Fiscal decentralization and local government efficiency: does relative deprivation matter?

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Abstract

Fiscal decentralization arguably improves government efficiency because it enhances responsiveness to local policy issues and incentivises fiscal discipline. However, critics suggest that central control over local spending is necessary to equalize fiscal outcomes between prosperous and deprived areas. Using a two-stage analysis, we investigate the validity of these arguments by analysing the separate and combined effects of fiscal decentralization and socio-economic deprivation on the productive efficiency of English local governments during 2002-2008. The results suggest that decentralization is positively related to productive efficiency and that there is a negative relationship between socio-economic deprivation and efficiency. Further analysis reveals that deprivation weakens the positive decentralization-efficiency relationship, calling into question simplistic proposals for fiscal decentralization.

Key words: fiscal centralization; deprivation; efficiency; local government; England

Introduction

The decentralization of tax and spending powers to sub-national levels of government has become one of the most popular policy prescriptions in countries all across the world (Rodríguez-Pose and Gill, 2003). In pursuit of improved economic efficiency, national governments have established new devolved institutions, ceded long-held powers to lower levels of government, and encouraged those units of government to raise more of their own revenues (Rodríguez-Pose and Sandall, 2008). Behind this movement towards greater local and regional control over public expenditure, is the notion that it will improve allocative efficiency because subnational governments are more responsive to local demands (Oates, 1999), and enhance productive efficiency because with greater fiscal responsibility comes greater fiscal discipline (Asatryan, Feld and Geys, 2015). Despite the popularity of decentralization initiatives across the globe, there remain important lacunae in our understanding of the dynamics of this ubiquitous policy. In particular, surprisingly few studies address the relationship between fiscal decentralization and the productive efficiency of sub-national governments (for rare exceptions see Balaguer-Coll, Prior and Tortosa-Ausina, 2010; Barankay and Lockwood, 2007). Still less research has examined the boundary conditions of this relationship, especially whether providing services to more deprived populations harms the decentralization-efficiency relationship. To address these gaps in the literature, we investigate the separate and, critically, the combined effects of local budgetary autonomy and socio-economic deprivation on productive efficiency in the English local government system.

Although fiscal decentralization has become the default policy position for many national (and international) institutions, it has not been without its critics. The 'new regionalists', in particular, suggest that centralizing control over local public services can be a means to averting debt formation, administrative duplication and corruption – all of which contribute to inefficiency (Rodríguez-Pose and Gill, 2003). In addition, fiscal centralization

may represent the best means for institutionalizing the fiscal discipline and budgetary management required to equalize spatial variations in public sector performance (Prud'homme, 1995). Research suggests that subnational governments can run up large budget deficits in the expectation that national authorities will 'bale them out' (Rodden, 2002). Local governments serving deprived populations may be particularly prone to such financial mismanagement, especially as their capacity for generating tax revenue is typically more restricted than those serving prosperous populations (Zafra-Gomez and Perez, 2010). Supporters of fiscal centralization suggest, therefore, that where central control over resource allocation is extended, fiscal outcomes across more and less deprived communities can be equalized because the influence of local interest groups over service delivery is restricted and service providers must meet universal standards (Rodríguez-Pose and Gill, 2003).

Do local governments with greater control over their budgets have higher levels of productive efficiency? Are local governments serving deprived populations less efficient? And, critically, does deprivation harm the productive efficiency of local governments with higher levels of budgetary autonomy? In this paper, we seek to provide answers to these important theoretical questions through a two-stage analysis of the productive efficiency of English local governments between the years 2002 and 2008. The paper will begin by developing theoretical arguments about the efficiency rationale that lies behind fiscal decentralization, before considering how socio-economic deprivation poses a challenge to local government efficiency. The ways in which the efficiency gains from fiscal decentralization might be contingent upon deprivation will then be explored. Then, measures of local government efficiency, fiscal decentralization, relative deprivation and appropriate control variables are identified and described. Thereafter, the results of the statistical modelling that we undertake are presented and discussed. Finally, the conclusion will elucidate theoretical and practical implications.

Fiscal decentralization and local government efficiency

The relative merits of fiscal decentralization have been debated at length in the academic literature (see Rodden, Eskeland and Litvack, 2003). One important strand of these debates has been the argument that the budgetary autonomy of sub-national government can minimise the costs of public service production (Ebel and Yilmaz, 2002). In fact, much of the theoretical and empirical literature in favour of fiscal decentralization has been concerned with the efficient provision of local public services (e.g. Besley and Coate, 2003; Brennan and Buchanan, 1980; Tiebout, 1956). Within that literature, the efficiency case for extending local control over public budgets typically rests on two inter-related arguments.

Firstly, by increasing budgetary autonomy, fiscal decentralization empowers local governments to make decisions independently of higher tiers of government – a development hypothesised to lead to greater political responsiveness, which, in turn, enhances productive efficiency (Persson and Tabellini, 2000). In theory, locally elected representatives are more alert to the needs of local people than national or regional politicians (Inman and Rubinfield, 1997). By gaining greater control over their budgets, local governments therefore become better able to tailor public policies and services to citizens' demands (Besley and Coates, 2003; Lindaman and Thurmaier, 2002). This generates productive efficiency gains because the costs associated with designing and producing the package of public goods that will meet local needs are correspondingly reduced. At the same time, citizens served by autonomous local governments may be more motivated to influence political decisions via the ballot box (Seabright, 1996) or other forms of civic participation (De Mello, 2011). Although the policy choices of sub-national governments may be susceptible to capture by local elites (Bardhan and Mookarjee, 2000), the positive reciprocal relationship between local autonomy and political engagement can result in a virtuous cycle of efficiency improvement. Moreover, as trust between citizens and politicians increases, so too does the potential for co-production of

public services – a development likely to improve performance and reduce production costs (De Witte and Geys, 2013).

Secondly, related to arguments about political responsiveness, fiscal decentralization can improve productive efficiency due to the increased visibility of performance accountability in autonomous local governments. In particular, by clarifying the roles and responsibilities of local versus national institutions, fiscal decentralization could elicit the efficiency-enhancing effects associated with Tiebout competition. According to Tiebout (1956), citizens' awareness of the performance of their own and neighbouring local governments can exert downward pressure on the costs of public service production. Citizens and businesses can keep the ratio of local taxes to service benefits to desired levels through the threat of 'voting with their feet' in search of a better deal elsewhere. Local governments with more budgetary autonomy are likely to benefit from the competitive effects of potential 'fiscal migration' to a greater extent because: a) they have greater discretion over policies to compete for businesses and households; b) they have a stronger economic incentive for retaining tax revenue; and, c) they have a stronger electoral incentive for demonstrating the success of local policies (Niskanen, 1971; Salmon, 1987).

Each of these arguments for fiscal decentralization rest on important assumptions about the "median voter". The supposed benefits of political responsiveness are dependent upon the average citizen having the ability and opportunities to hold local representatives to account effectively (Romer and Rosenthal, 1979). The potentially positive effects of Tiebout competition are dependent upon the "median voter" being able to accurately compare the costs and benefits of living between jurisdictions (Dollery and Worthington, 1996). In this context, English local government represents a good test case for examining the relationship between fiscal decentralization and productive efficiency.

Despite the presence of a strong central state, local politics and democracy remain an indispensable feature of community governance across England (Ward et al., 2015). In addition, citizens routinely receive information on how their property tax (the only tax levied by English local governments) is spent, which facilitates the comparison of tax-service packages across jurisdictions at the heart of Tiebout competition. Indeed, Borge and Rattsø (2008) show that locally-administered property tax incentivises cost control by local governments because it simulates citizen interest in local public services. Finally, during the study period (2002-08), the performance of all major English local governments was ranked on a widely publicised scale (Andrews et al., 2005). The availability of this information too may have a salutary effect. James and John (2007) find that the ruling parties of local governments known to be performing poorly experienced a drop in their electoral support.

There is currently a dearth of evidence on budgetary autonomy and local government efficiency from the English setting. A recent cross-country analysis produced by Sow and Razafimahefa (2015) confirms that fiscal decentralization can improve productive efficiency – a finding prefigured in Barankay and Lockwood's (2007) study of Swiss Cantons. However, these landmark studies utilise single indicators of education or healthcare output. Although this approach may reduce identification problems associated with aggregation bias, it does not capture the true nature of the local government production function, which is typically characterised by the assembly of multiple outputs. Widmer and Zweifel (2012) find a positive relationship between decentralization and a multidimensional indicator of the output of Swiss cantons, as do Balaguer-Coll et al. (2010) for a sample of Spanish municipalities, but neither of these studies applies an estimator that adequately controls for unobserved heterogeneity.

In summary, then, although there are competing arguments about the merits of fiscal decentralization, the evidence to date mostly confirms that it has beneficial efficiency implications (though see Malesky, Nguyen and Tran, 2014). Furthermore, the basic prediction

that local budgetary autonomy will drive efficiency upwards remains a guiding principle behind numerous policy initiatives. Hence, we hypothesise:

H1 - decentralization will be positively related to local government efficiency

A large number of exogenous factors may influence public service efficiency, but perhaps the most important is socio-economic deprivation. According to Townsend (1987), deprivation is caused by lack of resources, 'such as lack of types of diet, clothing, housing, household facilities, and fuel and environmental, educational, working and social conditions, activities and facilities that are customary' (131). People living in deprived communities thus have more urgent and complex needs than those living elsewhere. Because of this, deprivation is claimed to adversely affect public service provision, principally because it increases costs. For example, primary health care teams work harder in deprived areas (Carlisle, Avery and Marsh, 2002). In fact, the assumption behind fiscal equalization schemes is that a centrally determined transfer system is required to restrict the potentially vicious cycle of fiscal migration and economic decline that might result from unrestricted Tiebout competition between sub-national governments (Flatters, Henderson and Mieszkowski, 1974).

In addition to increased production costs in deprived communities, the resources available to co-produce service outputs are likely to be lower. Disadvantaged individuals and families simply have less time and money to add to service production than their more prosperous counterparts (Williams, 2003). For example, poor parents cannot subsidize state schools (e.g. through donations or unpaid help) or pay for home tuition to raise their children's school examination performance. Indeed, numerous studies show that deprivation harms school achievement levels (e.g. Department for Children, Schools and Families, 2009; West, Pennell, Travers and West 2001). At the same time, local governments serving deprived

communities may have higher labour costs as they struggle to recruit and retain staff, and confront higher rates of absenteeism and burnout (Audit Commission, 2002). Although little research directly addresses the link between deprivation and productive efficiency, several studies show that it has a negative effect on the performance of local public services (e.g. Andrews et al., 2005; Romero, Haubrich and Maclean, 2010). Due to the triple pressures of high need, low co-production capacity and staffing issues associated with serving deprived communities, our second hypothesis is therefore that:

H2 - deprivation will be negatively related to local government efficiency

Prior theory and evidence suggests that fiscal decentralization will generate efficiency improvements because local governments with greater budgetary autonomy are incentivised to respond to local needs and demands (Sow and Razafimahefa, 2015). By contrast, socio-economic deprivation poses a considerable efficiency problem for local governments, as it is associated with much greater quantity and diversity of need, thereby raising the cost of providing services to a good standard (Andrews et al., 2005). As a result, it is conceivable that the efficiency gains from fiscal decentralization are contingent upon deprivcation.

For its critics, fiscal decentralization tends towards inequitable outcomes for more deprived communities because the needs in such communities are so great that the local governments that serve them have little scope for adjusting the tax-service package in a way that would attract potentially mobile residents and businesses from elsewhere (Flatters, Henderson and Mieszkowski, 1974). For local governments with a higher level of budgetary autonomy, this problem may be especially acute.

While, in theory, they have more control over resource allocation, in practice, autonomous governments serving deprived communities may have less meaningful discretion

over service delivery choices due to the deep-rooted nature of the structural poverty that they confront. The chronic issues that poverty poses can make investment in high-quality labour-intensive public services a 'bad risk' (Le Grand, 1991) that autonomous local governments may avoid in favour of expenditure on the kinds of capital projects that attract businesses (Jimenez, 2014). Moreover, governments serving deprived populations are unlikely to be able to draw on the kind of coproductive capacity that is available to their more affluent neighbours (Smith, 1994). Nor are they as likely to be pushed to do things differently by disgruntled middle-class service users with high expectations of service providers (Duffy, 2000). As a result, the scope for efficiency-enhancing policy divergence in autonomous governments operating in deprived areas is likely to be constrained by the chronic needs of the population and the lack of support for alternatives to conventional policy solutions.

Little research has systematically examined whether the efficiency gains from fiscal decentralization are contingent upon deprivation at the local level. Cross-country research suggests that decentralization leads to higher productive efficiency in more affluent countries (Sow and Razafimahefa, 2015), and that it may result in worse outcomes for those populations in greatest need (Lindaman and Thurmaier, 2002). However, little is known about how this process works within a single local government system. Evidence from Switzerland indicates that attempts to equalize resource disparities between cantonal governments can lead to efficiency losses in both prosperous and less-advantaged governments (Widmer and Zweifel, 2012). However, that study does not model the combined effects of decentralization and fiscal need on productive efficiency. Given the problems that socio-economic deprivation poses for public service providers, it seems likely that it will negatively impact on other more positive institutional influences. Hence, although decentralization can bring benefits to communities by ensuring that local policy-makers are responsible for developing solutions to local problems,

the scope for them to do this in a cost-efficient way in deprived areas may be more restricted than in prosperous communities. Our third and final hypothesis is, therefore:

H3 - deprivation will weaken the positive decentralization-efficiency relationship

Methodology and data

To test the separate and combined effects of decentralization and deprivation on the productive efficiency of local governments, we deploy a two-stage analysis. First, productive efficiency is measured through a Value-for-Money (VFM) ratio constructed using publicly available measures of service expenditure and quality, and through a non-parametric Data Envelopment Analysis (DEA) (see section 3.2). In the second stage, we employ statistical models to evaluate the effects of decentralization and deprivation on productive efficiency. Specifically, our second stage baseline specification is the following dynamic panel data model: [1]

$$EFF_{it} = \beta_1 EFF_{i,t-1} + \beta_2 Dec_{it} + \beta_3 Deprivat_{it} + \beta_k Z_{it} + \eta_i + \delta_t + \varepsilon_{it} \quad (1)$$

where EFF_{it} is one of our measures of productive efficiency in local government *i* at time *t*. Dec_{it} is the *it*th observation of an indicator of fiscal decentralization. $Deprivat_{it}$ is the *it*th observation of the English Index of Multiple Deprivation. Z_{it} is the *it*th observation on *K* control variables accounting for external constraints on efficiency. μ_i denotes the unobservable government specific effect, δ_t represents the unobservable specific time effect (common to all governments) and ε_{it} the remainder stochastic disturbance term.

[1] Empirically, a panel-based approach is more appropriate than a cross-section analysis because, among other reasons, omitted variables or unobserved local governments' characteristics potentially affecting efficiency can be modelled by including an individual government effect. In addition, a dynamic model specification will allow us to test whether productive efficiency in time period *t* is affected by past efficiency achievements.

However, equation (1) provides only a test of the separate effects of fiscal decentralization and deprivation on productive efficiency. In other words, it can show whether decentralization and deprivation are individually related to efficiency but not if the efficiency gains from fiscal decentralization are contingent upon deprivation. To do so, we include the following interaction term (Dec*Deprivat):

$$EFF_{it} = \beta_1 EFF_{i,t-1} + \beta_2 Dec_{it} + \beta_3 Deprivat_{it} + \beta_4 (Dec * Deprivat)_{it} + \beta_k Z_{it} + \eta_i + \delta_t + \varepsilon_{it} \quad (2)$$

An important concern when estimating equations (1) and (2) is the correlation between the lagged dependent variable ($EFF_{i.t-1}$) and the error term (ε_{it}). Nickell (1981) showed that the commonly applied within-group estimator is biased and inconsistent when the number of time periods (*T*) is small and the number of cross-sectional units (*N*) large. To overcome this problem, Arellano and Bond (1991) developed a Generalized Method of Moments (GMM) procedure, which takes first differences to eliminate individual specific effects, and then instruments the potentially endogenous right-hand side variables in the first-differenced equation using levels of the series lagged at least two periods. This difference-GMM estimator was initially developed for samples with a large number of cross-sectional units and a small number of time periods. However, recent studies suggest that GMM approaches may perform poorly when the number of units (N) is not large enough (see, for example, Bun and Windmeijer, 2010). Our sample is relatively small (148 local governments) which may affect the reliability of GMM estimates.

To overcome this, we apply the Least Squares Dummy Variable Corrected (LSDVC) estimator derived initially by Kiviet (1995) and extended to unbalanced panels by Bruno (2005). The LSDVC estimator performs an analytical correction of the LSDV bias in short panels through an approximation of the finite-sample bias (see Kiviet, 1995; Bruno, 2005).

Bruno (2005) found that the LSDVC estimator outperforms difference-GMM in panels with a relatively low number of units and a number of time periods less than or equal to ten, which is our case. In addition, as a further precaution, we report estimates from a bootstrapped bias correction (BBC) for the fixed effects estimator in dynamic panels derived by Everaert and Pozzi (2007).[2] Hence, we rely on the LSDVC estimator, but report difference-GMM and BBC results to benchmark the robustness of the results.

Although these methodological approaches appear well-suited for the analysis of our first measure of productive efficiency, i.e. the VFM ratio, using conventional linear regressions to explain the variation of non-parametric estimates, such as the DEA scores for our alternative productive efficiency measure, may be problematic due to, among other reasons, the potential correlation of efficiency scores and the explanatory variables (Balaguer-Coll, Prior and Tortosa-Ausina, 2007). For this reason, we complement our analysis of DEA efficiency estimates with the double bootstrap procedure described in Simar and Wilson (2007).

Study context and data

The dataset for our study has been collected from the full population of 148 English single and upper tier local governments for the period 2002 to 2008. These are elected bodies with a Westminster-style cabinet system of political management made up of senior members of the ruling political party. Although the power of central government in the UK means that English "local government can only act within the bounds set by Parliament" (John and Copus 2011: 29-30), local governments manage about a quarter of the total public sector budget and retain a strong capacity for adapting to new circumstances. Locally elected politicians collectively decide on the approach to implementation of national policy frameworks on the basis of advice

[2] This estimator also aims to correct the bias of the dynamic fixed-effects estimator. The main practical difference between the BBC and the LSDVC estimators is that the BBC does not rely on a strict set of assumptions such as homoscedasticity (see, De Vos, Everaert, and Ruyssen, 2015).

from professional local government managers led by a chief executive officer. In terms of public service responsibilities, single-tier (London boroughs, metropolitan districts and unitary authorities) and upper-tier governments (county councils) are multi-purpose authorities responsible for providing services in the areas of education (e.g. primary, secondary and tertiary schooling), social care (e.g. nursing homes, supported independent living), environmental services (e.g. waste management, land use planning), and leisure and culture services (e.g. sports centres, libraries). With the exception of county councils, they also provide services in the areas of housing (e.g. sheltered accommodation) and housing benefits (e.g. rent subsidies for low-income individuals).

In addition to having more responsibilities than local governments in most other countries, English local governments tend to be bigger and to vary considerably in size, mainly according to whether they serve urban or rural populations. County councils in rural England, in particular, are very large (mean population of 692,615), while unitary authorities serving small cities and large towns are small (mean population of 181,844) when compared with other English local governments (overall mean population of 340,320). For the purposes of our study, we include the full population of single and upper-tier local governments, which cover the entire geographical area of England. These local governments correspond to NUTS 3 statistical regions, though a small number of them are grouped together, and others split up under this classification.

Efficiency measures

The analysis presented here focuses first on publicly available measures of government efficiency that were collected and published by the United Kingdom (UK)'s Audit Commission. More specifically, we follow Andrews and Entwistle (2015) and construct a ratio of the overall expenditures to overall outputs/outcomes delivered by each local government.

To do so, we rely for the outcome side of our productive efficiency ratio (or, in other words, the VFM ratio) on the core service performance elements of the Comprehensive Performance Assessments (CPAs) that were undertaken by the Audit Commission between the years 2002 and 2008. The core service performance score was based on judgements made by the Audit Commission about the quality of key services (children and young people, adult social care, environment, housing, libraries and leisure, and benefits). These quality judgements ranged from 1 (poor) to 4 (excellent) drawing largely on statutory performance indicators, but also user surveys and on-site inspections. For instance, in the case of environmental services, local governments with 35% or more performance indicators, such as waste recycling rates and the number of missed bin collections, at or below the bottom quartile for England were scored 1, whereas those achieving 35% or more in the top quartile with none in the bottom quartile were scored 4 (Audit Commission, 2005).

To construct an overall government-level performance score, the 4-point scores for each key service were weighted in terms of relative importance and budget (for a detailed description see Andrews et al., 2005). By drawing on such a comprehensive measure of local government performance, we capture each government's achievements across the full spectrum of outputs that they are responsible for producing. For example, as part of their duty to provide children and young people's services, English local governments (LGs) are responsible for all of the activities associated with nursery, primary, secondary and tertiary education and those associated with supporting the well-being of children in social care.

For the input side of the efficiency ratio we draw upon the total *per capita* service expenditure of each local government, excluding expenditure on central administration. This measure captures the staffing costs for production units, such as schools, nursing homes, and waste collection and disposal teams, plus the maintenance costs associated with the buildings and equipment required for service production. Hence, we derive a productive efficiency ratio

for our analysis by dividing the core performance score by the service expenditure measure. Figure 1 visually depicts the time series variation of both components of our productive efficiency ratio, along with the ratio itself, indicating that the variation in efficiency comes from changes in performance and in expenditure.

[Figure 1]

Although our first efficiency measure departs from the non-parametric approaches in some of the prior literature on local government efficiency (e.g. Balaguer-Coll et al., 2007; De Borger and Kerstens, 1996; Giménez and Prior, 2007; Worthington, 2000), we believe it to be a robust and policy-relevant measure. In particular, the core service performance measure is an independently audited indicator of the overall quality of local government outputs that has performed well in a range of different empirical studies (e.g. Boyne et al, 2012; Damanpour et al, 2009; Revelli, 2010). Moreover, during the study period, this output measure was the one that mattered most to local citizens, UK central government and local governments themselves (James and John, 2007; Turner et al., 2004).

Despite the confidence we have in our efficiency ratio, we acknowledge the difficulty of measuring local government efficiency accurately and the subjective nature of the criteria informing the derivation of the core service performance scores. Following the recommendations of prior studies (e.g. De Borger and Kerstens, 1996), we therefore complement our analysis of the VFM ratio with a first-stage estimation of productive efficiency by means of DEA techniques applied to the pooled data set, where each observation is accounted for as a single unit. More specifically, we compute radial distance measures based on the Debreu–Farrell notion of efficiency. The first question that arises when selecting the DEA model is its orientation, in the sense that either the inputs or outputs are considered

beyond the control of public managers. Public managers have, in general, greater control over the level of inputs than output and, in many cases, the emphasis is more on controlling costs rather than on increasing demand for public services. Hence, an input orientated model appears to be the most suitable for our study. A second question of interest when formulating a DEA model is the returns to scale assumption. In this paper, we assume variable returns to scale, which seems appropriate as local governments may not be operating at an optimal scale (see, e.g., Worthington, 2000).

DEA models require a careful selection of inputs and outputs. Here, the selection of outputs is based on the key services provided by local governments. As discussed in the main text, English single-tier and upper-tier governments are all responsible for providing education, social care, environmental, and leisure and culture services. We therefore include in our DEA model the following proxy indicators as outputs: (i) the number of pupils sitting the General Certificate of Secondary Education examination (education), (ii) older people helped to live at home (social care), (iii) tons of waste managed (environmental services), and (iv) population, which may proxy for leisure and culture services such as libraries and public sport facilities, as well as the various municipal administrative tasks (see, e.g., Borger and Kerstens, 1996; Balaguer-Coll et al., 2007, 2010). The selection of these outputs has been conditioned by the availability of public information regarding these services throughout the study period. Finally, to capture inputs we use local governments' total service expenditures as a proxy for the costs associated with local public service provision. This indicator denotes the total running expenses for the services in each government and year. A summary of outputs and inputs, along with descriptive statistics is provided in Appendix A; Table A1.

It is important to note that our productive efficiency measures capture different stages of the municipal production process. First, the VFM ratio indicates the financial cost of producing a given unit of service quality, reflecting the degree to which local government

activities result in welfare improvements. On the other hand, our DEA estimates indicate the ability of each municipality to minimize service expenditure within a certain fixed level of direct outputs, such as number of pupils, tons of waste managed, etc., not taking into account the welfare effects of producing these outputs (for a comprehensive overview of different stages of the municipal production process see, Bradford, Malt and Oates, 1996; Balaguer-Coll et al., 2010).

Independent variables

The primary independent variables of interest are those covariates measuring fiscal decentralization and deprivation. First, we capture the extent of fiscal decentralization by measuring the proportion of the overall local government expenditure that is funded via local property tax rather than central government transfers, also known as "expenditure autonomy" (Psycharis and Iliopoulou, 2016). The main general grant provided to English local governments is calculated on the basis of the need for specific public services, and in this way grant-based spending on key priorities can be controlled by central government. Nevertheless, local governments have discretion to allocate locally raised property tax in accordance with local priorities. The local property tax in England, known as the 'council tax', is the only tax levied by English local governments. Although council tax revenue varies to some extent according to the fiscal capacity of local governments, those serving more deprived communities that are more dependent upon council tax revenue confront harder policy choices than those serving more prosperous ones.

We follow Sharma (2012) in interpreting our measure of fiscal decentralization as vertical fiscal asymmetry rather than vertical fiscal imbalance (see Sow and Razafinahefa, 2015), which implies a prescription in favour of decentralization. We focus on fiscal asymmetry because the UK is known to have comparatively restricted autonomy over local

expenditure, even though much of that expenditure is managed at the local level and local democracy is well-established. According to Boex and Simatupang (2008), other measures of fiscal decentralization (e.g. % of public spending managed at the local level) do not capture local fiscal empowerment as effectively. The figures presented in Appendix A, Table A2 highlight that there is considerable variation in the degree of budgetary autonomy across English local governments, with decentralization ranging from 7% up to nearly 41%. Figure 1 above indicates that there was, on average, a negative trend in decentralization, particularly from 2003 onwards when central government investment in local public services increased.

Our second independent variable of interest, i.e. deprivation, is measured using the average ward score in each local government area of the English Index of Multiple Deprivation (IMD) published in 2000 by the Department for Environment, Transport and the Regions, by the Office of the Deputy Prime Minister in 2004 and by the Department for Communities and Local Government in 2007. This index is the standard measure of relative deprivation used by UK central government, and has been utilised in numerous previous studies (e.g. Romero et al., 2010). The mechanisms for allocating central grants to local governments in England seek to equalize levels of funding between deprived and prosperous communities (Senior, 1994). However, the combinative effects of its multiple dimensions may mean the actual influence of deprivation on productive efficiency exceeds that modelled within the grant allocation formula. Although deprivation is negatively correlated with fiscal decentralization, this does not generate multicollinearity likely to influence our analysis since the Variance Inflation Factor (VIF) is below 4 for all explanatory variables and the average VIF is 2.4.

Following the literature on determinants of local government efficiency, we include in our second stage regression models the following control variables; first, the lagged dependent variable to account for potential dynamic patterns in local governments' efficiency. O'Toole and Meier (1999) argue that the outcomes of public service production are inherently auto-

regressive – something studies have confirmed (e.g. Boyne et al., 2012). Second, annual estimates of the population of local governments are included to capture potential economies of scale (since population is included as an output variable in our DEA estimates, we do not include it as a regressor in the models explaining the DEA efficiency scores). Local governments serving big populations may be able to spread fixed costs and benefit from greater purchasing power (Boyne, 1995). Third, we add a measure capturing external grants allocated outside the needs-based funding formula. External grant revenue may be associated with lower productive efficiency, due to the 'flypaper effect' through which the receipt of external grants results in overspending by local governments (Hines and Thaler, 1995).

Next, we include a measure of the political attitudes of local residents, gauged using the averaged Labour Party vote share in local elections between 2001 and 2007. Labour voters have a 'collectivist' disposition supporting public services (see Clarke et al. 2004), which may mean local governments in Labour-voting areas find it easier to achieve efficiency gains (Andrews and Entwistle, 2015). Finally, we include a dummy variable which takes a value of 1 if the Labour party holds the local government or controls the relative majority of the cabinet posts. Left-wing local governments may be more susceptible to producerist capture than their right-wing counterparts who are more committed to exploring efficiency-enhancing service delivery models (Osborne and Slivinski, 1996). Descriptive statistics and data sources for all the variables used in our second-stage regression models are reported in Appendix A; Table A2.

Results

In this section, we present the estimates of our empirical models. Tables 1 and 2 report the estimated parameters of the panel models using the VFM ratio as the dependent variable,

excluding and including the variable interacting our decentralization and deprivation measures (models described in Eqn. 1 and Eqn.2, respectively).

Our preferred estimator, i.e. the LSDVC, assumes exogenous regressors, thus violating this assumption may yield invalid estimates. For this reason, we tested whether our variables of interest, i.e. decentralization and deprivation, can be treated as exogenous. To do so, we ran the Durbin-Wu-Hausman (DWH) test of endogeneity after a two-stage least squares (2SLS) specification. Briefly, the DWH test compares 2SLS and OLS estimates using within-transformed variables to check whether the resulting coefficient vectors are "similar enough" which, if true, would confirm the null hypothesis that the potentially endogenous covariates can be treated as exogenous (see Baum, Schaffer, and Stillman, 2007, for a more detailed description of this test).

In order to compute the DWH tests, we use as instruments the first three lags of the variables to be tested. Those internal instruments must satisfy the following conditions: first, they must be correlated with the potentially endogenous regressors and, second, they must satisfy orthogonality conditions, i.e., the instruments must be uncorrelated with the error term (exclusion restriction). Postestimation tests of instrument suitability suggest that these instruments are indeed relevant and valid. First, a Lagrange Multiplier (LM) test rejects the null hypothesis that the instruments are uncorrelated with the potentially endogenous regressors (LM statistics equal to 14.063 and 146.29). In addition, Sargan tests of overidentifying restrictions suggest that the null hypothesis that the exclusion restriction is valid cannot be rejected under any specification at the 5% significance level (Sargan statistic equal to 0.276 and 5.95). Nonetheless, although Sargan tests support our instruments' validity, the econometrics literature has suggested that internal instruments such as lagged variables may not be fully valid, since those potential factors inducing correlation between endogenous covariates and the error term can also potentially cause correlation between internal

instruments and the error term. Unfortunately, we were not able to find a set of suitable external instruments on this occasion, hence our DWH test results should be interpreted with caution.

For both cases, DWH tests did not reject the null hypothesis that a non-instrumental estimator would yield consistent estimates (DWH test statistics equal to 1.580 and 0.385, respectively). which suggests that, taking into account the constraints posed by our internal instruments, endogeneity is not a serious concern for our models.

We now discuss briefly the estimation results for the control variables before we focus on the separate and combined effects of fiscal decentralization and deprivation on efficiency. First, the lagged dependent variable, i.e. our productive efficiency ratio, takes positive values in all model specifications, and is statistically significant at the 99% confidence level for all but the difference-GMM estimates, which suggest that the productive efficiency of English local governments may exhibit a positive dynamic pattern – as prior theory and evidence predicts (Meier and O'Toole, 1999). Next, population size is positively related to productive efficiency, confirming that local governments serving larger populations may benefit from economies of scale (see Walker and Andrews, 2015). By contrast, the measure of external grants per capita is negatively related to efficiency, indicating that the overspending associated with the 'flypaper effect' may be a problem for English local governments, as is the case in the United States (Hines and Thaler, 1995). Finally, our measures of a "collectivist" disposition amongst citizens and the political ideology of the ruling party do not have a statistically significant effect on local government efficiency in England, for the period under consideration.

The findings support our first hypothesis that decentralization will be positively related to productive efficiency. The coefficient for decentralization in the linear-additive regression model reported in Table 1 is positive and statistically significant at the 99% confidence level. This finding is consistent with theories and evidence of the positive effects of fiscal

decentralization, which suggests that greater budgetary autonomy facilitates better and more efficient provision of public services (e.g. Barankay and Lockwood, 2007; Sow and Razafimahefa, 2015). It also supports Borge and Rattsø's (2008) arguments about the role that property tax can play in incentivising cost control. Although we are unable to disentangle the causal mechanisms that lie behind the positive decentralization-efficiency relationship, theory suggests that the political and competitive effects of budgetary autonomy can result in innovations in service delivery, efforts to cut red tape and motivate staff or the introduction of new management structures (see, for example, Brennan and Buchanan, 1980; Pollitt, 2007).

The findings in Table 1 provide support for our second hypothesis. The coefficient for deprivation is negative and statistically significant at the 95% confidence level. This suggests, in line with previous studies (e.g. Romero et al., 2010), that local governments serving deprived populations face greater challenges than their counterparts serving affluent populations. This is an unfortunate consequence of the greater quantity and diversity of need within deprived areas, particularly as regards services such as education, health, housing and social benefits (Romero et al., 2010). The chronic needs of deprived populations are likely to be reflected in worse performance on both sides of the efficiency equation. Due to differences in the fiscal incentive system and co-productive capacity between prosperous and less fortunate local governments, the cost of providing services to deprived communities is high and the chances of achieving good service quality lower. At the same time, the problems posed by deprived populations may destabilize the positive effects of more propitious institutional influences on productive efficiency.

[Table 1]

The inclusion of the variable interacting decentralization and deprivation within our model does not lead to a re-evaluation of our conclusions (see Table 2). First, the average marginal effect of decentralization on productive efficiency in the multiplicative interaction model is again positive and statistically significant (99% confidence level) and the average marginal effect of relative deprivation is still negative and significant at the 95% confidence level.[3] The coefficient for the interaction term is negative and significant at the 99% confidence level. Hence, we find strong support for the suggestion that the efficiency gains from fiscal decentralization are contingent upon deprivation. Local governments with high levels of budgetary autonomy that serve deprived populations appear to be less efficient than other more autonomous governments that serve affluent populations. [4]

[Table 2]

To fully explore this combined effect, an informative approach is to examine the marginal effect of decentralization across different levels of relative deprivation. Following Brambor, Clark and Golder (2006), we present this information by plotting the slope and confidence intervals of the marginal effects. Hence, Figure 2 illustrates the effect of decentralization on local governments' productive efficiency contingent on relative deprivation levels. The solid sloping line plots the marginal effect of logged decentralization ratios as the

[3] In multiplicative interaction models, the coefficient for the moderator variables show their relationship with the dependent variable when the moderated variable is set to zero, which it is not plausible in our context. For this reason, it is necessary to compute marginal effects (see Brambor et al., 2006).

[4] It should be noted that although our LSDVC, diff-GMM and BBC estimates point in the same direction, the estimated coefficients for the lagged dependent variable and the interaction term are significantly smaller when using the diff-GMM approach. However, the latter approach was developed for situations with a large number of cross-sections and could be biased in situations, such as our case, where that number of cross-sections is modest. For this reason, we believe the LSDVC approach is more suitable for our data and it should provide more accurate results.

logged deprivation index varies, while the shaded bands represent the 95% confidence interval. The figure confirms that the relative level of deprivation is likely to have an important negative effect on the connection between decentralization and local governments' efficiency, thus giving clear statistical support to our third hypothesis. That said, although deprivation clearly dampens the positive decentralization-efficiency relationship, figure 2 highlights that at no point within the range of the data is that relationship eradicated. Hence, while the efficiency-enhancing effects of decentralization do decline in more deprived communities, it may still be a successful strategy for improving productive efficiency in such communities.

[Figure 2]

In tables 3 and 4 we report results where our alternative measure of productive efficiency is regressed against our explanatory variables. For the LSDVC, difference-GMM and BBC models we use standard DEA estimates as the dependent variable, while for Simar and Wilson's double bootstrap procedure (thereafter SW) we employ first a smoothed homogeneous bootstrap algorithm to compute bootstrapped DEA efficiency estimates, followed by a second-stage truncated regression of those bootstrapped efficiency scores (for a comprehensive description of this approach see Simar and Wilson, 2007). It is important to note that, to our knowledge, the SW procedure cannot accommodate the lagged dependent variable as an explanatory variable. Hence, lagged efficiency scores are excluded from our SW estimates. Nevertheless, in this case our results do not seems to depend on the estimation approach.

Starting with the separate effect of decentralization and deprivation on the DEA efficiency scores, the results reported in Table 3 again support our first hypothesis regarding the positive effect of decentralization on productive efficiency. However, deprivation does not

have a negative relationship with the DEA measure of efficiency. This result likely reflects the differences between the two efficiency measures, with our VFM ratio explicitly incorporating output quality, which is particularly difficult for local governments serving deprived communities to improve. By contrast, the DEA scores are based on indicators of output quantity, which are included within the needs-based formula for the distribution of central government grants to local governments (Senior, 1994). For this reason, the DEA efficiency scores may be less sensitive to variations in the quantity of service need in deprived communities.

[Table 3]

Table 4 shows that the average marginal effect of decentralization on the DEA efficiency scores in the multiplicative interaction model is positive and statistically significant, and that the average marginal effect of deprivation is not statistically significant. Critically, the coefficient for the interaction term is again negative in all models. This result confirms our previous findings that deprivation weakens the positive decentralization-efficiency relationship, though in this instance deprivation behaves as what Sharma, Durand and Gur-Arie (1981) term a "pure" moderator of that relationship, having no independent effect on the dependent variable itself. Figure 3 illustrates the effect of decentralization on the DEA measures contingent on deprivation levels. The figure highlights that deprivation is likely to have an important negative effect on the connection between decentralization and local governments' efficiency, calling into question one-size-fits-all proposals for extending the budgetary autonomy of sub-national governments.

[Table 4]

[Figure 3]

Conclusions

In this paper, we investigated the separate and combined effects of decentralization and deprivation on the productive efficiency of local governments in England. The statistical results support our hypothesis that fiscal decentralization is positively related to productive efficiency. Critically, our results also suggest that the benefits of this policy may be attenuated for local governments serving more deprived communities that generally appear to struggle to provide high-quality services at a reasonable cost.

Our study offers support to advocates of fiscal decentralization and tends to confirm the argument that it can increase the productive efficiency of public service delivery. However, although greater budgetary autonomy appears to bring benefits to English local governments in terms of productive efficiency, these benefits appear to be contingent upon deprivation levels. The results suggest, therefore, that the balance of tax and spending powers between national and sub-national governments should be sensitive to the external socio-economic circumstances of different local governments. In particular, while our evidence indicates that local governments can potentially become more efficient by raising more of their own tax revenue, the efficiency gains that those serving deprived populations can realise by doing this may be small compared to those achievable in affluent areas. Since the benefits of decentralization might be unevenly spread across different dimensions of local government performance and different local government functions (see Letelier-Saavedra and Saez-Lozano, 2015), it may be that budgetary autonomy should be encouraged in prosperous areas, but that a more nuanced evaluation of its costs and benefits is required in deprived areas. From this perspective, our findings contribute to wider discussions about the relative merits of one-size-fits-all versus locally differentiated policy solutions, affirming that some form of

"selective decentralization" (Letelier and Ormeño, 2017) may represent the best means for addressing issues of public service provision.

Our analysis has limitations that offer opportunities for further research. In particular, due to the lack of reliable indicators it was not possible for us to precisely identify the causal mechanisms explaining the positive effects of fiscal decentralization. Further quantitative and qualitative research could shed light on whether local governments/citizens' empowerment or yardstick competition matter most when explaining productive efficiency improvements in the English context. In addition, due to data availability constraints we are restricted to evaluating fiscal asymmetry. Subsequent studies could investigate whether the relationships we identify hold for other relevant measures of fiscal decentralization, such as the local share of total government expenditure and taxation. Moreover, it would be interesting to explore whether the effects we identify vary across different local public services. The absence of a panel of data indicating how local governments allocated property tax to different services means we couldn't pursue this line of enquiry. Nevertheless, service-level analysis would provide valuable information for improving the design of grant mechanisms and the exercise of budgetary autonomy.

Finally, our research is restricted to a single national context. Evidence on the relationship between fiscal decentralization, deprivation and productive efficiency from other settings, and from systematic comparative studies, could move our empirical understanding of fiscal decentralization further forward. In particular, it is possible that the results would be quite different in contexts with a more challenging economic, political and institutional environment than that present within England between 2002-2008. For now, though, we can conclude that our study has contributed useful, if qualified, empirical support for the on-going advocacy of fiscal decentralization as a policy prescription.

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Table 1. Decentralization, deprivation and productive efficiency (Value-For-Money): Equation 1 estimates.

	LSDVC		DIFF-GMM		BBC	
	Coeff	S.E.	Coeff	S.E.	Coeff	S.E.
$Log(VFM)_{t-1}$	0.3728	0.0407	0.0522	0.0911	0.4792	0.0726
Log(Decentralization)	0.7378	0.0864	0.7575	0.0991	0.7366	0.1039
Log(Deprivation)	-0.0988	0.0475	-0.1607	0.0564	-0.1030	0.0571
Log(External Grants pc)	-0.0316	0.0081	-0.0592	0.0125	-0.0358	0.0105
Log(Population)	0.7447	0.2120	1.0269	0.2068	0.7772	0.2317
Log(Labour vote share)	-0.0508	0.0311	0.0624	0.0369	-0.0512	0.0347
Labour Control	0.0093	0.0141	-0.0139	0.0128	0.0077	0.0146
Observations	875		722		866	
Groups	148		148		148	
Wald-Chi2			674.21			

Notes: Logged values of continuous variables to deal with potential non-normal distributions. LSDVC robust standard errors computed through 5000 bootstrap replications. LSDVC bias correction initialized by Arellano and Bond (1991) estimator. BBC initialization deterministic; resampling scheme wild bootstrap; 150 bootstrap samples used for inference.

Table 2. Decentralization, deprivation and productive efficiency (Value-For-Money): Equation 2 estimates.

	LSDVC		DIFF-GMM		BBC	
	Coeff	S.E.	Coeff	S.E.	Coeff	S.E.
$Log(VFM)_{t-1}$	0.3775	0.0407	0.0710	0.0936	0.4784	0.0704
Log(Decentralization)	1.7071	0.3080	1.2142	0.3434	1.7516	0.3135
Log(Deprivation)	0.8606	0.2996	0.2717	0.3131	0.9062	0.3040
Log(External Grants pc)	-0.0309	0.0081	-0.0568	0.0123	-0.0353	0.0095
Log(Population)	0.7376	0.2108	1.0311	0.2089	0.7595	0.1954
Log(Labour vote share)	-0.0632	0.0310	0.0586	0.0374	-0.0650	0.0362
Labour Control	0.0106	0.0140	-0.0146	0.0123	0.0089	0.0145
Log(Dec)*Log(Deprivat)	-0.3116	0.0957	-0.1464	0.1008	-0.3275	0.1003
Average Marginal Effects:						
Decentralization	0.7390	0.0859	0.7675	0.0976	0.7343	0.0927
Deprivation	-0.0937	0.0474	-0.1686	0.0560	-0.0965	0.0504
Observations	875		722		866	
Groups	148		148		148	
Wald-Chi2			708.47			

Notes: LSDVC robust standard errors computed through 5000 bootstrap replications. LSDVC bias correction initialized by Arellano and Bond (1991) estimator. BBC initialization deterministic; resampling scheme wild bootstrap; 150 bootstrap samples used for inference.

Table 3. Decentralization, deprivation and productive efficiency (DEA): Equation 1 estimates.

	LSDVC		DIFF-GMM		BBC		SW	
	Coeff	S.E.	Coeff	S.E.	Coeff	S.E.	Coeff	S.E.
DEA scores$_{t-1}$	0.3271	0.0375	0.3898	0.1558	0.3941	0.1153		
Log(Decentralization)	0.3436	0.0486	0.5025	0.0543	0.3394	0.0678	0.2967	0.0227
Log(Deprivation)	0.0353	0.0264	-0.0245	0.0353	0.0357	0.0404	0.0132	0.0135
Log(External Grants pc)	-0.0167	0.0046	-0.0250	0.0049	-0.0169	0.0036	-0.0131	0.0025
Log(Labour vote share)	0.0038	0.0175	0.0157	0.0232	0.0040	0.0155	0.0052	0.0082
Labour Control	-0.0096	0.0078	-0.0069	0.0057	-0.0099	0.0061	-0.0002	0.0038
Observations	886		738		886		1034	
Groups	148		148		148		148	
Wald-Chi2			1758.65				28064.09	

Notes: LSDVC robust standard errors computed through 5000 bootstrap replications. LSDVC bias correction initialized by Arellano and Bond (1991) estimator. BBC initialization deterministic; resampling scheme wild bootstrap; 150 bootstrap samples used for inference. SW DEA scores computed through 2000 bootstrap replications. SW second stage computed through 5000 replications.

Table 4. Decentralization, deprivation and productive efficiency (DEA): Equation 2 estimates.

	LSDVC		DIFF-GMM		BBC		SW	
	Coeff	S.E.	Coeff	S.E.	Coeff	S.E.	Coeff	S.E.
DEA scores$_{t-1}$	0.3277	0.0372	0.4060	0.1530	0.3946	0.0971		
Log(Decentralization)	0.9857	0.1743	1.2547	0.3602	0.9968	0.3951	0.5981	0.0863
Log(Deprivation)	0.6698	0.1678	0.7013	0.3336	0.6880	0.4047	0.3110	0.0831
Log(External Grants pc)	-0.0163	0.0046	-0.0227	0.0051	-0.0165	0.0035	-0.0129	0.0025
Log(Labour vote share)	-0.0051	0.0176	0.0090	0.0236	-0.0038	0.0166	0.0028	0.0082
Labour Control	-0.0086	0.0078	-0.0066	0.0057	-0.0086	0.0051	0.0000	0.0038
Log(Dec)*Log(Deprivat)	-0.2060	0.0540	-0.2405	0.1039	-0.2123	0.1234	-0.0961	0.0264
Average Marginal Effects:								
Decentralization	0.3457	0.0485	0.5078	0.0543	0.337	0.0650	0.2996	0.0226
Deprivation	0.0389	0.0264	-0.0350	0.0360	0.0380	0.0456	0.0168	0.0134
Observations	886		738		886		1034	
Groups	148		148		148		148	
Wald-Chi2			1839.68				28448.37	

Notes: LSDVC robust standard errors computed through 5000 bootstrap replications. LSDVC bias correction initialized by Arellano and Bond (1991) estimator. BBC initialization deterministic; resampling scheme wild bootstrap; 150 bootstrap samples used for inference. SW DEA scores computed through 2000 bootstrap replications. SW second stage computed through 5000 replications.

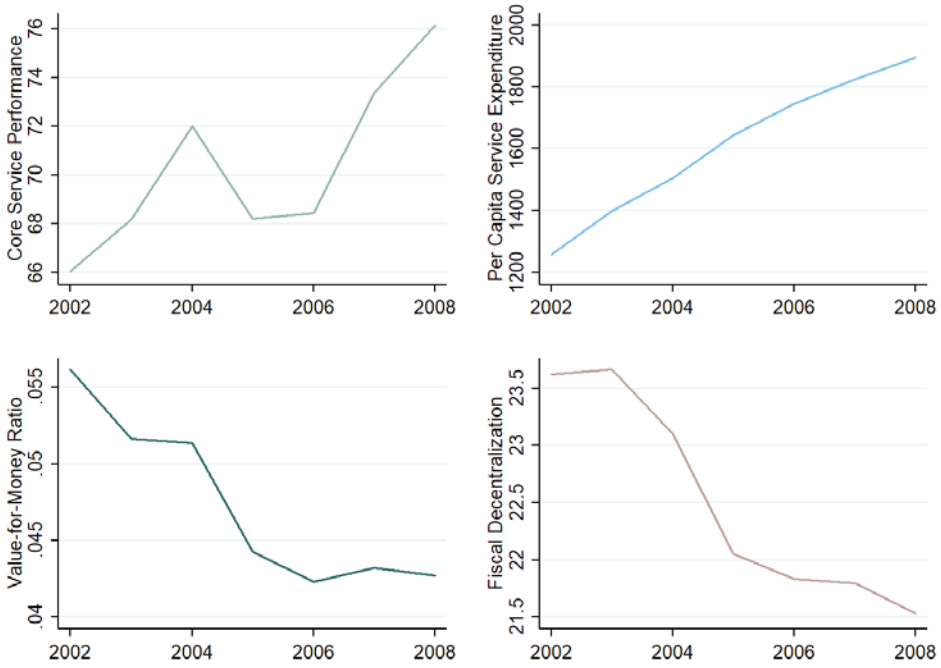

Figure 1. Time series variation in performance, expenditure, Value-for-Money ratio and decentralization

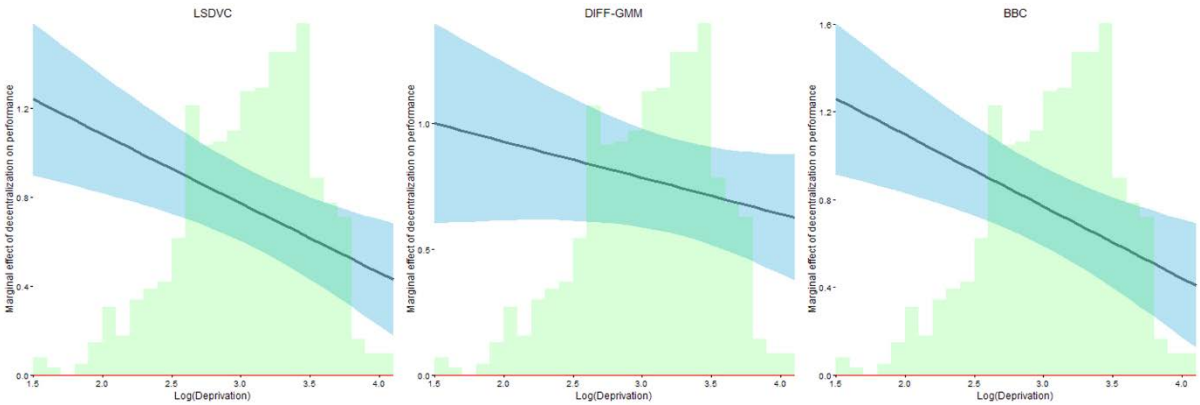

Figure 2. Marginal effect of decentralization on Value-for-Money contingent on deprivation

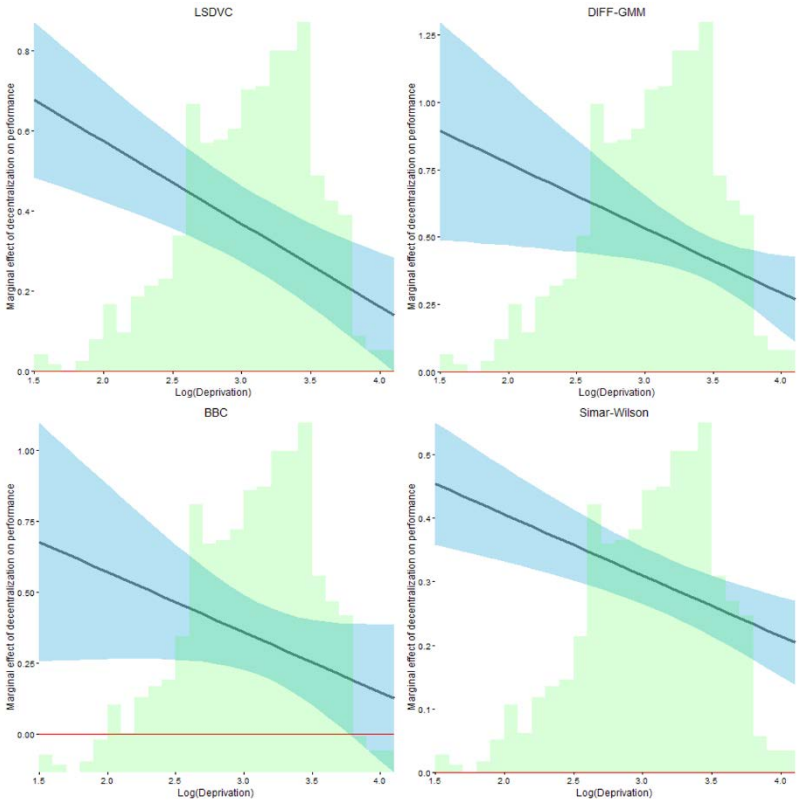

Figure 3. Marginal effect of decentralization on DEA scores contingent on deprivation

APPENDIX A

Table A1. DEA model: summary statistics for outputs and inputs.

	Mean	Std. Dev.	Min	Max
Outputs				
Tons of waste per capita	489.41	60.82	310.10	671.16
Number of pupils sitting the GSCE exam	3947.82	3020.10	428	16985
Older people aged 65 or over helped to live at home per 1,000 population aged 65 or over	74.51	31.89	14.46	184.49
Population	340320.90	255212.50	35000	1405200
Inputs				
Total service spending	497679.50	300465.40	35618	2320854

Data sources:

- Department for Environment, Food & Rural Affairs
- Department for Education
- Commission for Social Care Inspection (CSCI)
- Office for National Statistics (2002, 2003, 2004, 2005, 2006, 2007, 2008) *Mid-Year Population Estimates*. ONS: Newport.
- Audit Commission.

Table A2. Descriptive statistics and data sources; regression models.

	Mean	Std. Dev.	Min	Max
Productive efficiency (performance/expenditure)	0.05	0.01	0.02	0.10
Productive efficiency (conventional DEA estimates)	0.61	0.18	0.23	1.00
Productive efficiency (bootstrapped DEA estimates)	0.57	0.15	0.22	0.94
Fiscal decentralization	22.51	7.00	7.19	40.83
Deprivation	24.68	10.55	4.89	61.34
External grants *pc*	0.37	0.26	0.03	1.42
Population	340320.90	255212.50	35000	1405200
Labour vote share	30.57	11.82	0	69.7
Labour Control	0.32	0.47	0	1

Data sources:

- Audit Commission (2002, 2003, 2004, 2005, 2006, 2007, 2008) Comprehensive Performance Assessment, London: Audit Commission.
- Chartered Institute for Public Finance and Accountancy (2002, 2003, 2004, 2005, 2006, 2007, 2008) CIPFA Finance and General Statistics. London.
- Department of Environment, Transport and the Regions (2000) *Index of Multiple Deprivation*, DETR: London; Office of the Deputy Prime Minister (2004) *The English indices of deprivation 2004*. London: ODPM; Department of Communities and Local Government (2007) *The English indices of deprivation 2007*. London: DCLG.
- Office for National Statistics (2002, 2003, 2004, 2005, 2006, 2007, 2008) *Mid-Year Population Estimates*. ONS: Newport.
- Rallings C, Thrasher M, *Local Elections Handbooks, 2001-2007* (LGC Elections Centre, University of Plymouth)