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Corporatization, Administrative Intensity and the Performance of Public Sector Organizations

ABSTRACT

The process of corporatization in public services has led to the emergence of new, more autonomous organizational forms. However, while these reforms have been centrally about the development of management capabilities in public sector organizations, we know surprisingly little about what this process involves. To address this concern, we draw on the literature on administrative intensity (AI) to frame hypotheses about the likely relationship between corporatization and investments in management and administration, and the consequences of these investments for performance. As an empirical case, we then focus on the effects of Foundation Trust status on AI and efficiency, effectiveness and responsiveness in the acute care hospital sector in the English NHS. Based on a database of nine years (2008/09-2016/17) and dynamic panel data regressions, the results show that corporatization leads to a leaner administration and improved organizational efficiency, effectiveness and responsiveness. In addition, the analysis reveals that lower levels of AI positively mediate the relationship between corporatization and performance, although only in relation to the efficiency dimension. These findings highlight the crucial, but previously misunderstood, importance of lean administration as part of the corporatization reform package, with implications for theory, research and policy.

KEYWORDS: NPM; corporatization; dynamic panel data; lean administration; healthcare.

INTRODUCTION

One of the most enduring features of New Public Management (NPM) reforms globally has been moves to restructure public sector bureaucracies to create stand alone, 'complete organizations' such as civil service agencies, universities or hospitals that have greater formal autonomy (Andrews et al., 2020; Brunsson and Sahlin-Andersson, 2000; Pollitt and Bouckaert, 2011). This change is often referred to as corporatization: a half-way house between traditional public management and full privatization (Lindlbauer et al., 2016; Nelson and Nikolakis, 2012; Turner and Wright, 2022; Voorn et al., 2020). For some, corporatization highlights the influence of neo-liberal political ideology pushing for more outsourcing and private sector involvement in the running of public services (Alonso et al., 2022). For others, it reflects the view that while public sector organizations remain distinct, they can, and should, mimic practices from the commercial sector to become more 'business-like' (Bejerot and Hasselbladh, 2013).

A growing body of research has focused on the implementation of corporatization across different public sector contexts (Andrews et al., 2019; Overman and Van Thiel, 2016), with particular attention given to assessing its impact on performance (Aivazian et al., 2005; Bel et al., 2022; Bilodeau et al., 2007; Cambini et al., 2011; Ferreira and Marques, 2015; Kim and Cho, 2014; Lindlbauer et al., 2016; Nelson and Nikolakis, 2012; Voorn et al., 2020). However, far less is known about the implications of corporatization for 'administrative intensity' (hereafter AI), defined as the 'resources that organizations spend on administrative support functions rather than primary service and production processes' (Elston and Dixon, 2020; 113). Given that one of the primary rationales for corporatization is to 'modernize' or even transform management and administrative capabilities of public sector organizations, this neglect is puzzling. It means that while corporatization is centrally about changes in governance and management (at least at the

organizational level), we still know little about the precise nature of those changes, nor can we say much about their consequences for performance.

The relationships between corporatization, AI and performance are complex and 'theoretically ambiguous' (Boon and Wynen, 2017; 218). For example, with regard to the level of AI, if the goal of corporatization is to 'optimize' management (Boon et al., 2019; 233), this could lead to a reduced or even 'lean administration' (Boon et al., 2019). Policy makers may even view these reforms as an opportunity to reduce 'bureaucratic bloat' and reallocate funds to frontline services (Boyne and Meier, 2013). However, on the other hand, it is possible that corporatization will increase administrative demands. Greater autonomy implies that more (previously centralized) management functions will need to be delivered locally, for example, in areas such as HR, finance and procurement. Investments in administration may also be needed to deal with rising workloads associated with contracting and external performance monitoring (Boon and Wynen, 2017).

Equally ambiguous is the link between corporatization, AI and performance. With some exceptions (see Andrews et al., 2019), much of the research on corporatization notes a positive impact on performance (see Table 1a Online Appendix). But the role played by the level of AI in mediating this outcome is unclear. In theory, if public sector organizations move towards lean administration (lower AI), this could enhance their efficiency. However, it is also conceivable that such changes will generate hidden costs. According to Andrews et al. (2017; 115), while 'a large administrative function might constitute a bureaucratic burden', it 'could also enable organizations to better coordinate key activities'. From this perspective, corporatized organizations that substantially reduce their administrative overheads might end up being 'under

administered' (Elston and Dixon, 2020), with potentially negative implications for their ability to improve effectiveness and responsiveness.

Hence, in this paper we seek to address two primary questions: Will corporatization policies lead to changes in the level of AI and if so, in what direction (raising or lowering)? Second, what influence (if any) does the level of AI have on the performance - specifically efficiency, effectiveness and responsiveness - of public sector organizations that have undergone corporatization? We investigate these questions focusing on the illustrative case of English National Health Service (NHS) acute care hospital trusts (HTs). The NHS is a theoretically interesting case because, as in other healthcare sectors worldwide (Turner and Wright, 2022), reforms have established semi-autonomous HTs within a quasi-internal market (Department of Health, 1989). In 2003, this policy was extended with the introduction of Foundation Trusts (FTs) with 'earned' autonomy (Health and Social Care Act, 2003). Because the transformation into organizations with a more independent and autonomous legal status has been phased in slowly, the NHS represents a sector where corporatization is still uneven. This, consequently, makes it possible to address our research questions, comparing levels of AI between HTs that have/have not undergone corporatization and the mediating impact of AI on their efficiency, effectiveness and responsiveness.

In what follows, we review the wider public management literature on corporatization and AI to develop three primary hypotheses. We, then, turn to the NHS case, drawing on a mix of publicly available administrative data sources. The analysis of nine years of data using dynamic panel data approaches lends support to our hypotheses. Specifically, it finds that FT status is strongly associated with lower AI and positively affects efficiency, effectiveness and responsiveness. However, while a leaner administration represents a significant factor in

accounting for enhanced efficiency in corporatized entities, it does not appear to have negative implications for organizational effectiveness and responsiveness.

LITERATURE REVIEW AND HYPOTHESES

Corporatization: background

The goal of corporatization has been central to NPM reforms in many countries since the mid-1990s (Hood, 1991; Pollitt and Bouckaert, 2011). It is strongly associated with the marketization of public services and, for many, represents a midway stop between traditional public bureaucracy and privatization (Krachler et al., 2022). However, whereas privatization implies the selling off of public assets, 'corporatization represents a change in legal form that separates service delivery from traditional government agencies while keeping the organization in public hands' (Lindlbauer et al., 2016; 2). Focusing on healthcare, Saltman et al. (2011; 40) suggest that 'semi-autonomous [corporatized] public hospitals', sit in the middle of a continuum between 'regular public hospitals' with limited institutional and financial autonomy, at one extreme, and 'profit making private hospitals' at the other.

A guiding idea behind corporatization is the model of the Multi-Divisional form (M-form), creating separate business units and leaving central headquarters to provide overall strategic direction (Goold et al., 1994; Hill, 1985). When applied to the public sector, this has meant changing the legal status of hospitals, schools and local government agencies from organizations nested within a larger, vertically integrated, bureaucratic structure to 'complete organizations' with their own governance arrangements and distinct identity (Brunsson and Sahlin-Andersson, 2000). This has allowed organizations 'greater formal autonomy and more control over recruitment, members and resources', as well as the possibility 'to set [their] own

objectives…rather than just following centrally imposed rules' (ibid; 733). Of course, in practice the independence and autonomy of corporatized organizations such as hospitals is often constrained (Exworthy et al., 2011; Veronesi et al., 2015). Nevertheless, in theory corporatization offers more than status change and holds out the prospect of increased discretion over goal setting, resource allocation and workforce management (Bilodeau et al., 2007). All, these principles have been applied to the reform and re-structuring of public sector organizations globally, including in healthcare (Alonso et al., 2022; Andrews et al., 2019; Kirkpatrick et al., 2013) especially in European countries (Saltman et al., 2011).

Corporatization and administrative intensity

Despite this growing awareness of corporatization as an emerging and distinct mode of governance, less is known about its implications for management and administration. This is puzzling because an underlying assumption of corporatization reforms is that they will nudge public sector organizations to 'modernize their management' and 'optimize [its] functioning' (Boon et al., 2019; 233). Yet, it is unclear what this might imply for the level of resources devoted to AI and how this, in turn, might influence organizational performance.

By definition, the administrative overhead (or the 'bureaucracy of bureaucracies') relates to the full range of administrative (and management) tasks, including those performed at the corporate center, which provide support for staff directly involved in service delivery (Boon et al., 2019). Drawing on ideas from structural contingency theory (Donaldson, 2001), public administration scholars have explored the antecedents of AI and its relationship with performance (Andrews and Boyne, 2011; Andrews et al., 2017; Darnley et al., 2019; Rutherford, 2016). Attention has focused on how increased organizational size might lead to a fall in AI up to

a certain point where there is a reversal of this effect (Andrews and Boyne, 2014; Boon et al., 2019; Boyne and Meier, 2013; Rutherford, 2016). The so called 'complexity-administrative growth hypothesis' (Rushing, 1967) further suggests that more complex (internally differentiated) public services, such as local authorities in specific context such as the UK, and generalist acute care hospitals, will usually require more administrators to deal with co-ordination and information processing demands.

However, as noted earlier, the relationship between corporatization and AI is far less well understood and is potentially ambiguous (Andrews et al., 2020; Boon and Wynen, 2017). On the one hand, there are reasons to assume that corporatization will result in a rising employment of managers and administrators in public agencies. Following the M-form logic, a primary objective has been to enhance 'management decision-making competency' at lower levels, 'shifting decision-making competency from external actors to the agency itself' (Bejerot and Hasselbladh, 2013; 1365). Implied here is that certain management functions (such as HR and finance), which were once performed centrally (achieving economies of scale), are passed down to the level of hospitals, local governments, schools and other agencies. While devolving control to operating units might help with overall coordination (at the system level), it could result in a 'duplication of local coordination' (Mintzberg, 1993; Yingyi et al., 2003; 3). As Boon and Wynen (2017; 218) suggest, 'under…extended degrees of autonomy, larger numbers of employees may be involved in overhead functions to support their management in making the right use of its extended managerial freedoms'.

The changing environment of corporatized public sector organizations may also generate increasing demands on management and administration, especially in situations where governments have established quasi-markets, separating purchaser and provider roles (Krachler

et al., 2022). As Andrews and Boyne (2011; 894) point out, 'contracting-out, marketization and the demand for better strategic planning and performance management' might require 'bigger or better corporate capacity'. Similarly, Boon and Wynen (2017; 218) note that, to operate in more performance driven and competitive environments, 'agencies must develop and employ systems to measure, manage, and evaluate results, which translates into additional overhead'.

Notwithstanding these tendencies, there are arguably more compelling reasons to expect that corporatization will lead to a *reduction* in AI. Most obviously this is because the rising external performance demands noted earlier will have a dual effect. On the one hand, these demands could force corporatized organizations to invest in managers and administrators to ensure effective monitoring and compliance. However, the pressure to meet financial performance targets may push in the opposite direction, leading to cuts in administration. Like business units in the M-form structure, corporatized public sector organizations are 'managed at arms-length by the corporate head office' and 'compete with each other for resources on the basis of differential profit performance' (Hill, 1985; 733). This, in turn, may translate into a focus on 'goal pursuit and least-cost behavior' (Williamson, 1970; 134). In this sense, it is noted that corporatized public sector organizations are more likely to pursue economies of scale in the provision of back office functions such as IT, marketing and HR (Turner and Wright, 2022), including outsourcing (Boon et al., 2019). In some cases, corporatized entities may even be deliberately created to better manage labor costs under conditions of austerity (Andrews et al., 2020).

In addition, corporatized organizations might face powerful institutional demands to streamline their management and administration overheads. In theory, institutional demands could push corporatized organizations to devote more resources to administration, simply as a

way of flagging their competency and trustworthiness to external stakeholders (Boon and Wynen, 2017). However, it is more probable that any moves to increase AI will be perceived in negative terms by politicians, media and the general public as examples of rent seeking and bureaucratic bloat (Rutherford, 2016; Veronesi et al., 2019). This is especially likely in those countries (such as the UK and the US), where policies inspired by public choice theory have fostered a 'distrust of the permanent bureaucracy' (Aucoin, 1990; 235), including managers. In this environment, the greater visibility and media scrutiny faced by corporatized organizations is liable to exaggerate the risk aversion of senior managers and their unwillingness to recruit more administrators, even if these are needed (see Kirkpatrick et al. (2017a) for evidence from the English NHS).

Hence, it seems likely that, on balance, corporatization will lead to a reduction in the proportion of managers and administrators that are employed locally. Accordingly, as our initial hypothesis we predict that:

H1: Corporatization will have a negative impact on administrative intensity in public sector organizations.

Corporatization and the consequences of lean administration

In this section, we turn our attention to relationships between corporatization, AI and performance. As discussed, a primary driver for corporatization reforms is the belief that creating public sector organizations with greater formal autonomy will trigger improved performance. But how much evidence is there to support this claim? And, crucially, given our specific focus, how important is AI in mediating any relationship between corporatization and performance?

Corporatization and organizational efficiency, effectiveness and responsiveness

In recent years, there has been a growing interest in researching the impact of corporatization as a new governance form. The focus of this work has been on some or all dimensions of 'performance' including: outputs, efficiency, service outcomes and responsiveness (Boyne, 2002). Outputs might relate to the quantity (e.g., number of surgeries performed) and quality (for example, waiting times for treatment) of services delivered, whereas efficiency focuses on the relationship between inputs and outputs (e.g., costs per admission) (Walker et al., 2010). Outcomes suggest a more inclusive focus, taking into account the effectiveness of services (for instance, mortality rates) and their responsiveness to public preferences (Boyne, 2002), which are notoriously complex and multifaceted (Andrews et al., 2019).

Research exploring these dimensions of performance has so far produced mixed results (see Table 1a Online Appendix for a summary). On the one hand, studies focusing on local authorities in Spain (Bel et al., 2022) and the Netherlands (Voorn et al., 2020), reveal that services provided by publicly owned corporations do not perform substantially better than traditional public bureaucracies in terms of efficiency, quality of output and effectiveness. In healthcare, Portuguese corporatized hospitals are found to be less productive despite being more efficient (Ferreira and Marques, 2015). Similarly, Stiel (2022) shows that German corporatized utilities are not usually more efficient than those under direct public administration control. In a review of European studies, Dan (2014; 233) also concludes that, following corporatization, while efficiency improves, 'there is insufficient evidence to show that output levels improved, remained unchanged, or decreased less than the level of inputs'.

These findings align with a generally skeptical view about the likely impact of

corporatization (Bel et al., 2022; Krachler et al., 2022). It is suggested, for example, that while corporatization may involve greater formal autonomy, this will not be sufficient to motivate managers who could 'resist, or even sabotage change' (Bilodeau et al., 2007; 127). Delegating autonomy also increases the distance between 'political principals and management', increasing the risk that public organizations will fail to achieve 'public objectives', such as enhanced outputs or outcomes (Voorn et al., 2020; 3-4). In some situations, corporatization may perversely lead to rising labor costs, especially if unions are able to exploit localized collective bargaining to 'compensate for workers' reduced job security' (Voorn et al., 2017; 825).

However, the bulk of research would seem to contradict these negative assessments. While there are likely to be moral hazards associated with corporatization – as authority is delegated - it is assumed that these will be over-ridden by the greater willingness of public sector managers to share information and focus on improving efficiency (Cambini et al., 2011). The expectation is that clarity of goals and rewards will incentivize managers and ensure that they are less likely to engage in rent seeking behavior (Aivazian et al., 2005). The increased scrutiny and performance demands faced by organizations that have undergone corporatization might further reinforce this outcome (Lindlbauer et al., 2016; Turner and Wright, 2022). Although restricted, 'competition' could push local managers to operate with a business-like mind frame and simultaneously focus on efficiency, quality of outputs and outcomes (Turner et al., 2016; 714). As Overman and Van Thiel (2016; 5) suggest, corporatized organizations may be driven to 'improve their services and keep innovating to meet [market] demand'.

This more optimistic assessment of corporatization is also reflected in the majority of empirical studies (see Table 1a Online Appendix). Bilodeau et al. (2007), for example, show that the corporatization of government agencies in Canada has allowed them to improve their level of

revenues and efficiency. Nelson and Nikolakis (2012) find a positive effect of corporatization of state-owned forest agencies in Australia for their level of efficiency and profitability. Lower production costs have been reported in Italian corporatized bus companies (Cambini et al., 2011), and earlier work focusing on Japanese public agencies (Yamamoto, 2006) draws very similar conclusions. In healthcare, Lindlbauer et al. (2016) show that the shift of German public hospitals from a public legal form to a private legal one has positively influenced the level of organizational efficiency. Similar conclusions about efficiency are drawn by studies focusing on corporatization of public hospitals in Portugal (Ferreira and Marques, 2015; Rego et al., 2010), Poland (Patena and Kaszyk, 2015), South Korea (Lee et al., 2008), and Sweden (Aidemark and Lindkvist, 2004). Finally, in a comparative study of 14 European healthcare systems, Andrews et al. (2019) find that corporatization can lead to higher efficiency when supported by performance management systems.

Looking beyond efficiency, some research also notes a relationship between corporatization and organizational effectiveness and responsiveness. Regarding the former, Yamamoto (2006), for instance, reports higher levels of organizational effectiveness in Japanese corporatized administrative institutions. Likewise, focusing on South Korean agencies, Kim and Cho (2014) show that elements of corporatization linked to performance evaluation and reward systems are associated with higher level of formal effectiveness, in terms of achieved program objectives. Similar results are reported in studies concentrating on Foundation trusts in the English NHS (Kirkpatrick et al., 2017b). With reference to responsiveness, empirical studies analyzing public hospitals in England (Veronesi et al., 2015) and Poland (Patena and Kaszyk, 2015) find the existence of a positive relationship between corporatization and patient

experience. Analogously, evidence from South Korea shows that corporatization is likely to improve customer satisfaction (Kim and Cho, 2014).

Hence, on balance, there are valid reasons to assume that policies aimed at delegating formal authority and independence to public sector organizations, such as hospitals, will have positive consequences for performance along a number of dimensions. As such, we further predict that:

H2: Corporatization will have a positive impact on the efficiency, effectiveness and responsiveness of public sector organizations.

The mediating impact of administrative intensity

Retuning to our primary concern, how important is the level of AI (specifically, leaner administration) in mediating this relationship between corporatization and efficiency, effectiveness and responsiveness? On the one hand, following H1, it might be argued that leaner administration will directly contribute to improved efficiency. An obvious reason for this relates to the costs associated with too much spending on management and administration. The research on AI notes a curvilinear relationship, or tipping point, after which levels of AI may become counter-productive for efficiency (see, for instance, Andrews et al., 2017; Darnley et al., 2019; Rutherford, 2016). Large administrative 'overheads' may also have negative implications for allocative efficiency, soaking up resources that could have been used to support and develop front line services (Van Helden and Huijben, 2014). Andrews and Boyne (2011; 896) further suggest that higher AI could be a 'counter-productive form of centralization', especially if 'the interventions of corporate teams are…based on insufficient knowledge of the problems of

service delivery'. As such, it is conceivable that 'over-administration leads to bureaucracy, inflexibility, and expensive overheads' (Elston and Dixon, 2020; 113).

In addition, it is possible that corporatization will enhance the productive capacity of managers and administrators, allowing them to achieve more with less (Andrews et al., 2020). The enhanced labor market profile of public sector organizations that have undergone corporatization – perceived as being high status employers - may help them to recruit and retain more experienced and skilled managers (Lindlbauer et al., 2016). The greater formal autonomy of corporatized organizations might also generate a climate that promotes innovation, including the re-design of back office functions and IT systems (Turner and Wright, 2022). Lastly, it is possible that 'provider managers' in corporatized organizations share 'business-like' values, leading to a stronger focus on efficiency goals and willingness to 'reimagine their capabilities'.

However, it is clear that lean administration is not risk free and may be detrimental for other (non-efficiency related) performance goals. Such 'performance dysfunction' might be the consequence of peculiarities of public sector organizations (Kelman and Friedman, 2009) which traditionally pursue a large number of goals with finite resources. This can lead to raising 'tensions in global performance efforts' (Moynihan et al. (2011; i148) and the need to face performance trade-offs (Mikkelsen, 2018). In healthcare, for instance, the extant literature suggests that public sector managers are often presented with 'difficult dilemmas' to 'balance patient safety with limited available resources' and engage in cost/quality trade-offs (Hyde et al., 2016; 179). This is also consistent with what Kelman and Friedman (2009; 923) call 'effort substitution', resulting in attempts 'to improve speed (wait time) at the expense of the quality of care the patient receives'.

Returning to AI, while increasing its level is often associated with large (unproductive) administrative overheads and bureaucratic bloat, it can have a positive impact on service

effectiveness, as shown by research on universities (Andrews et al., 2017; Darnley et al., 2019; Rutherford, 2016) and local authorities (Andrews and Boyne, 2011). These effects are partly explained by the support that managers and administrators provide for the coordination of complex services, allowing frontline practitioners to devote more time to their clients (Rutherford, 2016). As Andrews et al. (2017; 116) suggest: 'organizations with a strong administrative component may…be better placed to synchronize the many moving parts'. By implication, any push to reduce administrative support (to achieve lean administration) may be counterproductive, making it harder for organizations to enhance services. Specifically, it would mean that these organizations are 'under-administered' (Elston and Dixon, 2020).

Hence, it is likely that lean administration in corporatized organizations will have differential consequences for performance. On the one hand, lower levels of AI will directly contribute to efficiency goals, for the reasons given above. However, on the other hand, under-administration might have a detrimental impact on goals that are not narrowly defined in financial terms. That could include the effectiveness and responsiveness of services, which arguably require more support from administrators and managers to help process information and assist with co-ordination. This will especially apply to complex, multi-purpose organizations such as UK local authorities or general acute care hospitals of the kind analyzed in this study. In the latter, having fewer managers in post could make it harder for clinical professionals to devote time to 'the hard work of healthcare transformation' (Bohmer, 2016; 375). As Andrews and Boyne (2011; 894) put it, 'senior managers face important trade-offs between organizational goals when deciding on the appropriate level of corporate capacity'.

Therefore, while lean administration may help with the attainment of efficiency, it could have the opposite impact on effectiveness and responsiveness. Consequently, we pose one final hypothesis in two parts:

H3a: Lower levels of administrative intensity will positively mediate the relationship between corporatization and efficiency in public sector organizations.

H3b: Lower levels of administrative intensity will negatively mediate the relationship between corporatization and effectiveness and responsiveness in public sector organizations.

To summarize, the main relationships we predict between corporatization, AI and organizational performance are captured in Figure 1. This shows the assumed negative effect of corporatization on AI and the hypothesized positive impact on the chosen performance indicators. In terms of the mediating effect of AI on organizational performance, our hypotheses predict opposite results: a positive, mediating effect on efficiency and a negative one on effectiveness and responsiveness,

Insert Figure 1 here

RESEARCH DESIGN

To investigate these hypotheses, we focused on the acute care sector of the English NHS. As noted, this case is theoretically interesting because the NHS has pioneered the introduction of a corporatized organizational form: the Foundation Trust (FT) (Health and Social Care Act, 2003). Since 2003, hospital trusts (HT) have been able to apply to become FTs if they meet a number of strict requirements, including financial viability. FTs remain in public hands but operate under a more independent and formally autonomous legal status (Exworthy et al., 2011). Accordingly, they have more freedom to develop their own HR management policies and practices (including staffing levels) and are permitted to retain any surpluses generated (Kirkpatrick et al., 2017a). This fact, and their limited freedom to admit private (fee paying) patients, may further increase the incentive for FTs to focus on performance improvement goals (Exworthy et al., 2011).

While most HTs are multi-purpose organizations (general hospitals) operating in the acute care sector, others (specialist HTs) concentrate on specific care offerings such as for children, orthopedics, and ophthalmology, with arguably less complexity.

Data sources

We used a mix of publicly available official NHS data sources relating to organizational and employment characteristics as well as performance indicators, mostly available from NHS Digital. This comprises the National Workforce Data Set (for employment records), the Hospital Episode Statistics database (for organizational activity such as patient admissions), the National Reporting and Learning System (for patient safety incidents reported), and the Hospital Estates and Facilities Statistics (providing information on location, type, and legal status of each trust). From the archives of NHS England (the executive body responsible for the running of the whole

NHS), we also accessed the NHS Inpatient Experience Quality Survey (related to patient experience on the quality of the service provided), the NHS Reference Costs Data Set (for tariffs and costs related to treatments related to NHS-funded services) and the NHS Bed Availability and Occupancy Data (collecting data on bed numbers and their overall usage). In addition, we accessed the annual report and accounts of each HT (including revenues and costs), held by the GOV.UK website. Our final composite database covered 9 years of data (from 2008/09 to 2016/17), comprising the vast majority (>90%) of acute care HTs in England (total number of observations, 1,215). As a result, we were able to run time series cross sectional analyses with both large *N* and *T*.

Variables employed

As a proxy for corporatization we looked at whether HTs had achieved FT status (or not). In the final year 2016/17, there were 85 FTs in the sample, more than half of the total HT population. Rather than employing a dichotomous variable, we constructed a continuous variable ('Years as FT') that measured the number of years operating as FT for each organization in the sample (see also Kirkpatrick et al., 2017a). We expected to observe a lagged effect of corporatization, with time needed for the changes linked to the process of corporatization to be fully implemented. The effects of corporatization were modelled from the first wave of FT status introduction (2004/05).

The second main variable related to AI. Drawing from examples in the literature (see Boon and Wynen, 2017; Rutherford, 2016), AI was operationalized in two ways. First, we used the ratio of all administrative staff to all staff ('Admin-to-all'), calculated using the information provided by the NHS Workforce Data Set. For each trust, we compiled figures for full time

equivalent (FTE) employees and used the NHS categorization to identify all non-clinical staff. This comprised all main staff groups in the NHS infrastructure support category: 'central functions, senior managers and managers, administrative staff clerical and administrative and estates'. We added Support to clinical staff but only with reference to employees involved with the delivery of non-clinical functions. Second, we created a variable – 'Non-managerial Admin-to-All' – that focused only on non-budget holder administrators. This variable included all the categories previously mentioned except for 'senior managers and managers' as a numerator.

Turning to performance measures, we followed the conceptual framework for evaluating statutory performance indicators developed by Boyne (2002). We focused on efficiency, (formal) effectiveness and responsiveness (see also Walker et al., 2010). With regard to efficiency, we used two main indicators measuring cost per unit of output. The first was the Reference Cost Index ('RCI'), derived from the NHS Reference Costs Data Set. The RCI comprises a unitary index that compares the average cost of the case-mix of each NHS trust (or 'cost per item' of healthcare) with the cost of that case-mix based on average unit costs of care and treatment across the whole population. Accordingly, an RCI of 100 means that the HT has average unit output costs equal to the national average. Conversely, an index of 110 signifies that the organization has average unit output costs 10 percent higher than the national average. Thus, higher RCI values (above 100) corresponded to lower organizational efficiency levels.

The second indicator of efficiency was derived from the HT financial statements. Specifically, we employed the proxy 'Cost per Admission', which uses the total costs of an organization as a baseline. Admissions (planned and unplanned) represent one of the key indicators of hospital activity and depend on patient demand as well as hospital resources, including personnel availability, bed occupancy, equipment and so on. This proxy captures

efficiency that goes beyond clinical activities (for instance the management of estates), achieved by driving costs down rather than growing revenues. To create the variable, we divided the total costs incurred by a HT annually by the total number of admissions.

To gauge the performance of HTs related to (formal) effectiveness, we looked at the number of patient reported safety incidents. Patient safety has increasingly become one of the primary indicators of service outcomes in healthcare systems across the world and the NHS has been at the forefront of this change. Any incident that has implications for patient safety may be reported directly by patients, the general public or by healthcare staff. In the study, it was operationalized as a relational proxy measuring the number of (all) patient safety incidents reported per 100 admissions ('Safety Incidents Reported'), hence accounting for volumes of activity, with lower numbers indicating relatively better performance.

As an indicator of organizational responsiveness, we focused on levels of patient experience for inpatient admissions ('Patient Experience'). Here we used data from the NHS Inpatient Experience Quality Survey, administered since 2001 by the sector regulator, the Care Quality Commission. Each HT receives a composite patient experience score based on responses to five categories: ease of access and waiting; quality, safety, and coordination of care; information and choice offered; quality of relationships; and cleanliness and comfortableness of the facilities.

As customary in healthcare-oriented research (e.g., Kirkpatrick et al., 2017b; Veronesi et al., 2019), a number of controls were included in the regression analyses to consider potential confounding factors that might impact on the level of AI and performance. First, the size of a HT ('Size') was derived from the Hospital Estates and Facilities Statistics. We calculated size as the natural log of the total number of beds. Larger size is normally associated with greater AI and

potentially negative implications for organizational efficiency, effectiveness and responsiveness. As a further control we tried to capture different levels of activity and patient turnover in the delivery of services by focusing on the percentage of bed occupancy in each HT ('Bed occupancy'). For this control, information was sourced from the NHS Bed Availability and Occupancy Data. We also included dummies to control for year-effects ('Year') and HT location within different English regions (Strategic Health Authority, 'SHA'). Here, the aim was to account for the London effect, where most of the private providers are concentrated and competition for staff is more intense.

We also included a variety of additional controls into the regression models to capture organizational complexity. First, using the Hospital Estates and Facilities Statistics data mentioned above, we accounted for the logistical complexity associated with running services from multiple sites ('Number of units'), with each HT having at least two sites (or units). Second, in order to gauge the level of task complexity, we derived the case-mix index for each HT ('Case-mix Index') using the grouping of patient events in Health Care Resource Groups (available from the National Casemix Office). A higher case-mix implies a more complex, resource intensive form of care (e.g., as in the case of brain surgery). An organization case-mix index was then calculated by dividing its raw case-mix value by the mean of all case-mix values in the sample. As a third control for complexity, we looked at the case load associated with the overall number of patient admissions in each HT. Drawing on the Hospital Episode Statistics database, this variable ('Admissions') was constructed by deflating the natural log of the admissions figure per organization by its case-mix value. Finally, as a sixth control, we looked at differences in the status of HTs, whether they were also engaged in teaching and research ('Teaching') or focused only on specialist services ('Specialist'). The latter variable captures the

distinction between general hospitals, which are multi-purpose organizations, and those which have a more specialist, narrower focus.

Empirical approach

Due to the complex nature of the relationships explored and the risk of reverse causality from potential endogeneity issues, the study adopted a time series cross-sectional panel data with HT-year cases design. First, it was necessary to adjust for the fact that only HTs that have already achieved financial viability are granted FT status (our proxy for corporatization). Second, past performance might have an impact on levels of AI, especially in situations where improved efficiency has generated slack resources and the ability to increase staffing levels. Third, we needed to account for the likely effect of path dependency in the performance of HTs by running estimations that included the lags of the relevant performance indicators. Finally, because levels of AI could be a predictor of corporatization (Andrews et al., 2020), it was important to control for this potential relationship in our supporting analysis for H1.

Consequently, we employed Arellano-Bover/ Blundell-Bond (Arellano and Bond, 1991; Arellano and Bover, 1995; Blundell and Bond, 1998) dynamic panel data estimator to address the aforementioned risks of reverse causality (see Veronesi et al. (2019) for a full explanation of the methodology). The system-GMM estimator controls for time-varying unobserved effects as well as for heteroscedasticity and autocorrelation of the errors within organization-level observations. Additionally, it addresses the problem of unobserved HT-level heterogeneity by first-differencing the variables and therefore allowing for fixed effects (Roodman, 2009).

Apart from its appropriateness for dynamic left hand-side variables, the system-GMM estimator is suitable for explanatory variables that are not strictly exogenous. Consequently, Years as FT (in all regression models) and the two AI variables - admissions, and bed occupancy - were treated as fully endogenous to account for the possibility that, for example, past and current HT performance levels would impact on the AI proxies, the number of admissions and so forth. We ran all estimations with the one-step procedure and clustered robust standard errors at the HT level. However, analogous results were obtained when employing the two-step system-GMM estimator with Windmeijer-corrected clustered robust standard errors (see Tables 4a-7a Online Appendix). Furthermore, the study employed an alternative dynamic panel data estimation technique (Ahn and Schmidt, 1995), combining linear as well as additional nonlinear (quadratic) moment conditions (alternative estimations available on request). This estimator follows the assumption of serially uncorrelated idiosyncratic errors and, through the additional nonlinear moment conditions, can generate more efficient and improved finite-sample performance.

Lastly, to test the mediating effect of AI on the corporatization-performance nexus (H3), we used a single-mediator model (MacKinnon et al., 2007). Working on the assumption that a mediator is in a causal sequence between two other variables, mediation entails adding a third variable (M - here AI) to the relationship between independent (X – FT status) and dependent variables (Y - organizational efficiency, effectiveness and responsiveness). To investigate the mediation path between X and Y through M, the study employed Baron and Kenny's (1986) causal steps approach (see Kirkpatrick et al. (2017a) for a full explanation of the methodology).

RESULTS

Table 1 reports the descriptive statistics of the sample population in the study. While a small number of trusts (ten) had started to operate as FTs in 2004/05, in most cases, FT status was less well established (mean time 3.25 years). The overall ratio of all administrative staff to all staff stood at around 26.6%, falling to 24.2% of the workforce if managers are excluded. The average size of a HT was around 600 beds with a workforce of around 4,250 FTE employees, operating from four different units and with a relatively high percentage of bed occupancy (~87). The latter suggested that for most HTs, operational slack was somewhat limited. Around 19% of observations related to hospital teaching trusts, with a lower percentage (11) associated with specialist centers. Following Certo et al. (2020), we checked the coefficient of dispersion for ratio variables, which were all below the suggested thresholds for concern.

There were no specific issues of multicollinearity because all the values for the variables of interest fell within acceptable limits (see Table 2a in the Online Appendix reporting the bivariate Pearson correlation matrix for all variables employed in the estimation models). However, we calculated the variance inflation factors in each of the estimations, to further mitigate the concern that collinearity could bias the regression results. Again, all the relevant values were comfortably within the acceptable threshold (<5).

Insert Table 1 here

Moving on to the analysis, the first set of results relates to H1 where we assumed that corporatization would lead to a decrease in AI (or a leaner administration). As shown in Table 2, the outcomes of the system-GMM estimations revealed a statistically significant ($p<.05$) and

negative effect of the proxy 'Years as FT' on both measures of AI employed in the study (i.e., whether the presence of managers was included or not). This means that the move towards FT status (our proxy for corporatization) appeared to have a direct and negative impact on the level of investment in management and administrative functions, providing strong support for H1. In economic terms, the effect of corporatization was relatively small. An increase of 1 SD in the predictor led on average to a reduction of 3 managers and/or administrators for a workforce of around 3,000 employees.

With regard to the other variables included in the model specification, it is not surprising that part of the variance in the two dependent variables was determined by previous levels of AI, suggesting path dependency. Interestingly, the traditional antecedents of AI – size and complexity – noted in previous research (Andrews and Boyne, 2014; Boon et al., 2019; Boyne and Meier, 2013; Rutherford, 2016), did not appear to have any significant effect in our analysis. Explanations for this could include the longer number of years in the panel and the greater sophistication of the methodology used in this study, making it possible to better account for dynamic relationships and endogeneity concerns. Controlling for year-effects and location of HTs further supported these findings. Similarly, all the post-estimation robustness tests confirmed the validity and reliability of the analysis (see Table 2)[1], including when using the Ahn and Schmidt (1995) estimator (results not reported).

[1] Post-estimation robustness tests reported in Tables 3-6 are: i) Hansen test, ii) Arellano-Bond test, iii) Difference-in-Hansen test. In the Hansen test, the null hypothesis is that the instruments as a group are exogenous. In the Arellano-Bond test, the null hypothesis is that the errors in the first-difference equation do not have second-order serial correlation. In the Difference-in-Hansen test, the null hypothesis is that the instrument subset is exogenous. Difference-in-Hansen test statistics are presented for the levels equation for both the full set of instruments and the subset based on the dependent variables.

Insert Table 2 here

The next set of results relates to H2 and the assumed positive effect of corporatization on efficiency, effectiveness and responsiveness. Table 3 shows that, as hypothesized, corporatization did appear to generate higher efficiency using both proxies employed in the study. 'Years as FT' was statistically significant and negatively linked to the RCI ($p<.05$) as well as with Cost per Admission ($p<.01$). Corporatization also positively affected our proxies for HT effectiveness and responsiveness. Specifically, the effects on Safety Incidents Reported and Patient Experience were statistically significant (respectively at $p<.1$ and $p<.01$ levels), therefore leading to better performance. Thus, consistent with much of the existing literature on corporatization, we found strong support for H2. In economic terms, a 1 SD increase in the corporatization proxy led to a 5-percentile point reduction in the RCI from its median value and 12 percentile points decrease from the median value in the second indicator of efficiency: Cost per Admission. With regard to effectiveness, when corporatization increased by 1 SD from the median value, this led to a 3 percentile points drop in safety incidents reported. In relation to responsiveness, a 1 SD increase in corporatization corresponded to an 8 percentile rise from the median value of patient experience.

In line with previous studies, the proxy for specialist trusts was strongly linked with higher patient experience but greater inefficiency – partly because these trusts concentrate on more complex (and costly to run) treatments. Predictably, there was some evidence of path dependency in the performance of HTs in the sense that better (or worse) performing HTs tended to improve (or worsen) their subsequent performance. These results were confirmed when the year and location dummies were added. The post-estimation robustness tests and the alternative

dynamic panel data estimation approach (Ahn and Schmidt, 1995) reinforced the validity of these findings, with qualitatively similar results.

Furthermore, to control for possible selection bias in the organizations becoming FTs, we ran a covariate adjustment with propensity score analysis where FTs were considered 'treated' organizations. This approach measures the probability of treatment assignment conditional on observed baseline characteristics (Austin, 2011). First, propensity scores were calculated with the treated organizations being the FTs (i.e., probability of being an FT) using a probit estimation approach. The resulting propensity scores were then added as a further control variable to the system-GMM estimations. Results for the main independent variables were again qualitatively very similar (see Table 8a Online Appendix).

Insert Table 3 here

Turning to H3a and H3b and the possible mediating role of AI in the relationship between corporatization and efficiency, effectiveness and responsiveness, our analysis proceeded in two stages (see Tables 4 and 5). First, we explored the potential relationships between the levels of AI and the chosen performance indicators. Second, we then investigated how far levels of AI mediated the relationship between corporatization and performance.

Regarding the first stage, the system-GMM estimations showed that larger administrative functions (with or without the managerial component) were associated with both higher values, leading to greater inefficiency, of the RCI (Table 4, columns 1-2) and the Cost per Admission proxy (Table 4, columns 3-4). However, interestingly, there was no evidence of a significant

effect of AI on safety incidents reported and overall patient experience (Table 4, columns 5-8). Turning to the economic significance of these findings, a 1 SD increase in 'Admin-to-all', which corresponded to 40 less administrators per 1,000 employees, led to a worsening in the RCI by 5 percentile points from its median value and an increase in the Cost per Admission ratio by 15 percentile points from its median value. Once again, the findings held up when using different specifications of the regression models, post-estimation robustness tests and alternative dynamic panel data estimations.

Insert Table 4 here

Finally, building on this analysis, we completed the three-step approach (Baron and Kenny, 1986; MacKinnon et al., 2007) to explore the hypothesized mediating effect of AI on the relationship between corporatization and organizational efficiency, effectiveness and responsiveness. Given the results noted above, showing that levels of AI had no significant impact on effectiveness and responsiveness (therefore rejecting H3b), we conducted this final analysis only in relation to efficiency. To recap, in the first step (X - FT Status - affecting Y - organizational performance, related to H2) we had found that corporatization was a positive predictor of efficiency. The system-GMM estimations linked to H1 then offered positive verification of the second step (X affecting M - AI). Finally, the third step (M affecting Y in the presence of X) was substantiated in the regression analysis where the negative effect of both proxies for AI on organizational efficiency remained statistically significant ($p<.1$) when the corporatization proxy - 'Years as FT' - was added to the model specifications (see Table 5).

Here, the coefficients of the main predictor X were in absolute terms smaller than the coefficients relating X to Y in the absence of the mediator (see Table 3 for comparison) (Baron and Kenny, 1986). Therefore, the mediation path revealed that the positive effects of corporatization on two efficiency measures – RCI and Cost per Admission – was partially due to reductions in the levels of AI within HTs that had become FTs. The Sobel-Goodman test with bootstrapping largely confirmed the significance of the mediation paths (see Table 5).

Regarding the economic significance of the findings, Table 5 shows the overall effect of the mediation path to be relatively small. Specifically, the mediation of (lower) AI levels accounted for around 10% of the improvements in efficiency arising from corporatization. As stated, we did not find evidence of mediation in relation to safety incidents reported and overall patient experience, as neither of our proxies for AI appeared to be a significant predictor of these performance indicators. Consequently, these findings lend support only for H3a but not for H3b.

Insert Table 5 here

DISCUSSION AND CONCLUSION

This paper has sought to contribute to debates about the nature and impact of policies of corporatization and the emergence of new organizational forms in the public sector (Andrews et al., 2020; Brunsson and Sahlin-Andersson, 2000; Pollitt and Bouckaert, 2011). These policies sit within a wider NPM paradigm, highlighting the ambition to marketize public services (Alonso et al., 2022) and move organizations closer to the governance model of private firms (Cooper et al., 2022; Krachler et al., 2022). However, while the aspiration to 'modernize' management and

administration has been central to corporatization (Boon et al., 2019; 233), we know surprisingly little about this process.

Drawing on insights from the wider literature on AI and focusing on the illustrative case of publicly owned hospitals in the English NHS, our analysis has helped to address these concerns by highlighting two main conclusions. First, we find that corporatization is associated with reduced levels of AI (or lean administration) (H1). While public sector organizations that experience corporatization may face new administrative demands associated with the duplication of coordination (Mintzberg, 1993; Yingyi et al., 2003) and contract management (within quasi markets), other tendencies to engage in 'low cost behaviors' (Hill, 1985) and rein back AI appear to be stronger (Boon et al., 2019). If anything, this may be exaggerated by the institutional context of growing accountability and media scrutiny of corporatized organizations as reform package substantially aimed to improve public services (Kirkpatrick et al., 2017a). In the UK and US, for example, public concerns about 'bureaucratic bloat' have grown in recent years (Kirkpatrick et al., 2017a; Rutherford, 2016; Veronesi et al., 2019). In economic terms, the magnitude of the effects we observe are not substantial – suggesting that any downsizing of AI, following corporatization - will be slow and piecemeal. Nevertheless, the direction of travel appears clear, with corporatization policies, on balance, being more likely to repress rather than enhance levels of AI.

Second, we find that this trend towards leaner administration in public sector organizations following corporatization has mixed consequences for performance. As expected, our analysis found that FT status (our proxy for corporatization) did have a positive impact on organizational efficiency, effectiveness and responsiveness (H2), in line with the majority of previous studies (for example, Andrews et al., 2019; Bilodeau et al., 2007; Lindlbauer et al.,

2016; Nelson and Nikolakis, 2012; Rego et al., 2010). Similarly, as expected, we found that lean administration (or lower AI) contributed to enhanced efficiency (H3a) (Cambini et al., 2011). This could be attributed to the low cost behaviors noted earlier (Elston and Dixon, 2020; Rutherford, 2016), and to the increased productive capacity of managers and administrators. However, against expectations, our analysis did not find that lean administration was counter-productive for other performance goals associated with the effectiveness and responsiveness of services (H3b). This suggests that performance 'trade-offs are not inevitable' (Mikkelsen, 2018; 57), as managers seem to be able to make the most of administrative resources, improving efficiency goals without deteriorating effectiveness and responsiveness.

Taken together, these findings have important implications for theory, research and policy. Concerning theory, our study contributes both to debates about corporatization and AI. As we saw, while there has been a growing literature on corporatization and the changing regulation associated with it, little is known about the implications for management and administration. Given the 'theoretically ambiguous' (Boon and Wynen, 2017) nature of these relationships, our analysis helps to break new ground, revealing for the first time a clear pattern of lean administration. It suggests that the goal of modernizing and optimizing management in this context is unlikely to result in bureaucratic bloat, but rather the opposite is true.

Related to this, our analysis helps to deepen understandings of the relationship between corporatization and performance. As previously noted, there is some evidence to support claims about enhanced performance (Andrews et al., 2020), although the precise mechanisms leading to it are not always clear (Turner and Wright, 2022). Most explanations focus on the way greater formal autonomy has increased both the willingness and ability of organizations to deliver better performance. By allocating 'control rights to managers…corporatization may be an effective

way to reduce principal-agent problems' (Lindlbauer et al., 2016; 317). External performance management systems and quasi markets which generate further pressure on CEOs 'to "deliver" on targets' are also important factors (Bilodeau et al., 2007; 124; Overman and Van Thiel, 2016). Thus, our own analysis adds to these explanations by highlighting the critical, but so far misunderstood role, of lean administration in driving improvements in efficiency.

This finding does not, of course, rule out possible hidden costs associated with corporatization and lean administration. For managers and administrators, the focus on efficiency could mean greater work intensification, reduced employment prospects and declining morale. These pressures have been widely noted in the NHS (Hyde et al., 2016), and may partly account for rising clinical workloads and staff turnover. Importantly, our results suggest that lower AI is not having a directly negative impact on effectiveness and responsiveness. However, there may be risks in the longer term. In complex public services, rising levels of AI could help support co-ordination and generate space to develop services (Andrews et al., 2017). This has already been noted in the NHS, where 'high quality administration…has the potential to improve patient experience, reduce inequalities, and promote better care' (The King's Fund, 2021). As such, lean administration could be a double-edged sword. While it may help drive efficiency, following corporatization, this could be at the expense of opportunities to plan and deliver service improvements.

A second, more tentative, theoretical contribution of our study is to the burgeoning literature on AI in public sector organizations. This work draws heavily on concepts from traditional structural contingency (Donaldson, 2001; Rushing, 1967), but has focused mainly on the explanatory role of organizational size and complexity as key variables (Andrews and Boyne, 2014; Boon et al., 2019; Boyne and Meier, 2013; Rutherford, 2016). With some exceptions

(Andrews et al., 2020; Boon and Wynen, 2017), far less attention has been given to other contingencies associated with strategy, structure and the emergence of the M-form, including its equivalent in public sector organizations (Goold et al., 1994; Hill, 1985). The latter, as we saw, has been integral to NPM reforms and the goal of separating steering from rowing (Osborne and Gaebler, 1992). As such, our research helps to advance this literature, theorizing and testing possible relationships between these governance changes and levels of AI.

Turning to implications for research, our findings add to and extend empirical knowledge about the impact of corporatization and AI more generally. In some respects, our data, based on longitudinal observations, and methodological approach also go beyond existing studies. The statistical technique employed here (system-GMM) has significant advantages over previous research, helping to better model dynamic relationships, deal with concerns about endogeneity and ultimately enhance robustness. Furthermore, it is notable how our analysis of the NHS case did not offer strong support for either of the antecedents of AI that have dominated previous work, namely size and complexity (Andrews and Boyne, 2014; Boon et al., 2019; Boyne and Meier, 2013; Rutherford, 2016).

Lastly, regarding implications for policy (and practice), to some extent our analysis reinforces the beliefs of policy makers about the likely benefits of corporatization as a broad direction of travel. In addition, our results highlight ways in which changes in AI might support this policy going forward. Notably, the NHS case suggests that restricting levels of AI will not necessarily be detrimental to the success of corporatization. On the contrary, through a leaner administration, it may be possible to enhance the productive potential of managers and bureaucrats without undermining effectiveness and responsiveness. This approach is not without risks or hidden costs that might be detrimental in the longer term. Nevertheless, in a context of

austerity and increasingly cash strapped public services globally, policy makers may view these risks and their hidden costs as acceptable.

Of course, when drawing these conclusions, it is important to consider a number of caveats and directions for further research. First, it would be useful to look beyond the English NHS case to assess how far our results and conclusions hold for other areas of the public sector - beyond healthcare - and in different countries. This might help to improve generalizability, especially given the distinct features of the healthcare case. For instance, the lack of any positive mediating effect of a leaner administration on effectiveness and responsiveness might be interpreted in light of the professionally dominated nature of healthcare and the importance of clinical expertise (Kirkpatrick et al., 2017b). The absence of these conditions in other public sector organizations, such as multi-purpose local and central government agencies, may produce different results. In addition, it is possible that different levels of political involvement (or interference) in public services will be significant. This is especially possible given the importance of 'overt and non-politicized public objectives' as a necessary condition for the success of corporatization (Voorn et al., 2017; 835). In this regard, the experience of other countries will be of interest. While corporatization policies are increasingly global, their implementation (and consequences) are likely to vary a great deal across national settings (Krachler et al., 2022). NPM reforms imply the 'the adoption of a similar set of institutional arrangements', but one must also consider 'endogenous pressures resulting in distinctive institutional models' (Andrews et al., 2019; 1253). Moreover, it would be interesting to consider additional performance measures to capture different corporatization reform 'goals', such as increasing democratic participation in strategic decisions and facilitating the reorganization of

services in line with local needs (Sager et al., 2010). It is possible that higher levels of AI will allow for a broader participation in resource allocations to the benefit of local communities.

Lastly, it would be useful to learn more about the micro processes that explain how changes in AI affect performance. Especially helpful here could be in depth case studies or large-scale surveys of managers. Corporatization might enhance the productive capacity of administrators and their willingness to innovate and engage with work redesign. However, although plausible, we can only impute this from our study. Similarly, more attention needs to be given to the potential role of information technology and the digitalization drive in enhancing (or not) this productive capacity of managers and administrators. Bilodeau et al. (2007; 124) note that the greater autonomy of public sector organizations could ensure that they 'make better use of information technology' by automatizing the back-office administration. But is this necessarily the case and if so, how exactly is IT being used and implemented?

Data availability

Data available from https://doi.org/10.5061/dryad.ngf1vhhxx.

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TABLES AND FIGURE

Figure 1
Theoretical model

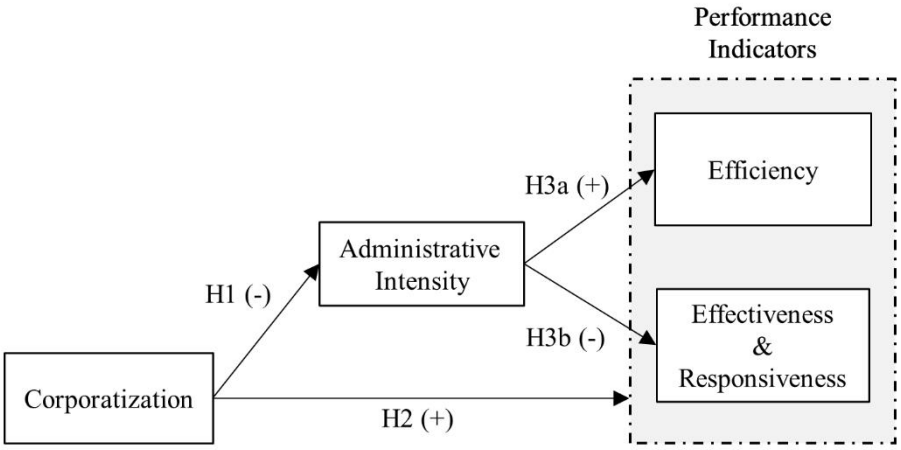

Table 1
Descriptive Statistics (N=1215)

Variable	Definition	Mean	Median	Min	Max	St.Dev.
Years as FT	Number of years a trust has been an FT	3.25	2.00	0.00	12.00	3.61
Admin-to-All	Number of administrative staff per 1000 staff	266.03	265.69	169.08	450.39	41.00
Nonmanagerial Admin-to-All	Number of nonmanagerial administrative staff per 1000 staff	241.59	240.15	140.87	392.11	40.59
RCI	Reference Cost Index	99.89	99.00	78.00	157.00	8.01
Cost per Admission	Expenditure per Admission	3414.40	3017.27	1114.00	9934.81	1368.76
Patient Experience (N=1181)	Patient Experience	76.26	75.90	67.10	88.20	3.44
Safety Incidents Reported (N=1071)	Number of patient safety incidents reported per 100 admissions	7.25	6.95	2.88	19.48	2.47
Size	Natural log of total number of beds	6.37	6.47	1.95	7.69	0.69
Number of Units	Number of units of a hospital trust	4.35	4.00	2.00	18.00	2.60
Case-mix Index	Case-mix for each hospital trust divided by mean case-mix	1.00	0.22	0.04	10.83	1.44
Bed Occupancy	Percentage of bed occupancy of a hospital trust	0.87	0.88	0.42	1.00	0.07
Admissions	Natural log of admissions deflated by case-mix	60.19	51.59	0.88	311.68	55.32
Teaching Trust	Dummy variable for teaching status	0.19	0.00	0.00	1.00	0.39
Specialist Trust	Dummy variable for specialist status	0.11	0.00	0.00	1.00	0.32

Table 2
Coefficients for System-GMM estimations: Admin variables are the dependent variables (H1)

	Dependent Variable	
Variable	*Admin-to-All*	*Non-managerial Admin-to-All*
First lag of the dependent variable	0.985***(0.000)	0.982***(0.000)
Years as FT	-0.256** (0.027)	-0.258** (0.022)
Size	0.474 (0.711)	0.822 (0.477)
Number of Units	-0.231 (0.143)	-0.198 (0.186)
Case-mix Index	-0.314 (0.411	-0.290 (0.411)
Bed Occupancy	-11.703 (0.149)	-8.765 (0.240)
Admissions	-0.003 (0.792	-0.008 (0.451)
Teaching Trust	1.739** (0.031)	1.215 (0.138)
Specialist Trust	3.711** (0.037)	3.532** (0.042)
Year Dummies	YES	YES
SHA Dummies	YES	YES
Observations	1062	1062
Number of groups	146	146
Number of instruments	59	59
Hansen test (chi^2)	28.45 (0.69)	31.81 (0.53)
Ar(2) (z)	1.09 (0.28)	1.43 (0.15)
Diff-in-Hansen test (chi^2)		
full set	26.63 (0.43)	28.31 (0.34)
subset	1.83 (0.97)	3.50 (0.84)
Wald (chi^2)	7618***(0.000)	8434***(0.000)

Notes: Robust standard errors clustered at the hospital trust level. All estimations include a constant, year dummies and Strategic Health Authority (SHA) dummies, which are not reported due to space reasons. P-values in parentheses. Significance at * p<0.10, ** p<0.05, *** p<0.01.

Table 3
Coefficients for System-GMM estimations: Performance indicators are the dependent variables (H2)

	Dependent Variable			
Variable	*RCI*	*Cost per Admission*	*Safety Incidents Reported*	*Patient Experience*
First lag of the dependent variable	0.368* (0.060)	0.151 (0.405)	0.798*** (0.000)	0.229*** (0.000)
Years as FT	-0.298** (0.026)	-52.963*** (0.001)	-0.031* (0.066)	0.152*** (0.000)
Size	-0.020 (0.979)	220.829 (0.108)	-0.515** (0.016)	-0.172 (0.534)
Number of Units	0.191 (0.211)	62.912*** (0.002)	0.067** (0.018)	0.118*** (0.003)
Case-mix Index	0.181 (0.537)	119.184** (0.017)	-0.041 (0.475)	0.046 (0.495)
Bed Occupancy	7.051 (0.555)	2297.797 (0.380)	5.694 (0.104)	-6.211* (0.060)
Admissions	-0.003 (0.720)	-2.984** (0.012)	-0.000 (0.881)	-0.004 (0.258)
Teaching Trust	0.530 (0.497)	383.040** (0.048)	0.208 (0.118)	0.445 (0.142)
Specialist Trust	8.913*** (0.006)	2504.774*** (0.000)	-0.120 (0.739)	5.627*** (0.000)
Year Dummies	YES	YES	YES	YES
SHA Dummies	YES	YES	YES	YES
Observations	1062	1062	921	1027
Number of groups	146	146	144	142
Number of instruments	46	46	52	54
Hansen test (chi^2)	19.35 (0.50)	27.12 (0.13)	29.37 (0.34)	36.15 (0.14)
Ar(2) (z)	1.02 (0.31)	0.21 (0.83)	0.28 0.77)	-0.14 (0.89)
Diff-in-Hansen test (chi^2)				
full set	17.71 (0.41)	20.48 (0.25)	27.84 (0.22)	28.08 (0.26)
subset	1.64 (0.65)	6.65 (0.08)	1.54 (0.82)	8.07 (0.09)
Wald (chi^2)	206*** (0.000)	737*** (0.000)	1246*** (0.000)	1083*** (0.000)

Notes: Robust standard errors clustered at the hospital trust level. All estimations include a constant, year dummies and Strategic Health Authority (SHA) dummies, which are not reported due to space reasons. P-values are parentheses. Significance at * p<0.10, ** p<0.05, *** p<0.01.

Table 4
Coefficients for System-GMM estimations: Performance indicators are the dependent variables

	RCI				*Cost per Admission*				*Safety Incidents Reported*				*Patient Experience*			
Variable	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)	
First lag of the dependent variable	0.459**	(0.012)	0.487***	(0.007)	-0.035	(0.856)	-0.119	(0.593)	0.791***	(0.000)	0.788***	(0.000)	0.231***	(0.000)	0.240***	(0.000)
Admin-to-All	0.038***	(0.009)			6.870*	(0.082)			3.580	(0.461)			-6.747	(0.217)		
Non-managerial Admin-to-All			0.037***	(0.007)			8.695*	(0.061)			5.099	(0.288)			-8.295	(0.117)
Size	1.046	(0.190)	0.854	(0.272)	473.250**	(0.030)	504.375**	(0.029)	-0.408	(0.123)	-0.400	(0.101)	-0.359	(0.281)	-0.355	(0.276)
Number of Units	0.167	(0.222)	0.162	(0.231)	77.697***	(0.009)	83.912***	(0.010)	0.069**	(0.026)	0.069**	(0.021)	0.095**	(0.035)	0.094**	(0.031)
Case-mix Index	0.224	(0.439)	0.198	(0.492)	187.219***	(0.005)	208.066***	(0.006)	-0.020	(0.746)	-0.016	(0.804)	0.035	(0.629)	0.030	(0.676)
Bed Occupancy	3.547	(0.761)	2.936	(0.804)	2149.670	(0.438)	2260.308	(0.430)	5.134	(0.139)	5.264	(0.126)	-9.080**	(0.017)	-8.932**	(0.017)
Admissions	0.004	(0.669)	0.004	(0.692)	-1.072	(0.456)	-0.899	(0.561)	0.001	(0.765)	0.001	(0.682)	-0.005	(0.163)	-0.005	(0.141)
Teaching Trust	0.350	(0.598)	0.380	(0.555)	485.625**	(0.047)	553.637**	(0.048)	0.199	(0.146)	0.219	(0.118)	0.530	(0.105)	0.506	(0.118)
Specialist Trust	7.365**	(0.014)	7.132**	(0.015)	3023.892***	(0.000)	3317.171***	(0.000)	-0.160	(0.658)	-0.124	(0.736)	5.538***	(0.000)	5.437***	(0.000)
Year Dummies	YES		YES		YES		YES		YES		YES		YES		YES	
SHA Dummies	YES		YES		YES		YES		YES		YES		YES		YES	
Observations	1062		1062		1062		1062		921		921		1027		1027	
Number of groups	146		146		146		146		144		144		142		142	
Number of instruments	46		46		46		46		52		52		54		54	
Hansen test (chi^2)	16.84 (0.66)		16.57 (0.68)		25.48 (0.18)		24.33 (0.23)		25.98 (0.52)		26.60 (0.48)		36.30 (0.14)		36.52 (0.13)	
Ar(2) (z)	1.17 (0.24)		1.20 (0.23)		0.10 (0.92)		-0.11 (0.91)		0.24 (0.81)		0.22 (0.83)		-0.05 (0.96)		-0.01 (0.99)	
Diff-in-Hansen test (chi^2)																
full set	15.66 (0.55)		14.20 (0.65)		22.56 (0.16)		22.44 (0.17)		23.14 (0.45)		22.66 (0.48)		32.34 (0.12)		31.39 (0.14)	
subset	1.18 (0.76)		2.36 (0.50)		2.92 (0.40)		1.89 (0.60)		2.84 (0.59)		3.94 (0.41)		3.96 (0.41)		5.13 (0.27)	
Wald (chi^2)	290***	(0.000)	307***	(0.000)	472***	(0.000)	390***	(0.000)	1255***	(0.000)	1263***	(0.000)	717***	(0.000)	709***	(0.000)

Notes: Robust standard errors clustered at the hospital trust level. **All estimations include a constant, year dummies and Strategic Health Authority (SHA) dummies, which are not reported due to space reasons.** P-values in parentheses. Significance at * p<0.10, ** p<0.05, *** p<0.01.

Table 5
Coefficients for System-GMM estimations: Mediation effects of AI (H3a and H3b)

	RCI		*Cost per Admission*	
Variable	(1)	(2)	(3)	(4)
First lag of the dependent variable	0.409** (0.012)	0.423***(0.008)	0.189 (0.224)	0.140 (0.380)
Years as FT	-0.266** (0.024)	-0.263** (0.025)	-46.155***(0.006)	-48.161***(0.006)
Admin-to-All	0.037** (0.014)		5.960* (0.085)	
Non-managerial Admin-to-All		0.036** (0.012)		7.406* (0.067)
Size	0.937 (0.217)	0.754 (0.312)	362.303** (0.035)	377.454** (0.036)
Number of Units	0.142 (0.303)	0.143 (0.312)	55.115***(0.008)	58.523***(0.008)
Case-mix Index	0.247 (0.341)	0.231 (0.373)	130.771***(0.008)	142.959***(0.007)
Bed Occupancy	-0.728 (0.944)	-0.992 (0.923)	1163.200 (0.639)	1213.911 (0.620)
Admissions	0.002 (0.800)	0.002 (0.832)	-1.798 (0.117)	-1.681 (0.167)
Teaching Trust	0.578 (0.402)	0.614 (0.366)	383.157** (0.037)	428.641** (0.034)
Specialist Trust	7.869***(0.007)	7.834***(0.005)	2336.342***(0.000)	2516.284***(0.000)
Year Dummies	YES	YES	YES	YES
SHA Dummies	YES	YES	YES	YES
Observations	1062	1062	1062	1062
Number of groups	146	146	146	146
Number of instruments	54	54	54	54
Hansen test (chi^2)	23.97 (0.63)	23.53 (0.66)	32.25 (0.22)	31.93 (0.24)
Ar(2) (z)	1.05 (0.30)	1.06 (0.29)	0.34 (0.73)	0.22 (0.82)
Diff-in-Hansen test (chi^2)				
full set	21.53 (0.55)	20.42 (0.62)	25.50 (0.33)	26.57 (0.28)
subset	2.45 (0.65)	3.11 (0.54)	6.75 (0.15)	5.36 (0.25)
Sobel-Goodman test with bootstrapping	0.0332**(0.01)	0.0233**(0.03)	3.592** (0.04)	0.2966 (0.80)
Wald (chi^2)	270*** (0.000)	272*** (0.000)	844***(0.000)	707***(0.000)

Notes: Robust standard errors clustered at the hospital trust level are in brackets. All estimations include a constant, year dummies and Strategic Health Authority (SHA) dummies, which are not reported due to space reasons. P-values in parentheses. Significance at * p<0.10, ** p<0.05, *** p<0.01