

The Effect of Shared Service Centers on Administrative Intensity in English Local Government: A Longitudinal Evaluation

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Abstract

“Administrative intensity” (AI) describes the proportion of total resources that organizations spend on administrative support functions rather than primary service and production processes. We test whether “sharing” administrative activities between organizations leads to a fall in AI due to economies of scale, as is often supposed, using organizational and financial data from over 300 English local authorities. We employ multi-wave change-score regression analysis to relate changes in AI from 2008 to 2016 to levels of shared services participation, and further test whether reform performance varies by category of local authority, type of administration or degree of structural complexity. Although we find that some measures of AI fell slightly over this period, this was unrelated to shared service adoption for any category of local authority. Sharing of clerical rather than professional types of administration, and sharing by organizations and within partnerships characterized by lower structural complexity, also failed to improve reform outcomes. Faulty assumptions about the extent of administrative scale diseconomies in English local government partly explain this significant reform underperformance.

INTRODUCTION

Organizations use scarce resources to achieve complex tasks. Allocating these resources between competing priorities is a primary responsibility of executive management. A recurring dilemma is how much to resource the *administration* of the organization – that is, the activities that coordinate and assist organizational members to achieve collective objectives, without themselves contributing directly to those objectives. Examples include the personnel and financial management functions, legal counsel, internal audit, and information technology.

Known by organization theorists as the problem of “administrative intensity” (Pondy, 1969; Price, 1997), decisions about the balancing of primary and “back-office” expenditure are often challenging. Over-administration leads to bureaucracy, inflexibility and expensive overheads, to the detriment of core service or production activities (Ward et al., 1997; Kalseth & Rattsø, 1998). But under-administered organizations make mistakes, are unpredictable, and fail to deliver major objectives (Chandler, 1962; Rutherford, 2016; Andrews et al., 2017). In theory, resolving this dilemma involves establishing the minimum administrative requirements for an organization to reliably meet its goals, and then determining the most efficient mode of delivery. Yet many uncertainties make this task easier said than done.

Faced with declining budgets and rising demand for public services, governments in rich democracies have become particularly sensitized to questions of administrative resourcing in recent years (Boyne & Meier, 2013; Boon & Wynen, 2017). Is the public sector over-administered? Is precious resource wasted on the back office, to the detriment of frontline public services or mounting government debt? Often, policymakers have answered “yes!” and have instigated significant reforms to curb the perceived excess of administration (OECD, 2015). Preeminent

among these is the “shared service center” model. This involves multiple organizations or organizational divisions amalgamating and “sharing” back-office functions, whilst remaining otherwise independent entities (Strikwerda, 2014). Standardized administration is provided to all parties, irrespective of differences in primary tasks and goals. The hope is that economies of scale and scope will result, beyond what the collaborators can achieve autonomously – reducing administrative intensity without full-scale organizational amalgamation.

Widely adopted in the private sector (Gospel & Sako, 2010; Strikwerda, 2014), and strongly advocated by consultants and think tanks (AGA & Accenture, 2015; OECD, 2015), shared services are appearing in numerous public sectors where decentralization and specialization are thought to undermine organizational efficiency (Paagman et al., 2015; Elston & MacCarthaigh, 2016). The simplicity of the economy-of-scale logic and persuasive anecdotes about private-sector successes have assured this rapid and wide-spread adoption. But are expectations matched by achievements? Does administrative intensity decrease? And do the financial benefits justify the transition and coordination costs? Research evidence is extremely thin. While some studies report cost savings from collaborative production of frontline public services (Andrews & Entwistle, 2010; Bel et al., 2014; Pérez-López et al., 2015; Park et al., forthcoming; although see Drew et al., forthcoming), most research on back-office collaboration is qualitative and focused on reform processes rather than outcomes. The few evaluations that do exist use small samples, are cross-sectional, and/or rely on perceptual rather than administrative data (for instance, Dollery & Grant, 2009; Schwarz, 2014).

These limitations motivate the present study, which is the first large, longitudinal evaluation of the shared services reform trend. Using organizational and

financial data from over 300 local authorities in England, we compare changes in administrative intensity during 2008-2016 with the level of council participation in inter-organizational shared services. We use several measures of administrative intensity, a new index of shared services participation, and a variety of supplementary tests to determine whether reform outcomes are affected by type of local authority, type of administrative function or degree of structural complexity within organizations and across sharing partnerships. Our results show that, on most measures, administrative intensity declined slightly over this period, though with much variation between authorities. However, this trend was unrelated to shared services adoption for any category of local authority. Type of administration shared and degree of structural complexity also made little or no difference to the results. These findings call into question the significant efforts that English councils have put into shared services during a period of severe financial stress, and, more generally, the key assumptions that underpin similar reforms in other contexts.

The article is structured as follows. The first section reviews existing literature on shared service centers and introduces our empirical case. The second uses organization theory and evidence on the determinants of administrative intensity to hypothesize the effects of shared service adoption on English local government. The third section describes the methods and data, the fourth tests each hypothesis, and the fifth performs additional tests to help explain the results. The sixth section discusses practical and theoretical implications.

SHARED ADMINISTRATIVE SERVICES: TRIED BUT UNTESTED

Consultants, management “gurus” and think tanks write enthusiastically about the “promise” of shared service centers (hereafter SSCs) (Bergeron, 2003; Accenture, 2005; Chartered Institute of Public Finance & Accountancy, 2010; Partnership for

Public Service & Deloitte, 2015; Shared Services Leadership Coalition, 2015). This “grey literature” reveals the current popularity of SSCs, the breadth of administrative activities thought conducive to sharing, and the major savings expected to accrue. For instance, consultants in the United States recently estimated federal government could save up to \$47bn annually from total back-office expenditure of \$125bn (AGA & Accenture, 2015), while UK central government envision reductions of 25-40 per cent, amounting to £600m a year (Cabinet Office, 2012). Various methods are used to produce these forecasts, ranging from casual reference to (unaudited) private-sector experience (for example, HM Treasury, 2009) to “benchmarking” an organization’s back-office functions against “best-in-class” comparators – for instance, in terms of ratio of support to non-support workers or unit costs of discrete procedures (for example, New Zealand Treasury, 2013).

There is little peer-reviewed research on SSCs. Descriptive case studies are most common, exploring the processes and challenges of implementation (Conway et al., 2011; McCracken & McIvor, 2013; Kennewell & Baker, 2016; Tammel, 2017). Several observe that implementation fidelity is sometimes low in SSC reforms, given employee or manager resistance to new ways of working or lessened autonomy (Redman et al., 2007; Meijerink et al., 2014). More theoretically-informed research examines the transaction-cost profiles of different administrative activities (Minnaar, 2014), the evolution of inter-organizational relationships (Banoun et al., 2016; Elston et al., 2018), and the impact of specialization and standardization on administrative work and careers (Howcroft & Richardson, 2012).

Among the few studies of reform outcomes, Dollery and Grant (2009) compare several projects in Australia in terms of budget compliance, time to deliver and savings achieved. Others use indicators such as number of staff re-deployed to

non-administrative tasks (de Barros Neto, 2017; Tammel, 2017). Government auditors adopt similar methods (Economic Regulation Authority, 2011; National Audit Office, 2016). In general, all report disappointing results, blaming poor forecasting of transition costs, problems with information technology, or defection by dissatisfied clients. Yet selective case studies say little about the overall efficacy of the reform. The only attempt at larger, quantitative evaluation is Schwarz's (2014) cross-sectional survey of 72 public agencies in the United States. Respondents disclosed expected and achieved cost savings, alongside standardized information about reform characteristics. Average reductions were 3.5 per cent, compared with expectations of 11 per cent; but half of respondents report no savings or cost increases, and the remainder claim anything from 5 to 50 per cent reductions. Schwarz relates these findings to various organizational characteristics, but the use of perceptual rather than administrative data is troubling. Reported outcomes correlate strongly with respondent profile, with SSC managers estimating higher savings than SSC customers, who are underrepresented in the sample.

Shared services in English local government

For a larger and more sophisticated evaluation of the impact of SSCs on administrative intensity, we examine the case of local government in England, which currently consists of 353 separate councils divided into five categories. Reporting to locally-elected councilors but operating within a statutory framework maintained by central government, these bureaucracies deliver or commission a range of social, educational, cultural and other services within a defined locale, as well as some infrastructure and regulatory functions (Stewart, 2000). In the 2016-17 financial year, nearly one quarter of all public expenditure in England was channeled through councils (Local Government Information Unit, 2017). Different areas operate either a

one- or two-tiered system. Shire counties (SC) are the top layer of the two-tier system, and have multiple shire districts (SD) beneath. London boroughs (L), metropolitan districts (MD), and unitary authorities (UA) each combine those functions split under the two-tier system. SDs are on average the smallest council type by population served and range of services delivered; though even these serve far larger populations than typical councils in Europe (John, 2010).

The search for economies of scale in both administration and service delivery has driven decades of reform in English local government, through the redrawing of council boundaries and expansion of the single-tier system (John, 2010; Andrews, 2015). Indeed, Stewart (2000, p.66) speaks of an implicit “sizism” in re-organization efforts, at the expense of local participation and democratic anchorage. SSCs are at once a continuation and innovation on this theme, harnessing the supposed economic advantages of larger organizational size whilst avoiding the need for further vertical or horizontal amalgamation. Thus, for some years, and with increasing fervor since the global financial crisis, central government has encouraged local SSCs. In 2004, the report, *Releasing Resources to the Frontline*, argued for their expansion across the public sector. In 2006, the government white paper, *Strong and Prosperous Communities*, encouraged councils to share back-office services, and the Department for Communities and Local Government (DCLG) published technical guidance to assist with reform design. By 2012, shared services were ranked first among fifty cost-saving strategies published in the DCLG advisory document, *50 Ways to Save: Examples of Sensible Savings in Local Government*. This followed the 2010 Government Spending Review, when the Conservative-Liberal Coalition sought major reductions in public expenditure. Local services experienced 40 per cent real-terms cuts in central funding over four years, raised by a further 10 per cent in 2013

(Hastings et al., 2015). Increases in local taxes, the other main revenue stream for local government, were also limited.

Faced with these difficulties and tantalizing claims about SSCs, councils embarked upon extensive reform. The belief was that “clear financial benefits can be made from sharing services,” with “easy savings ... made by reducing staff” and long-term reductions accruing from “wider business transformation” (Local Government Association, 2012, p.5). With only “modest” set-up costs, these reforms would have “less than a two-year payback period” (ibid.).

The remainder of the paper tests what was achieved in practice.

DETERMINANTS OF ADMINISTRATIVE INTENSITY

Theoretical orientation for the evaluation

Scholars have explained administrative resourcing in organizations from three main perspectives. A growing rational-choice literature examines administrative intensity (hereafter AI) as a product of bargaining between actors with different preferences over the size of the bureaucratic component (Freeman, 1979; Kalseth & Rattsø, 1998; Boyne & Meier, 2013). From a sociological perspective, “institutional” pressures external to the organization – such as fashionable management ideas – have also been found influential (Tolbert, 1985; Edelman, 1990). But most research on AI draws on structural contingency theory – a functionalist branch of organization science that explains choices about organizational design by their consequences for performance. At least 80 such contingency studies of AI have been published, analyzing a wide range of organizations (for reviews, see Starbuck, 1965; Travers, 1979; Andrews & Boyne, 2014). These provide a rich basis for the present evaluation, given the functionalist logic shared with SSC reformers and the mutual interest in administrative economies of scale.

When analyzing organizational structure, contingency theorists distinguish between line, staff and auxiliary components, where “line” refers to primary service or production activities, “staff” describes executive support with coordination and control, and “auxiliary” means clerical, technical and professional tasks (Simon et al., 1958, pp.280-295). Much AI research collapses the staff-auxiliary distinction to examine administration as one heterogeneous activity, with AI defined in reference to “line” activities as “the amount of an organization’s resources or energies which are devoted to coordination of its activities, rather than to performance of its tasks” (Travers, 1979, p.v). This is typically calculated as the number of personnel in non-production roles, or the budget allocated to non-production departments, relative to total workforce or budget (Price, 1997). However, it should be noted that SSCs focus more on auxiliary than staff tasks – a point we return to later.

Hypotheses

The question of whether large organizations achieve economies of scale in staff and auxiliary administration (and, hence, lower AI compared to small entities) has been central to contingency studies since the 1950s. In general, scale economies occur when indivisible factors of production receive fuller utilization from increased output of goods and services; when greater workload allows enhanced specialization of method and personnel; and when quantity discounts are achieved from external suppliers (Shepherd, 1990). Evidence of such economies in the administrative apparatus of organizations (rather than “line” functions) is mixed, although more studies confirm than refute the advantages of scale. Economies are reported in manufacturing firms (Rushing, 1967; Pondy, 1969), government agencies (Blau & Schoenherr, 1971; Boon & Wynen, 2017), school districts (Holdaway & Blowers, 1971), hospitals (Anderson & Warkov, 1961; Tosi & Patt, 1967), universities

(Hawley et al., 1965; Rutherford, 2016), and labor unions (Campbell & Akers, 1970). Diseconomies – that is, higher AI in larger organizations – have been found in school districts (Terrien & Mills, 1955; Daft, 1978), labor unions (Raphael, 1967), and church administration (Hinings & Bryman, 1974). And some studies find no association between administrative intensity and size (Baker & Davis, 1954; Child, 1973; Freeman, 1973).

What explains these contradictory results? Research design and inconsistent measurement may all have contributed, but more substantively, theorists also suggest a trade-off between *size* and *complexity* of the organization (Rushing, 1967; Pondy, 1969; Campbell & Akers, 1970). While increased output of products or services can engender administrative efficiencies, this can be associated with greater complexity or “differentiation” in the organizational structure, in terms of number and diversity of interdependent tasks, personnel and departments (Blau, 1970; Blau & Schoenherr, 1971). Such structural complexity requires increased coordination, which is met by greater administrative effort. The balance of gains from scale and losses from complexity determines the overall impact of up-scaling on AI.

Existing literature thus provides qualified support for the SSC proposition. Administrative savings would seem possible from the increased output generated by inter-council collaboration, so long as the services chosen for sharing are subject to the main sources of scale economies, and provided that these efficiency gains are not matched or, worse, outweighed by the coordination costs of increased structural complexity. There are several reasons to regard both assumptions as reasonable in the context of SSC adoption in English local government.

Firstly, in the period since most AI research was undertaken (pre-1980) there has been extensive automation of back-office administration. “Enterprise resource

planning” software, employee “self-service” platforms and other technologies have brought large capital investments to administrative work (Kamal, 2012; Fishenden & Thompson, 2013) of exactly the “indivisible” nature that makes increased output more efficient due fuller utilization of capacity. The procurement and maintenance of such systems should also be more efficient if, by collaborating, councils use their aggregate demand to leverage better prices from technology suppliers. And enhanced specialization, made possible by the greater workload achieved through collaboration, can improve efficiency of those parts of the back-office that remain labor-intensive (Howcroft & Richardson, 2012).

Secondly, regarding increased structural complexity, much AI literature suggests that differentiation occurs mainly when organizations increase output by adding entirely new products and services, rather than simply expanding existing activity (Campbell & Akers, 1970; DeWitt, 1993). If heterogeneity remains broadly constant while size increases, growth in coordination costs should be minimal “because the same procedures can be used to administer a large volume of responsibilities that are homogeneous” (Blau, 1972, p.19). Conversely, addition of new activities increases heterogeneity and “requires a new set of processes as well as additional employees to coordinate them” (Rutherford, 2016, p.345). Given the operational similarities between English councils – namely, their delivery of mostly statutory public services within a common fiscal and regulatory environment – the increase in heterogeneity for SSCs administering HR, accounting and other services to multiple councils may be relatively small, producing minimal negative side-effects.

These key assumptions, though reasonable, require testing – and we do so below. But, for now, they provide prima-facie support for the SSC reform

proposition, leading us to hypothesize a reduction in AI in local authorities related to their level of participation in SSCs, reflecting the major claim of reformers:

- *Participation in administrative shared service arrangements is associated with a reduction in administrative intensity in local authorities (Hypothesis 1)*

SSC proponents – in England and elsewhere – regard the benefits of back-office collaboration to apply indiscriminately, and there has been little effort to single out types of organization most suited to reform. In practice, however, some may be better positioned to gain than others. In particular, baseline AI influences opportunities for improvement. All formal organizations must maintain some administrative capacity; full elimination of coordination and support processes is neither possible nor desirable (Chandler, 1962; Rutherford, 2016; Andrews, et al., 2017). Thus, organizations with already low AI face limited opportunities for further reductions, and any gains will only come only with considerable effort. Conversely, organizations spending a high proportion of resource on administration have greater opportunity to effect improvements by streamlining work.

High baseline AI may signal a number of conditions. The organization's primary business may require particularly significant administration (Ward et al., 1992; Ward, et al., 1997). Internal capacity for process analysis and innovation may be low. And, in the public sector, institutional constraints beyond the control of managers may inflate AI – for instance, organizational size and procedures. On this point, prior research indicates that Shire Districts (SDs) have, by a considerable margin, the highest AI of all English council types, being the lowest tier of local government and providing the smallest range of services to, on average, the smallest populations (Audit Commission, 1994; Andrews & Boyne, 2009). Consequently, we expect SDs to benefit most from SSCs:

- *The effect of shared service participation on administrative intensity varies by type of local authority, with district councils benefiting most* (Hypothesis 2)

Finally, the effect of SSCs might vary by type of administration involved, and, particularly, whether it is capital- or labor-intensive. Studies of the effect of scale on separate managerial, professional/technical, and clerical functions report marked differences (Rushing, 1967; Blau & Schoenherr, 1971; Freeman & Hannan, 1975; Emmert & Crow, 1988; Ward, et al., 1997). Most find that managerial work is demand-independent (you only need one executive board per organization) and thus subject to strong economies of scale (Holdaway & Blowers, 1971; James, 1972; Kasarda, 1974; Ward, et al., 1997; Rutherford, 2016; an exception is Coates & Updegaff, 1973). Conversely, no scale economy, or a diseconomy, were typically found for labor-intensive professional and clerical functions (Baker & Davis, 1954; James, 1972; Kasarda, 1974; Daft, 1978; Ward, et al., 1992).

This poses a challenge to the SSC movement. Despite some examples of councils sharing management teams (Bello et al., 2018), it is clerical and professional administration that have been the main target of reform – precisely those functions *less* likely to benefit from up-scaling according to previous research. While computers and automation have reduced the labor-intensity of clerical processing in recent years, potentially invalidating previous findings on the limited benefit of up-scaling, professional administration remains labor-intensive. Indeed, recent research on professional service firms, such as legal practices and auditors, confirms that there are few opportunities for scale economies in such work, given its “high knowledge intensity, low capital intensity” (Somaya & Mawdsley, 2015) and “low fixed costs and lack of standardization” (Løwendahl, 2005, p.153). Hence, our third hypothesis expects SSCs to perform better for clerical than professional administration:

- *Shared service participation is associated with a greater reduction in administrative intensity for clerical administration than for professional administration (Hypothesis 3)*

DATA AND METHODS

Research design

The merits of different methods for conceptualizing and analysing change have been much debated (Bergh & Fairbank, 2002; Morgan & Winship, 2007; van Breukelen, 2013). To test our three hypotheses, we performed multi-wave change-score analysis (Allison, 1990; Rogosa et al., 1982; Oakes & Feldman, 2001) on organizational and financial data from the 317 English local authorities (out of 353) for which sufficient financial data were available. The dependent variable was the relative change in AI (as defined below), calculated as the slope of $\ln(\text{AI})$ against time from nine annual data points between 2008 and 2016. This multi-wave or “growth-curve” approach improves estimation of the DV in the presence of outliers and mitigates issues of regression towards the mean and correlation with initial values found in two-wave change-score analyses (Oakes & Feldman, 2001; Bergh & Fairbank, 2002). The primary independent variable was participation in SSCs on a 1-4 scale as described below (with 1 representing no participation).

Alternatives to change-score analysis include ANCOVA methods in which each year’s value of the DV is regressed on the previous year’s value and a “treatment” dummy. We chose the change-score (growth-curve) method for the following reasons. First, our aim was to investigate whether shared service participation was associated with a sustained change in AI over the period of interest, reflecting the reform expectation that SSCs result in medium-term savings rather than transient reductions. Second, when the distribution of “treatment” and “control” cases

cannot be considered random, as with LA decisions to adopt SSCs (see discussion of self-selection, below), the change-score method yields less biased results than ANCOVA (Allison, 1990; Oakes & Feldman, 2001). Third, change-score analysis (which required us only to assess whether each LA joined SSCs during the period of interest) better accommodates ambiguities in LAs' reporting of SSC "start dates," which may variously describe the commencement of reform planning, the beginning of a staged-roll out, or full service implementation. Finally, individual LAs may either be founding partners or late subscribers to sharing partnerships (unreported in the dataset), and often join multiple SSCs, with various partners, and at different times. This makes year-by-year assessment of participation less reliable.

Variables and Data Sources

Dependent Variables: Changes in Administrative Intensity

The change in AI from 2008 to 2016 was calculated from annual editions of the Local Authority Revenue Expenditure statistics published by central government.¹

"Management and Support Services" (M&SS) spending covers administrative services such as human resources, finance, legal, and ICT services. Three measures were calculated: (i) total M&SS as a percentage of total gross expenditure² (AI_total); (ii) M&SS employee expenditure as a percentage of total employee expenditure (AI_employee); and (iii) M&SS "running costs" (the "non-employee" component) as a percentage of total gross expenditure (AI_running_costs). These measures captured overall changes in administrative spending, as well as shifts of resource between employee and non-employee components. All three DVs were calculated as the linear

¹ <https://www.gov.uk/government/collections/local-authority-revenue-expenditure-and-financing> Local authority financial years run from April. All dates are given as "financial year ending."

² Total gross expenditure was calculated net of internal recharges (payments between departments) to avoid double-counting.

gradient of the natural logarithm (ln) of each AI ratio against time from 2008 to 2016, which corresponds to the average annual percentage change in AI. Individual AI values were excluded if reported as zero or negative in a particular year. Cases (36 of 353 LAs) were excluded where M&SS spending was misreported as zero in all years from 2008 to 2016, was zero in the final three years, or if there were fewer than three non-zero data-points in total. Excluded LAs showed no significant differences on any measure of SSC adoption compared to included LAs. Two-tier councils (shire counties and shire districts) were slightly over-represented in the exclusions (11-12 per cent, relative to 6-8 per cent of other LA categories).

Independent Variables

The 2016 edition of the “Shared Services Map” from the Local Government Association (LGA) was used to construct the index of SSC participation.³ The following variables were obtained by coding the dataset:⁴ (i) the number of administrative activities; (ii) whether the SSC involved dedicated organizational resources or was “non-institutionalized” (e.g. a shared procurement framework or a single shared employee); and (iii) categorization of each administrative activity as “clerical” or “professional.” “Clerical” included routine delivery of HR, IT, finance, revenues, pensions, procurement, and facilities functions, while “professional” included legal, audit and other advisory or consultancy roles. The start date of each SSC and number of participating LAs and other public bodies were also recorded.

³ This was updated with additional information from the 2017 edition, released mid-analysis.

⁴ Once the coding categories were agreed, a test set of SSCs was coded by both authors and the coding criteria refined accordingly. Then, the whole dataset (downloaded from <https://www.local.gov.uk/our-support/efficiency-and-income-generation/shared-services/shared-services-map> on 18 October 2016) was coded by each author and any discrepancies resolved by discussion. Coder agreement was 75-94% before discussion. Duplicate SSCs and mislabelled LAs were identified and corrected before analysis. Collaborative arrangements for non-administrative frontline tasks were excluded.

Where there was insufficient or incomplete evidence in the LGA dataset, information was obtained online or by contacting the LAs concerned.

To allow for implementation and “bedding-in” time, as well as the uncertainties around the meaning of “start dates” described above, we assume that SSCs have no effect on AI in their year of creation or in the following year, and that effects on AI should be most marked in the following four years. Thus, LAs were only scored for participation in SSCs established no more than four years before the start of the period for which we have AI data (2008-2016), and no less than two years before the end. LAs participating only in SSCs that started outside that period were given an index score of zero, as were LAs that did not appear in the LGA dataset.

The index of participation in SSCs ($Index_Q$) was constructed thus:

- i. First, the contribution of each SSC to the index was calculated:

$$Index_{SSC} = (\text{number of administrative activities}) \times \log(\text{participants}) \times (\text{nonIwt})$$

where *nonIwt* was 0.2 for non-institutionalized SSCs (as defined above) and 1.0 for all other SSCs.

- ii. Then, the total index for each LA was calculated as the sum of contributions of all SSCs in which that LA participated:

$$Index_{LA} = \sum Index_{SSC}$$

- iii. Finally, each LA was assigned a level of SSC participation based on the quartiles of $Index_{LA}$. This level ($Index_Q$) was used as the independent

variable and took the following values: 1 = *zero*, 2 = *low*, 3 = *medium*, and 4 = *high*.⁵

- iv. To test Hypothesis 3, two supplementary indexes were created in a similar way to *Index_{LA}*, counting only administrative activities falling within each of the categories “clerical” and “professional” as described above. Three levels of participation (zero, low, high) were assigned for *Index_{CLER}* and *Index_{PROF}*.

Control Variables

By confining the analysis to English local government, we hold constant several factors that prior research suggests might affect AI, including sector (public, private, hybrid), technology (manufacturing or service), and configuration of political institutions (Emmert & Crow, 1988; Ward, et al., 1992; Kalseth & Rattsø, 1998). Yet the five types of English LA also differ systematically in their service responsibilities and typical geography. Therefore, LA type was included as an explanatory variable. Population was also included as a proxy for different levels of output within each LA type (see Andrews & Boyne, 2009). And because the central government grant to councils is distributed through multiple needs-based formulae, and those councils facing the greatest cuts after 2010 might be especially keen to reduce AI, we also include two-year projected council budget change 2011-2013 as a control variable. This is drawn from DCLG’s “Local Government Spending Settlement 2011-2013” and represents the *anticipated* funding shortfall that councils were told to plan for during the first two years of austerity, when many plans for SSCs were laid.⁶

⁵ The lowest quartile of *Index_Q* included seven LAs that participated only in non-institutionalized SSCs with small numbers of partners, as well as 74 strict ‘non-participants’.

⁶ Some transitional funding was used to cap annual reductions at 8.8% (benefiting ~40 LAs); but this was a temporary measure, and so we use uncapped figures to give a better representation of the level of reductions signaled to councils at the start of the “age of austerity.”

Other independent variables controlled for differing external constraints that may influence resource allocation in individual LAs. As austerity increased, LAs with more deprived, diverse, and urban populations may have greater pressure to cut back-office costs and preserve frontline services. We therefore obtained measures of the rural or urban nature of the area (estimated as population density), the diversity of the population served (estimated as ethnic diversity and age diversity Gini-Simpson indices (Jost, 2006)) and the level of deprivation (estimated as the proportion of lone-parent households) from the Office of National Statistics. Population and household data are mid-2015 estimates; age and ethnicity are taken from the 2011 UK-wide Census. In our models we assume that these variables do not alter appreciably over the time period; but they are included because their *effects on AI* could vary with increasing financial pressure.

Descriptive statistics for all these variables are shown in Table 1, distinguishing unitary and upper-tier authorities (L, MD, SC, and UA) from lower-tier authorities (SD).

Statistical Model

Hypotheses 1, 2 and 3 were tested by ordinary least-squares (OLS) regression using the R statistical package (R Core Team, 2012), and the results are shown in Tables 2 to 4. The dependent variables (the OLS slope of $\ln(AI)$ against time) were leptokurtic (i.e. had “fatter tails” than a normal distribution), and were evenly distributed around zero. These were transformed using an arcsinh function (a signed pseudo-logarithm) to meet normality criteria, as assessed by the Shapiro–Wilk test (Lupton et al., 1999; Thode, 2002). Independent variables were transformed where necessary to reduce skewness: positively skewed variables (population, population density and ethnic diversity) were log-transformed, and age diversity, being negatively skewed, was

squared. The model fits were found to be homoscedastic (Breusch & Pagan, 1979), apart from some model fits including AI_running_costs. Robust standard errors were therefore estimated in those models. Models were estimated with and without external constraints; those with constraints are shown in the tables to demonstrate the lack of correlation between the DVs and these variables.

RESULTS

Descriptive Statistics

Total spending in English local authorities over the period 2008-2016 increased in real-terms⁷ from 2008 to 2010, then fell by about 17 per cent from 2010 to 2016.

Total employee costs fell by about 30 per cent in real terms from 2010 to 2016, while total non-employee (“running”) costs fell by 7 per cent. The category of Management and Support Service spending (M&SS, used to calculate AI) showed similar trends to total expenditure, falling about 20 per cent in real terms from 2010 to 2016. Hence, across the population of LAs as a whole, AI (the ratio of M&SS to total spending) remained relatively constant at about 8-9 per cent of total spending over the whole period.⁸ As shown in Table 1, in 2016, shire districts (SDs) had on average higher AI than other types of LA (a difference that was statistically significant even after controlling for population served) and greater falls in AI_total and AI_employee.

The level of participation in shared services in 2016 was high, with over three-quarters of LAs participating in one or more relevant SSCs, and some in up to eight. Seventy-four LAs did not participate in any SSCs. SDs were most often represented in SSCs as they are both the most numerous council type and had high SSC

⁷ Costs are corrected for inflation by means of the GDP deflator series produced by HM Treasury.

⁸ The AI averages shown in Table 1 are dominated by the numerous lower-tier LAs and hence do not represent the overall proportions of total local government spending.

participation rates (87 per cent). Participation of other council types varied from 92 per cent of shire counties to 42 per cent of London boroughs, but overall SDs had a higher average participation index than other council types taken together. The 125 SSCs included in the analysis contained between two and over 100 partners. Eighty per cent had start dates of 2010 or later, when local authority retrenchment began.

Table 1 about here.

Hypothesis Tests

Hypothesis 1. *Participation in administrative shared service arrangements is associated with a reduction in administrative intensity in local authorities*

The results from the OLS regression analysis are presented in Table 2. There was no statistically significant relationship between *Index_Q* and the change in AI using any of our three measures (AI_total, AI_employee or AI_running_costs). Thus, level of participation in SSCs was not associated with a change in AI (in either direction), and Hypothesis 1 was not supported. There was, however, a statistically significant positive relationship between population served by each LA and change in AI_total and AI_employee. LAs serving larger populations tended to show a smaller decrease (or indeed an *increase*) in their administrative intensity (AI_total and AI_employee) over the period compared with LAs serving smaller populations. As population is a proxy for organizational size, this variable is likely to reflect different types of LA. AI_running_costs showed a marginally significant relationship with age diversity.

Table 2 about here

Including LA type as an explanatory variable (data not shown) confirmed that the effect of population was largely due to differences in LA type, with SDs showing significantly more negative trends in AI_total and $AI_employee$ than the others. So while SDs had a much higher overall AI throughout the period, they managed to cut AI proportionally much more than other types of LA. Indeed, Table 1 shows that $AI_employee$ actually rose on average by over three per cent a year for all LA types other than SDs. Nevertheless, controlling for LA type made no difference to the relationships between $Index_Q$ and the DVs, which remained non-significant.

Hypothesis 2. *The effect of shared service participation on administrative intensity varies by the type of local authority involved, with district councils benefiting most.*

To test whether the relationship of the DVs and $Index_Q$ varied by LA type, interaction effects between LA type and $Index_Q$ were included in the regression. The results are shown in Table 3. Hypothesis 2 was not supported since no individual LA type demonstrated a significant relationship of $Index_Q$ with change in AI after controlling for explanatory variables, and there was no evidence that SDs benefited more from SSC participation, despite their higher baseline AI.

Table 3 about here

Hypothesis 3. *Shared service participation is associated with a greater reduction in administrative intensity for clerical administration than for professional administration.*

The index of clerical shared services ($Index_{CLER}$) showed no significant relationship with any of the DVs. However, the index of professional SSCs, $Index_{PROF}$, showed a slight *positive* relationship with the change in AI_total and

AI_running_costs, but not with the change in AI_employee. Results for the DV “AI_total” are shown in Table 4. While this finding does not give strong support to Hypothesis 3, it is in the expected direction: SSCs performing labor-intensive professional administration were associated with ‘worse’ financial outcomes than those undertaking more automated clerical work, which were merely associated with no change in AI. Caution is needed in interpreting this result. *Index_{PROF}* accounts for an extremely small amount of the variance in AI change, and the significance level varies with the inclusion or exclusion of different EVs and the analyses of different types of LA. It is possible that the result is an artefact of multiple comparisons. Nonetheless, because these coefficients have the same (positive) sign as the non-significant coefficients found for the SSC indexes in all of the other models reported in this paper, this statistically-significant result reinforces our overall finding that SSCs are not associated with reduced AI, and indeed the reverse may be the case.

Table 4 about here.

Additional analyses

We performed a number of alternative model specifications to confirm the above results. We ran the models in Tables 2 to 4 without the demographic control variables without altering the results of the hypothesis tests (apart from some coefficients for Hypothesis 3 becoming non-significant). We also replaced *Index_Q* as the primary independent variable with a simple count of SSCs for each LA, and a binary variable (“participation” or “no participation” in SSCs), with no change in results. And we replaced ‘LA type’ with a binary variable ‘SD’ or ‘other’ LA type in the test of Hypothesis 2, again with no change in outcome.

In change score analysis, the initial value of the DV can be included as an additional EV (van Breukelen, 2013). We already applied controls that are related to the initial value of AI (LA type and/or population) in our original models. Including the initial value of AI introduced problems of multicollinearity and did not alter our conclusions. In some tests, the relationship between SSC participation and change in AI became just significantly positive, which is consistent with the signs of the coefficients in our reported results (and contrary to our hypotheses about the benefits of reform), but in no case explains more than ~1% of the variation in change in AI.

We also retested Hypotheses 1, 2 and 3 for all three DVs by means of fixed-effects panel analysis using a linear time-trend variable with standard errors clustered at the LA level. The signs and significances of all of the coefficients showed virtually complete agreement with those in Tables 2 to 4 above, and changed none of the conclusions. The diagnostics on these alternative tests were, however, less satisfactory than our OLS tests, reflecting, we believe, the skewness of the derived slopes which we previously corrected by the arcsinh transformation.

Various forms of selection bias can operate when analysing non-random data. Sampling bias and common source bias do not apply, as we use the whole population of English LAs and derive DVs and EVs from entirely separate databases. However, self-selection bias could apply, because SSC participation is not randomly distributed but depends on managerial decision-making, as do the factors leading to an increase or decrease in AI. Thus, unobserved factors could be correlated with both SSC participation (and/or self-reports of participation in the LGA survey) and changes in AI, without there being a direct causal link. As we found little or no correlation between key variables, self-selection could only have confounded our results by converting a significant relationship into a non-significant one (for a hypothetical

example, see Clougherty et al., 2016). This could happen if SSC-participating and non-participating councils differ systematically in ways that rendered putative ‘true’ relationships insignificant. As reported in Table 1, lower tier councils (SDs) have on average higher SSC participation than other types of council and greater reductions in AI. Other variables in Table 1 do not correlate significantly with SSC participation once council type is allowed for. Thus, we find no systematic differences between participating and non-participating councils within each LA type. (Analysis of all possible factors associated with SSC participation is beyond the scope of this paper, but is a productive direction for future research.)

In our analysis, systematic differences between SSC participation of different LA types is allowed for by including LA type as an EV in our hypothesis tests. As an additional check, we repeated the tests for each hypothesis for SDs and for other LA types separately. We found no significant correlations between the index of participation and changes in any measure of AI apart from Hypothesis 3. In that case, when analysing SDs alone, the professional index was positively correlated with the trend in AI_running costs, in accordance with the results reported above for the whole population of LAs. We therefore conclude that self-selection bias is unlikely to have confounded our results.

Thus, all robustness checks confirmed our initial results.

DISCUSSION

Three quarters of local authorities participate in one or more SSC, reflecting the challenging financial situation experienced over this period and the widespread belief in the efficacy of shared service reforms. Yet we found no significant relationship between SSC participation and change in the proportion of resources spent on administration. This result is consistent across our three measures of AI (total,

employee and running costs). LAs did, on average, maintain or slightly reduce AI over this period, so that cuts in total spending were matched by at least proportional reductions in administration. Shire districts, with the highest baseline AI, achieved on average the greatest percentage fall. Such reductions are notable given that organizations with declining resources typically shed productive functions *faster* than administrative functions, thereby *increasing* AI (Freeman & Hannan, 1975; Freeman, 1979; DeWitt, 1993). But we found no significant relationship between trends in AI and SSC participation for any council type, or for SDs versus the rest. Neither professional nor clerical SSCs were associated with a decrease in AI; indeed, professional SSCs showed a weak correlation with *increased* AI. Thus, our three hypotheses were not supported, although the difference between clerical and professional SSCs was in the expected direction.

What explains these results, which run so contrary to reform rhetoric? For a preliminary analysis, we return to the initial assumptions about scale economies and structural complexity. Using available data, we test whether faults in either or both account for the inability to detect significant savings.

Economies of scale

SSC reforms assume that back-office administration is subject to strong and consistent returns to scale. Existing research provides mixed evidence of this in organizations generally. But what about local authorities specifically? Cross-sectional analysis of inter-council variation in AI relative to population served (a proxy for council output) provides an initial indication. SDs typically have significantly higher AI than other council types, suggesting that scale does indeed generate strong efficiency gains. But differences in service responsibilities between council types, and especially the absence of large education and social services in

SDs, invalidates this comparison. A more robust approach is to explore variation of AI against population between councils of the same type. OLS analysis by Andrews and Boyne (2009) using 2004 data found a negative relationship between back-office/total costs and population after controlling for council type, representing a fall of about 14 per cent on doubling council size. Replicating this on 2016 data, we also found a negative but slightly weaker relationship between AI and population. Thus, larger councils of the same type are administered only slightly more efficiently than smaller ones, suggesting that claims of large diseconomies in council administration have been overstated. Moreover, since the AI literature establishes that workforce growth is not typically matched by proportionate increases in managerial costs (Baker & Davis, 1954; James, 1972; Kasarda, 1974; Daft, 1978; Ward, et al., 1992), some of the observed efficiency advantage of larger councils likely relates to efficiencies in top management. With current data, we are unable to quantify exactly how much, but clearly the above cross-sectional analysis *over*-estimates the potential savings available to SSCs which only consolidate auxiliary (i.e., non-managerial) tasks.

Structural complexity

Not only must council administration have a cost function that benefits from upscaling, but any efficiencies resulting from collaboration should not be traded-off against the increased administrative effort that typically accompanies growth in structural complexity. In fact, two aspects of structural complexity are relevant. First is the heterogeneity of activities performed *within* individual councils, which translates into “differentiated” internal structures (Blau, 1970; Campbell & Akers, 1970). More heterogeneous councils (with larger, more numerous, and more diverse departments) may experience greater difficulty in coordinating the internal reforms necessary to adopt and operate shared services than more homogenous councils.

Second is inter-organizational complexity. SSCs with more diverse clients in terms of number and range of frontline responsibilities face greater challenges in meeting all of their administrative needs than those with more homogeneity across the partnership (for qualitative evidence of this, see Economic Regulation Authority, 2011; National Audit Office, 2016).

We performed three tests to establish whether structural complexity at the intra- or inter-organizational level helps explain our results.

For LA-level complexity, we assessed councils in two ways (Dooley, 2002): (i) number of spending categories accounting for more than 1 per cent of gross council expenditure in 2016, similar to Andrews and Boyne's (2014) measure of complexity in universities; and (ii) an entropy-based measure which accounts for distribution of spending across categories (the sum of $-x_i \ln(x_i)$ across spending categories i where x_i is the proportion of spending on each category in 2016) (Jacquemin & Berry, 1979). On both measures (Figures 1A and 1B), SDs were the least complex type of LA, in line with expectations (Stewart, 2000).

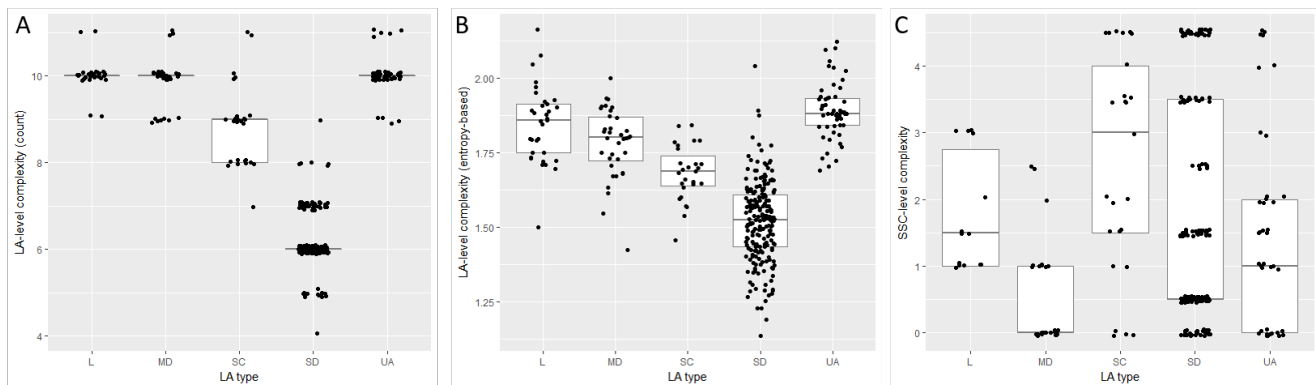
For SSC-level complexity, contingency research has not previously considered "differentiation" across a partnership of organizations, requiring us to design a new measure based drawing on key contingency principles. SSCs serve up to five types of LA, and a fifth include other public agencies such as police authorities. We assume that partnerships between similar types of LA are less complex than between different types, since the requirements for the SSC to fulfil are more homogenous.

Additionally, SDs contribute least complexity to any partnership, since they deliver significantly fewer public services. Non-LA partners contribute most complexity, being governed differently and charged with distinct responsibilities to LAs. Thus, SSC-complexity is calculated by the number of different types of partner involved,

weighted as: SD=0.5, L=MD=SC=UA=1, Non-LA=2. (Non-institutionalized SSCs, as defined previously, score zero.) These SSC-complexity scores were assigned to each participating LA. Where LAs participated in multiple SSCs, the score of the most complex SSC was assigned. On this measure, Metropolitan Districts were involved in the least structurally complex SSCs, on average (Figure 1C).

Figure 1. Three measures of LA- and SSC-level complexity. A: Number of cost categories representing over 1 per cent of total gross spending (out of a maximum of 13 categories); B: Entropy-based complexity (maximum $\ln(13)=2.57$); C: SSC-level complexity (out of a maximum of 6.5), for SSC-participants only. Boxplots show horizontal lines at the median, upper, and lower quartiles. Jitter was added to data-points to aid visualization (horizontal and vertical in A and C, horizontal in B).

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Repeating our hypothesis tests with each complexity measure included as an explanatory variable did not alter the relationship between change in AI and SSC participation (results not shown). We also found no interaction effects between the intensity of SSC participation and SSC-complexity. Thus, there is no evidence that councils with lower structural complexity, or that participated in less heterogeneous partnerships, achieved greater success in reducing AI through shared services than those with higher internal complexity or party to more complex SSCs. There are two

possible explanations for this. The increase in coordination costs when moving from autonomous to inter-organizational working, regardless of the degree of similarity among partners, may simply exceed the threshold at which gains from scale are reversed; in which case our SSC data, which involves a minimum of two LAs working collaboratively, shows insufficient variation to test the impact of different degrees of complexity on the SSC-AI relationship. Certainly, collaboration entails many additional considerations and difficulties compared with independent working (McGuire & Agranoff, 2011; Elston, et al., 2018). Alternatively, because functionalist theories of AI focus on “staff” roles of coordination and control, and neglect “other particulars relevant to [explaining] intensity” (Travers, 1979, pp.35-36), our results may signal a need for new theorizing about the determinants of non-“staff” administration in organizations. Auxiliary functions are less intrinsic to coordination and control, and so may be less affected by structural complexity.

Summary

Therefore, from these preliminary investigations, our null results are explained by the limited potential for scale economies in council administration. While cross-sectional analysis indicates that larger LAs are generally more efficient than smaller councils of the same type, the potential gain is not large. Moreover, only a proportion of this is accessible to SSCs focused on auxiliary support services, given the likelihood that the observed efficiency in larger councils relates in part to managerial economies. Finally, trading-off gains from up-scaling and losses from increased structural complexity cannot be ruled out, but was not detected in our dataset.

Study Limitations

Limits to the sensitivity of our analysis should be acknowledged, not least as a spur to future work using more granular data. Only a very small proportion of the variance in the change of AI was explained by our model, with R^2 only exceeding 0.1 for the change in AI_employee. Unlike the absolute value of AI, which we can model with R^2 of over 0.78 (due mainly to large systematic differences in AI between LA types), relative *change* in AI is a second-order effect which is much harder to predict. In addition, while using longitudinal administrative data is a considerable advance on current SSC literature, it is not perfect. The ideal would be a breakdown of M&SS expenditure into subcategories which could then be matched with specific SSC functions. There are also inconsistencies in this data source. After removing obvious inaccuracies, we assume the remaining figures accurately reflect administrative spending in LAs, and were recorded consistently across time and between councils. As for the LGA dataset used for our main independent variable, this also has a number of limitations. The product of a self-selected survey of council managers, it does not claim to match the quality of official statistics. We detected and corrected some SSC duplications and mislabeling of LA participants, but errors may remain. The dataset provides inconsistent details about SSC governance (an omitted variable in our study; see Provan & Kenis, 2008); limited information about SSC start dates, as noted; and does not designate individual LAs as either SSC vendors or clients, which could affect the cross-matching of data sources. Lastly, while qualitative descriptions allow coding and comparison of the range and broad extent of activities delegated to SSCs, they do not disclose the precise ratio of shared to retained work. Weighting the SSC participation index in the manner described is a workable solution; but our

analysis is unlikely to be sensitive to savings that are small relative to total administrative expenditure.

CONCLUSION

This evaluation of the financial effects of shared service adoption on English local government is the first of its kind in a number of respects. No previous study has undertaken longitudinal analysis of a large administrative dataset to test the efficacy of this popular but unproven public management reform. No study has invoked the lens of organizational contingency theory, and the large and highly relevant literature on administrative intensity, to understand the aims and hypothesize the possible side-effects of SSC adoption. And, consequently, no study has yet enumerated and critiqued in such detail the assumptions behind SSC adoption, nor raised the prospect of attributing disappointing outcomes to flaws in these assumptions.

After analyzing the entire population of English LAs (barring cases with insufficient financial data) over nine years, and performing a series of robustness checks, our results are unambiguous. SSCs have not yet delivered the financial performance promised, either for local government as a whole or for individual categories of local authority. Nor does our data suggest that imposing strict “scope conditions” on SSC reforms – for instance, limiting participation to organizations with high baseline AI; forming partnerships only between similar types of organizations; and sharing only the capital-intensive (technology-based) administrative functions – is a promising way forward.

These findings have significant policy and research implications. In particular, while debate continues on ways to enhance efficiency in decentralized and specialized public services, our study indicates that compared with capital-intensive frontline services, where collaboration between (smaller) councils often proves cost-

effective (Andrews & Entwistle, 2010; Bel, et al., 2014; Pérez-López, et al., 2015), back-office administration may be less suited to sharing than commonly supposed. Possibly this is because of its non-standardized capital infrastructure, continuing labor intensity in spite of the potential for automation, and the high degree of connectivity between administrative teams and the multiple line functions they support. Yet, more research is needed. In particular, councils are multipurpose but integrated organizations, and recent research has established that collaboration in one activity can have “knock-on” effects for other seemingly unrelated activities (see Drew, et al., forthcoming). Future studies should thus expand from our relatively narrow focus on the impact on AI to explore how shared administration affects council operations and finances more broadly. Given the connectivity between administrative and line functions, these secondary effects of SSC adoption could be considerable. Furthermore, recognizing the contingency-theory precept that “context matters” for effective organizational design, further research on SSC adoption in organizations of smaller size and different purpose to English LAs is needed; particularly to explore whether the aforementioned logical scope conditions prove more effective in other circumstances.

Meanwhile, while we do not exclude the possibility that individual SSCs can and have produced efficiencies, great caution is needed by those advocating and implementing this type of reform.

Theoretical implications

As for the theoretical implications of our study, while contingency theory performed well in explaining the limited potential for administrative scale economies in our research setting, it proved less satisfactory in identifying precisely why that

limited potential failed to be realized, although data limitations and the peculiarities of the phenomena under investigation also contributed to this.

Contingency studies highlight the complex relationship between output, structural differentiation, and AI, as well as the differing response to up-scaling by the various types of administration – management, professional/technical, and clerical. The large size of English councils by international standards, and the non-managerial administration typically delegated to SSCs, mean that collaboration was unlikely to produce the magnitude of cost reduction widely forecast, regardless of any coordination costs. As helpful as contingency theory is in understanding this, its focus on internal structure and task characteristics renders it less suited to diagnosing precisely what prevented those modest potential savings from being realized. Some modifications and extensions to the theory are possible. We conceived and operationalized a new measure of inter-organizational structural differentiation (SSC-level complexity) based on (dis)similarity between SSC partners. This demonstrates that some “read-across” of contingency concepts to the collaborative domain is possible and can be pursued further in future. However, a number of other important contextual variables – such as trust, cognitive proximity, and prior social networks (Gulati & Gargiulo, 1999; Knoblen & Oerlemans, 2006) – are known to contribute to partnership success. These have no precedent in the contingency tradition, and to incorporate them requires quite different data to the administrative and archival sources typically used. Synthesis of these disparate fields is a worthy goal if contingency theory – a venerable but perhaps timeworn field – is to be updated for the “networked” age.

Table 1. Descriptive statistics for the English local authorities included in the analysis^a

	All LAs (n = 317)		Unitary and upper-tier LAs (n = 140)		Second-tier LAs (Shire Districts) (n = 177)	
	Mean	StdDev	Mean	StdDev	Mean	StdDev
<i>Administrative intensity in 2016 (Management & Support Services costs as a percentage of relevant total costs)</i>						
AI_total	23.4	18.8	7.9	3.7	35.9	16.6
AI_employee	25.7	20.7	9.3	4.0	39.1	19.1
AI_running_costs	11.6	9.6	4.2	2.7	17.5	9.1
<i>Relative annual percentage change in AI from 2008 to 2016</i>						
Change in AI_total	-1.49** ^b	9.48	-0.50	10.00	-2.28***	8.99
Change in AI_employee	0.20	9.19	3.11***	8.93	-2.11**	8.74
Change in AI_running_costs	-1.36*	11.23	-1.50	13.55	-1.25	9.04
<i>Independent variables</i>						
Index of participation in shared services ($Index_{LA}$)	4.35	5.19	3.35	5.02	5.14	5.19
$Index_Q$ (quartiles of $Index_{LA}$, 1 = no participation to 4 = high participation)	2.56	1.11	2.22	1.12	2.82	1.02
Population	217,868	223,339	356,920	278,086	107,884	30,614
Population density	1,700	2,526	2,876	3,305	769	924
Projected 2y budget change (percent)	-10.56	3.65	-8.20	3.61	-12.43	2.39
Lone parent households (percentage of all households)	6.60	1.71	7.47	1.87	5.92	1.20
Ethnic diversity index	1,814	1,779	2,709	2,188	1,107	872
Age diversity index	8,787	72	8,772	96	8,798	41

^{a.} 12 unitary or upper-tier LAs and 24 lower-tier LAs were excluded from the analysis as they reported insufficient M&SS data to calculate the relative change in AI over the period.

^{b.} Slopes significantly different from zero: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 2. Relationship between change in AI and SSC participation

	Dependent variables								
	Change in ln(AI_total)		Change in ln(AI_employee)		Change in ln(AI_running_costs)				
	Estimate	Std Error	Estimate	Std Error	Estimate	Std Error			
(Intercept)	-4.77	4.85	-0.51	4.00	-8.65	4.33	*		
<i>Index_Q</i>	0.06	0.06	0.00	0.05	0.05	0.05			
ln(population)	0.27	0.11	*	0.27	0.09	**	0.03	0.10	
(Age diversity)^2	0.00	0.00		0.00	0.00		0.00	0.00	*
ln(Ethnic diversity)	-0.05	0.11		0.06	0.10		-0.07	0.10	
ln(Population density)	-0.04	0.08		-0.11	0.07		0.06	0.07	
Percentage of lone-parent households	0.03	0.06		0.11	0.05	*	-0.01	0.05	
Projected 2y budget change (percent)	0.01	0.02		0.06	0.02	***	0.02	0.02	
N	317		317		317				
F statistic	2.05 on 7 and 309 DF, p= 0.022		7.79 on 7 and 309 DF, p<0.001		1.64 on 7 and 309 DF, p= 0.125				
Adjusted R-squared	0.023		0.131		0.014				
p-value for Studentized Breusch-Pagan test ^a	0.419		0.472		0.024				

Significance codes: * p < 0.05; ** p < 0.01; *** p < 0.001.

^a Where the Breusch-Pagan test indicated heteroscedasticity, robust standard errors gave similar levels of significance.

Table 3. Relationship between change in AI and SSC participation interacted with the type of local authority

	Dependent variables						
	Change in ln(AI_total)		Change in ln(AI_employee)		Change in ln(AI_running_costs)		
	Estimate	Std Error	Estimate	Std Error	Estimate	Std Error	
(Intercept)	-9.91	5.85	-4.16	4.78	-12.12	5.25	*
Index _Q	0.27	0.18	0.03	0.15	0.13	0.16	
LAtype= MD	-0.39	0.70	-1.20	0.57	0.02	0.63	
LAtype = SC	0.37	0.97	0.97	0.79	0.11	0.87	
LAtype = SD	-0.52	0.64	-0.81	0.52	-0.51	0.57	
LAtype = UA	-0.30	0.62	-0.63	0.50	-0.28	0.55	
ln(population)	0.15	0.15	0.07	0.13	-0.10	0.14	
(Age diversity)^2	0.00	0.00	0.00	0.00	0.00	0.00	*
ln(Ethnic diversity)	-0.07	0.12	0.06	0.10	-0.06	0.10	
ln(Population density)	-0.06	0.09	-0.09	0.07	0.01	0.08	
Percentage of lone-parent households	0.01	0.07	0.05	0.05	-0.01	0.06	
Projected 2y budget change (percent)	0.02	0.03	0.01	0.03	0.00	0.03	
IndexQ:LAtype= MD	-0.11	0.27	0.30	0.23	-0.21	0.25	
IndexQ:LAtype = SC	-0.32	0.31	-0.27	0.25	-0.04	0.27	
IndexQ:LAtype = SD	-0.22	0.20	-0.05	0.16	-0.05	0.18	
IndexQ:LAtype = UA	-0.20	0.23	0.15	0.19	-0.07	0.21	
N	317		317		317		
F statistic	1.63 on 15 and 301 DF, p= 0.097		5.28 on 15 and 301 DF, p<0.001		1.09 on 15 and 301 DF, p=0.361		
Adjusted R-squared	0.024		0.163		0.004		
Studentized Breusch-Pagan test	0.775		0.930		0.003		

Significance codes: * p < 0.05; ** p < 0.01; *** p < 0.001.

Table 4. Relationship between change in AI and “clerical” and “professional” SSC participation.

	Estimate	Std Error	Estimate	Std Error	
(Intercept)	-10.99	5.73	-11.22	5.68	*
<i>Index_{CLER}</i>	0.09	0.08			
<i>Index_{PROF}</i>			0.19	0.08	*
ln(population)	0.15	0.15	0.15	0.15	
LAtype = MD	-0.61	0.38	-0.65	0.37	
LAtype = SC	-0.44	0.48	-0.43	0.47	
LAtype = SD	-1.01	0.41	* -1.06	0.41	**
LAtype = UA	-0.72	0.35	* -0.75	0.35	*
(Age diversity)^2	0.00	0.00	0.00	0.00	
ln(Ethnic diversity)	-0.06	0.12	-0.08	0.12	
ln(Population density)	-0.06	0.08	-0.04	0.08	
Percentage of lone-parent households	-0.02	0.06	-0.03	0.06	
Budget change	-0.02	0.03	-0.02	0.03	
N	317		317		
F statistic	1.89 on 11 and 305 DF, p=0.04		2.32 on 11 and 305 DF, p=0.009		
Adjusted R-squared	0.03		0.04		
p-value for Studentized					
Breusch-Pagan test	0.58		0.51		

Significance codes: * p < 0.05; ** p < 0.01; *** p < 0.001.

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