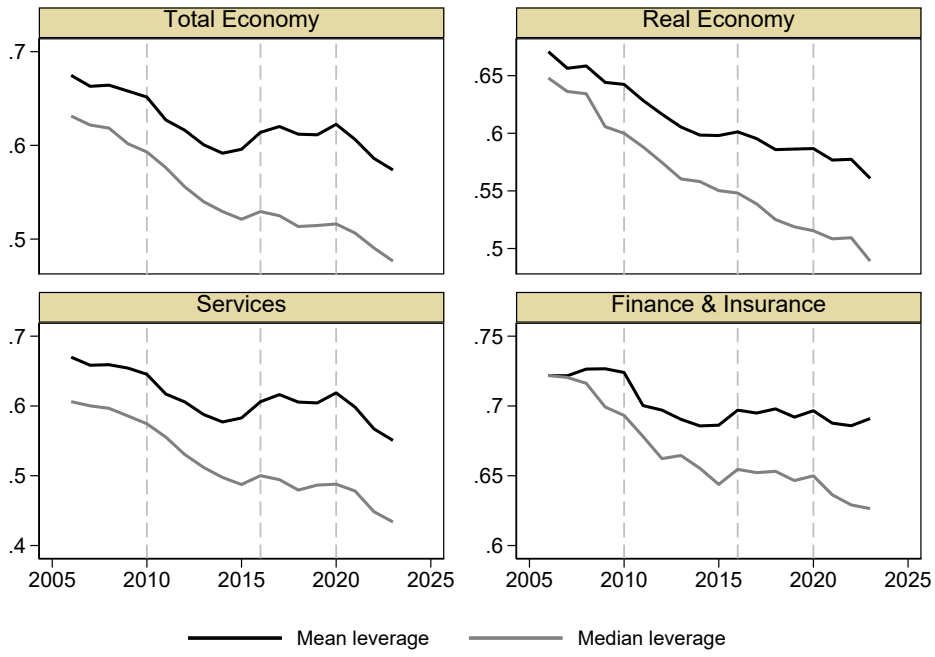
We find a large decline in corporate leverage between 2006 and 2023. Figure 15 plots mean and median leverage after winsorising at the 1st and 99th percentiles by year.[8]

The figure reveals three main patterns. First, median leverage is consistently highest in the finance and insurance sector. In 2006, median leverage in finance and insurance was 72.2%, compared with 64.8% in the real economy and 60.6% in services—a difference of 7.4 and 11.6 percentage points, respectively. By 2023, these gaps had widened to 13.7 percentage points relative to the real economy and 19.3 percentage points relative to services. Second, median leverage declined in all sectors between 2006 and 2023. Median leverage fell by 17.2 percentage points in services and by 15.9 percentage points in the real economy, compared with a 9.5 percentage-point decline in finance and insurance. Third, the divergence between the mean and median indicates that leverage remained high at the top of the distribution and that dispersion in leverage across firms within the same sectors increased.

Figure 16 allows us to compare the sectors at the 75th and 90th percentiles of leverage. At the 75th percentile, leverage is higher and more stable in finance. Leverage in the real economy and in services is almost 10 percentage points lower and is declining. At the 90th percentile, leverage in the real economy and services is equal to or higher than finance sector leverage at the start of our sample period. However, 90th percentile leverage in the finance sector grows while 90th percentile leverage in the other sectors remains stable.

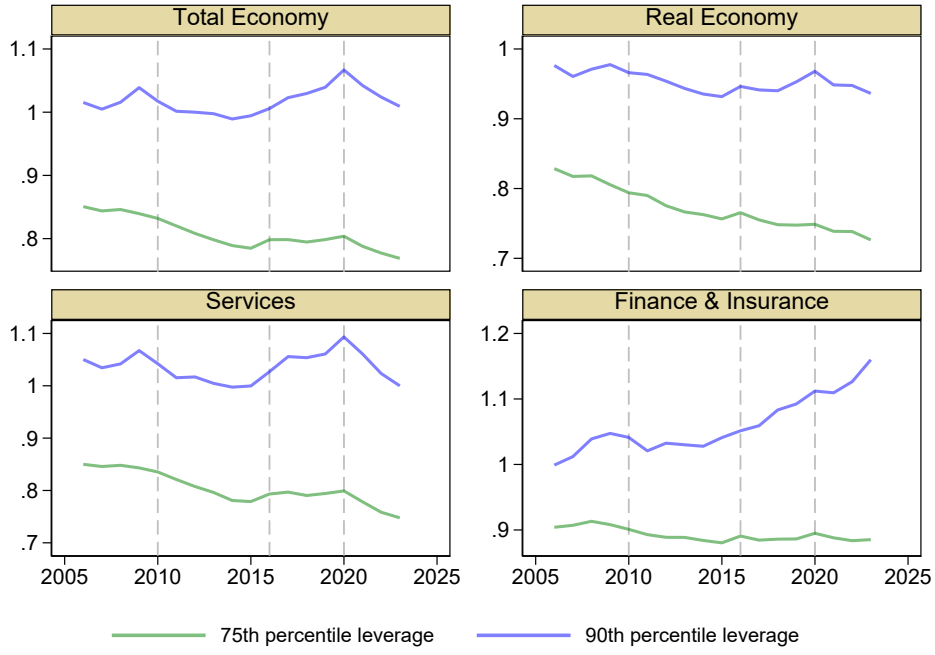
[8] Winsorising by year replaces extreme low values in the distribution with the 1st percentile and extreme high values with the 99th percentile. Winsorising reduces the effect of extreme values on the mean and has no impact on the median. For corporate leverage, winsorising is necessary to ensure the analysis is not driven by extreme outliers. Alternative plots based on trimming extreme values are virtually identical.

Figure 15: Leverage by sector



Notes: The figure displays mean and median leverage by sector. Leverage is defined as total liabilities divided by total assets. The data are winsorised at the 1st and 99th percentile within each year.
Source: Authors' calculations using FAME.

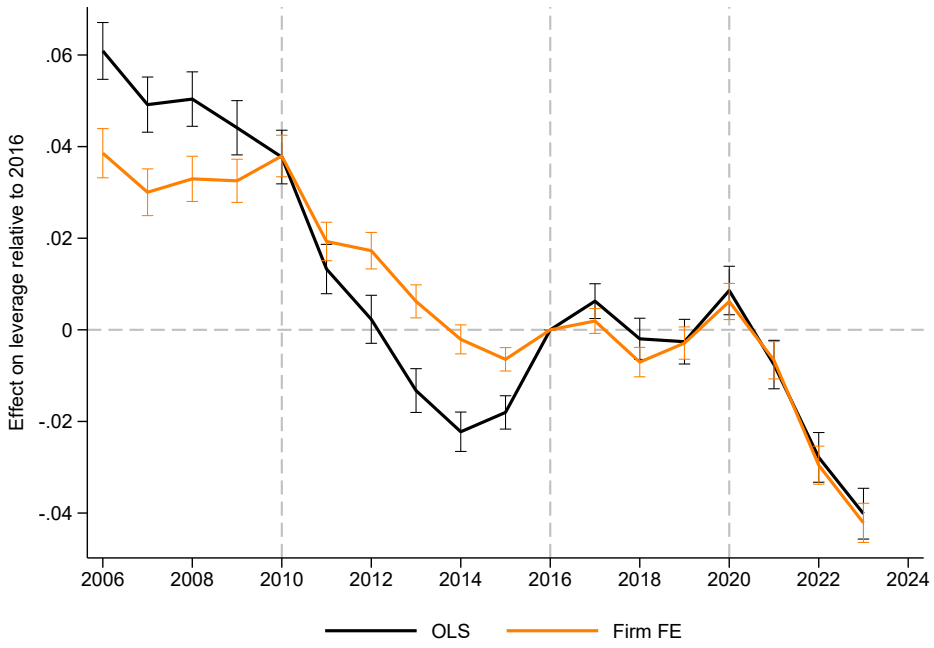
Figure 16: Quantiles of leverage by sector



Notes: The figure plots 75th and 90th percentiles of leverage by sector. Leverage is defined as total liabilities divided by total assets. The data are winsorised at the 1st and 99th percentiles within each year.
Source: Authors' calculations using FAME.

To disentangle aggregate trends from changes in firm composition, Figure 17 displays time fixed effects from OLS and firm fixed effect regression models. In the figure, one can clearly see that both aggregate trends and compositional effects evolved quite differently in the UK's four macroeconomic epochs. In the GFC period, average leverage (the black line) was falling, declining by two percentage points. In contrast, the aggregate trend (the orange line) was flat, showing that most of the fall in the mean was driven by changes in firm composition. Then from 2010-2016, average leverage fell by another 6 percentage points, reaching a trough in 2014 before recovering by two percentage points by 2016. During this period, the aggregate trend was negative, explaining approximately two-thirds of the fall in leverage from 2010-2014. The negative compositional effect was reversed from 2014-2016 so that by 2016, the net compositional effect between 2010-2016 was zero. After the Brexit vote, both average leverage and the aggregate trend remained flat until 2020 when there was an increase. Both then declined steeply from 2021-2023, a period of rapid price inflation.

Figure 17: Leverage decomposition

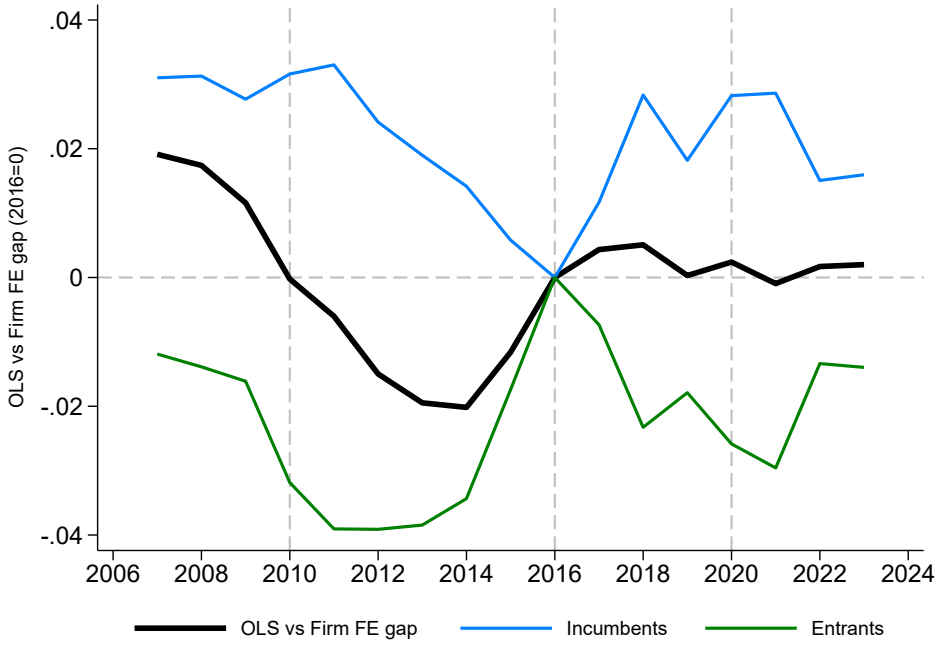


Notes: The figure shows estimated year effects for leverage relative to 2016 from pooled OLS regressions (black line) and regressions including firm fixed effects (orange line). Vertical lines show confidence intervals. Leverage is defined as total liabilities divided by total assets and is winsorised at the 1st and 99th percentiles by year.

Source: Authors' calculations using FAME.

Figure 18 the difference between the OLS and fixed effect series into contributions from incumbent and entering firms. One can see from the blue line in the figure that the relative contribution of incumbent firms is positive; exiting firms had lower leverage on average. At the same time, the contribution of entering firms is negative; entering firms had lower leverage on average. The net effect of exiting firms was highest during the GFC. This effect of exiting firms continued during fiscal consolidation, but in that period was outweighed by the low leverage of entering firms, perhaps reflecting the tight lending restrictions of financial institutions during that period. After the Brexit vote, incumbent firms continued to have higher leverage on average, while entering firms had lower leverage. But these two effects cancelled out so that the net compositional effect was zero.

Figure 18: Leverage: incumbents vs entrants



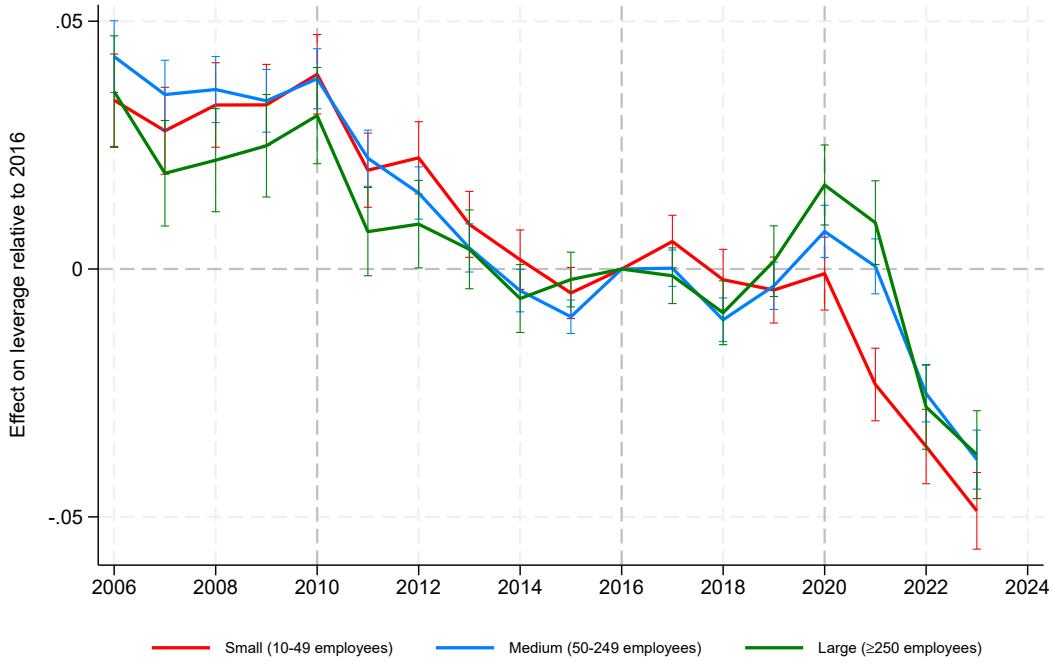
Notes: The black line shows the gap between OLS and firm fixed effects from Figure 17. The blue and green lines show the respective contributions of incumbents and entrants to this gap. Leverage is defined as total liabilities divided by total assets and is winsorised at the 1st and 99th percentiles by year.
Source: Authors' calculations using FAME.

Finally, Figure 19 shows how leverage dynamics vary with firm size. Leverage in smaller firms declined a bit faster from 2010-2016 while large firms'leverage] increased relative to smaller firms during Covid-19. Otherwise, leverage dynamics are very similar across firms

of different sizes.

There are a number of reasons that levels of leverage differ across sectors, and that, in particular, financial sector firms are different from the other sectors. First, financial firms are intermediaries. Their economic function is to borrow in order to lend. Second, banks and insurance companies have access to stable funding in the form of deposits and premiums. Third, because their assets are financial in nature (rather than physical), they are often liquid and collateralisable, enabling banks to borrow and to more easily diversify asset risks. Fourth, regulation of financial institutions focuses on capital buffers, not low leverage.

Figure 19: Leverage by firm size



Notes: The figure shows estimated year effects for leverage relative to 2016 from regressions including firm fixed effects by different firm sizes (small, medium, large).Vertical lines show confidence intervals. Leverage is defined as total liabilities divided by total assets and is winsorised at the 1st and 99th percentiles by year.

Source: Authors' calculations using FAME.

What has caused the economy to deleverage? There are many possible explanations. One contributing factor is the decline in the finance sector as a share of the economy.[9] A second factor is the increased stringency of financial sector regulations. As discussed

[9]The share of finance in total output declined from just under 10% just before the financial crisis to about 8% in 2023 Mahmood et al. (2026).

in the introduction, in the wake of the GFC, UK financial regulators (along with their global peers) imposed a range of restrictions, including increased capital requirements, leverage ratio restrictions, liquidity requirements, mortgage lending limits, and stress testing requirements. These restrictions forced regulated financial institutions to hold more capital and to restrict lending. A third factor is low demand for investment stemming from low productivity growth. A fourth possible factor is compositional changes within sectors. Our analysis above reveals that compositional changes did play an important role during the GFC and during the period of fiscal consolidation, but on net played no role after 2016. This net compositional effect masks potentially important roles played by entry and exit of firms as revealed in Figure 18.

4 Conclusion

This paper uses a large annual panel of UK firms from FAME to study and decompose long-run trends in productivity, corporate investment, and leverage between 2006 and 2023. We examine whether these trends primarily reflect common changes among incumbent firms or changes in the composition of the corporate sector arising from firm entry and exit.

For productivity, our results confirm and update the extensive existing literature. Weak post-crisis growth, widening differences between firms at the frontier and the rest, and the importance of slower TFP growth all appear in the FAME data. We extend this evidence through 2023 and show that it also holds when finance and insurance are included. The close alignment of pooled and firm fixed effects estimates implies that the post-2016 weakness is primarily visible within incumbent firms rather than being caused by changes in firm composition.

For investment, the principal break occurs after 2016. Investment intensity declines substantially among incumbent firms, and the fall is larger once firm fixed effects are included than in the corresponding raw averages. Changes in composition therefore do not account for the slowdown. On the contrary, they partly conceal it, because firms with

relatively low investment became more likely to exit. The broad pattern is present across firm sizes, although the post-2016 decline is largest among large firms.

For leverage, the relative importance of common time and compositional effects changes over the sample period. The initial decline during the GFC is largely associated with changes in firm composition, as the pooled average falls while the within-firm component remains comparatively stable. From 2010 onwards, however, the continued decline in leverage is primarily observed within incumbent firms. Entry and exit make offsetting contributions and have little net effect over the later part of the period. This pattern is broadly shared across the firm-size distribution, although smaller firms deleverage more rapidly during the fiscal-consolidation period.

The common implication of the productivity, investment, and leverage results is that none of the sustained trends can be explained principally by a changing mix of firms. Composition is important at particular points, especially for leverage during the GFC and for the observed investment rate after 2016, but the longer-run movements are mainly visible within incumbent firms.

The timing of the investment slowdown is consistent with a possible role for the uncertainty that followed the Brexit referendum, while the leverage results are consistent with balance-sheet repair, changes in firms' demand for external finance, and the post-crisis regulatory environment. Our analysis does not separately identify these mechanisms, but it helps define a clear agenda for future research. A first priority is to distinguish deleveraging caused by changes in the supply of credit from a demand-driven reduction in borrowing by firms with limited investment opportunities. A second is to determine whether debt overhang from the GFC continued to constrain investment during later periods. A third is to assess whether pandemic support altered firm survival and balance sheets in ways that affected subsequent investment and leverage. Answering these questions requires additional identifying variation. By establishing when the investment and leverage trends emerged and whether they arose within firms or through entry and exit, our analysis identifies the periods, firms, and margins on which future work should focus.

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APPENDIX FOR:

Long-Run Trends in Corporate Investment and Leverage in the UK: A Decomposition

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A Data Appendix

A.1 FAME data

We use FAME data (formally from Bureau van Dijk), which provides comprehensive company information in the UK and Ireland since 2006. We focus on companies that are incorporated in the UK and are therefore listed in Companies House. The aim is to create a representative database of companies with complete information on assets, debt, equity, and employment by industry. In what follows, we provide all the details of the data cleaning process.

Small companies. Accounting data in the FAME database is highly incomplete and/or inaccurate for small companies. These issues arise because, in the UK, such companies are not required to publish complete audited accounts. Instead, they publish abbreviated accounts (and, more recently, abridged or micro-entity accounts) and, typically, their accounts are not audited. We therefore exclude companies with fewer than 10 employees.

Companies outside the UK. We focus on companies that are incorporated in the UK. We exclude accounts of non-UK companies. The FAME data includes some consolidated accounts for non-UK firms that can be identified through additional letters in the registered number (i.e. firm ID), which starts with either '#' (e.g. Spain, Germany), 'IE' (i.e. Ireland), or 'GI' (i.e. Gibraltar). We therefore keep those in England, Northern Ireland, Scotland, and Wales.

Duplicates. FAME contains multiple observations per year for some companies (i.e. duplicates based on all variables). In other cases, FAME contains some seemingly identical observations, which only differ in a few variables. In those cases, we take the observations with fewer missing values. Finally, conditional on company name, registered number, and year, we remove remaining duplicates by manually reviewing annual reports and retaining observations that contain the correct values.

Same company name. In a very few cases, we find that companies with different registered numbers (i.e. firm ID) share the same company name. We drop these cases.

Excluding subsidiaries. FAME contains the consolidated accounts of business groups in addition to the accounts of their subsidiaries. This requires some additional attention to rule out double counting the subsidiaries, since their information is also included in the accounts of their parent companies. To address this, we use the ownership data to reconstruct firm-level ownership hierarchies for each year from 2006 to 2023. For each firm-year, we identify the direct shareholder with the largest stake and focus on majority ownership links (at least 50%). Because Bureau van Dijk records ownership links at specific dates within the year, some links are missing in isolated yearly files. We impute these cases by bridging single-year gaps when the same owner appears on both sides and, more generally, by carrying ownership links forward until a new link is recorded.

We then construct the full ownership chain recursively for each firm-year, following majority ownership links up the hierarchy until no further parent is observed. When several majority shareholders are reported, we retain the parent with the largest ownership share, and we truncate chains when cyclical ownership structures arise. Using the resulting hierarchy, we identify the highest relevant parent and exclude lower-level subsidiaries whose activity is already consolidated in that parent's accounts. In the final sample, we retain the highest-level entity that is an operating firm and files consolidated accounts alongside all independent firms.

Complete balance-sheet information. We restrict our sample to companies with non-missing values in total assets, shareholders' funds (equity), and debt (current liabilities). We assume missing values for long-term liabilities are genuine zeros and validate this by checking that the accounts balance.

Account balancing. Assets must equal debt plus equity. We encounter a few companies whose accounts do not balance. We identify those companies (i.e. companies whose balance sheets deviate from equality by more than £2,000 in a given year), compare the downloaded data to more detailed data and to the balance sheets published in annual reports on the Companies House website, and correct them accordingly.

Incorrect values. The FAME data occasionally contains inconsistencies in the scale of reported financial variables (e.g. debt, turnover), where values for the same company are expressed in different units (e.g. thousands or millions of pounds) across different years. These discrepancies likely arise from data-entry or reporting errors in the underlying company filings. We identify potential cases by flagging firms whose reported magnitudes change implausibly between consecutive years, suggesting a shift in units rather than in underlying performance. For these flagged observations, we verify and correct the data manually using the original annual reports available at Companies House. In addition, we implement a set of firm-specific corrections for variables such as employment, wage bills, turnover, and balance-sheet items, and drop a very small number of clear outliers.

We pay particular attention to the variable *number of employees*, where implausible changes over time may indicate errors in the underlying FAME data rather than shifts in firm size. We therefore flag companies exhibiting *ex ante* implausible employment growth or contraction patterns and verify them manually using annual reports from Companies House. We proceeded as follows. First, we identified companies whose reported maximum employment exceeds their minimum by a factor of at least 100. Some reflected genuine changes (e.g. companies that grew from nothing like Octopus and Revolut) while others arose from data-entry mistakes (e.g. misplaced decimal points), which we correct accordingly. Second, we identified companies where employment fell by at least 20-fold from the

previous year and then rose 20-fold or more in the following year.

After checking them manually, we correct those cases arising from misreporting. In other cases, discrepancies stemmed from changes in reporting scope, i.e. the company switched from reporting a total for the group to a total for the company, or decided to include (or not include) temporary or agency staff in the total figures. We create a dummy variable that flags those companies as reporting inconsistent employment figures.

Industry (re)classification. FAME data contains the primary 6-digit industry code for each company (based on the UK Standard Industry Classification 2007). We aggregate this to the 2-digit level.

In raw FAME data, some companies appear as 'head offices' (SIC industry 70) simply because they are registered as the ultimate parent of a corporate group, reflecting the legal or organisational structure of the company rather than its actual line of business. Shell PLC, for example, is recorded under 70100 ('activities of head offices'), even though its textual descriptions unambiguously state that it operates as an energy and petrochemical company engaged in oil and gas extraction worldwide. To better align recorded industries with companies' real operations, we reclassify such cases using information from the rich text fields available in FAME. In particular, we extract two textual descriptions for each company – the primary business line and the full overview – and ask a large language model (ChatGPT, *gpt-4o-mini*) to interpret these texts, identify the firm's main line of business, and propose plausible SIC codes at both the 2-digit and 4-digit levels. We then define a set of decision rules:

1. If both sources – primary business line and full overview – agree on the industry code, that code is retained.

2. If both sources are missing, the company remains coded as 70.

3. When the full overview suggests a 'holding company' or 'head office', but the primary business line points to a specific sector, we keep the latter.

4. When the primary business line suggests a 'holding company' or 'head office' but the full overview points to a clear operational focus, we follow the latter.

5. All remaining cases default to the full overview's 2-digit classification.

The resulting "corrected industry" variable, therefore, replaces the 70 label for firms whose textual descriptions clearly indicate a substantive operational sector. In our final dataset, the 70 category captures only companies that perform pure head-office or management functions without explicit operational activities. Returning to the example above, Shell PLC is recoded from 70 to 06 ("extraction of crude petroleum and natural gas") based on its descriptive fields.

Negative long-term debt. In a few cases, companies report negative long-term liabilities. These cases primarily reflect pension scheme surpluses. In such cases, we reallocate the reported amount to assets and record no long-term debt.

Negative or high leverage. We define leverage as the ratio of total liabilities over total assets. We drop cases where assets are negative. We flag (but keep) cases where leverage is bigger than one and identify extreme cases (leverage above 20) for further inspection.

Negative turnover values. Turnover is defined as the operating revenue in FAME. In a few cases, some companies report negative turnover values. We flag (but keep) those companies reporting negative turnover values.

High turnover/assets values. We compute the ratio turnover over assets to further check outliers. We flag (but keep) companies with high (more than 50) turnover/assets values.

Implausible asset and wage bill growth. To further check for data inconsistencies and potential outliers, we compute annual growth rates in total assets and total wages and salaries (i.e. wage bill). We flag (but keep) observations of companies when growth exceeds 20-fold or falls by at least 95% relative to the previous year.

A.2 Industry Groups

To facilitate analysis, we group industries into three broad sectors (based on their two-digit SIC 2007 industry codes):

1. *Real economy*: agriculture, forestry and fishing (industry codes 1–3); mining and manufacturing (5–33); utilities (35–39); and construction (41–43).

2. *Services*: wholesale and retail trade (45–47); transportation and storage (49–53); accommodation and food service activities (55–56); information and communication (58–63); real estate activities (68); professional, scientific and technical activities (69–75); administrative and support service activities (77–82); public administration and defence (84); education (85); human health and social work activities (86–88); arts, entertainment and recreation (90–93); other service activities (94–96); households as employers (97–98); and activities of extraterritorial organisations (99).

3. *Finance and insurance*: financial and insurance activities (64–66).

A.3 Variables and definitions

We construct a set of firm-level variables from balance sheet, income statement, and employment information in FAME. Total assets are measured as the book value of all assets (intangible and tangible assets, stock, current and non-current assets). We define total liabilities as the sum of current liabilities (loans and short-term debt, creditors) and non-current liabilities (long-term financial liabilities including borrowing from credit institutions and bonds issued). Our measure of leverage is the ratio of total liabilities to total assets.

On the income side, operating revenue (turnover) is measured as the sum of net sales, other operating revenues and stock variations. We define the wage bill as total employee costs, and employment as the number of employees on the company's payroll. We construct value added as the sum of the wage bill and EBITDA (i.e. Earnings before Interest, Tax and Depreciation & Amortisation). Using these variables, we define productivity as

value added per worker and average wages as the wage bill per employee. In parts of the analysis, we work with logarithms and distributional statistics (e.g. percentiles) of these variables.

Investment is measured as the net outflow of cash from investing activities, as reported in firms' cash flow statements. This measure includes expenditure on physical and intangible capital as well as net acquisitions of subsidiaries and financial assets. We define the investment rate as investment scaled by total assets. Finally, we define net assets as total assets minus current liabilities, which captures the firm's short-term solvency position.

All monetary variables are expressed in real terms using the UK GDP deflator, except for wages, which are deflated using the CPI.

B Data validation

This section provides a series of validation exercises to assess the coverage, representativeness, and reliability of the FAME data used in the analysis.

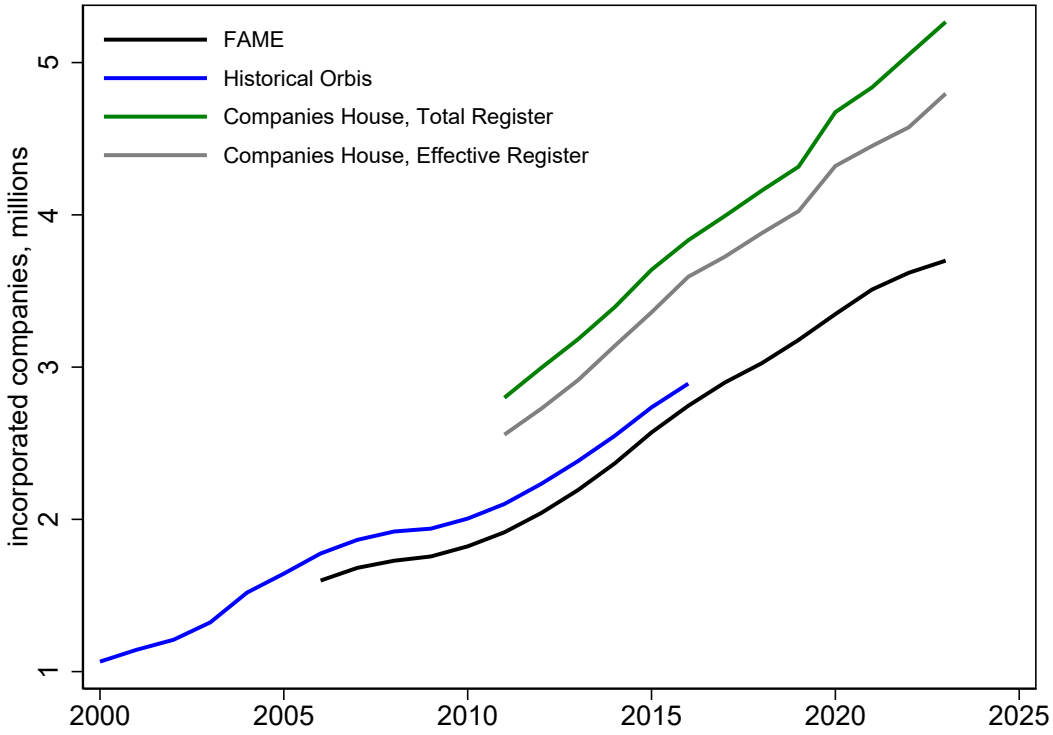
B.1 Number of incorporated companies in the UK

To validate the coverage of our firm-level data, Figure B.1 compares the evolution of the number of incorporated companies in our raw FAME extract with two external benchmarks: (i) the Historical Orbis dataset used in the IFS Deaton Review (De Loecker et al., 2022), and (ii) official Companies House statistics on the UK company register.

FAME captures a substantial share of the UK corporate population. Relative to the effective Companies House register (which excludes firms in dissolution or liquidation), FAME covers approximately 75–80% of incorporated entities over the period 2011–2023. This gap is consistent with differences in scope between administrative registers and research-oriented firm databases. In particular, Companies House includes a wide range of legal entities that are not necessarily economically active firms, such as LLPs (Limited Liability Partnerships), CICs (Community Interest Companies), dormant companies, and

very small entities with limited reporting requirements. As a result, the lower counts in FAME are likely to reflect the exclusion or underrepresentation of entities with little or no usable financial information, rather than missing economically meaningful firms.

Figure B.1: Number of incorporated companies in the UK



Notes: The figure shows the number of incorporated companies in the UK. The blue line is based on Historical Orbis (De Loecker et al., 2022), the black line is based on FAME data, and the green and grey lines, corresponding to the total and effective register of companies, come from Companies House.

By contrast, FAME coverage relative to Historical Orbis is substantially higher, at around 90–95% in overlapping years. This is expected given that both datasets originate from Bureau van Dijk sources, while Historical Orbis is constructed as a historical archive that retains both active and dead incorporated firms. The slightly higher counts in Historical Orbis are therefore consistent with its broader temporal coverage of firms that have exited the current population. Importantly, beyond differences in levels, the time-series dynamics are highly consistent across all sources. Between 2011 and 2023, the number of firms in FAME increases from approximately 1.9 million to 3.7 million (around 93% growth), closely tracking the expansion of the Companies House register over the same period. In particular, the effective register grows from approximately 2.55 million to 4.79

million, while the total register increases from around 2.80 million to 5.26 million (both approximately 88% growth). This similarity in growth rates indicates that FAME captures the aggregate evolution of firm population in the UK economy very closely, despite differences in coverage levels.

B.2 Number of firms in our sample

Table B.1 reports the number of firms in our sample by year, firm size, and industry group. These figures reflect the sample after data cleaning and the application of our sample restrictions, as described in Appendix A.

To assess the representativeness of our sample, we compare its evolution to official statistics on the UK business population from the Department for Business and Trade (Department for Business and Trade, 2025). To ensure comparability, we focus on firms with 10 or more employees, which corresponds to the employer population covered in our analysis. According to DBT statistics, the number of such firms grew by approximately 28% between 2010 and 2023. Over the same period, the number of firms in our sample increases from 43 to 57 thousand, corresponding to a growth of approximately 33%. The similarity in growth rates indicates that our sample closely tracks the aggregate dynamics of the UK employer business population over time. In particular, this reduces concerns that the expansion of firms in our sample is driven by changes in coverage or selection, and instead suggests that it reflects broader trends in firm entry and growth.

Table B.1: Number of firms by year, firm size and industry group

	Firm size					Industry group			
Year	Small	Medium	Large	V. large	Huge	Real econ.	Services	Finance	Total
2006	18,678	18,032	6,579	227	12	11,447	28,208	3,873	43,528
2007	18,497	18,423	6,651	236	14	11,556	28,644	3,621	43,821
2008	18,557	18,658	6,810	226	17	11,664	29,099	3,505	44,268
2009	17,660	18,707	6,624	209	16	10,944	28,511	3,761	43,216
2010	17,453	18,714	6,667	200	15	10,431	28,817	3,801	43,049
2011	17,348	19,234	6,797	206	16	10,259	29,464	3,878	43,601
2012	17,446	20,460	6,983	211	16	10,306	30,885	3,925	45,116
2013	17,729	21,491	7,264	212	15	10,457	32,193	4,061	46,711
2014	18,494	22,258	7,613	217	13	10,571	33,582	4,442	48,595
2015	19,869	23,034	7,988	231	16	10,874	35,421	4,843	51,138
2016	21,878	23,375	8,440	239	15	11,128	37,573	5,246	53,947
2017	22,840	23,107	8,892	234	15	10,954	38,518	5,616	55,088
2018	21,801	23,310	9,187	241	15	10,539	38,001	6,014	54,554
2019	21,400	23,673	9,475	235	13	10,452	37,850	6,494	54,796
2020	21,443	23,647	9,492	218	12	10,365	37,558	6,889	54,812
2021	21,464	23,457	9,478	209	11	10,101	37,181	7,337	54,619
2022	21,839	24,427	10,052	230	11	10,192	38,224	8,143	56,559
2023	22,043	24,778	10,254	233	12	10,151	38,472	8,697	57,320
Total	356,439	388,785	145,246	4,014	254	192,391	608,201	94,146	894,738

Notes: Small firms have 10–49 employees, medium firms 50–249 employees, large firms 250–9,999 employees, very large firms 10,000–99,999 employees, and huge firms 100,000 or more employees. Industry groups correspond to the classification described in the text: real economy, services, and finance & insurance. Data are from FAME database.

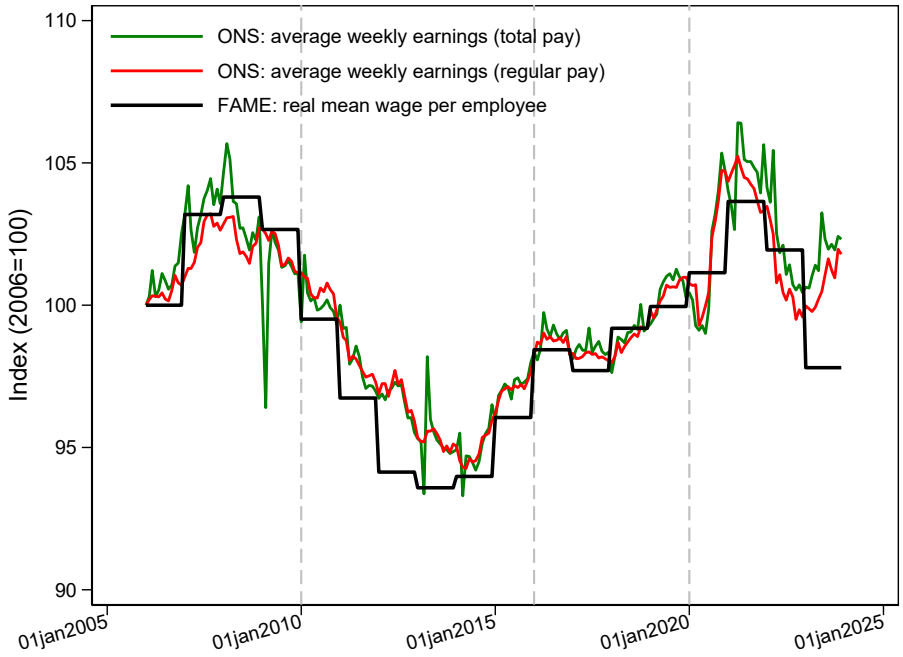
B.3 Real Average Wages: ONS vs FAME

To further assess the reliability of the data, we compare wage dynamics in FAME with official earnings statistics from the Office for National Statistics (ONS). Figure B.2 plots mean real wage per employee in FAME alongside ONS measures of real average weekly earnings for total pay and regular pay. All series are indexed to 2006=100. FAME wages are constructed as the real wage bill divided by the number of employees at the firm level, whereas the ONS series measures average weekly earnings at the worker level. FAME data are annual while the ONS series are monthly. Despite these differences, the three series display very similar movements throughout the sample period. In particular, the FAME series closely tracks the decline in real wages following the global financial crisis, the prolonged period of weak wage growth during the early 2010s, and the subsequent recovery in the second half of the sample. The FAME measure also captures the broad dynamics around the Covid-19 and aftermath period.

B.4 Investment: ONS vs FAME

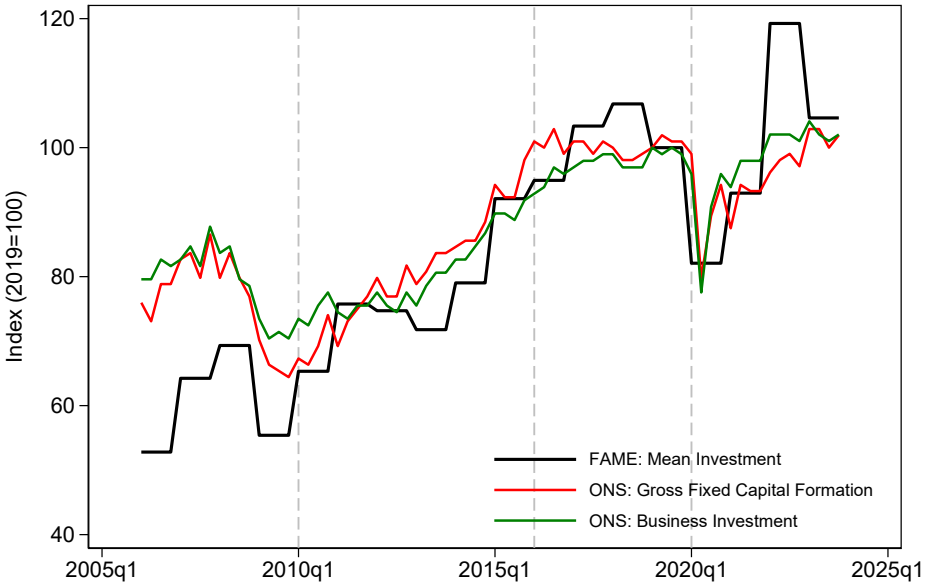
To further assess the reliability of the data, we compare aggregate investment series constructed from FAME with official statistics from the Office for National Statistics (ONS). Figure B.3 plots mean firm-level investment in FAME alongside ONS measures of gross fixed capital formation and business investment, indexed to 2019=100. While the three series are not directly comparable—ONS data are quarterly whereas FAME data are annual, and the underlying definitions differ—they display similar broad patterns over time after 2010. The pre-2010 period is less well aligned. This could be due to poor financial reporting of investment prior to 2010 or could be due to accounting changes around the financial crisis. The reasons for this discrepancy are not fully clear. The spike in investment observed in 2022 reflects the use of a GDP deflator in constructing the series. The ONS GDP deflator fluctuated dramatically post-Covid-19. Despite these differences, the overall co-movement suggests that FAME captures aggregate investment dynamics reasonably well.

Figure B.2: Average real wages: FAME vs ONS



Notes: The black line shows mean real wage per employee in FAME, constructed as the real wage bill divided by the number of employees. The green and red lines show ONS real average weekly earnings for total pay and regular pay, respectively. All series are indexed to 2006=100. All series are deflated using CPI. FAME data are annual, while ONS data are monthly.

Figure B.3: Investment: FAME vs ONS



Notes: The black line shows mean firm-level investment in FAME, while the red and green lines show ONS gross fixed capital formation and business investment, respectively. All series are deflated before indexing; series are indexed to 2019q1=100. ONS data are quarterly, while FAME data are annual.