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Innovation in capital funding by public hospitals during austerity: Evidence from the English National Health Service

ABSTRACT
Continuing cost and demographic pressures are posing challenges to healthcare systems in many countries and to address these, investing in hospital infrastructure is essential to ensure a sustainable and efficient delivery of hospital services. However, due to tightening financial conditions, many healthcare systems face increasing difficulty in mobilising the capital resources required for healthcare investments. In this article, using a panel dataset on English publicly funded hospitals covering 2015-2021, we investigate how NHS hospitals' income generation, including growing revenue from private patients, and access to different borrowing facilities are associated with hospitals' capital expenditure. We further examine how these associations differ across NHS Foundation Trusts and NHS Trusts, with the former enjoying greater financial autonomy. Our findings show that private patient income is positively associated with capital expenditure for Foundation Trusts, but not for NHS Trusts. Similarly, subsidised borrowing facilities are positively associated with capital expenditure for Foundation Trusts, while no such relationship is observed for NHS Trusts. We argue that these patterns reflect a growing hybridity in hospital funding models, in which commercial income streams and public financing mechanisms increasingly intersect, but with uneven effects across organisational forms. We conclude by discussing the implications of the NHS capital regime for the growing divergence in capital investment patterns across English hospitals.

Keywords: capital borrowing regimes; capital investment; commercialisation; hybridity; hospitals; NHS.

1. Introduction

As many countries face continuing rises in healthcare costs due to demographic pressures and other factors, enhancing healthcare productivity is fundamental to improve the operational and financial sustainability of healthcare systems. A key mechanism to achieve healthcare productivity gains is investment in hospital infrastructure, including new buildings and the replacement of medical and other equipment (Karmann & Roesel, 2016). However mobilising funding for investments in hospital infrastructure is a challenge in many countries (Rechel et al., 2009).

Existing research on capital expenditure has focused predominantly on the private sector (Adelino et al., 2015) or, within the public sector, on local government investment decisions (Subires & Bolívar, 2017). A more limited literature examines capital expenditure by profit and non-profit hospitals, largely in the US context (Adelino et al., 2015; Patel & Seegert, 2020). By contrast, relatively little empirical evidence exists on how capital expenditure in predominantly publicly funded hospital systems is associated with different sources of income and financing, particularly where hospitals operate under significant institutional and regulatory constraints.

Healthcare provision in many OECD countries relies heavily on publicly funded hospitals (OECD, 2022). Understanding how such hospitals are able to undertake capital investment under conditions of fiscal pressure is therefore important. This study focuses on the English National Health Service (NHS), a predominantly publicly funded healthcare system that has experienced sustained financial pressure since the Great Recession of 2008. The NHS represents a particularly significant case, as healthcare spending accounts for around 10% of the UK economy, with the NHS comprising approximately 78% of this total (Custance, 2021). At the same time, the NHS faces a growing capital maintenance backlog, which reached £11.6 billion in 2022/23 (NHS, 2023), highlighting ongoing challenges in maintaining and renewing hospital infrastructure.

Over the last decade, the English NHS has experienced declining real-terms funding growth, organisational instability, and continued reform (Ham, 2023). Austerity policies following 2010 intensified New Public Management–inspired reforms aimed at improving efficiency and financial discipline (Hyndman & Lapsley, 2016), shaping hospital financial practices. These pressures have been compounded by rising demand associated with increased life expectancy and, more recently, by the COVID-19 pandemic, which exacerbated backlogs in patient care and infrastructure maintenance (HFMA, 2018). Although capital investment accounted for less than 6% of total health spending in 2020/21 (The King's Fund, 2022), it remains essential for service delivery and quality of care. Nevertheless, capital budgets have frequently been reallocated to support day-to-day operational spending, constraining hospitals' ability to invest in infrastructure (NAO, 2020).

During this period, governance and funding arrangements within the NHS have also evolved. Alongside traditional NHS Trusts, Foundation Trusts (FTs) were introduced with greater operational and financial autonomy, including enhanced flexibility to generate commercial income and access certain borrowing facilities. These reforms have contributed to the emergence of hybrid organisational forms, combining public-service obligations with elements of private-sector financial logics (Grossi et al., 2024). At the same time, changes to central government funding mechanisms and borrowing arrangements have altered the capital financing environment in which hospitals operate. While prior accounting research has examined financial reporting practices and the use of accruals to meet break-even requirements (Ballantine et al., 2008), less attention has been paid to how different income sources and financing arrangements are empirically associated with hospital capital expenditure under these institutional conditions.

Against this background, this study adopts an empirical focus. Rather than seeking to identify the full set of determinants of hospital capital investment decisions, we examine whether – and how – capital expenditure by English NHS hospitals is associated with (i) income generated from private patients, (ii) access to subsidised public capital and loan financing, and (iii) institutional form (FTs versus NHS Trusts). In doing so, we explicitly recognise that hospitals' borrowing capacity and capital spending are subject to substantial regulatory and central controls, particularly for NHS Trusts.

Using a panel dataset of 193 English hospitals covering the period 2015–2021, we provide empirical evidence on how these associations differ across organisational forms. Our findings show that private patient income and access to subsidised borrowing are positively associated with capital expenditure among FTs, whereas these relationships are not observed for NHS Trusts, which remain largely dependent on central government capital allocations. These results point to a hybridised financing environment in which organisational autonomy conditions the extent to which hospitals are able to translate income and financing opportunities into capital investment.

This article makes three main contributions. First, it extends the literature on hospital capital investment by providing empirical evidence from a predominantly publicly funded healthcare system. Second, it contributes to public sector accounting research on hybridity and financial autonomy by showing how institutional form shapes the relationship between income, financing arrangements, and capital expenditure (Bracci et al., 2015; Kurunmäki & Miller, 2011). Third, by examining the role of private patient income within the NHS, the study contributes to debates on the hybridisation of revenue streams in public and non-profit organisations (Exworthy & Lafond, 2021; Hodgson et al., 2022; Guan et al., 2024), highlighting uneven implications for hospitals' infrastructure investment capacity.

The remainder of this article is structured as follows. Section 2 reviews the relevant literature and outlines fundamental institutional features of the English NHS system, which subsequently provide the basis for our hypotheses. Section 3 describes the data and methodology, while Sections 4 and 5 present the empirical results and conclusions.

2. Prior literature and hypothesis development

Considering the large sums of public funding involved and their critical impact on hospitals' efficiency, remarkably few studies exist on capital investment in healthcare. Most studies investigate how capital expenditure affects hospital operating expenditure or efficiency more broadly rather than factors associated with hospitals' capital investment (Anderson et al., 1987). The few existing empirical studies focusing on hospitals' capital expenditure, as a dependent variable, primarily investigate the US, with findings often reflecting the specific institutional setup of US hospitals, where most are not publicly funded. Adelino et al. (2015) investigate how US hospitals' capital expenditure reacts to cash flow shocks, finding that hospitals' capital expenditure is more sensitive to cashflow shocks than other types of expenditure, such as salaries, thereby resembling findings for shareholder-owned corporations (Lewellen & Lewellen, 2016). Similarly, the ability of US hospitals to raise debt capital in public markets has prompted studies on the impact of hospital debt ratings (Bernet et al., 2008).

The impact of broader economic conditions has been investigated as well. Choi (2017) considers the impact of the Great Recession on the capital investments by Californian profit and non-profit hospitals, finding that non-profit hospitals most substantially reduced their capital investments due to liquidity constraints. The impact of accounting information on investment decisions by Californian hospitals is analysed by Bai, Hsu, and Krishnan (2014), whilst Patel and Seegert (2020) investigate how hospital capital expenditure is affected by competition, finding that, in response to tax incentives, hospitals in concentrated markets increase investment more than hospitals in competitive markets.

Research on hospital capital expenditure in the UK is limited with existing studies predominantly taking a qualitative approach often focused on the accounting treatment of capital expenses and investigating financial and institutional structures which have experienced considerable change since these studies were first published (Heald & Scott, 1996; Mellett et al., 2009; Shaoul, 1998). Recent public sector accounting research continues to document how fiscal pressures influence financial management in healthcare organisations, for example showing that abnormal accruals are used by NHS hospitals to achieve regulatory metrics including break-even targets (Ballantine et al., 2008; Greenwood et al., 2017) and that some public healthcare providers may even under-report performance in anticipation of bailouts (Anessi-Pessina & Steccolini, 2024).

Consequently, to understand recent capital expenditure trends in the NHS, it is fundamental to consider the institutional framework in which English hospitals operate.

In England, NHS healthcare is free at the point of use, based on clinical need. Established in 1948, the NHS has evolved alongside shifting government priorities (HFMA, 2023). Funded through taxation, hospitals earn revenue by treating patients on behalf of Clinical Commissioning Groups (CCGs), which plan and commission local services. Incentivised by NPM thinking and reflecting the 'business-like' ways of operating introduced across the UK public sector (Hood, 1991), governance changes were implemented in the NHS through the introduction of FTs in the early 2000s. Such reforms continued into the 2010s, as the global financial crisis and subsequent government-enforced austerity measures intensified the drive for NPM in the UK (Hyndman & Lapsley, 2016). The aim was to replace central state ownership and direction with a new form of social ownership controlled and run locally (Department of Health, 2002). FTs were granted more freedom and powers to manage their own finances, with the first FTs established in April 2004 (Health and Social Care Act 2003). FTs embody a hybrid model that combines public ownership with private-sector-inspired governance and financial practices, thereby reflecting the wider proliferation across many parts of the UK public sector of increasingly hybrid accountability arrangements that have supplemented – and in some cases supplanted – traditional vertical forms of political accountability (Massam, 2017).

The sources of capital funding for NHS hospitals, which include both NHS Trusts and FTs, are diverse but mainly include internally generated resources such as retained surpluses, which could be derived from activities funded by NHS-income or non-NHS income, or proceeds from the sale of non-current assets (HFMA, 2018 p.6). NHS Trusts are subject to a statutory break-even duty and must therefore generate income sufficient to cover expenses including depreciation charges in their financial accounts, although this requirement does not in itself provide resources for capital investment. While the break-even duty does not apply to FTs, they are required to operate effectively, efficiently, and economically and demonstrate financial viability by staying solvent and maintaining continuity of services (see Table 1) (Monitor, 2013 p.5). Capital expenditure requirements increase over time as asset replacement costs rise, due to inflation, technological change, higher specifications, and expanded service needs. Consequently, hospitals require additional funding sources to meet growing capital demands, regardless of whether they achieve surplus or break-even positions.

A further factor placing pressure on the financial position of English hospitals is reductions made by central government to the national tariffs used for reimbursement of patient treatments by NHS hospitals. After 2008, the UK government implemented austerity measures aimed at reducing public spending and controlling total government deficit. Although the NHS budget was nominally protected, or "ring-fenced", in practice, funding increases slowed dramatically to around 1% annually, compared to an historic average of around 4% per year in real terms (Roberts et al., 2012). This reduction has had significant consequences, particularly for tariff prices – the prices paid to hospitals under the NHS Payment by Results (PbR) system. Whereas prior to 2009/10, hospitals, on average, made a small surplus on each patient they treated, in the context of post-2008 austerity, tightening of the formula has resulted in hospitals generally receiving a lower cash reimbursement than what has been the cost of providing the care. In 2015/16, this resulted in an average costs-versus-payment gap of 5.5 percent (Gainsbury, 2017).

Financial pressures have incentivised many NHS hospitals to explore alternative sources of revenue, generally referred to as non-NHS ('private') income, which is income not from health services commissioned by NHS England or CCGs. Efforts by hospitals to enhance their non-NHS income have been encouraged by legislative changes introduced in 2012, which expanded the proportion of non-NHS ('private') income hospitals are allowed to earn to up to 49% (Health and Social Care Act 2012). This represented a significant increase from the previous effective cap of approximately 2% on private patient income (NHE, 2014). Whilst non-NHS income comes from a variety of activities – such as user fees (e.g., car parking) and commercial activities (e.g., land sales) – the majority derives from clinical services. The inter-connections between private and public healthcare go back to the foundations of the NHS in 1948, however private patients' income has seen the fastest growth in recent years out of all non-NHS income sources (e.g., 21.5% increase, from £978 million in 2013/14 to £1.19 billion in 2015/16) (Exworthy & Lafond, 2021).

The reduction in government payments has reduced surpluses hospitals can generate from treatment of NHS patients. However, the provision of care to privately funded patients is an activity hospitals are likely to continue engaging in long-term only if it generates a surplus. While surpluses may be allocated differently, we hypothesise that hospitals undertaking for-profit patient activities will be particularly incentivised to invest in their facilities, thereby increasing capital expenditure. This is supported by findings in relation to private hospitals outside the UK, such as those in Germany (Schulten & Böhlke, 2013), and emerging evidence on private patient income generation by NHS hospitals (Exworthy & Lafond, 2021; Exworthy et al., 2024). These studies show that the quality of hospital facilities is a key determinant underlying the growing (international) demand for private hospital treatments, including by publicly funded hospitals such as those in the NHS. This suggests that hospitals undertaking commercial activities may face stronger incentives to maintain and invest in hospital infrastructure. In light of this, the following hypothesis is formulated:

H1: Private patients' income is positively associated with hospital capital expenditure.

An additional funding source impacting hospitals' capital expenditure is borrowing. In England, NHS hospitals may borrow for capital investment purposes, which most do via the UK central government – the Department of Health and Social Care (DHSC) in practice. During the period of our analysis, the DHSC issued different types of loans, mainly categorised into two types: normal course of business loans, provided mainly for capital investment purposes, and interim support loans, aimed at providing cash support loans for day-to-day revenue spending to hospitals in financial difficulty. The cumulative size of the loans is substantial, with normal course of business loans amounting to around £3bn, and interim support loans rising to around £13.4bn in 2019/20, up from £2.2bn in 2015/16 (Anandaciva, 2020; Thomas, 2019).

In addition to NHS loans, and over time increasingly replacing these loans, is so called public dividend capital (PDC). Similar to the loans, PDC is issued to hospitals lacking sufficient internally generated resources, with PDC representing the government's equity interest in defined public assets across the NHS.[1] Unlike loans, PDC generally does not have to be repaid, nor do interest payments apply. However, hospitals are required to pay the government a PDC dividend set at 3.5% of an organisation's average relevant net assets per annum, a rate unchanged since introduced in the 1990s (Custance, 2021). NHS hospitals seeking to access PDC – the government's capital budget in practice – must demonstrate that their investments provide value for money, i.e., enabling hospitals to make a return by realising efficiency savings. This assumption underlies the 3.5% PDC rate charged to hospitals. Although not as attractive as the NHS loan scheme, the PDC dividend rate is generally lower than the cost of capital hospitals face who rely on commercial bank loans or PFI funding (DHSC, 2023). While interim loans are used for day-to-day spending and thus no positive effect on capital investment is expected, access to capital loans and public dividend capital is likely to be positively associated with hospitals' capital investments. Therefore, it can be expected that hospitals able to access NHS capital tend to exhibit higher levels of capital investments, leading to the following hypothesis:

H2: Access to subsidised capital has a positive impact on hospitals' capital expenditure.

[1] When NHS Trusts were created in the 1990s, the government transferred ownership of land, buildings and equipment to the new trusts. The government can issue new PDC as a way of giving finance to NHS Trusts, thereby increasing (or in fact restoring) the government's equity share in the trust (Anandaciva, 2020).

The distinction between NHS Trusts and FTs is also reflected in the different financial regulatory frameworks applying to them. FTs have no statutory financial duties in terms of capital expenditure and can incur capital expenditure to the extent that they can fund it with internally generated resources or through borrowing. In contrast, NHS Trusts are assigned a capital resource limit (CRL), which caps their capital expenditure and is aimed to ensure that the DHSC, of which the NHS and individual NHS Trusts are a part, stays within the resources voted to it by Parliament (HFMA, 2023). The aggregate resource envelope is divided into a revenue and capital limit for individual NHS Trusts, meaning that in practice NHS Trusts may have sufficient cash balances for capital investments but are unable to spend them if doing so would cause the DHSC to exceed its overall spending limit. Conversely, no such spending limits apply to FTs.[2]

Similarly, FTs financial flexibility is enhanced by their greater borrowing autonomy, which includes the option to borrow from the open market, including loans from commercial organisations such as banks, as well as public lenders such as local governments. Hospitals utilise the option of non-departmental borrowing especially to offset what is widely regarded an overly bureaucratic and time-consuming approval process for obtaining capital funding from the DHSC (NAO, 2020). Although NHS Trusts are also able to borrow externally, they are required to demonstrate, unlike FTs, that non-departmental borrowing provides them with better value for money than financing through the DHSC (HFMA, 2022, p. 160). As long-term loans are generally priced at a lower cost when arranged via the DHSC, external loans are unlikely to be a viable financing option for NHS Trusts seeking to invest in long-term assets. Consequently, non-departmental borrowing by NHS Trusts is more likely to be utilised to meet working capital needs arising from cash flow shortages. As cash flow shortages often indicate a weaker financial position, hospitals with greater working capital borrowing needs are likely to have less capacity for capital investment, as is also suggested by case study evidence (Clover, 2014). Based on the specific governance and regulatory structures applying to borrowing by NHS Trusts versus FTs, the following hypothesis has been formulated:

H3: *Non-DHSC capital is positively associated with capital expenditure by hospitals with FT status but negatively associated with capital expenditure by NHS Trusts.*

[2] While spending limits that are required to be adhered to by NHS Trusts are not present for FTs, the Health and Care Act 2022 (later than our research period 2015-21) includes a clause that gives the DHSC powers to impose capital spending restrictions on FTs if FTs were considered to not be working effectively to prioritise capital expenditure, risking the breach of relevant national limits (HFMA, 2023).

3. Data and methodology

In this section, we explain the data collection procedure and provide summary statistics for the variables employed in this study.

3.1 Data

Within our empirical setting, we begin our sample with all NHS hospitals in existence during the years 2015 to 2021. We selected the 2015–2021 period due to the unavailability of comprehensive public financial data for NHS trusts and FTs before 2015, and because 2021 was the most recent year with accessible data at the time of our study. During this period, several NHS Trusts transferred to FT status which resulted in them being awarded greater autonomy compared to NHS Trusts. Key differences in relation to the statutory requirements focussed on financial performance are summarised in Table 1. In addition to NHS Trusts transitioning to FT status, several hospitals were also involved in mergers. In turn, to maintain a consistent sample over our time period, we only include hospitals that remained in their original form as at 2015 until 2021, removing NHS Trusts who transferred to FTs or merged with others, resulting in a sample of 69 NHS Trusts and 124 FTs. Data on English hospital finances is publicly available from different NHS sources, reflecting the different organisations responsible for data collection over time, including NHS England and the DHSC, as well as the now-abolished, central NHS organisations, Monitor and NHS Improvement. Table 2 provides a complete overview of the sources and measurements of our variables.

3.2 Capital expenditure

The key dependent variable we employ is hospital capital expenditure. While some prior literature has defined capital expenditure as the change in reported property, plant and equipment as reported on the balance sheet (e.g., Carroll et al., 2015), we use a more specific measure to control for strategic disposals and common non-cash related accounting adjustments such as revaluations, impairment and the material accounting estimate of depreciation. Subsequently, we define capital expenditure (*Capexp*) as the cash purchase of property, plant and equipment and investment property, sourced from the cash flow statement allowing us to measure actual capital expenditure.

3.3 Model development

To test our hypotheses, we employ the following model for trust *i* in year *t*:

$$Capexp_{it} = Priinc_{it} + Caploans_{it} + Pdiv_{it} + PFI_{it} + Otherloans_{it} + NHSinc_{it} + Surdef_{it} + Intloans_{it} + Backlog_{it-1} + Capcomit_{it-1} + \mu_i + \delta_t + \varepsilon_{it} \qquad \text{(Equation 1)}$$

In our first hypothesis (H1), we test whether private patient income is associated with hospital capital expenditure. To facilitate this, we include the variable *Priinc* which measures the amount of income generated by a trust from servicing private patients, those whose treatment is not being funded by the NHS itself. We hypothesise that private patient income is positively associated with capital expenditure and therefore expect a positive relationship with *Capexp.*

Our second hypothesis (H2) addresses the association between access to subsidised capital and trusts' capital expenditure. To assess this, we measure the level of capital loans owed to the DHSC. We do this by representing the two core sources of capital from the DHSC, namely *Caploans*, which measures the level of capital loans owed at the end of the year and *Pdiv*, representing the amount of public dividend capital received during the year.

For our final hypothesis (H3), we assess the impact of loans from non-DHSC sources: this comprises Private Finance Initiative (PFI) obligations and similarly privately financed schemes (*PFI*), as well as other loans from private or non-central government sources (*Otherloans*, e.g., loans from local authorities or commercial banks). *PFI* is defined as the outstanding balance of liabilities under PFI or public–private partnership schemes; because PFI projects do not require upfront cash outlay by the hospital, such investments are not recorded in *Capexp*, so including the PFI liability as an independent variable allows us to capture the association between these privately financed assets and capital investment capacity. Additionally, we employ a PFI dummy variable for which the value of 1 is given to hospitals having a PFI scheme and 0 for others (see online accessible supplementary appendices where consistent results can be found).

Control variables

In addition, we include several control variables that may influence NHS capital expenditure. First, we control for income from NHS-funded patient care (*NHSinc),* a major funding source for all hospitals. Second, we control for interim revenue-support loans (*Intloans*) received for daily operations provided from the DHSC, as a comparison to other forms of borrowing. This variable is expected to be negatively related to capital expenditure, as interim loans are typically employed in financial emergency situations where a hospital would likely exhibit reduced capital expenditure. Third, the annual surplus (or deficit) of the hospital (*Surdef*) is included as a measure of overall financial performance. A surplus could provide internal funds for investment, but persistent deficits might constrain capital spending (except to the extent deficits are covered by government support).

Due to the financial reporting framework that the NHS operates within, unique additional disclosures are available, allowing for specific prior-year capital-related variables to be incorporated into our model. Accordingly, we include two lagged independent variables: *Backlog*, and *Capcomit.* The former refers to the investment in reducing backlog maintenance (i.e., addressing previously deferred capital maintenance), and the latter is the amount of contractual capital commitments of property, plant and equipment at the end of the prior year. By including these lagged variables, we capture the carry-over effects of prior-period maintenance needs and capital plans on current capital expenditure.

Finally, all variables are scaled by a trust's prior-year total assets. μ_i and δ_t capture the unobservable hospital-specific effects and year-specific effects, respectively, and ε_{it} refers to the error term. Table 2 provides a complete overview of the sources and measurements of all variables used within our model.

4. Empirical strategies and results

Our empirical analysis begins by presenting descriptive statistics and correlation analyses, including variance inflation factors to check multicollinearity. We then estimate baseline models using two-way fixed effects (hospital and year) regressions. However, these initial fixed-effects results may suffer from endogeneity caused by omitted variables or reverse causality, not accounting for potential dynamic effects of past investment. Therefore, as a robustness check, we adopt a two-step system Generalized Method of Moments (GMM) estimator (Arellano & Bond, 1991). We report robust standard errors for all models to account for heteroskedasticity. When focusing on regional heterogeneity with smaller sample groups (i.e., dividing the FTs and NHS Trusts samples by their geographic locations), where the number of instruments in GMM may become too large relative to sample size, we adopt the Least Squares Dummy Variable Corrected (LSDVC) estimator (Bruno, 2005) and the bootstrapped bias correction (BBC) for the fixed effects estimator in dynamic panels (Everaert & Pozzi, 2007).

4.1 Descriptive statistics

Table 3 reports the summary statistics of the key variables used in our models, with several noticeable findings. First, an average hospital in our sample spent £15.7 million per year on capital purchases (*Capexp*), though this varies widely (minimum near zero, maximum £174m). Income from NHS patients averages £320 million for hospitals, with a median of £257m, with the largest hospital reporting £1.7 billion in a year. This variation is mirrored in private patient income, where hospitals generate £2.7 million, on average, with the highest amount being £133 million - equating to over 40% of the average NHS patient revenue. As previously discussed, during our sample period many hospitals faced significant cost pressures, with the average annual financial position being a deficit of £7.1 million.

In terms of capital funding, there is substantial variation across hospitals. Outstanding capital loans from DHSC (*Caploans)* average £12.6m, and annual PDC injections (*Pdiv*) average £14.3m – though both have very large maxima (over £300m for capital loans, over £800m for PDC in some years) reflecting the non-recurring nature of capital financing for many hospitals. Interim support loans (*Intloans*) also show a wide range: while the mean is £23.5m, more than half of hospital-years saw no interim loan (median £0), but one distressed trust accumulated £645m in interim borrowing over the period. For non-DHSC financing, PFI schemes stand out with an average outstanding obligation of £38 million and a maximum of just over £1 billion. This is unsurprising, as PFI was used for large capital projects such as new hospital builds (Hellowell & Vecchi, 2012; NAO, 2010). Notably, however, over half of the hospital-year observations in our sample have no PFI debt at all (median PFI = £0), indicating that PFI financing is concentrated in a subset of hospitals rather than being ubiquitous across the NHS. Other external loans (*Otherloans*) are smaller on average but still significant for some hospitals (£3.5m mean, median £0.11m, max £202m). Finally, the prior-year backlog maintenance investment (*Backlog*) and committed capital expenditure (*Capcomit*) also vary considerably; for example, some hospitals made no backlog reduction in a given year while others spent over £50m on backlog catch-up (mean £2.07m). These patterns mark the heterogeneity in both the resources available to hospitals and their capital spending needs.

4.2 Correlation analysis

Table 4 presents the correlations among the key variables. While we note several significant correlations at the 5% level, none of them demonstrate correlation values higher than 0.7, alleviating concerns about severe multicollinearity. We further test for multicollinearity by estimating the variance inflation factor (VIF) coefficients for all regression models, all of which are below the threshold of 5 (see Table 4), further supporting our assumption that multicollinearity is not a serious issue (Baum, 2006).

4.3 Empirical results

Table 5 presents our main regression results. Columns (1) to (3) report the two-way fixed effects estimations with year dummies: column 1 uses the full sample, while columns 2 and 3 split the sample into FTs and NHS Trusts, respectively. In column 1 (full sample), we find support for H1: private patient income (*Priinc*) is positively associated with capital expenditure at the 5%

significance level, with a coefficient of 0.171. However, when we split the sample, this effect is strongly positive for FTs (column 2) and not significant for NHS Trusts (column 3). This result illustrates that capital expenditure is positively associated with a hospital's activity in generating private income. By contrast, NHS Trusts do not appear to channel private income into capital projects – a difference we explore further below. This divergence suggests that FTs, with their greater autonomy, appear better able to reinvest revenue from private services into higher levels of capital expenditure, whereas NHS Trusts may be using any private income primarily to shore up day-to-day operations. This result is consistent with the greater spending pressures and stricter financial rules faced by NHS Trusts, which likely cause any surplus from private patient services to be used for immediate operational needs rather than long-term investments (NAO, 2016).

For H2, we examine the role of subsidised public capital. In the full sample (column 1), both capital loans (*Caploans*) and public dividend capital (*Pdiv*) are positively related to capital investment at the 1% significance level. This indicates a strong connection between receiving these forms of government financing and undertaking capital projects. The coefficient of *Caploans* in the full sample equals 0.183, while that for *Pdiv* is 0.063, both significant at the 1% level. Comparing the sub-samples, *Caploans* and *Pdiv* remain significant for both groups of hospitals, but capital expenditure tends to be more sensitive to capital loans in NHS Trusts (coefficient of 0.234) than in FTs (coefficient of 0.162). This may reflect that NHS Trusts rely heavily on DHSC loans when they need to invest (since they have fewer alternatives), whereas FTs, while still benefiting from government loans and grants, have other options as well.

Regarding H3 (non-subsidised capital), we include PFI obligations and other external loans. As Table 5 shows, *PFI* is not significant in our model, which is unsurprising given that PFIs have become unpopular due to recent critiques regarding their value for money, with new PFIs effectively halted in England since 2018 (HFMA, 2023; NAO, 2010). Our findings suggest that by the latter half of the 2010s, PFI (and similar private finance) was no longer a driver of new capital spending; instead, hospitals appear to have turned to other borrowing sources, as evidenced by the positive effect of *Otherloans*. Interestingly, when we split the sample, the significance of *Otherloans* holds for FTs (col. 2) but disappears for NHS Trusts (col. 3), indicating that whilst FTs exhibit a positive association between alternative borrowing (e.g., bank loans, local government loans) and capital investments, NHS Trusts do not. This parallels the result for private income and highlights a consistent pattern: FTs exhibit positive associations between a wider variety of funding sources and capital expenditure, while such associations are absent or weaker for NHS Trusts, consistent with the more restrictive capital and borrowing regime faced by the latter. In the split-sample fixed effects, the PFI variable remains insignificant for both FTs and NHS Trusts, suggesting that neither group was effectively using PFI for new capital during the period under investigation. In additional analysis (not tabulated, see online appendix Table 1), we found some evidence that PFI had a negative association with capital spending for NHS Trusts once dynamic effects were accounted for, which aligns with the expectation in H3 that heavy PFI burdens could crowd out other investments for the more financially constrained Trusts.

Among the control variables, NHS patient income (*NHSinc*) unsurprisingly shows a positive relationship with *Capexp* (significant in full sample and FT sample), indicating that larger hospitals (in terms of activity) invest more, all else equal. The surplus/deficit (*Surdef*) is not significant in any specification, which might be because short-term accounting results are less relevant for capital decisions in the NHS – hospitals with deficits can still invest if they receive loans/PDC, and indeed in some cases appear to have been given capital funds as part of turnaround plans (Clover & Barnes, 2015). This reflects the idea that financial sustainability is not a hard constraint in the public hospital sector due to the possibility of government support (i.e., a soft budget constraint). Interim loans (*Intloans*) show a negative coefficient, as expected, but are not significant in most models, confirming that emergency bailout loans are not associated with capital spending but instead aimed at plugging operating gaps. Additionally, the variable *Backlog*, representing prior year investment in reducing maintenance backlog, is statistically insignificant – possibly because hospitals address backlog as one-off campaigns or as extra funding allows. Conversely, *Capcomit*, representing contractual capital commitments for property, plant, and equipment, is positively and significantly (at the 1% level) related to capital expenditure in all models. This indicates that hospitals which had more committed-but-unspent capital projects in the pipeline at the end of last year tend to spend more on capital in the current year – as would be expected, since those commitments translate into actual expenditure as projects progress.

The fixed-effects results discussed above provide initial evidence for our hypotheses, but they may be subject to endogeneity problems for which missing variables in the error term – particularly those related to hospital performance – is a key source. For example, more successful, better equipped hospitals may attract a greater number of private patients, which in turn lead to increased capital expenditure. To address this concern, and based on the availability of hospital-level data, we include a key performance indicator – average waiting time (AWT) – into the models for fixed-term and GMM regressions. AWT captures a hospital's operational efficiency, service accessibility, and degree of patient-centred care. Extended waiting times often indicate capacity constraints, such as limited clinical space, outdated infrastructure, or equipment shortages, all of which may necessitate increased capital investment to expand or modernise facilities (Appleby et al. 2014; NAO 2020). The results remain consistent when AWT is included; to maximise transparency, these estimates – based on 260 observations with missing data – are provided in the online supplementary appendix. Furthermore, we adopt the two-step system GMM approach developed by Arellano and Bond (1991), which is capable of estimating dynamic equations consistently, ensuring that past relevance is accurately captured. Meanwhile, the GMM approach imposes fewer assumptions on model specification and parameters than ordinary least squares (OLS) methods, increasing the likelihood of consistent estimates (Andrews et al., 2012). Furthermore, by first differencing and using lagged independent variables as instruments, endogeneity caused by time-invariant heterogeneity and reverse causality can be effectively addressed (Abdallah et al., 2015). Also, GMM estimations are appropriate for datasets with a small-time dimension (T) and a large cross-section (N), aligning with our research context (Cameron and Trivedi, 2009). To retain most of the sample observations, we include a one-year lagged dependent variable in the models (Ullah et al., 2018).

Finally, as a key procedure of performing GMM estimations, we treat all time-varying variables as endogenous as they may be reversely related to capital expenditure or associated with the unobserved factors (Veronesi et al., 2019). The GMM estimation results, shown in Table 6, include a lagged variable of *Capexp*, which is positive and significant (at the 1% significance level), confirming a degree of persistence in hospital capital spending from year to year. The GMM results are broadly consistent with the fixed effect results, with private patient income (*Priinc)* remaining positively related to capital expenditure, including for FTs when observations are disaggregated by hospital category. Further, capital loans (*Caploans*) and public dividend capital (*Pdiv*) continue to have significant positive influences on capital expenditure for the whole sample and hospital categories separately. For H3, column (2) and (3) report estimators from the sample of FTs and NHS Trusts. In line with the fixed-effect results, *Otherloans* remain positive and significantly related to capital expenditure for FTs (and the full dataset) but become a significantly negative predictor (at the 1% level) of capital expenditure for NHS Trusts. Furthermore, as we hypothesised, the negative *PFI*-capital expenditure relationship is now significant at the 5% level only for NHS Trusts, consistent with our expectation that PFI obligations might crowd out NHS Trusts' spending.

To ensure robustness, we also performed moderation analysis to justify whether the FT/NHS Trusts status (measured by a dummy with 1 for FTs and 0 for NHS Trusts) causes statistically significant divergences in regard to the effects of *PFI* and *Otherloans* on capital expenditure (Rodriguez et al., 2022)[3]. As shown in column (4), the interaction terms *Trust*PFI* as

[3] We only applied this approach for the two-step GMM analysis. This is because the status for our selected FTs and NHS Trusts remained unchanged during our research period, which makes the within-group fixed-effect-based

well as *PFI* itself are still insignificant. While the coefficient of *Trust*Otherloans* equals 1.493 at the 1% significance level. This suggests that the *Otherloans* coefficients for FTs and NHS Trusts are not only significantly different from each other, but also, the FT status is strong enough to turn the negative relationship of *Otherloans* (coefficient = -0.689, significant at 1%) into a positive one. This is consistent with fixed-effect regression findings, corroborating our argument that an increase in non-departmental borrowing is associated with reduced capital expenditure by NHS Trusts, suggesting NHS Trusts with greater reliance on other loans face increased revenue pressures, which in turn reduces their capacity for capital investment. Overall, the GMM analysis – by addressing potential endogeneity with internal instruments – gives us greater confidence that the relationships observed (especially the differing roles of *Priinc* and *OtherLoans* in FTs vs NHS Trusts) are not driven by omitted factors or reverse causality.

4.4 Additional analysis

Our main hypotheses discuss the implications of various statutory and regulatory differences that arise within our sample which may be associated with differences in trust behaviour (see Table 1). In England, further structural differences exist that may impact the generalisability of our sample, necessitating additional analysis. Specifically, there has been an on-going political debate regarding the ‘north-south’ divide, suggesting that parts of England have significantly different socio-economic characteristics (Balchin, 2021) with direct impacts on health inequalities (Bernard et al., 2024). Politically this has been reflected in recent UK governments enacting various initiatives to improve health and prosperity in the North of England, such as the ‘levelling up’ agenda (DLUHC, 2022).

Tables 7 and 8 present our main model, divided into firstly three geographical regions; the North, Midlands and South[4], further subdivided by the types of trust in each region, i.e., NHS Trusts versus FTs. Here, the limited number of observations in each subgroup means that the “large N and small T” prerequisite for system GMM is not satisfied. Thus, as mentioned above, we rely on the LSDVC estimator (Bruno, 2005) as well as the bootstrapped bias correction (BBC) for the fixed effects estimator in dynamic panels (Everaert and Pozzi, 2007). While both approaches work well

analysis fail to estimate the variations within a sample (i.e., a hospital) over the years. However, the two-step system GMM allows for simultaneous estimations in differences and levels. In other words, time-invariant effects can be estimated within level equations, which is considered a key advantage of this approach (Blundell et al., 2000).

[4] A Trust’s region is defined by NHS England and is reported within data sources presented within Table 2.

in the case of “small Ns”, the latter (i.e., BBC) may be more effective, as it does not require strict assumptions, such as homoskedasticity (De Vos et al., 2015).

Compared to our main results, some geographical differences are observed, supporting the existence of a potential ‘north-south’ divide. With regard to subsidised capital (*Caploans* and *Pdiv*), trusts in the North appear to only access PDC (*Pdiv*), which is non-repayable and issued on a non-commercial basis, suggesting that trusts within the Midlands and South have access to a wider range of capital sources. This result is further supported by the result for non-subsidised capital (*Otherloans*), where strong results are seen within the South, and consistent with our main model, only FTs have access to commercial sources.

Finally, due to the specific features of the LSDV and BBC estimation strategies, private income lacks significance in most estimations that disaggregate hospitals by regions and categories. However, a negative and weakly significant relationship is found for private patient income in relation to NHS Trusts located in Northern England. A possible explanation is that NHS Trusts in the North face specific challenges when providing private healthcare, which may result in private patient provision being unprofitable, such as generally lower demand for private healthcare and greater difficulties in recruiting and retaining staff (Buchan et al., 2020). Hence, while for most hospitals private patient income may enhance capital investment or have a neutral effect (Tables 5 and 6), in some cases this activity might drain a hospital’s capacity to invest in capital.

5. Summary and conclusions

Capital investment behaviour by private sector firms has long been an area of debate in the academic literature; however, few studies have examined capital expenditure by non-profit organisations. While comprising a relatively small proportion of overall expenditure, capital expenses in healthcare are critical to ensuring the future productivity of healthcare systems, which is increasingly important in light of demographic trends. These trends, including but not limited to an ageing population, place additional pressure on the performance of healthcare systems in the UK and other developed countries. In this article, we examine the association between hospital capital expenditure and key financial and governance variables of publicly funded hospitals in England, including private patient income and access to different borrowing arrangements. Since 2010, in the aftermath of the financial crisis, NHS hospitals have operated under significantly tighter financial constraints due to austerity measures and slower growth in public funding. This prolonged funding squeeze has limited their ability to finance long-term capital investments and serves as an important backdrop to the findings of this study.

We analyse hospital capital expenditure by focusing on cash spending on PPE and investment property. We find that capital investments are positively influenced by income generated from private patients in the case of FTs, indicating that, for FTs, private patients' income is positively associated with capital expenditure, supporting H1. For NHS Trusts, however, we find no positive impact of private patient income on capital expenditure. This may be due to the increased spending pressures faced by NHS Trusts, combined with a stricter regulatory framework in which these hospitals operate, suggesting that any surpluses generated from private patient services may be absorbed by operational pressures rather than reflected in higher capital expenditure. We further find that, on average, hospitals that have been able to access departmental loans or received public dividend capital, invest more in their capital assets, confirming H2. Other external financing sources, such as PFI arrangements and non-governmental loans, are positively associated with capital investments in the aggregate; however, when disaggregating our results by hospital category we find significant yet opposite results with PFIs and non-governmental loans negatively impacting capital expenditure by NHS Trusts, but positively impacting capital expenditure by FTs. These results reflect the differences between both categories of hospitals in terms of their financial autonomy, access to capital, and financial flexibility under pressure. Taken together, these findings are consistent with the operation of a hybrid financial regime in which public funding mechanisms coexist with commercial income and borrowing, but with uneven implications for capital expenditure across organisational forms. In particular, our evidence suggests that more autonomous Foundation Trusts exhibit positive associations between a wider range of borrowing sources and capital expenditure, whereas such associations are absent or weaker for NHS Trusts, which appear more constrained and often prioritise operational pressures over capital spending.

Our study is the first to empirically document the impact of this two-tier dynamic – a product of post-NPM hybridisation of the NHS – for hospitals ability to undertake capital investments. These findings contribute to public sector accounting and health policy debates on the unintended consequences of introducing market-oriented reforms within a publicly funded health system. They also add to the literature on hybridity, which has largely examined the benefits, challenges, and governance of hybrid organizational forms across sectors or organization fields (Grossi et al., 2022; Kurunmäki & Miller 2011), and resonate with the broader institutional perspective emphasised by Taylor et al. (2025), who show that legal, regulatory, and political reforms can be powerful influences on accounting and financial outcomes. However, hybridity may generate divergent (financial) consequences for organisations operating within the same sector, and such institutional influences help explain why the capital investment patterns we observe between FTs and NHS

Trusts diverge even when operating within the same system – an aspect that has received comparatively less attention in empirical studies of capital investment within healthcare. Mobilising sufficient resources for capital investment remains one of the key challenges confronting state-run healthcare in England. This challenge has been compounded by the prolonged effects of austerity-era funding constraints, which have limited the growth of NHS capital budgets and increased the difficulty of planning and delivering long-term infrastructure projects.

Despite recent policy measures – such as the introduction of tighter controls to prevent raiding of capital budgets for day-to-day spending, and the implementation of central government relief (bailouts) that have released hospitals from repaying large interim loans (NAO, 2020) – hospitals in England continue to face significant difficulties in funding and delivering their capital investment plans. This has important implications for the productivity of NHS hospitals and, in several cases, poses risks to patient safety and quality of care due to ageing infrastructure (NHS Providers, 2023). The results of our study show that, in response to growing financial pressures, alternative sources of income and non-traditional borrowing play an important role in shaping hospitals' observed capital investment patterns. While such funding does not replace traditional capital allocations, it provides an important supplementary source of finance and reflects an emerging NHS financing strategy that may gain in relevance as fiscal pressures persist in a publicly funded healthcare system. This includes private patient income, with case study and anecdotal evidence showing that some hospitals have explicitly reinvested this revenue into new or upgraded facilities benefiting all patients (Exworthy et al., 2024), highlighting how private income can directly support capital projects when public allocations fall short.[5] This demonstrates that the impact of austerity in the NHS context is complex and, as observed in other countries and public sector domains, goes beyond simply 'making cuts and balancing budgets' (Bracci et al., 2015, p. 895).

However, hospital-specific financial and regulatory features critically impact hospitals' ability to invest, even when these hospitals all operate within the same, primarily publicly funded healthcare system. Our evidence underlines that the NHS capital funding model is producing divergent outcomes: traditional NHS Trusts appear particularly constrained, whereas FTs are better positioned to innovate in capital financing. These findings stress the importance of restructuring the capital funding frameworks of the NHS, which seem particularly restrictive for NHS Trusts.

[5] E.g., Great Ormond Street Hospital (GOSH) NHS Foundation Trust states that its International and Private Care Directorate "is an important component of the overall funding model for GOSH" and "enables the Trust to invest in enhancements to services and facilities which support and drive benefits across the NHS" (2023, p. 37). Similarly, Moorfields Eye Hospital NHS Foundation Trust reports that surplus from its private patient care activities "is reinvested to support NHS patients and services" (2023, p. 6).

Furthermore, present constraints often force hospitals to focus on maintaining existing services rather than pursuing much-needed long-term strategic upgrades to healthcare infrastructure. Exploring additional flexibilities in how capital funding is managed and regulated would be relevant – for example, allowing hospitals more leeway to carry forward unspent capital allocations to future periods or to pool capital resources between hospitals, as well as considering new models of accessing capital funding, including partnerships with private-sector investors under appropriate governance. We also echo the recommendation that the creation of regional capital funds within Integrated Care Systems (ICSs) could serve as an important mechanism to address capital funding disparities, promoting collaboration and shared investment priorities across local healthcare providers (NAO, 2020).

Whilst our article provides important empirical insights into recent capital expenditure trends across the NHS, more knowledge is needed on how publicly funded hospitals can be better supported in planning and delivering capital investments in constrained public funding environments. This includes better understanding the role of financial management capabilities, leadership, and institutional support in shaping investment outcomes – factors that may moderate the relationship between funding mechanisms and capital spending decisions.

Our analysis is subject to limitations: due to data accessibility constraints, we may not have incorporated all factors influencing capital expenditure. Further, we examine a single country over a seven-year period, so generalisation to other contexts should be cautious, and we do not directly assess the outcomes of capital investments (such as improvements in care quality or efficiency), which could be investigated in future research. International examples of how publicly funded healthcare systems outside the UK manage capital investment, along with further in-depth analysis of capital management capabilities across different NHS organisations, will likely yield valuable insights into a spending domain that has, until now, received little attention but is critical to ensuring that publicly funded healthcare systems remain fit for purpose.

6. References

Abdallah, W., Goergen, M., & O'Sullivan, N. (2015). Endogeneity: How failure to correct for it can cause wrong inferences and some remedies. *British Journal of Management, 26*(4), 791-804.

Adelino, M., Lewellen, K., & Sundaram, A. (2015). Investment decisions of nonprofit firms: Evidence from hospitals. *The Journal of Finance, 70*(4), 1583-1628.

Anandaciva, S. (2020). *Financial debts and loans in the NHS*. London: The King's Fund.

Anderson, G., Erickson, J., & Feigenbaum, S. (1987). Examining the relationship between capital investment and hospital operating expenditures. *The Review of Economics and Statistics, 69*(4)709-713.

Andrews, R., Boyne, G. A., & Walker, R. M. (2012). Overspending in public organizations: does strategic management matter? *International Public Management Journal, 15*(1), 39-61.

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies, 58*(2), 277-297.

Bai, G., Hsu, S. H., & Krishnan, R. (2014). Accounting performance and capacity investment decisions: Evidence from California hospitals. *Decision Sciences, 45*(2), 309-339.

Balchin, P. N. (2021). *Regional Policy in Britain: The North South Divide*. Routledge.

Ballantine, J., Forker, J., & Greenwood, M. (2008). Public and private sector auditors and accruals quality in English NHS hospital Trusts. *The British Accounting Review, 40*, 28-47.

Baum, C. F. (2006). *An introduction to modern econometrics using Stata*. Stata Press.

Bernard, K., McGowan, V. J., & Bambra, C. (2024). "Power, control, strain": Lay perceptions of health inequalities across England's 'North South divide'. *Social Science & Medicine*, *355*(2), 117089.

Bernet, P. M., Rosko, M. D., & Valdmanis, V. G. (2008). Hospital efficiency and debt. *Journal of Health Care Finance, 34*(4), 66-88.

Blundell, R. & Bond, S. (2000). GMM estimation with persistent panel data: An application to production functions. *Econometric Reviews 19*(3), 321–40.

Bracci, E., Humphrey, C., Moll, J., & Steccolini, I. (2015). Public sector accounting, accountability and austerity: more than balancing the books? *Accounting, Auditing & Accountability Journal, 28*(6), 878-908.

Bruno, G. S. (2005). Estimation and inference in dynamic unbalanced panel-data models with a small number of individuals. *The Stata Journal, 5*(4), 473-500.

Buchan, J., Ball, J., Shembavnekar, N., & Charlesworth, A. (2020). *Building the NHS workforce in England.* London: The Health Foundation. Available at https://www.health.org.uk/publications/reports/building-the-nhs-nursing-workforce-in-england

Calem, P. S., & Rizzo, J. A. (1995). Financing constraints and investment: New evidence from hospital industry data. *Journal of Money, Credit and Banking, 27*, 1002-1014.

Cameron, A. C., & Trivedi, P. K. (2010). *Microeconometrics using stata* (Vol. 2). College Station, TX: Stata press.

Carroll, N. W., Smith, D. G., & Wheeler, J. R. (2015). Capital investment by independent and system-affiliated hospitals. *INQUIRY: The Journal of Health Care Organization, Provision, and Financing, 52*, 1-9.

Choi, S. (2017). Hospital capital investment during the great recession. *INQUIRY: The Journal of Health Care Organization, Provision, and Financing, 54*, 1-11.

Clover, B. (2024). Cashflow crisis at NHS trusts. *Local Government Chronicle*, 21 May 2024. Available via: https://www.lgcplus.com/services/health-and-care/cashflow-crisis-at-nhs-trusts-21-05-2014/

Clover, B., & Barnes, S. (2015). FT to receive £328m as part of takeover of neighbour. *Health Service Journal*, 12 March.

Custance, M. (2021). *Why is NHS infrastructure vital to economic recovery?* Grant Thornton insights, 4 June. Available via: https://www.grantthornton.co.uk/insights/why-is-nhs-infrastructure-vital-to-economic-recovery/

Department of Health (2013). *The regulation and oversight of NHS trusts and NHS foundation trusts: joint policy statement to accompany care bill quality of services clauses*. London: UK Government.

De Vos, I., Everaert, G., & Ruyssen, I. (2015). Bootstrap-based bias correction and inference for dynamic panels with fixed effects. *The Stata Journal, 15*(4), pp. 986-1018.

DHSC (2023). Guidance Secretary of State's Guidance under section 42A of the National Health Service Act 2006. Department of Health and Social Care, 20 January. Available via: https://www.gov.uk/government/publications/guidance-on-financing-available-to-nhs-trusts-and-foundation-trusts/secretary-of-states-guidance-under-section-42a-of-the-national-health-service-act-2006

DLUHC (2022). *Levelling Up the United Kingdon*. London: Department for Levelling Up, Housing and Communities.

Everaert, G., & Pozzi, L. (2007). Bootstrap-based bias correction for dynamic panels. *Journal of Economic Dynamics and Control, 31*(4), 1160–1184.

Exworthy, M., & Lafond, S. (2021). New development: Commercialization of the English National Health Service: a necessity in times of financial austerity? *Public Money & Management, 41*(1), 81-84.

Exworthy, M., Lunt, N., Tuck, P., & Mistry, R. (2024). From commodification to entrepreneurialism: how commercial income is transforming the English NHS. *Public Money & Management, 44*(4), 308-316.

Gainsbury, S. (2017). “When the price isn’t right: how cuts in hospital payments added up to the NHS deficit” Nuffield Trust comment. Available at www.nuffieldtrust.org.uk/news-item/when-the-price-isn-t-right-how-cuts-in-hospital-payments-added-up-to-the-nhs-deficit

Great Ormond Street Hospital NHS Foundation Trust (2023). *Annual Report and Accounts 2022/23.* Available at https://media.gosh.nhs.uk/documents/Great_Ormond_Street_Hospital_for_Children_FT_Annual_Report_202223_FINAL_VERSIO_33xZbh6.pdf

Greenwood, M. J., Baylis, R. M., & Tao, L. (2017). Regulatory incentives and financial reporting quality in public healthcare organisations. *Accounting and Business Research, 47*(7), 831–855.

Grossi, G., Laguecir, A., Ferry, L., & Tucker, B. (2024). Accounting and accountability for managing diversity tensions in hybrid organisations. *The British Accounting Review, 56*, 101470.

Grossi, G., Vakkuri, J., & Sargiacomo, M. (2022). Accounting, performance and accountability challenges in hybrid organisations: a value creation perspective. *Accounting, Auditing & Accountability Journal, 35*(3), 577-597..

Guan, S., Tian, S., & Deng, G. (2024). Revenue diversification or revenue concentration? Impact on financial health of social enterprises. *Public Management Review, 23*(5), 754–774.

Ham, C. (2023). *The rise and decline of the NHS in England 2000–20 How political failure led to the crisis in the NHS and social care*. London: The King’s Fund.

Heald, D., & Scott, D. A. (1996). Assessing capital charging in the National Health Service. *Financial Accountability & Management, 12*, 225-244.

Hellowell, M., & Vecchi, V. (2012). An evaluation of the projected returns to investors on 10 PFI projects commissioned by the National Health Service. *Financial Accountability & Management, 28*(1), 77-100.

HFMA (2018). *NHS capital – a system in distress?* Bristol: Healthcare Financial Management Association.

HFMA (2023). *NHS finance*. Bristol: Healthcare Financial Management Association.

Hodgson, D. E., Bailey, S., Exworthy, M., Bresnen, M., Hassard, J., & Hyde, P. (2022). On the character of the new entrepreneurial National Health Service in England: Reforming health care from within?. *Public Administration, 100*, 338-355.

Hood, C. (1991). A public management for all seasons?. *Public administration, 69*(1), 3-19.

Hyndman, N., & Lapsley, I. (2016). New public management: The story continues. *Financial Accountability & Management, 32*, 385-408.

Karmann, A., & Roesel, F. (2017). Hospital policy and productivity–evidence from German states. *Health Economics, 26*(12), 1548-1565.

Kurunmäki, L., & Miller, P. (2011). Regulatory hybrids: Partnerships, budgeting and modernising government. *Management Accounting Research, 22*(4), 220-241.

Lewellen, J., & Lewellen, K. (2016). Investment and cash flow: New evidence. *Journal of Financial and Quantitative Analysis*, 51(4), 1135-1164.

Linton, M.-J., Coast, J., Williams, I., Copping, J., & Owen-Smith, A. (2019). Developing a framework of quality indicators for healthcare business cases: a qualitative document analysis consolidating insight from expert guidance and current practice. *BMC Health Services Research*, *19*, 1-9.

Massam, R. (2017). *Public accountability and the case of the NHS foundation trust policy: An exploration of the views and experiences of policy makers, regulators, directors and governors.* PhD Thesis. Oxford: Oxford University

Mellett, H., Marriott, N., & Macniven, L. (2009). Devolution, accruals accounting and asset management in NHS Wales. *Financial Accountability & Management, 25*, 435-450.

Monitor (2013). *Compliance Framework 2013/14.* https://www.oxfordhealth.nhs.uk/wp-content/uploads/2013/07/90ii_BOD_ToPublishComplianceFramework201314March131.pdf

Moorfields Eye Hospital NHS Foundation Trust (2023). *Annual Report and Accounts 2022/23*. Available at https://www.moorfields.nhs.uk/mediaLocal/f4edsgrd/none-moorfields-eye-hospital-nhs-ft-annual-report-accounts-2022-23.pdf).

National Health Service Act 2006. London: The Stationery Office.

NAO (2010). *The performance and management of hospital PFI contracts*. London: The Stationery Office

NAO (2016). *Financial sustainablity of the NHS*. London: The Stationery Office

NAO (2020). *Review of capital expenditure in the NHS*. Available at www.nao.org.uk/report/review-of-capital-expenditure-in-the-nhs/

NHE (2014). NHS trusts taking advantage of relaxed rules on private patient income. *National Health Executive*, 20 August.

NHS England (2025). *Capital guidance 2025/26.* London: NHS England, published 30 January 2025. Available at: https://www.england.nhs.uk/long-read/capital-guidance-2025-26/

NHS England (2021). Guidance on NHS system capital envelopes for 2020-21. Available at: https://www.england.nhs.uk/publication/guidance-on-the-cash-and-capital-regime-for-2021-22/

NHS Improvement (2018). *Consolidated NHS provider accounts 2017/18*.

NHS Providers (2023). *No more sticking plasters: repairing and transforming the NHS estate. No more sticking plasters: repairing and transforming the NHS estate*. Available at https://nhsproviders.org/no-more-sticking-plasters

Roberts, A, Marshall, L., & Charlesworth, A. (2012). *A decade of austerity? The funding pressures facing the NHS from 2010/11 to 2021/22*. Nuffield Trust. Available at : https://www.nuffieldtrust.org.uk/research/a-decade-of-austerity-the-funding-pressures-facing-the-nhs-from-2010-11-to-2021-22

OECD (2022). *Private health insurance spending*. Paris: OECD. Available via: https://www.oecd.org/els/health-systems/private-health-insurance.htm#:~:text=Around%2010%25%20of%20all% 20health,financing%20in%20many%20OECD%20countries.

Patel, E., & Seegert, N. (2020). Does market power encourage or discourage investment? Evidence from the hospital market. *The Journal of Law and Economics, 63*(4), 667-698.

Powell, M., Gillett, A., & Doherty, B. (2019). Sustainability in social enterprise: Hybrid organizing in public services. *Public Management Review, 21*(2), 159-186.

Rechel, B., Erskine, J., Dowdeswell, B., Wright, S., McKee, M., & Organization, W. H. (2009). *Capital investment for health: case studies from Europe*. World Health Organization. Regional Office for Europe.

Rodriguez, J. E., Williams, D. R., & Bürkner, P. (2022). Heterogeneous heterogeneity by default: testing categorical moderators in mixed-effectsmeta-analysis. *British Journal of Mathematical and Statistical Psychology*, *76*(2), 402-433.

Schulten, T., & Böhlke, N. (2013). Hospitals under growing pressure from marketisation and privatisation. In C. Hermann & J. Flecker (2012). *Privatization of Public Services* (pp. 89-108). New York: Routledge.

Shaoul, J. (1998). Charging for capital in the NHS trusts: to improve efficiency? *Management Accounting Research, 9*, 95-112.

Staffordshire and Stoke-on-Trent (2023). *Capital Accounting Policy.* Available at https://staffsstoke.icb.nhs.uk/your-nhs-integrated-care-board/our-publications/governance-handbook/all-policies/finance-policies/capital-accounting-policy-v1

Subires, L, & Bolívar, M. P. (2017). Financial Sustainability in Governments. A New Concept and Measure for Meeting New Information Needs. In *Financial Sustainability in Public Administration: Exploring the Concept of Financial Health*, edited by M. P. Rodríguez Bolívar, 3-20. Switzerland: Palgrave.

Taylor, G., Cumming, D., Li, D., & Shi, J. (2025). The role of legal, regulatory and political reforms and institutions in influencing accounting and financial outcomes. *The British Accounting Review, 57*, 101647.

The King's Fund (2022). *Capital investment in the NHS*. Available at https://www.kingsfund.org.uk/projects/nhs-in-a-nutshell/nhs-capital-investment

Thomas, R. (2019). NHS trusts owe government £14bn. *Health Service Journal*, 19 August.

Ullah, S., Akhtar, P., & Zaefarian, G. (2018). Dealing with endogeneity bias: The generalized method of moments (GMM) for panel data. *Industrial Marketing Management*, 71, 69-78.

Veronesi, G., Kirkpatrick, I. and Altanlar, A. (2019). Are Public Sector Managers a "Bureaucratic Burden"? The Case of English Public Hospitals. *Journal of Public Administration Research And Theory*, 29(2), 193-209.

Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data*. MIT press.

Tables

Table 1
Summary of performance metrics required to be met by NHS Trusts and Foundation Trusts (FTs).

Performance metric	***NHS Trust***	***FTs***
Statutory duty to break even [S]	✓	×
Remain within an external financing limit [NS]	✓	×
Remain within a capital resource limit [NS]	✓	×

Note: S= statutory requirement as noted within the National Health Service Act 2006. NS = non-statutory requirement. (Source: compiled by authors using National Health Service Act 2006 and HFMA 2023.)

Table 2
Definitions of variables, along with their sources.

Variable [a]	Definition [b]	Source: NHS Trusts	Source: FTs
$Capexp_{it}$	Cash additions of property, plant and equipment and investment property for the year. Sourced from the cash flow statement.	2015/16 – 2016/17 Department of Health and Social Care 2017/18 – 2018/19 NHS Improvement 2019/20 – 2021/22 NHS England	2015/16 – 2016/17 Monitor 2017/18 – 2018/19 NHS Improvement 2019/20 – 2021/22 NHS England
$PPETurnover_{it}$	Measured as the value of PPE held at the end of the year divided by income received during the year from NHS patients ($NHSinc_{it}$).		
$Priinc_{it}$	Income received during the year from private patients.		
$Caploans_{it}$	Outstanding capital loans owed to the DHSC at year-end.		
$Pdiv_{it}$	Public dividend capital received during the year.		
PFI_{it}	Outstanding PFI amounts (or similar schemes) owed at year-end.		
$NHSinc_{it}$	Income received during the year from NHS patients.		
$Intloans_{it}$	Interim loans owed to the DHSC at year-end.		
$Otherloans_{it}$	All other loans: Outstanding loans not described above (calculated as total borrowing MINUS *CapLoansi* MINUS $Intloans_{it}$ MINUS PFI_{it}), these can include loans from various non-departmental sources including local councils		
$Surdef_{it}$	Net annual financial result, reported as surplus or deficit for the year.		
$Backlog_{it-1}$	Investment in reducing backlog maintenance incurred during the prior year.		
$Capcomit_{it-1}$	Amount of contractual capital commitments of property, plant and equipment at the end of the prior year.		
$Backlog\%_{it}$	Measured as investment in reducing backlog maintenance incurred during the year		

	divided by the value of PPE held at the end of the year.		

Notes: [a] Variables are measured for each trust *i* at time *t*. *t* represents a financial year end.
[b] When used within model (1), all variables are scaled using a trust's prior year total assets.

Table 3

This table reports the descriptive statistics of the variables of interest in our model presented in equation 1 and defined in Table 2. We report the mean, standard deviation, minimum, maximum, median as well as the skewness and kurtosis of each variable. Note that the values stated below are unscaled and reported in £'000.

	N*	Mean	Std. Dev.	Min	Max	Median	Skewness	Kurtosis
$Capexp_{it}$	1,350	15,721	17,466	166	174,148	10,499	3.43	19.89
$NHSinc_{it}$	1,350	319,739	222,177	18,163	1,707,301	257,367	2.19	9.62
$Priinc_{it}$	1,350	2,763	9,878	0	132,621	211	7.41	71.46
$Surdef_{it}$	1,350	(7,053)	29,317	(291,524)	263,364	(1,224)	(0.56)	28.87
$Caploans_{it}$	1,350	12,633	26,753	0	324,471	3,170	6.05	55.01
$Pdiv_{it}$	1,350	14,283	53,160	0	801,643	1,073	7.27	74.28
PFI_{it}	1,350	37,879	103,574	0	1,083,487	0	5.71	47.47
$Intloans_{it}$	1,350	23,507	58,052	0	644,923	0	4.27	28.76
$Otherloans_{it}$	1,350	3,505	14,575	0	202,403	107	9.28	104.12
$Backlog_{it}$	1,350	2,072	3,663	(75)	56,823	993	6.52	76.59
$Capcomit_{it}$	1,350	6,726	24,227	0	340,273	1,464	8.70	93.34

*Note that due to missing data, our observations fall from an expected total of 1,351 to 1,350.

Table 4 Correlation matrix

This table reports the correlations between our variables used within our main model presented in equation 1. Variables are as defined within Table 2 and have been scaled by lagged total assets.

	VIF values	$Capexp_{it}$	$NHSinc_{it}$	$Priinc_{it}$	$Surfdef_{it}$	$Caploans_{it}$	$Pdiv_{it}$	PFI_{it}	$Intloans_{it}$	$Otherloans_{it}$	$Backlog_{it-1}$	$Capcomit_{it-1}$
$Capexp_{it}$		1										
$NHSinc_{it}$	1.15	0.125*	1									
$Priinc_{it}$	1.08	0.034	-0.187*	1								
$Surfdef_{it}$	1.32	0.002	0.123*	0.073*	1							
$Caploans_{it}$	1.09	0.116*	-0.057*	0.100*	-0.071*	1						
$Pdiv_{it}$	1.13	0.368*	0.070*	-0.051	0.032	-0.074*	1					
PFI_{it}	1.13	-0.161*	-0.192*	-0.093*	-0.081*	-0.115*	0.024	1				
$Intloans_{it}$	1.37	-0.024	0.034	-0.050	-0.443*	0.167*	-0.104*	0.075*	1			
$Otherloans_{it}$	1.01	0.137*	-0.019	0.027	-0.005	-0.013	-0.010	-0.078*	-0.032	1		
$Backlog_{it-1}$	1.14	0.266*	0.090*	-0.006	-0.119*	0.077*	0.198*	-0.171*	0.174*	0.032	1	
$Capcomit_{it-1}$	1.07	0.679*	-0.083*	0.018	-0.023	0.120*	0.183*	-0.015	-0.010	-0.014	0.081*	1

Note: * = statistically significant at the 5% level.

Table 5
This table reports the panel fixed effects regression results.

Dependent variable	(1) All $Capexp_{it}$	(2) FTs only $Capexp_{it}$	(3) NHS Trusts only $Capexp_{it}$
$Priinc_{it}$	0.171**	0.216**	-0.120
	(0.076)	(0.086)	(0.515)
$Caploans_{it}$	0.183***	0.162**	0.234**
	(0.062)	(0.079)	(0.092)
$Pdivit_{it}$	0.063***	0.066***	0.062***
	(0.012)	(0.016)	(0.019)
PFI_{it}	0.019	0.032	-0.044
	(0.035)	(0.026)	(0.097)
$Otherloans_{it}$	0.220**	0.247**	0.018
	(0.098)	(0.109)	(0.205)
$NHSinc_{it}$	0.025***	0.036***	0.009
	(0.007)	(0.008)	(0.007)
$Surdef_{it}$	-0.016	-0.020	-0.025
	(0.016)	(0.016)	(0.026)
$Intloans_{it}$	-0.003	0.003	-0.014
	(0.011)	(0.014)	(0.017)
$Backlog_{it-1}$	0.104	-0.008	0.307
	(0.151)	(0.142)	(0.278)
$Capcomit_{it-1}$	0.326***	0.443***	0.313***
	(0.026)	(0.052)	(0.029)
Constant	0.002	-0.017	0.037
	(0.013)	(0.012)	(0.025)
Year	Yes	Yes	Yes
N*	1150	738	412
Adj. R^2	0.61	0.41	0.75
F	48.13***	18.02***	67.35***

Robust standard errors are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively. Our sample size has fallen compared to that reported within Table 3 due to the need for the lagged variables $Backlog_{it-1}$ and $Capcomit_{it-1}$.

Table 6
This table reports dynamic GMM regression results with the one-year lagged dependent variable.

Dependent variable	(1) All *Capexp$_{it}$*	(2) FTs only *Capexp$_{it}$*	(3) NHS Trusts only *Capexp$_{it}$*	(4) Moderators added *Capexp$_{it}$*
Lagged Capexp$_{it}$	0.247***	0.130***	0.357***	0.260***
	(0.029)	(0.020)	(0.024)	(0.026)
Priinc$_{it}$	0.154**	0.115**	0.294	0.227***
	(0.070)	(0.047)	(0.498)	(0.067)
Caploans$_{it}$	0.029*	0.020*	0.110**	0.055**
	(0.017)	(0.011)	(0.048)	(0.022)
Pdivit$_{it}$	0.048***	0.056***	0.044***	0.050***
	(0.007)	(0.008)	(0.008)	(0.006)
PFI$_{it}$	-0.013	-0.021	-0.028**	-0.024
	(0.010)	(0.015)	(0.012)	(0.015)
Trust PFI$_{it}$*				0.014
				(0.019)
Otherloans$_{it}$	0.670***	0.536***	-0.702***	-0.689***
	(0.116)	(0.073)	(0.185)	(0.203)
Trust Otherloans$_{it}$*				1.493***
				(0.228)
NHSinc$_{it}$	0.031***	0.032***	0.003	0.031***
	(0.006)	(0.005)	(0.006)	(0.005)
Surdef$_{it}$	-0.018*	-0.014*	-0.019	-0.030***
	(0.010)	(0.008)	(0.012)	(0.009)
Intloans$_{it}$	-0.001	0.008	-0.000	0.226
	(0.006)	(0.006)	(0.009)	(0.147)
Backlog$_{it-1}$	0.194	-0.014	1.128***	0.357***
	(0.139)	(0.095)	(0.154)	(0.005)
Capcomit$_{it-1}$	0.367***	0.493***	0.334***	-0.002
	(0.006)	(0.031)	(0.005)	(0.010)
Constant	-0.014	-0.008	0.019*	-0.017
	(0.009)	(0.007)	(0.010)	(0.012)
Year	Yes	Yes	Yes	Yes
Hospital	Yes	Yes	Yes	Yes
N*	1149	738	411	1149
Sargen-Hansen	57.42	53.03	30.41	80.17
Prob > chi^2	0.46	0.47	0.25	0.20
AB test (2)	-0.53	-1.15	0.13	-0.25
Prob > |z|	0.60	0.25	0.90	0.81

Robust standard errors are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively. Sargan-Hansen test results show that the overidentifying restrictions are always valid (i.e., the instruments are valid). Arellano–Bond AR(2) test results show that there is no second-order or higher-order serial correlation.

Table 7

This table reports LSDVC regression results for all hospitals, FTs and NHS Trusts in the North, South, and Midlands, with capital expenditure (*$Capexp_{it}$*) used as the dependent variable.

	(1) North	(2) North	(3) North	(4) Midlands	(5) Midlands	(6) Midlands	(7) South	(8) South	(9) South
	All	FT	Trust	All	FT	Trust	All	FT	Trust
Lagged $Capexp_{it}$	0.148***	0.175***	-0.121	0.236***	0.216	0.177*	0.184***	0.130**	0.274***
	(0.048)	(0.062)	(0.149)	(0.077)	(0.154)	(0.096)	(0.040)	(0.055)	(0.061)
$Priinc_{it}$	-0.340	-0.341	-13.603*	0.346	0.592	-5.932	0.148	0.174	0.433
	(1.020)	(0.875)	(8.795)	(0.650)	(0.730)	(6.238)	(0.150)	(0.149)	(0.608)
$Caploans_{it}$	0.038	0.045	-0.092	0.515***	0.473*	0.519**	0.143***	0.127**	0.171*
	(0.056)	(0.078)	(0.248)	(0.146)	(0.259)	(0.224)	(0.050)	(0.060)	(0.099)
$Pdivit_{it}$	0.070***	0.069***	0.087***	0.041*	0.012	0.025	0.077***	0.062***	0.107***
	(0.016)	(0.022)	(0.032)	(0.022)	(0.048)	(0.033)	(0.010)	(0.015)	(0.020)
PFI_{it}	-0.057	-0.066	-0.082	-0.025	0.029	-0.123	0.091***	0.094***	0.032
	(0.058)	(0.067)	(0.106)	(0.048)	(0.066)	(0.106)	(0.031)	(0.035)	(0.072)
$Otherloans_{it}$	0.179	0.168	1.014	-0.432	-1.389	-0.557	0.275**	0.283***	0.114
	(0.141)	(0.149)	(0.638)	(0.359)	(0.906)	(0.383)	(0.112)	(0.094)	(0.242)
$NHSinc_{it}$	0.027***	0.030***	0.021	0.009	0.018	0.011	0.033***	0.037***	0.020
	(0.009)	(0.012)	(0.025)	(0.010)	(0.022)	(0.014)	(0.007)	(0.007)	(0.014)
$Surfdef_{it}$	-0.057**	-0.059**	-0.003	-0.035	-0.032	-0.031	-0.005	-0.001	-0.033
	(0.023)	(0.030)	(0.052)	(0.041)	(0.072)	(0.066)	(0.014)	(0.016)	(0.029)
$Intloans_{it}$	0.011	0.002	0.047*	-0.054**	-0.043	-0.085**	0.005	-0.003	0.019
	(0.017)	(0.020)	(0.028)	(0.023)	(0.050)	(0.039)	(0.012)	(0.017)	(0.019)
$Backlog_{it-1}$	0.153	0.085	0.859	-0.196	-1.064	-0.052	0.134	-0.104	0.363
	(0.169)	(0.208)	(0.870)	(0.289)	(1.267)	(0.377)	(0.185)	(0.261)	(0.316)
$Capcomit_{it-1}$	0.469***	0.449***	1.403***	0.314***	0.568**	0.318***	0.272***	0.340***	0.249***
	(0.047)	(0.053)	(0.455)	(0.016)	(0.225)	(0.018)	(0.026)	(0.071)	(0.028)
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	350	290	60	206	88	118	593	360	233

Robust standard errors are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

Table 8

This table reports BBC regression results for all hospitals, FTs and NHS Trusts in the North, South, and Midlands, with capital expenditure (*Capexp*$_{it}$) used as the dependent variable.

	(1) North All	(2) North FT	(3) North Trust	(4) Midlands All	(5) Midlands FT	(6) Midlands Trust	(7) South All	(8) South FT	(9) South Trust
Lagged Capexp$_{it}$	0.117***	0.157***	-0.170	0.265***	0.297**	0.175	0.194***	0.166***	0.281***
	(0.041)	(0.048)	(0.142)	(0.087)	(0.142)	(0.111)	(0.045)	(0.053)	(0.068)
Priinc$_{it}$	-0.464	-0.520	-13.242*	0.140	0.647	-6.318	0.151	0.160	0.389
	(0.624)	(0.635)	(7.096)	(0.566)	(0.564)	(5.249)	(0.158)	(0.153)	(0.541)
Caploans$_{it}$	0.051	0.053	-0.097	0.512***	0.485**	0.511***	0.154***	0.123*	0.180**
	(0.046)	(0.047)	(0.228)	(0.128)	(0.198)	(0.165)	(0.052)	(0.068)	(0.081)
Pdivit$_{it}$	0.076***	0.075***	0.084***	0.041**	0.018	0.024	0.081***	0.069***	0.113***
	(0.011)	(0.013)	(0.028)	(0.019)	(0.042)	(0.029)	(0.013)	(0.016)	(0.018)
PFI$_{it}$	-0.059	-0.060	-0.083	-0.037	0.035	-0.139	0.095***	0.083**	0.057
	(0.040)	(0.046)	(0.081)	(0.040)	(0.054)	(0.095)	(0.035)	(0.042)	(0.070)
Otherloans$_{it}$	0.157	0.168	0.923	-0.395	-1.338	-0.587	0.266**	0.240**	0.072
	(0.113)	(0.126)	(0.609)	(0.299)	(0.872)	(0.363)	(0.103)	(0.106)	(0.232)
NHSinc$_{it}$	0.027***	0.031***	0.024	0.011	0.022	0.013	0.033***	0.039***	0.018
	(0.006)	(0.008)	(0.017)	(0.008)	(0.018)	(0.011)	(0.006)	(0.008)	(0.012)
Surfdef$_{it}$	-0.059***	-0.063***	-0.013	-0.039	-0.034	-0.041	-0.005	-0.004	-0.037
	(0.019)	(0.020)	(0.039)	(0.039)	(0.063)	(0.063)	(0.014)	(0.018)	(0.027)
Intloans$_{it}$	0.014	0.005	0.045**	-0.053**	-0.037	-0.086***	0.008	-0.001	0.023
	(0.011)	(0.016)	(0.022)	(0.022)	(0.047)	(0.032)	(0.013)	(0.019)	(0.019)
Backlog$_{it-1}$	0.117	0.074	0.862	-0.320	-1.050	-0.172	0.199	-0.129	0.329
	(0.134)	(0.145)	(0.730)	(0.289)	(1.198)	(0.313)	(0.203)	(0.325)	(0.274)
Capcomit$_{it-1}$	0.476***	0.456***	1.337***	0.315***	0.604***	0.326***	0.272***	0.333***	0.250***
	(0.039)	(0.037)	(0.346)	(0.015)	(0.183)	(0.017)	(0.025)	(0.070)	(0.029)
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	350	290	60	206	88	118	592	359	233

Robust standard errors are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

Supplementary online appendix (not to be included in the main paper)

Regression Table 1

This table reports fixed effects regression results and dynamic GMM regression results with the one-year lagged dependent variable.

	(1) FE All	(2) FE FTs	(3) FE Trusts	(4) GMM All	(5) GMM FTs	(6) GMM Trusts	(7) GMM Moderator
Lagged Capexp$_{it}$				0.176***	0.144***	0.371***	0.162***
				(0.035)	(0.034)	(0.053)	(0.037)
Priinc$_{it}$	0.196**	0.194*	0.019	0.316***	0.333**	0.265	0.387***
	(0.083)	(0.100)	(0.509)	(0.067)	(0.169)	(0.201)	(0.072)
Caploans$_{it}$	0.164**	0.187**	0.229**	0.100***	0.135***	0.099*	0.095*
	(0.070)	(0.086)	(0.094)	(0.036)	(0.046)	(0.055)	(0.049)
Pdivit$_{it}$	0.056***	0.070***	0.051***	0.037***	0.037**	0.052***	0.051***
	(0.012)	(0.019)	(0.013)	(0.009)	(0.015)	(0.010)	(0.009)
PFIdummy$_{it}$	0.010	0.008	-0.004	-0.007	-0.008	-0.027**	-0.063***
	(0.011)	(0.011)	(0.007)	(0.009)	(0.011)	(0.012)	(0.022)
*Trust*PFIdummy$_{it}$*							0.089***
							(0.025)
Otherloans$_{it}$	0.223**	0.265**	0.075	0.481***	0.576***	-0.259	-0.548**
	(0.097)	(0.105)	(0.207)	(0.117)	(0.126)	(0.201)	(0.266)
*Trust*Otherloans$_{it}$*							1.188***
							(0.283)
NHSinc$_{it}$	0.031***	0.039***	0.004	0.012	0.022**	0.009	0.013*
	(0.008)	(0.009)	(0.019)	(0.007)	(0.009)	(0.013)	(0.008)
Surfdef$_{it}$	-0.018	-0.026	-0.004	-0.019	-0.042***	-0.032	-0.042***
	(0.017)	(0.018)	(0.023)	(0.013)	(0.015)	(0.022)	(0.012)
Intloans$_{it}$	-0.005	0.006	-0.002	-0.010	-0.013	0.003	0.007
	(0.012)	(0.016)	(0.016)	(0.010)	(0.014)	(0.011)	(0.010)
Backlog$_{it-1}$	0.198	0.113	0.381	0.544***	0.711***	0.687***	0.730***
	(0.200)	(0.229)	(0.297)	(0.158)	(0.236)	(0.154)	(0.195)
Capcomit$_{it-1}$	0.314***	0.401***	0.305***	0.368***	0.481***	0.316***	0.350***
	(0.029)	(0.054)	(0.032)	(0.011)	(0.036)	(0.008)	(0.011)
Awt$_{it-1}$	0.001	0.002	0.006***	0.003*	0.006***	-0.003	0.002
	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)
north				-0.005	-0.014	-0.003	0.001
				(0.011)	(0.015)	(0.024)	(0.014)
midlands				0.063***	0.062	0.046***	0.150***
				(0.024)	(0.062)	(0.010)	(0.036)
Constant	-0.018	-0.038**	0.006	-0.018	-0.049*	0.018	-0.013
	(0.016)	(0.016)	(0.032)	(0.015)	(0.028)	(0.022)	(0.022)
Hospital	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	888	567	327	888	567	321	888
Adj. R^2	0.65	0.45	0.78				
F	49.42***	15.13***	87.10***				
Sargen test				47.84	28.17	23.84	56.73
Prob > chi^2				0.22	0.75	0.59	0.41
AB test (2)				-0.66	-1.07	0.52	-0.58
Prob > |z|				0.51	0.29	0.60	0.56

Robust standard errors are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively. Sargan-Hansen test results show that the overidentifying restrictions are always valid (i.e., the instruments are valid). Arellano–Bond AR(2) test results show that there is no second-order or higher-order serial correlation.

Regression Table 2

This table reports LSDVC regression results for all hospitals, FTs and NHS Trusts in the North, South, and Midlands, with capital expenditure (*$Capexp_{it}$*) used as the dependent variable.

	(1) North ALL	(2) North FTs	(3) North Trusts	(4) Midlands ALL	(5) Midlands FTs	(6) Midlands Trusts	(7) South ALL	(8) South FTs	(9) South Trusts
Lagged $Capexp_{it}$	0.073	0.057	0.122	0.175*	0.104	0.171	0.153***	0.147**	0.117
	(0.045)	(0.052)	(0.082)	(0.105)	(0.160)	(0.159)	(0.052)	(0.057)	(0.188)
$Priinc_{it}$	0.069	0.131	0.579	0.317	0.429	-7.897	-0.019	-0.064	-10.439**
	(0.148)	(0.162)	(0.572)	(0.844)	(0.654)	(13.036)	(0.840)	(1.019)	(4.781)
$Caploans_{it}$	0.201***	0.178***	0.278***	0.480**	0.421	0.390	0.053	0.061	-0.033
	(0.054)	(0.064)	(0.073)	(0.220)	(0.320)	(0.391)	(0.060)	(0.068)	(0.149)
$Pdivit_{it}$	0.081***	0.082***	0.086***	0.032	0.010	0.008	0.063***	0.067***	0.057***
	(0.014)	(0.020)	(0.018)	(0.029)	(0.060)	(0.045)	(0.015)	(0.020)	(0.021)
$PFIdummy_{it}$	0.005	-0.000	-0.001	0.010	0.008	-0.006	0.006	0.005	0.008
	(0.009)	(0.010)	(0.016)	(0.011)	(0.010)	(0.006)	(0.014)	(0.016)	(0.008)
$Otherloans_{it}$	0.332***	0.312**	0.234	-0.342	-1.175	-0.448	0.204	0.207	0.616
	(0.077)	(0.131)	(0.210)	(0.450)	(0.911)	(0.588)	(0.170)	(0.151)	(0.404)
$NHSinc_{it}$	0.035***	0.042***	0.025*	0.009	0.027	0.005	0.030***	0.034***	0.027**
	(0.008)	(0.009)	(0.013)	(0.019)	(0.019)	(0.034)	(0.009)	(0.010)	(0.013)
$Surfdef_{it}$	-0.004	-0.006	-0.015	-0.046	-0.038	-0.072	-0.070***	-0.081***	-0.020
	(0.015)	(0.018)	(0.026)	(0.055)	(0.065)	(0.104)	(0.022)	(0.025)	(0.029)
$Intloans_{it}$	0.013	0.005	0.026	-0.063*	-0.036	-0.098*	0.006	-0.001	0.035*
	(0.015)	(0.024)	(0.019)	(0.036)	(0.061)	(0.055)	(0.019)	(0.020)	(0.019)
$Backlog_{it-1}$	0.248	-0.302	0.571**	-0.097	-0.512	0.137	0.304	0.253	0.529
	(0.239)	(0.358)	(0.262)	(0.312)	(1.413)	(0.540)	(0.242)	(0.287)	(0.498)
$Capcomit_{it-1}$	0.121***	0.317***	0.057	0.335***	0.460**	0.337***	0.433***	0.430***	0.386
	(0.029)	(0.062)	(0.040)	(0.018)	(0.214)	(0.029)	(0.052)	(0.062)	(0.370)
Awt_{it-1}	0.000	0.002	-0.002	0.000	0.001	-0.003	0.000	-0.001	0.003
	(0.002)	(0.002)	(0.002)	(0.003)	(0.004)	(0.006)	(0.003)	(0.003)	(0.003)
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	438	258	180	161	68	93	289	241	48

Robust standard errors are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

Regression Table 3

This table reports BBC regression results for all hospitals, FTs and NHS Trusts in the North, South, and Midlands, with capital expenditure (*$Capexp_{it}$*) used as the dependent variable.

	(1) North ALL	(2) North FTs	(3) North Trusts	(4) Midlands ALL	(5) Midlands FTs	(6) Midlands Trusts	(7) South ALL	(8) South FTs	(9) South Trusts
Lagged $Capexp_{it}$	0.138***	0.129**	0.254	0.224**	0.142	0.241*	0.098**	0.080	0.175*
	(0.050)	(0.052)	(0.260)	(0.094)	(0.182)	(0.124)	(0.047)	(0.061)	(0.094)
$Priinc_{it}$	0.155	-0.151	-21.204***	0.223	0.342	-9.298	0.037	0.095	0.672
	(0.670)	(0.777)	(7.226)	(0.428)	(0.527)	(6.446)	(0.141)	(0.159)	(0.465)
$Caploans_{it}$	0.047	0.063	-0.059	0.482***	0.412**	0.331	0.208***	0.176***	0.323***
	(0.050)	(0.054)	(0.198)	(0.122)	(0.174)	(0.204)	(0.050)	(0.065)	(0.068)
$Pdivit_{it}$	0.066***	0.073***	0.057**	0.048***	0.017	0.021	0.082***	0.084***	0.088***
	(0.012)	(0.014)	(0.021)	(0.018)	(0.048)	(0.029)	(0.013)	(0.021)	(0.018)
$PFIdummy_{it}$	0.003	0.008	0.007	-0.002	0.002	0.001	-0.010	0.010	0.007
	(0.010)	(0.008)	(0.012)	(0.018)	(0.015)	(0.014)	(0.009)	(0.011)	(0.016)
$Otherloans_{it}$	0.179	0.190	0.525	-0.377	-1.362*	-0.563*	0.331***	0.274**	0.206
	(0.125)	(0.134)	(0.490)	(0.247)	(0.749)	(0.333)	(0.092)	(0.117)	(0.177)
$NHSinc_{it}$	0.030***	0.035***	0.025	0.008	0.025	-0.018	0.032***	0.042***	0.020*
	(0.007)	(0.009)	(0.015)	(0.013)	(0.018)	(0.022)	(0.006)	(0.009)	(0.012)
$Surfdef_{it}$	-0.068***	-0.081***	-0.026	-0.062*	-0.040	-0.034	-0.001	-0.005	-0.022
	(0.020)	(0.025)	(0.037)	(0.036)	(0.058)	(0.079)	(0.015)	(0.019)	(0.025)
$Intloans_{it}$	0.008	0.000	0.030	-0.053**	-0.023	-0.068*	0.016	0.005	0.029
	(0.013)	(0.017)	(0.018)	(0.021)	(0.051)	(0.035)	(0.015)	(0.025)	(0.020)
$Backlog_{it-1}$	0.294*	0.232	0.534	-0.242	-1.017	-0.162	0.308	-0.341	0.759***
	(0.172)	(0.202)	(0.543)	(0.248)	(1.166)	(0.333)	(0.201)	(0.406)	(0.235)
$Capcomit_{it-1}$	0.438***	0.433***	0.287	0.333***	0.487***	0.321***	0.114***	0.317***	0.047*
	(0.044)	(0.047)	(0.371)	(0.012)	(0.167)	(0.017)	(0.028)	(0.066)	(0.029)
Awt_{it-1}	0.001	-0.000	0.003	0.000	0.001	-0.002	0.000	0.002	-0.003
	(0.002)	(0.002)	(0.004)	(0.002)	(0.003)	(0.005)	(0.001)	(0.002)	(0.002)
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	289	241	48	158	66	92	428	253	175

Robust standard errors are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.