Is caring productive?

The effect of Adult Social Care on paid production in England

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**Abstract**

Long-term care (LTC) provides essential support to service users and informal carers to improve their quality of life. By improving quality of life, LTC can potentially impact economic growth, for example, it may enable service users of working age and their carers to spend more time in paid employment. This study investigates the effect of publicly-funded LTC expenditure on a measure of paid production across local authorities in England. We analyse yearly data from 2014/15 to 2019/20 using a dynamic panel model estimated by the Arellano-Bond estimator. We find that a £1,000 increase in LTC expenditure *per client* increases paid production *per capita* by £216 in the short run and by £670 in the long run. These findings may inform policy makers interested in assessing the financial sustainability of LTC policies.

Key words: Long-term care, Adult Social Care, expenditure, Gross Domestic Product, dynamic panel, instrumental variables

JEL codes: H50, H53, I38, C23, C26

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# Introduction

Long-term care (LTC) provides essential day-to-day support with activities of daily living such as washing, dressing and cooking through institutional and community-based care services. Increasing life expectancy and the declining availability of informal care (Joshua, 2017) suggest that demand for formal LTC services is likely to increase in future. To address this rising demand, several countries are gradually investing more resources in the public LTC sector. In the decade 2012-2021, publicly-funded LTC expenditure as a share of the GDP rose on average across OECD countries by almost 3% every year (according to Eurostat data). This poses the question of whether growing public investment in this sector may only represent an unsustainable financial burden. It is therefore important to understand the range of aspects of social benefit that LTC provides.

Formal LTC services primarily aim to improve the quality of life of service users (henceforth, users) and informal unpaid carers (henceforth, carers). By doing so they may also have an effect on the economy. For example, LTC may enable users and carers of working age to spend more time in employment or education. Furthermore, through its effect on users and carers, LTC may impact other sectors (e.g., the health care sector) by allowing them to generate additional benefits to individuals who may not be users or carers (e.g., by providing more services to NHS patients). Therefore, investment in the public LTC sector may offer other benefits by helping the economy to grow faster through multiple channels, which are not necessarily restricted to the LTC sector, users and carers. The existence and scale of any effect of LTC on paid production and measures of economic growth, however, remains an unanswered empirical question.

The literature on the effect of publicly-funded LTC expenditure on the economy is scant. De Henau et al. (2016) is one of the first studies investigating the effect of LTC investments on the economy across seven OECD countries. Their findings suggest that spending an additional 2% of GDP in the LTC sector increases GDP by an additional 3% to 6% in the short term. Costa-Font and Vilaplana-Prieto (2023) also explore the impact of an increase in LTC expenditure on GDP per capita across a sample of OECD countries. The authors find that a 1% increase in LTC expenditure increases GDP per capita by 0.20% in the following period. Some studies find a positive relationship between healthcare expenditure and economic growth (e.g., Bedir, 2016, Devlin and Hansen, 2001), but others suggest a negative relationship between overall public spending and economic growth (e.g., Altunc and Aydın, 2013, Schaltegger and Torgler, 2006). This potentially conflicting evidence might indicate heterogeneity across different types of public expenditure and across OECD countries. Therefore, additional country and sector specific evidence is needed to inform the allocation of public expenditure to specific sectors in particular countries.

This study uses a dynamic panel data model to investigate whether and to what extent publicly-funded LTC expenditure impacts measures of economic growth at a local level across England. The publicly-funded programme responsible for delivering LTC and other social care services in England is called Adult Social Care (ASC). This aims to improve the wellbeing of eligible individuals with mental and/or physical challenges (DHSC, 2021), where eligibility is assessed based on both personal needs and finances (as explained in greater detail in Section 1.1). Existing studies suggest that publicly-funded ASC expenditure (henceforth, ASC expenditure) improves the quality of life of both users and carers (Longo et al., 2021, Longo et al., 2023a, Longo et al., 2025), as well as population health (Martin et al., 2021) through the health care sector (Longo et al., 2023b). On this basis, it is possible that ASC may stimulate the economy through multiple plausible channels as discussed more fully in Section 1.2.

The remainder of this study is organised as follows. Section 2 describes the data and the sample used in the analysis, while Section 3 discusses the empirical methods. Section 4 illustrates the results, and Section 5 concludes.

## The ASC sector in England

In England, there are 152 upper-tier local authorities (LAs)[[1]](#footnote-2) who are responsible for publicly-funded ASC services. Access to most services is restricted to individuals aged 18 or older with sufficiently high needs and low finances. Eligibility criteria may vary across LAs but all LAs must guarantee a minimum level of ASC protection according to the 2014 Care Act.

ASC primarily aims to improve or maintain the quality of life of users and their carers (DHSC, 2021) through a wide range of services including long-term and short-term support, provision of home adaptations (e.g., shower seats), equipment (e.g., alarms for people with hearing impairment) and technology (e.g., telecare), as well as information and advice (NHS Digital, 2023). Long-term support (LTS) is at the core of ASC services, provided over an undefined period of time. Short-term support is time-limited with the aim of improving independence and reducing reliance on LTS. The other services, such as adaptations and equipment, tend to be provided on a one-off basis. ASC services are delivered in the community (domiciliary care) or through institutions. Community-based services allow people to continue living in their own homes, for example, through support from professional carers at home or befriending activities in day centres. In contrast, institutional care provides users with accommodation and continuous support from professional carers in residential homes, whereas qualified nurses are also employed in nursing homes.

LAs fund ASC services using revenues from local taxes, grants from the central government and, to a lesser extent, user contributions (Cromarty, 2019). Local taxes include the council tax on the occupation of domestic houses, and the business rates tax on the occupation of business premises. Grants from the central government are distributed across LAs according to a relative need formula, while user contributions can only be used to fund the services for which they are paid.

## The broader effects of ASC on the economy

While achieving its primary objective of improving the quality of life of users and carers, ASC may stimulate the economy through multiple channels in both the short and long run. Figure 1 illustrates some of these possible channels. As suggested by De Henau et al. (2016), an extra investment in ASC may impact paid production through an increase in employment within the sector. The resulting larger ASC supply may also increase the demand for intermediate goods and services used by the ASC sector which may, in turn, increase employment across the sectors of the ASC suppliers. Moreover, greater employment both within and outside the ASC sector may stimulate consumption. This is especially true among low-income individuals, such as care workers who represent one of the groups with the lowest pay in the UK (Topping, 2023). Therefore, more consumption may increase employment across those sectors where consumption occurs. We call this chain of effects of an additional investment in ASC on employment, and in turn paid production, *direct* multiplier effects.[[2]](#footnote-3)

Other multiplier effects may be more *indirect* running through the impact of ASC on outcomes. An obvious channel is through users and carers whose improved quality of life may lead them to experience additional employment and consumption opportunities. Longo et al. (2021, 2023a, 2023b) find that ASC expenditure improves the quality of life of both users and carers, and enables them to spend more time in enjoyable activities including work and education. Another potential channel is through the health care sector. Martin et al. (2021) and Longo et al. (2023b) find that higher ASC expenditure reduces mortality. Longo et al. (2023b) find that these mortality effects are due to users and carers reducing their use of NHS services with little impact on health, such as avoidable emergency care visits. The reallocation of these saved resources towards more effective NHS services, such as outpatient activity, generates additional health by reducing mortality for other NHS patients. In other words, a higher ASC expenditure may generate, indirectly via the NHS, better population health which, in turn, may impact economic growth (e.g., Bloom et al., 2004).

Although there is currently no supporting empirical evidence, other channels through which ASC may impact the economy may plausibly exist, such as children’s outcomes. ASC may indeed enable users and carers to spend more time on informal childcare. This may lead to better outcomes for children that may have consequences on economic growth in the long run (e.g. Hanushek and Woessmann, 2020). Our empirical strategy (discussed in Section 3) aims to estimate an effect of ASC expenditure on paid production that takes account of all plausible direct *and* indirect multiplier effects.

# Data

We analyse six years of yearly data available in the public domain at the upper-tier LA level from the financial year 2014/15 to 2019/20 (Table A1 in the Appendix provides the sources).[[3]](#footnote-4) Gross Value Added (GVA) per capita is our dependent variable.[[4]](#footnote-5) GVA is a measure of paid production capturing changes in the value of the economy due to the production of goods and services. It is used by the UK government to monitor economic policy and allocate resources (ONS, 2019).

A key independent variable is ASC expenditure per client. This is obtained by dividing total ASC expenditure (net of capital charges and income from LA joint arrangements) by the number of ASC clients. Clients are defined as individuals, including (service) users and carers, who receive any type of ASC service. Another key independent variable is the proportion of (ASC) clients in the adult population, which we obtain by dividing the number of clients by the population aged 18 or older. We control for council tax base per capita, as well as several other time-varying variables including user and carer characteristics and local population characteristics, to capture social care need.

Table 1 reports some descriptive statistics. It shows that in our sample GVA per capita is, on average, £29,142, while ASC expenditure per client is £9,895 and the mean proportion of clients is 5.6 percentage points. In addition, on average across LAs, there are 391 domestic properties per 1,000 individuals liable to pay council tax. Table 1 provides the full list and summary statistics of all other variables in our analysis.

## Data sample and quality

We obtain our analysis sample by excluding observations with missing values for the dependent variable, any of the independent variables, or the instruments. GVA shows the highest proportion of missing values (4.3%) relative to control variables (each with less than 2%).[[5]](#footnote-6) Therefore, our sample excludes nine LAs (less than 6% of all LAs), and we analyse an unbalanced panel including 143 LAs, each observed on average 4.85 times, for a total of 694 observations.

By excluding LAs with missing values, we carry out a complete case analysis, assuming that observations are missing completely at random. Given that missingness is mostly due to the GVA variable, we argue that this assumption is plausible insofar as LAs boundaries changed over time as a result of local initiative likely driven by exogenous factors such as, for example, a common governing party across LAs or shared local identity.

# Methods

We estimate the short-run and long-run effect of ASC expenditure per client and proportion of clients on GVA per capita using the following dynamic panel model:



where *yit* is GVA per capita in LA *i* (=1,…,*I*) at time *t* (=2014/15,…, 2019/20), *yit-1* and *yit-2* are respectively the first and second time-lag (henceforth, lag) of GVA per capita, *expenditureitASC* is ASC expenditure per client, *clientsitASC* is the proportion of clients, *Xit* is a vector of time-varying control variables, *τt* are time dummies capturing time trends (e.g., inflation, technical progress), *τt*×*ρi* are interaction dummies capturing time-varying unobserved heterogeneity at regional level (e.g., labour and capital costs), *αi* captures time-invariant unobserved heterogeneity across LAs (i.e. LA fixed effects), and *εit* is a time-varying idiosyncratic error term.

In equation , the short-run (or contemporaneous) effect of ASC expenditure per client is captured by γ. If γ>0, a £1,000 increase in ASC expenditure per client at time *t* increases GVA per capita by γ at time *t*. The long-run effect is captured by γ/(1-β1-β2), where 1/(1-β1-β2) is the long-run multiplier of the short-run effect, and 1-β1-β2 is the rate of convergence capturing the speed at which the economy approaches the steady state. Similarly, the short-run effect of the proportion of clients is captured by δ, where δ>0 indicates that a one percentage point increase in the proportion of clients increases GVA per capita, and the long-run effect is δ/(1-β1-β2). An increase in ASC expenditure per client, holding the proportion of clients (and all else) constant, can be interpreted as an increase in care intensity, while an increase in the proportion of clients, holding ASC expenditure pe client (and all else) equal, can be interpreted as an expansion in eligibility.

Estimating is challenging. First, the estimation of the short-run and long-run effect of ASC expenditure per client requires some modelling of the dynamics of GVA per capita by including its potentially endogenous lags. We estimate using the Arellano-Bond or difference Generalized Method of Moments (GMM) estimator (Arellano and Bond, 1991), and assume the idiosyncratic error term *εit* is serially uncorrelated, implying that only *yit-1* is endogenous. To reduce the potential risk of instrument proliferation (Roodman, 2009), our primary specification uses 12 (out of 18) moment conditions for Δ*yit-1* by restricting the number of exogenous deeper lags to the fourth lag. We use *yit-2* as one more exogenous variable to aid identification. We weight observations by population and employ a two-step variance estimator with Windmeijer correction.

Furthermore, ASC expenditure per client and the proportion of clients are also likely to be endogenous. There may be omitted variables because decisions on ASC services may be correlated with unobserved determinants of both GVA per capita and social care need. There may also be reverse causality because, for example, a more flourishing local economy may increase the resources available to LAs to fund their services. We address endogeneity in these two ASC variables by controlling for council tax base per capita and using the amount of ‘missing’ or forgone council tax revenues per client and its square as instruments.[[6]](#footnote-7) As mentioned in Section 1.1, the council tax is a tax on the occupation of domestic properties and the main source of local funding for ASC services. We obtain the missing council tax revenues, i.e. the revenues forgone as a result of actual revenues falling below the maximum achievable, by measuring the loss in council tax revenues due to past decisions on the council tax charge. We argue that historic decisions made by LAs on council tax charges and whether to participate in a ‘freeze grant scheme’ had unanticipated consequences for the current capacity to raise revenues. Therefore, conditional on observed time-varying and unobserved time-invariant social care need across LAs, these historic decisions are unlikely to be related to current social care outcomes and need. The next Section (3.1) provides a full discussion of this instrument.

## Missing or forgone council tax revenues

Revenues from council tax (a local tax on the occupation of domestic properties) are determined by two components: the council tax charge and the council tax base. The council tax charge is decided by the LA depending on the budget requirement, while the council tax base is out of the immediate control of the LA and reflects the number and past value (according to a property valuation in 1991) of domestic properties within the LA. Differences in the council tax base and in the choices about the charge determine heterogeneity in council tax revenues and, in turn, spending power across LAs.

While differences in the council tax base can be argued to reflect historical features across LAs, past and current national policies, combined with historic decisions on the council tax charge made by LAs, may have had largely unanticipated consequences on the ability of an LA to raise revenue in subsequent periods. An example is the combination of the council tax freeze grant scheme and caps placed on increases in the council tax charge.

The freeze grant scheme was implemented between 2011/12 and 2015/16. In each of these five years, LAs could decide to receive a freeze grant equivalent to a certain proportion of the council tax charge (e.g., 2.5% in 2011/12) if they refrained from increasing their council tax charge. All LAs chose to take the freeze grant in 2011/12, but the pattern of choices varied across LAs afterwards. The freeze grants received each year became a permanent part of the annual central funding from the central government. For example, LAs that decided to take the freeze grant in 2011/12 kept receiving the 2011/12 freeze grant amount every year after 2011/12 regardless of whether or not they took the freeze grant in subsequent years. The only exception was the freeze grant in 2012/13 as this was a one-off grant. Moreover, during the five years of the freeze grant scheme LAs were subject to a capping policy which meant they could not increase the council tax charge above a certain proportion, the cap, without running a local referendum which could reject proposed increases (e.g., the cap was 3.5% in 2011/12). This capping policy continued after the end of the freeze grant scheme and it is still in place at the time of writing although the cap tends to vary over time.

It can be argued that LAs taking the freeze grant, but facing a cap on increases in council tax charge over subsequent years, experienced a gradually weaker financial position, and in turn spending power, over time compared to LAs that chose not take it every year. For example, in 2014/15 (our first financial year of data), LAs that took the freeze grant every year since 2011/12 lost a greater amount of council tax revenues (per capita) compared to LAs that took the freeze grant only in 2011/12. There are three reasons for this. First, LAs that renounced the freeze grant from 2012/13 to 2014/15 could increase the council tax charge to generate revenues that were higher than the freeze grant amount. Second, LAs that renounced the freeze grant from 2012/13 to 2014/15 but only increased council tax charge to generate revenue similar to the freeze grant would still accumulate the increases in the council tax charge over time, while the level of the council tax charge for LAs that always took the freeze grant up to 2014/15 either stopped at or was reduced below the charge level in 2010/11. Because of the capping policy, charges that remained at the 2010/11 level could not be increased sufficiently to offset the lack of increases in the past years. Therefore, increasing the council tax charge to the cap in subsequent years would generate less revenue for LAs that took the freeze grant for longer. Finally, LAs that took the freeze grant up every year to 2014/15 only received the one-off freeze grant amount obtained in 2012/13, rather than a continual annual funding transfer from the central government to LAs.

Moreover, LAs that renounced the freeze grant could have developed different financial positions depending on their choices on the council tax charge increase. For example, LAs that renounced the freeze grant from 2012/13 to 2014/15 and increased the council tax charge by a proportion below the cap lost a greater amount of council tax revenues compared to LAs that increased the council tax charge by the cap every year. This possibility remained after the end of the freeze grant scheme, since from 2016/17 the capping policy on the council tax charge increase continued.

We use the time-variability of the current missing (i.e. below the maximum achievable) council tax revenues that are due to LAs’ past decisions on participation in the freeze grant scheme and the council tax charge as a source of conditionally exogenous variation. We calculate the missing council tax revenues by subtracting the actual council tax revenues from the revenues that could have been obtained through the best course of actions in the past (i.e. by increasing the council tax charge by the cap since the introduction of the freeze grant scheme in 2011/12 and up to the previous year). Section A1 of the Appendix illustrates in greater detail how we calculate the amount of missing council tax revenues using a simplifying example. We argue that, conditional on observed time-varying and unobserved time-invariant social care need, past choices on the council tax charge were based on political decisions that could not anticipate a loss in current and future spending power. With hindsight, LAs might have made different decisions to avoid this loss in council tax revenues and better address current social care need. Therefore, we argue that past decisions were independent from unobserved factors determining time-variability in current social care need and outcomes (e.g. severity of illness).

Moreover, as noted above, missing council tax revenues are also driven by the council tax base. The council tax base, however, could be impacted by past GVA growth. For example, LAs with a flourishing local economy in the past could be in a better position to build new houses and expand their council tax base. Therefore, we address this potential violation of the exclusion restriction assumption by controlling for council tax base per capita.

## Spatial spillovers across LAs due to commuting

Each LA provides ASC services to its residents. Unsurprisingly, providing ASC services in an LA may impact the GVA of that LA. In addition, the GVA of that LA can benefit from the ASC services provided in other LAs, and vice versa, if these are linked via commuting routes. For example, ASC services in an LA may enable resident users and carers to commute to neighbouring LAs and contribute to their GVA. Similarly, ASC services to care recipients in an LA may enable their carers that live in another LA to work in the care recipients’ LA of residence or elsewhere. The other channels generating a broader effect of ASC on the economy discussed in Section 1.2 may also have similar spillover effects. Therefore, ASC services may impact the GVA of the LA that provides them as well as the GVA of other LAs because of spillover effects due to commuting.

To estimate these potential spillover effects, we employ an econometric specification similar to but now including spatially lagged covariates as follows:



where *wij* are the row-standardised elements of a spatial contiguity weight matrix, *W*. The raw elements of *W* are equal to one if LA *i* and *j* (=1*,…,J*, with *j*≠*i*) are linked via a commuting route as defined by travel-to-work areas (ONS, 2015), or zero otherwise. *W* is row-standardised such that ∑*jwij*×*expenditureitASC* (∑*jwij*×*clientsitASC*) is the average ASC expenditure per client (proportion of clients) across the travel-to-work neighbours of LA *i*. While *γ1* (*δ1*) in is interpreted as *γ* (*δ*) in , *γ2* (*δ2*) captures the spillover effect of a £1,000 (one percentage point) increase in the average ASC expenditure per client (proportion of clients) across travel-to-work neighbours on LA *i*’s GVA.

The spatial econometric literature classifies as a spatial lag of X (SLX) model (LeSage and Pace, 2009), which estimation does not pose particular econometric challenges (Elhorst, 2014, p. 10). Therefore, we estimate using the Arellano-Bond estimator, weighting by population, and employing a two-step variance estimator with Windmeijer correction similarly to . To account also for the potential endogeneity of ∑*jwij*×*expenditureitASC* and ∑*jwij*×*clientsitASC* we use the average missing council tax revenues per client across travel-to-work neighbours and its square as instruments.

# Results

We report key results from our main specification estimating the impact of ASC expenditure per client and proportion of clients on GVA per capita in Table 2 (full results are included in Table A2). We find that increasing ASC expenditure per client by £1,000 increases GVA per capita by £216 in the short run, and this estimate is statistically significant at the 5% level. We also find that increasing the proportion of clients by one percentage point increases GVA per capita by £556 in the short run, and this is also statistically significant at the 5% level. Using the estimated coefficients on *yit-1* and *yit-2* we estimate the rate of convergence to be equal to 0.322 (=1─0.579─0.099) and this is statistically significant at the 1% level. The short-run effect of ASC expenditure and proportion of clients multiply by just over 3 times (3.103=1/0.322) to reach £670 (=£216×3.103) and £1,726 (£556×3.103), respectively, in the long run. These estimates are also statistically significant at the 1% level.

We empirically assess the validity of by running a sequence of tests. First, the Arellano-Bond test for autocorrelation does not reject the null hypothesis of absence of second-order autocorrelation (reported in Table 2).[[7]](#footnote-8) This implies that *yit-2* is likely to be exogenous and corroborates our choice of using it as a control and GMM-style instrument. In addition, we explore the validity of the instruments. At the time of writing, there is no viable test for the strength of the instruments in the presence of multiple endogenous variables and heteroscedasticity after implementing difference GMM. Therefore, we check whether all instruments are likely to be good predictors of our three endogenous variables (first lag of GVA per capita, ASC expenditure per client, and proportion of ASC clients) using a Cragg-Donald robust under-identification test by which the null hypothesis of under-identification is rejected (at the 5% level). This suggests that the set of instruments includes good predictors of all three endogenous variables. We also run a Hansen test of over-identification and fail to reject the null hypothesis that the over-identifying restrictions are valid (reported in Table 2) suggesting that the instruments are likely to be exogenous.

Finally, as difference GMM does not provide first-stage results, we assess the interpretation of the effect of missing council tax revenues on both ASC expenditure and proportion of clients by estimating a ‘naïve’ first stage of where these two endogenous variables are regressed on all instruments and controls. As shown in Table 3 (full results in Table A3), we find that, at the mean level, an increase in the missing (council tax) revenues per client by £1 increases ASC expenditure per client by £3 and reduces the proportion of ASC clients by 0.002 percentage points. This reduction in the proportion of clients corresponds, on average, to six fewer clients (=0.002 percentage points ÷ 5.6 percentage points on average × 15,896 clients on average) and, in turn, to an extra £4 per client (=6 clients × £9,895 per client on average ÷ 15,890 clients) available for existing clients. Therefore, the (approximately) £3 increase in ASC expenditure per client captures the net increase in available funding, i.e. the extra £4 per client from the lower proportion of ASC clients net of the additional pound per client of missing revenues. In other words, greater missing revenues per client are associated with lower proportion of clients and higher expenditure per client, i.e. higher treatment intensity, for existing clients. As illustrated in Figure 2, this is observed for an amount of missing revenues of up to £1,000 per client. Beyond this value LAs stop decreasing the proportion of clients receiving ASC and start decreasing treatment intensity for existing clients. This finding is in line with evidence suggesting that the cost-containment measures in the ASC sector during the first half of 2010s led LAs to decrease access to ASC services for older people to focus more on existing clients with the highest need (Seamer et al., 2019).

## Results from the spatial lag model and sensitivity analysis

Table 2 also includes the key results from regression including the spatial lag of ASC expenditure per client and proportion of clients as additional key independent variables of interest (full results are reported in Table A2). The findings from this spatial model are mostly consistent with those from . They suggest that a £1,000-increase in ASC expenditure per client increases GVA per capita by £375 in the short run (statistically significant at the 1% level) and by £1,161 in the long run (significant at the 5% level). They also suggest that a one percentage point-increase in the proportion of clients increases GVA per capita by £990 in the short run (at the 1% level) and by £3,066 in the long run (at the 1% level).

In addition, we find that a £1,000-increase in the average ASC expenditure per client and a one percentage point-increase in the proportion of clients across the travel-to-work neighbouring LAs increase GVA per capita by £731 (at the 5% level) and £2,032 (at the 1% level), respectively. As, on average, we observe 14 travel-to-work neighbours for each LA, the increase in ASC expenditure per client and proportion of clients in a single travel-to-work neighbour may increase GVA per capita by £52 (=£731÷14) and £145 (=£2,032÷14), respectively. This suggests that substantial spillover effects due to commuting are likely to exist. This is especially the case for LAs with a higher number of travel-to-work neighbours, for example, LAs in the South of England, which have on average 21 neighbours, compared to just six in the North.

Furthermore, we carry out several sensitivity analyses to test the robustness of the key estimated coefficients in on the lags of GVA per capita and ASC expenditure per client. To test the former, following Bond (2002), we estimate model by OLS and within-group estimator as these provide, respectively, a lower and upper bound of the rate of convergence. We find that OLS produces an estimate of -0.024 and the within-group estimator of 0.412, both statistically significant at 1% level. Our estimate (0.322) falls in this range suggesting that it is well-behaved. Furthermore, we estimate a version of model that includes only the first lag and another version that collapses all the possible 18 GMM-style instruments to four. The model with a single lag produces an estimate of 0.308 while the model with collapsed instruments returns an estimate of 0.265, both statistically significant and similar to the estimate in equation .

As a sensitivity check on the estimated coefficient of ASC expenditure per client and proportion of clients, we additionally control for non-ASC expenditure per capita in . It could be argued that the exclusion restriction could be violated because the missing council tax revenues instruments could impact unobserved LA expenditure for other services that may also drive GVA per capita. In fact, council tax revenues are mostly used to fund ASC services (Local Government Association, 2017). Results from this analysis are indeed robust compared to results from . As a further test of the validity of our empirical strategy, we estimate by assuming that both ASC expenditure and proportion of ASC clients are exogenous. The endogeneity of these variables implies that the estimates we obtain from this model are likely to be downwardly biased. This is because areas with higher ASC expenditure (or a higher proportion of ASC clients) are likely to have higher social care need. Therefore, the estimate of the effect of an increase in ASC expenditure (proportion of ASC clients) would capture its beneficial effect on GVA as well as the detrimental effect of higher unobserved need on GVA. In this model, as expected, we estimate coefficients on ASC expenditure and proportion of ASC clients equal to -30 and -3, respectively, and both statistically insignificant.

Finally, we run a falsification test using a static panel model akin to the one used by Longo et al. (2021) and Longo et al. (2023a). This uses cross-sectional variation in the council tax base as the primary instrument to predict ASC expenditure and proportion of ASC clients. The council tax base in a model where the dependent variable is GVA is however likely to be endogenous. Council tax base can also be driven by past GVA growth (as discussed in Section 3.1). For example, a fast-growing local economy in the past might have incentivised local authorities to build more houses which determined an expansion of their council tax base. Areas with a higher council tax base are likely to have more resources available to fund ASC services and, therefore, a higher ASC expenditure. The estimates of the effect of an increase in ASC expenditure per client and proportion of clients may capture their beneficial effect on GVA as well as the fact that a higher GVA may imply a larger council tax base. Hence, these estimates are likely to be upwardly biased.

Moreover, as the council tax base mostly varies across LAs rather than over time, we estimate this model by accounting for region fixed effects rather than LA fixed effects. This allows us to control for additional time-invariant variables capturing population characteristics (summarised in Table 1) that are likely to be correlated with social care need. In addition, by analysing also cross-sectional variability, this model is likely to estimate an effect that reflects a long-run equilibrium (e.g., Houthakker, 1965, Kuh, 1959). Therefore, the estimates from this model can be compared with the long-run estimates from . Table A4 shows that a £1,000-increase in ASC expenditure per client and a one percentage point-increase in the proportion of clients increase GVA per capita by £3,332 (statistically significant at the 5% level) and £5,885 (statistically insignificant), respectively. As expected, these estimates are more than three times larger than our estimates of the long-run effect in , which are equal to £670 and £1,726, respectively.

# Discussion and conclusions

This study investigates whether and how extra public investments in the LTC sector in England impact a policy-relevant measure of paid production called GVA. We find that increasing care intensity, measured through ASC expenditure per client, by £1,000 increases GVA per capita by £216 in the short run and £670 in the long run. In addition, increasing eligibility, measured through the proportion of ASC clients, by one percentage point increases GVA per capita by £556 in the short run and £1,726 in the long run. These findings suggest that investing an additional £1m in either ASC care intensity or eligibility in a typical LA would generate, respectively, a total of £5m (with a 95% confidence interval ranging from £1m to £9m) or £7m (from £2m to £13m) in paid production benefits in the short run (Section A2 shows the calculations). In the long run, the same investment would lead to paid production benefits of £15m (from £4m to £27m) or £22m (from £7m to £37m), respectively. Moreover, our findings suggest that simply injecting an additional, untargeted, £1m into the ASC sector will lead the typical LA to decrease care intensity and expand eligibility generating paid production benefits of £6m (from £3m to £12m) in the short run and £22m (from £9m to £32m) in the long run. In other words, we estimate a fiscal multiplier for ASC that varies from five to seven in the short run, depending on whether investments target existing or new clients. This fiscal multiplier can become approximately three times larger in the long run. Furthermore, our evidence on spatial spillovers suggests that this estimate may be conservative, as the effect of an increase in ASC expenditure in one LA can propagate across neighbouring local economies via commuting routes. Therefore, additional public investment in the ASC sector generates paid production benefits of a value that is larger than the investment itself in the short and the longer run.

Substantial paid production benefits from public investments in the ASC sector are not surprising because there are multiple channels through which the effect of ASC expenditure is likely to operate. Extra investments in ASC staff may have the effect of redistributing resources from the rich to the poor with a positive net multiplier effect. These investments would be mostly funded through council tax, which is positively correlated to income (Davies and Orton, 2004), and a progressive general taxation (Bhattacharjee et al., 2022), and be mostly focused on low-income staff. Indeed, almost 60% of ASC staff includes care workers (The King's Fund, 2024) who are one of the lowest paid groups in the UK (Topping, 2023). Therefore, a short- and even a long-run multiplier effect is to be expected from the direct effects of raising and spending public money on ASC.

In its current form, publicly-funded ASC is part of a social protection system by providing services to individuals with the highest level of health and social care need, who tend to be at the lower part of the income distribution. Social care need is indeed associated with lower socio-economic status and the financial eligibility criteria targets public funding on the least well off that have fewer resources to fund care from private means. Therefore, the direct recipients, their unpaid carers, family and wider social network also tend to be at the lower part of the income distribution. Evidence suggests that publicly-funded ASC improves care related quality of life, health and mental health outcomes for recipients of care (Forder et al., 2018, Longo et al., 2021, Salas‐Ortiz et al., 2024) and informal (unpaid) carers (Longo et al., 2025). It also suggests that informal carers are able to reallocate their time from less to more pleasant tasks (Longo et al., 2025) and there is no evidence that publicly-funded care fully substitutes for privately-funded care. Although there is currently no data to estimate similar effects on informal carers that are unknown to LAs, family and their wider social networks, it seems plausible that such effects might exist. All these observed and, as yet, unobserved but plausible direct and indirect channels impact on a range of employment and consumption opportunities. On this basis, ASC may have an important role in reducing inequality in multiple dimensions including income and wellbeing which may, in turn, stimulate growth (e.g. Gutiérrez-Romero, 2021; Islam and McGillivray, 2020).

In addition, ASC may have important interactions with other public sectors enabling them to improve a range of outcomes across a wide group of beneficiaries. For example, Martin et al. (2021) found that ASC expenditure reduced mortality across a wide range disease areas. Longo et al. (2023b) identified that this effect was through an indirect channel: that higher ASC expenditure helps the National Health Service (NHS) to reallocate resources from less to more cost-effective services and this enhances the effect of the NHS in reducing population mortality, which itself is associated with increases in paid and unpaid production (Claxton et al., 2015, Roberts, 2015). It is not implausible that the ASC sector might support other sectors too such as education, children’s services and housing. For example, ASC may allow recipients, carers and family to spend more time in informal childcare which may improve education outcomes and reduce demand for children’s services. Similarly, improving care related quality of life and activities of daily living might enable a better allocation of support for social housing with indirect effects on the local labour market. Overall, there are several observed and currently unobserved channels through which public spending on ASC may have positive short- and long-run multiplier effects.

The magnitude of our estimated short-run fiscal multiplier (five to seven) is consistent with other studies estimating a similar type of fiscal multiplier. For example, the study by De Henau et al. (2016) provides evidence of beneficial *direct* multiplier effects of LTC investments on the GDP across multiple countries including the UK. These translate into a short-term fiscal multiplier of 3.5 in the UK, which is lower compared to our estimate. This is to be expected since our analysis, unlike De Henau et al. (2016), captures both *direct* and *indirect* multiplier effects (illustrated in Section 1.2). Our result is also consistent with studies estimating a short-run fiscal multiplier although for other sectors and countries. For example, Reeves et al. (2013) estimate sector-specific short-run fiscal multipliers in the pre-recession period 1995-2007 across 25 European countries and find a substantially positive fiscal multiplier for several publicly-funded sectors. These include a fiscal multiplier of 2.88 (with a 95% confidence interval of) [1.94, 3.81] for social protection, 4.32 [2.51, 6.14] for health, 7.57 [-3.81, 18.95] for education, 8.24 [3.94, 12.54] for culture and recreation, and 8.39 [-3.84, 20.62] for environment. Unlike De Henau et al. (2016) and Reeves et al. (2013), we estimate the fiscal multiplier by analysing time-variability across LAs within a single country and, therefore, our estimate better reflects England’s institutional idiosyncrasies.

This study has some limitations. First, our results alone cannot answer the question about the net effect on GVA of increasing ASC expenditure funded through cuts in other specific publicly-funded services. Rather, our model estimates the overall net effect of an exogenous increase (or decrease) in ASC expenditure, capturing the GVA effect of potential substitutions and complementarities between ASC expenditure and other expenditure and dimensions of outcome. In other words, it estimates the GVA effect of an increase in ASC expenditure net of any other GVA effects arising from changes in other dimensions whether, for example, in publicly- or privately-funded expenditure, or in informal care. The net GVA effect of increasing ASC expenditure through cuts in other services could be estimated if information about the relationship between the other services facing cuts and their GVA effects were available. We leave the further exploration of these topics to future research.

Second, this study estimates a linear effect of ASC expenditure rather than a quadratic effect as in other studies (Longo et al., 2023a, Longo et al., 2025, Salas‐Ortiz et al., 2024). Including an additional endogenous term, such as the square of ASC expenditure per client, requires the use of an additional suitable external time-varying instrument, which is currently unavailable. Although this limits our ability to test for the plausible hypothesis of diminishing marginal returns, understanding the marginal effect alone remains a substantial and policy relevant contribution. For example, it can be interpreted as a lower bound on the GVA effects of non-marginal changes in expenditure assuming diminishing marginal returns.

Finally, our analysis is based on a reduced sample, primarily due to missing values in GVA data. Missingness in GVA stems from the restructurings of LA boundaries which are likely to be random and driven by exogenous factors such as local identity. Any residual concern that missingness in GVA might be associated with ASC demand-side factors is addressed through our IV approach. Nevertheless, a reduced sample lowers statistical power. Future research using a full sample of LAs, when these data become available, could test the robustness of our findings.

In conclusion, this is one of the first studies that estimates the impact of LTC expenditure on the economy by analysing data within a single country. It contributes to the economic literature investigating the relationship between public spending and economic growth, as well as the literature focusing on the effects of formal LTC services. It adds an important aspect of social benefit to the emerging picture of the effects of ASC on policy-relevant outcomes, suggesting that publicly-funded ASC has beneficial effects on quality of life, health, and the economy. These findings can better inform the debate about the growing public investment in the LTC and other sectors. Furthermore, they offer a basis for informing an estimate of the marginal value of public funds for the ASC sector in England (Longo et al., 2024), thereby supporting decisions on the overall level of public expenditure and its allocation across sectors.

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# Tables and Figures

Table 1 – Summary statistics.

| Variable | | Mean | Standard deviation | | | Min | Max |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Overall | Between | Within |
| Gross Value Added (£) per capita (current prices) | | 29,142 | 26,141 | 26,217 | 1,915 | 12,169 | 291,542 |
| ASC expenditure (£000) per client | | 9.895 | 3.337 | 3.087 | 1.301 | 1.884 | 20.693 |
| Prop. ASC clients | | 5.6 | 2.5 | 2.3 | 0.8 | 2.1 | 25.2 |
| Adult Social Care clients | | 15,896 | 13,520 | 13,300 | 2,442 | 1,015 | 90,110 |
| Population aged 18 and older | | 287,086 | 218,757 | 219,846 | 3,693 | 30,612 | 1,228,483 |
| Council tax base per capita | | 0.391 | 0.063 | 0.062 | 0.003 | 0.281 | 0.789 |
| LTS user characteristics | Prop. LTS users who are female | 60.2 | 3.3 | 2.5 | 2.2 | 35.3 | 82.4 |
| Prop. LTS users who are aged 65 or older | 65.8 | 5.3 | 4.7 | 2.3 | 49.7 | 79.7 |
| Prop. LTS users with sensory support | 1.5 | 1.2 | 1.0 | 0.7 | 0.0 | 9.8 |
| Prop. LTS users with support with memory and cognition | 8.5 | 5.4 | 5.0 | 2.1 | 0.0 | 33.6 |
| Prop. LTS users with learning disability support | 17.4 | 3.3 | 3.0 | 1.4 | 0.6 | 29.7 |
| Prop. LTS users with mental health support | 11.1 | 6.3 | 5.5 | 3.0 | 0.0 | 47.9 |
| Prop. LTS users with social support | 2.2 | 2.1 | 1.8 | 1.0 | 0.0 | 10.5 |
| Prop. LTS users who received no help with questionnaire | 20.0 | 4.6 | 3.6 | 2.9 | 2.1 | 42.5 |
| Prop. LTS users with questionnaire read by someone | 46.7 | 5.2 | 3.9 | 3.5 | 16.5 | 64.8 |
| Prop. LTS users with questionnaire translated by someone | 20.6 | 5.0 | 3.8 | 3.3 | 2.2 | 50.8 |
| Prop. LTS users with questionnaire written by someone | 38.3 | 5.0 | 3.8 | 3.4 | 17.1 | 55.0 |
| Prop. LTS users with questionnaire talked through with someone | 28.6 | 4.1 | 2.8 | 3.0 | 11.8 | 59.6 |
| Prop. LTS users with questionnaire answered by someone without user | 10.0 | 2.9 | 2.0 | 2.1 | 0.0 | 27.6 |
| Prop. LTS users receiving the easy-read version of the questionnaire | 17.4 | 5.1 | 3.7 | 3.5 | 0.0 | 62.9 |
| Carer characteristics | Prop. carers whose questionnaire was in English | 99.9 | 1.2 | 1.0 | 0.7 | 81.5 | 100.0 |
| Prop. carers who received no help with questionnaire | 89.7 | 5.4 | 5.0 | 2.4 | 46.4 | 100.0 |
| Prop. carers who do not live with care recipient | 24.5 | 8.1 | 6.9 | 4.2 | 5.5 | 58.6 |
| Prop. carers with physical impairment or disability | 20.0 | 3.8 | 2.9 | 2.4 | 9.2 | 50.0 |
| Prop. carers with sight or hearing loss | 16.2 | 3.5 | 2.9 | 2.0 | 0.0 | 26.5 |
| Prop. carers with mental health problem | 9.5 | 3.0 | 2.1 | 2.1 | 0.0 | 18.9 |
| Prop. carers with learning disability | 2.9 | 1.6 | 1.3 | 0.9 | 0.0 | 12.7 |
| Prop. carers with long-standing illness | 28.4 | 4.9 | 3.4 | 3.5 | 0.0 | 45.2 |
| Prop. carers with other health condition | 12.9 | 3.8 | 2.7 | 2.7 | 0.0 | 50.0 |
| Prop. carers with no particular health condition | 39.6 | 6.0 | 4.7 | 3.8 | 0.0 | 56.5 |
| Prop. carers with care recipient that has dementia | 35.0 | 7.1 | 6.1 | 3.8 | 13.6 | 64.7 |
| Prop. carers with care recipient that has a physical disability | 52.3 | 5.2 | 3.9 | 3.6 | 18.5 | 71.6 |
| Prop. carers with care recipient that has sight or hearing loss | 29.6 | 4.1 | 3.1 | 2.7 | 19.0 | 41.0 |
| Prop. carers with care recipient that has a mental health problem | 21.9 | 5.7 | 4.8 | 3.4 | 8.8 | 42.4 |
| Prop. carers with care recipient that has problems connected to ageing | 34.1 | 5.9 | 4.4 | 4.0 | 17.8 | 54.4 |
| Prop. carers with care recipient that has a learning disability | 20.9 | 7.0 | 5.4 | 4.4 | 3.6 | 50.7 |
| Prop. carers with care recipient that has long-standing illness | 39.4 | 5.1 | 4.1 | 3.0 | 3.4 | 54.5 |
| Prop. carers with care recipient that has terminal illness | 5.4 | 1.7 | 1.2 | 1.3 | 0.8 | 14.0 |
| Prop. carers with care recipient that has alcohol or drug dependency | 1.6 | 1.2 | 0.8 | 0.8 | 0.0 | 11.9 |
| Population characteristics | Prop. people who are female | 0.5 | 0.0 | 0.0 | 0.0 | 0.5 | 0.5 |
| Prop. people aged 65 or older | 0.2 | 0.0 | 0.0 | 0.0 | 0.1 | 0.2 |
| Prop. people of British white ethnicity | 0.8 | 0.2 | 0.2 | 0.0 | 0.2 | 1.0 |
| Prop. households with single person aged 0-64 | 18.7 | 4.2 | 4.2 | 0.0 | 11.9 | 36.0 |
| Prop. households with single person aged 65 or older | 11.9 | 2.0 | 2.1 | 0.0 | 6.0 | 16.5 |
| Prop. household deprived in 3 dimensions | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |
| Prop. household deprived in 4 dimensions | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Prop. people with disability living allowance aged 18 or older | 3.5 | 1.7 | 1.2 | 1.3 | 0.9 | 11.7 |
| Prop. people aged 18 or older entitled to Personal Independence Payment | 2.9 | 1.7 | 1.0 | 1.3 | 0.3 | 9.3 |
| Prop. people aged 18-64 entitled to employment and support allowance (ESA) | 5.8 | 2.0 | 1.9 | 0.5 | 2.0 | 12.9 |
| Prop. people with ESA assessment outcome of severe functional disability | 0.7 | 0.4 | 0.3 | 0.2 | 0.1 | 2.8 |
| Prop. people aged 65 or older claiming Attendance Allowance | 13.8 | 2.1 | 2.1 | 0.5 | 8.7 | 20.6 |
| Region | East Midlands | 0.058 | 0.233 | 0.231 | 0 | 0 | 1 |
| East of England | 0.065 | 0.246 | 0.256 | 0 | 0 | 1 |
| London | 0.228 | 0.420 | 0.418 | 0 | 0 | 1 |
| North East | 0.086 | 0.281 | 0.278 | 0 | 0 | 1 |
| North West | 0.156 | 0.363 | 0.369 | 0 | 0 | 1 |
| South East | 0.122 | 0.328 | 0.333 | 0 | 0 | 1 |
| South West | 0.079 | 0.270 | 0.267 | 0 | 0 | 1 |
| West Midlands | 0.101 | 0.301 | 0.298 | 0 | 0 | 1 |
| Yorkshire and The Humber | 0.105 | 0.307 | 0.307 | 0 | 0 | 1 |
| IV | Missing council tax revenues (£) | 10,110,216 | 9,213,763 | 8,699,429 | 3,013,484 | 352,936 | 74,948,800 |
| Missing council tax revenues (£) per client | 760 | 561 | 497 | 270 | 38 | 4,101 |
| Population of all ages | | 365,257 | 276,402 | 277,795 | 4,664 | 38,352 | 1,568,623 |
| Observations | | 694 |  |  |  |  |  |
| Local authorities | | 143 |  |  |  |  |  |
| ASC=adult social care, Prop.=proportion, LTS=long-term support, IV=instrumental variable | | | | | | | |
| The presented descriptive statistics are obtained from the analysis sample. This includes 143 out of the 152 local authorities in England because data on Gross Value Added is missing for some local authorities. | | | | | | | |

Table 2 – Results from regressions and .

|  |  |  |
| --- | --- | --- |
| Variable | Regression (1) | Regression (2) |
| Gross Value Added per capita | Gross Value Added per capita |
| Gross Value Added per capita at t─1 | 0.579\*\*\* | 0.577\*\*\* |
| Gross Value Added per capita at t─2 | 0.099 | 0.100 |
| ASC expenditure (£000) per client | 215.907\*\* | 374.688\*\*\* |
| [28.986, 402.829] | [141.483, 607.893] |
| Prop. ASC clients | 556.293\*\* | 989.927\*\*\* |
| [128.396, 984.190] | [420.155, 1,559.698] |
| Travel-to-work neighbours' ASC expenditure (£000) per client |  | 730.926\*\* |
|  | [118.181, 1,343.671] |
| Travel-to-work neighbours' prop. ASC clients |  | 2,032.201\*\*\* |
|  | [497.974, 3,566.429] |
| Rate of convergence | 0.322\*\*\* | 0.323\*\*\* |
| Long-run effect of ASC expenditure per client | 669.868\*\*\* | 1161.052\*\*\* |
| [165.805, 1173.931] | [288.164, 2,033.94] |
| Long-run effect of prop. ASC clients | 1,725.937\*\*\* | 3,067.500\*\*\* |
| [556.685, 2,895.189] | [832.660, 5,302.341] |
| Observations | 694 | 694 |
| Arellano-Bond test for AR(2) in first difference | 0.285 | 0.279 |
| Hansen test of over-identifying restrictions | 0.262 | 0.296 |
| ASC=Adult Social Care | | |
| All variables in this regression are first-differenced. We weight observations by population and employ a two-step variance estimator with Windmeijer correction. | | |
| We use 12 of the 18 available moment conditions to instrument the first lag of Gross Value Added per capita, and missing council tax revenues per client and its square to address endogeneity also in ASC expenditure per client and proportion of ASC clients. Full results on controls are reported in Table A2. | | |
| Standard errors are clustered within local authorities. Square brackets include 95% confidence intervals. \*\*\* p-value<0.01, \*\* p-value<0.05, \* p-value<0.1 | | |

Table 3 – Key results from the ‘naïve’ first stage of regression .

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | | Naïve first stage of (1) | |
| ASC expenditure per client | Prop. of ASC clients |
| Instruments | Missing council tax revenues per client at mean level | 0.003\*\*\* | -0.002\*\*\* |
| Missing council tax revenues per client squared | -0.000004\*\*\* | 0.000001\*\* |
| Gross Value Added per capita in 2019, lag at t─2 | -0.0001 | 0.0001 |
| Gross Value Added per capita in 2019, lag at t─3 | 0.0001 | -0.0001 |
| Gross Value Added per capita in 2019, lag at t─4 | -0.00003 | 0.000001 |
| Gross Value Added per capita in 2018, lag at t─2 | 0.00002 | 0.00004 |
| Gross Value Added per capita in 2018, lag at t─3 | -0.0001 | 0.000004 |
| Gross Value Added per capita in 2018, lag at t─4 | 0.0001 | -0.00003 |
| Gross Value Added per capita in 2017, lag at t─2 | 0.0001 | 0.0001 |
| Gross Value Added per capita in 2017, lag at t─3 | -0.0001 | -0.00003 |
| Gross Value Added per capita in 2017, lag at t─4 | 0.0001 | -0.00004 |
| Gross Value Added per capita in 2016, lag at t─2 | -0.0002 | 0.0001 |
| Gross Value Added per capita in 2016, lag at t─3 | 0.0002 | -0.0001 |
| Gross Value Added per capita in 2015, lag at t─2 | -0.000003 | 0.00001 |
| Observations | | 694 | 694 |
| R-squared | | 0.693 | 0.346 |
| ASC=Adult Social Care, Prop.=proportion, LTS=long-term support, Pop. Char.=population characteristics | | | |
| All variables in this regression are first-differenced. We weight observations by population and cluster standard errors within local authorities. | | | |
| We use 12 of the 18 available moment conditions to instrument the first lag of Gross Value Added per capita, and missing council tax revenues per client and its square as instruments. Full results on controls are reported in Table A3. | | | |
| \*\*\* p-value<0.01, \*\* p-value <0.05, \* p-value <0.1 | | | |

Figure 1 – Channels through which ASC may impact paid production.

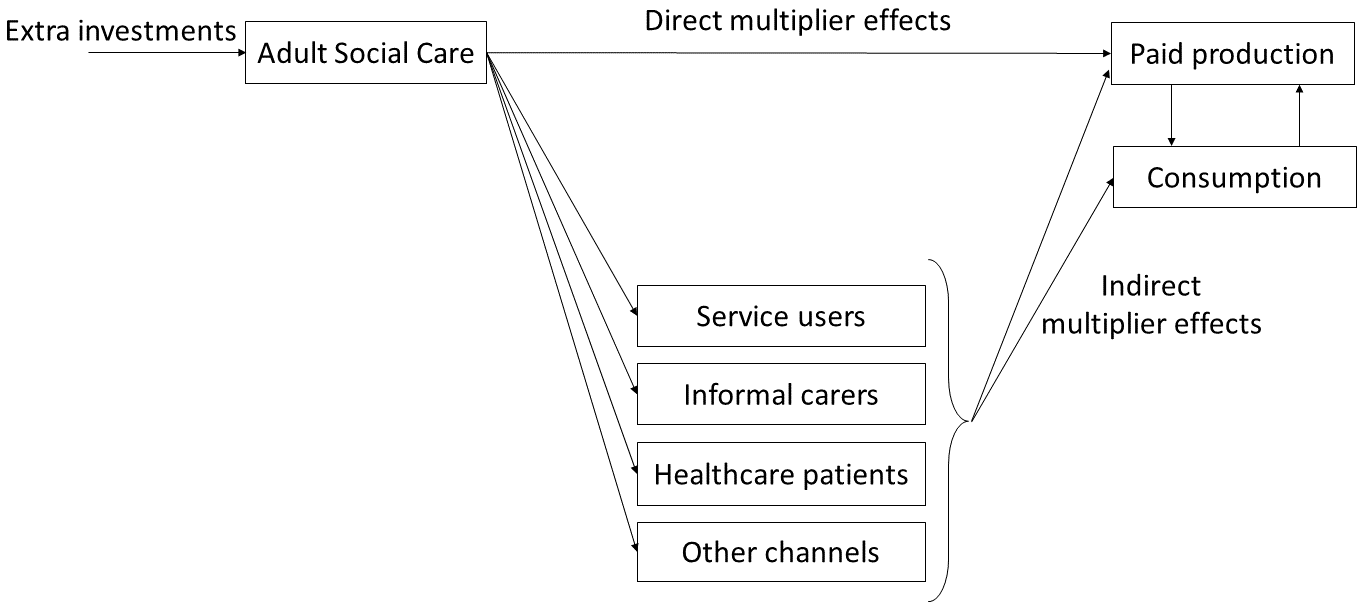
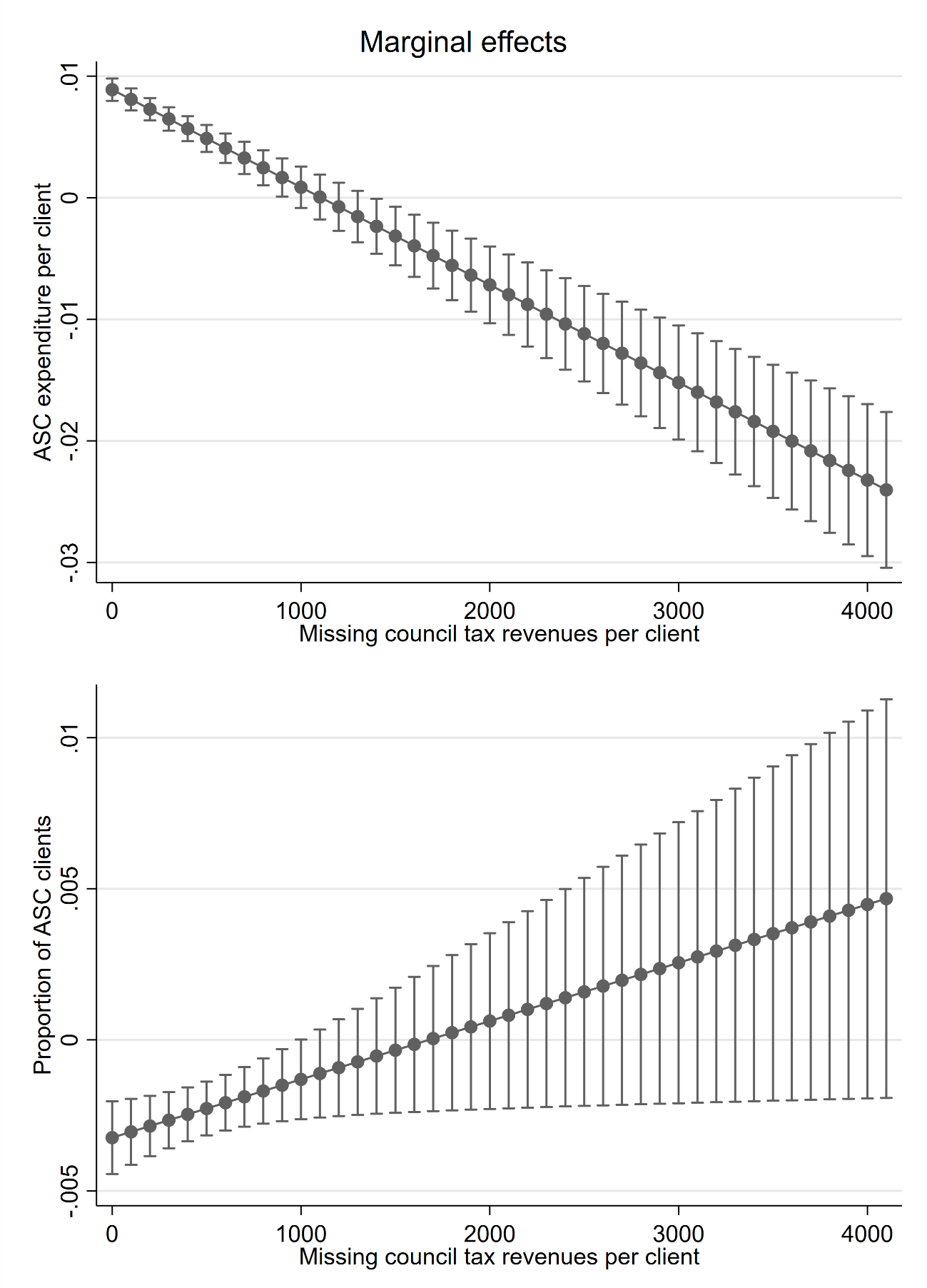


Figure 2 – Key marginal effects from the ‘naïve’ first stage of regression .



# Appendix

# A1. Calculations of the missing (foregone) council tax revenues: a simplifying example

In this section we explain how we calculate the missing council tax revenues using a simplifying example. Figure A1 provides a graphical representation. The council tax is a local tax levied on the occupation of domestic properties in England. Suppose there exists an LA A which includes a single domestic house (the council tax base), and that charges the occupants of this house a council tax of £1,000 (the council tax charge) in 2010/11. Suppose we want to calculate the missing council tax revenues in 2014/15 and that we observe all the choices about the council tax charge of LA A since the implementation of the freeze grant scheme in 2011/12. Since the introduction of the scheme, the freeze grant is set at 1.5% of the council tax charge. Finally, suppose that from 2011/12 to date LA A can increase its annual council tax charge by no more than 5% (the cap) without holding a local referendum.

In 2011/12, LA A decides not to increase the council tax charge, and this implies that it makes £1,000 from the council tax charge as well as £15 (=0.015×£1,000) from the 2011/12 freeze grant. In 2012/13, LA A decides again not to increase the council tax charge and makes £1,000 from the council tax charge, £15 from the 2011/12 freeze grant (which has now become a permanent part of this LA’s annual funding), and £15 from the 2012/13 freeze grant. The same choice occurs in 2013/14 and LA A makes £1,000 from the council tax charge and £45 from the 2011/12, 2012/13 and 2013/14 freeze grant combined. Finally, in 2014/15, LA A decides to increase the council tax charge by the cap of 5% and is able to raise £1,050 (=£1,000×1.05) plus the past freeze grants (£45) with a total revenue of £1,095. We call this sequence of choices, the baseline scenario (top row in Figure A1). In 2014/15, however, LA A could have raised £121 more had it increased the council tax charge by 5% in every year between 2011/12 and 2013/14: the ‘max revenue’ scenario (middle row in Figure A1). Therefore, £121 is what we call missing council tax revenues.

Past choices of the council tax charge and participation to the freeze grant scheme combined with the capping policy are the only reason why there are missing council tax revenues in 2014/15 and subsequent periods. The same 5% increase in the council tax charge in 2014/15 generates lower revenue in the baseline scenario than in others, because the capped increase of 5% in 2014/15 is applied to a smaller accumulated council tax charge up to 2013/14. The equal revenue scenario (last row in Figure A1) illustrates that even an LAs that only increased the council tax charge to generate the same revenue as the freeze grant from 2011/12 to 2013/14 would still be able to generate more revenue in 2014/15 from the same 5% increase in the council tax charge. Since the capping policy has continued to date, the historic choices of council tax charge and participation in the freeze grant scheme continues to impact the ability of LAs to raise revenue, i.e. the missing council tax revenues persist and grow after the end of the freeze grant scheme in 2014/15.

# A2. Calculations of the effects in pounds

We find that, in the short run, investing an additional £1,000 per client in a typical LA, which is equivalent to a total investment of £15,896,000 (=£1,000×15,896 clients on average), increases paid production by £216 per capita, corresponding to a total of £78,895,512 (=£216×365,257 people on average). This means that each additional £1m invested in ASC in a typical LA generates approximately £5m in paid production benefits (=£78,895,512× £1,000,000÷£15,896,000) in the short run. Similarly, in the long run, an additional £15,896,000 invested in ASC increases paid production by a total of £244,722,190 (=£670×365,257 people on average). Hence, each additional £1m invested in ASC in a typical LA generates a total of £15m (=£244,722,190× £1,000,000÷£15,896,000) in paid production benefits in the long run.

In addition, we find that, in the short run, increasing the proportion of clients by one percentage point increases paid production by £556 per capita, which is equivalent to £203,082,892 (=£556×365,257 people on average). Since, for the typical LA, one percentage point corresponds to 2,839 clients (=15,896 clients on average×1 percentage point÷5.6 percentage points) which, in turn, cost £28,091,263 (=2,839 clients×£9,895 per client on average) to the ASC sector, then each additional £1m invested in ASC generates approximately £7m (=£203,082,892×£1,000,000÷£28,091,263) in paid production benefits in the short run. In the long run, the paid production effect of the same one percentage point increase in the proportion of clients is £630,433,582 (=£1,726×365,257 people on average). Therefore, the paid production effect of a £1m investment in ASC amounts to £22m (=£630,433,582×£1,000,000÷ £28,091,263).

Finally, we find that reducing missing council tax revenues by £1 per client means that the typical LA has £15,896 (=£1 per client×15,896 clients on average) more in council tax revenues. This leads to a decrease in ASC expenditure per client by £2.7 and an increase in the proportion of clients by 0.0016 percentage points. These changes in ASC expenditure per client and proportion of clients translate into a total reduction of £42,931 (=£2.7 per client× [15,896 clients on average+4.5 new clients]) and a total increase of £44,940 (=0.0016 percentage point×15,896 clients on average÷ 5.6 percentage points on average×£9,895 per client on average) in ASC expenditure. Considering the short-term fiscal multiplier for each of these changes in ASC expenditure, we calculate that investing an additional, untargeted, £1m in ASC generates a total of £6m (=(-£42,931×5+£44,940×7)÷£15,896) in paid production benefits. In the long run, the same investment generates £22m (=(-£42,931×15+£44,940×22)÷£15,896) in paid production benefits.

Figure A1 – Illustration of the simplifying example.

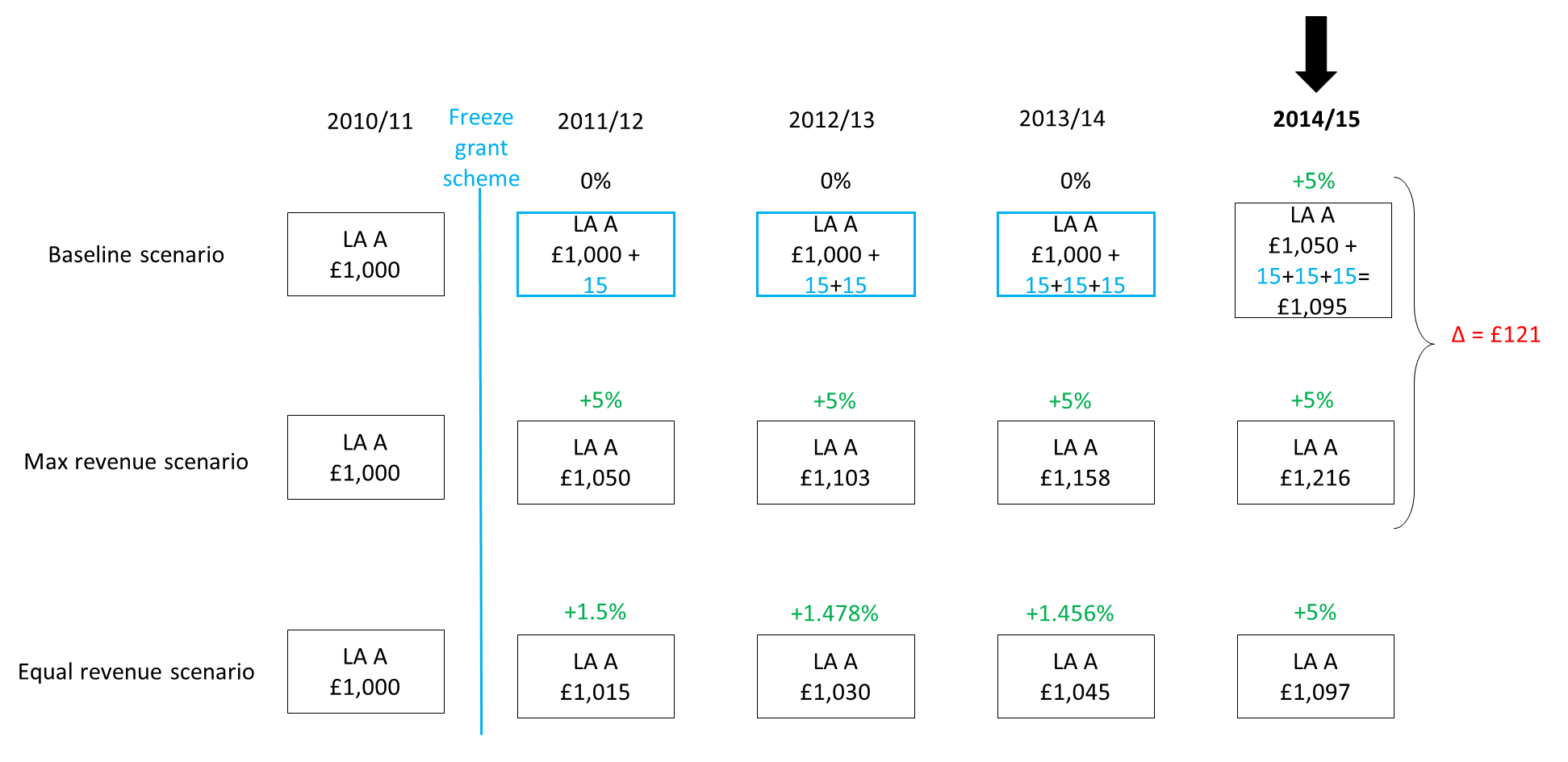


Table A1 – Sources of data.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variable (hyperlinked) | Original unit | Unit of analysis | Source of data | Date of last access |
| [Gross Value Added](https://www.ons.gov.uk/economy/grossdomesticproductgdp/datasets/regionalgrossdomesticproductlocalauthorities) | Local authority | Local authority | Office of National Statistics | 04/11/2024 |
| [Total public adult social care expenditure and number of adult social care clients](https://digital.nhs.uk/data-and-information/publications/statistical/adult-social-care-activity-and-finance-report) | Local authority | Local authority | NHS Digital: Adult Social Care Activity and Finance Report | 04/11/2024 |
| [Characteristics of users receiving long term support and geographical region](https://digital.nhs.uk/data-and-information/publications/statistical/personal-social-services-adult-social-care-survey) | Individual | Local authority | NHS Digital: Personal Social Services Adult Social Care Survey | 04/11/2024 |
| [Carer characteristics](https://digital.nhs.uk/data-and-information/publications/statistical/personal-social-services-survey-of-adult-carers) | Individual | Local authority | NHS Digital: Personal Social Services Survey of Adult Carers in England | 04/11/2024 |
| [Population demographic characteristics](https://census.ukdataservice.ac.uk/get-data/aggregate-data) | LSOA | Local authority | 2011, 2021 Census | 04/11/2024 |
| [Social benefits](https://stat-xplore.dwp.gov.uk/webapi/jsf/login.xhtml?invalidSession=true&reason=Session+not+established.) | LSOA/MSOA | Local authority | Department for Work and Pensions website | 04/11/2024 |
| [Index of multiple deprivation and its domains](https://opendatacommunities.org/resource?uri=http%3A%2F%2Fopendatacommunities.org%2Fdef%2Fconcept%2Ffolders%2Forganisations%2Fdepartment-for-communities-and-local-government) | LSOA | Local authority | Ministry of Housing, Communities & Local Government website | 04/11/2024 |
| [Council tax base](https://www.gov.uk/government/collections/council-taxbase-statistics) | Local authority | Local authority | Government website: council taxbase statistics | 04/11/2024 |
| [Council tax charges](https://www.gov.uk/government/collections/council-tax-statistics) | Local authority | Local authority | Government website: council tax statistics | 04/11/2024 |

Table A2 – Full results from regression and .

| Variable | | Regression (1) | Regression (2) |
| --- | --- | --- | --- |
| Gross Value Added per capita | Gross Value Added per capita |
| Gross Value Added per capita at t─1 | | 0.579\*\*\* | 0.577\*\*\* |
| Gross Value Added per capita at t─2 | | 0.099 | 0.100 |
| Endogenous | ASC expenditure (£000) per client | 215.907\*\* | 374.688\*\*\* |
| [28.986, 402.829] | [141.483, 607.893] |
| Travel-to-work neighbours' ASC expenditure (£000) per client |  | 730.926\*\* |
|  | [118.181, 1343.671] |
| Prop. ASC clients | 556.293\*\* | 989.927\*\*\* |
| Travel-to-work neighbours' prop. ASC clients |  | 2,032.201\*\*\* |
| Council tax base per capita | | 184,113.578 | 221,729.984\* |
| Council tax base per capita squared | | -176,305.000 | -208,753.000\* |
| Neighbours' council tax base per capita | |  | 279,972.313 |
| Neighbours' council tax base per capita squared | |  | -430,362.000 |
| LTS user characteristics | Prop. LTS users who are female | 9.234 | 17.508 |
| Prop. LTS users who are aged 65 or older | 12.643 | -16.084 |
| Prop. LTS users with sensory support | -50.603 | -43.489 |
| Prop. LTS users with support with memory and cognition | -9.216 | -4.075 |
| Prop. LTS users with learning disability support | -36.204 | -72.172\* |
| Prop. LTS users with mental health support | 4.635 | -14.974 |
| Prop. LTS users with social support | -17.309 | -41.961 |
| Prop. LTS users who received no help with questionnaire | -33.234\*\* | -28.834\* |
| Prop. LTS users with questionnaire read by someone | 15.834 | 22.217\* |
| Prop. LTS users with questionnaire translated by someone | -9.315 | -11.417 |
| Prop. LTS users with questionnaire written by someone | -21.144\*\* | -20.920\* |
| Prop. LTS users with questionnaire talked through with someone | -14.233 | -8.359 |
| Prop. LTS users with questionnaire answered by someone without user | -5.193 | -5.033 |
| Prop. LTS users receiving the easy-read version of the questionnaire | 8.932 | 9.594 |
| Neighbours' LTS user characteristics | Prop. LTS users who are female |  | -23.009 |
| Prop. LTS users who are aged 65 or older |  | -44.492 |
| Prop. LTS users with sensory support |  | 314.957\* |
| Prop. LTS users with support with memory and cognition |  | 19.114 |
| Prop. LTS users with learning disability support |  | -74.625 |
| Prop. LTS users with mental health support |  | -91.852 |
| Prop. LTS users with social support |  | 68.491 |
| Prop. LTS users who received no help with questionnaire |  | 28.375 |
| Prop. LTS users with questionnaire read by someone |  | 84.096\*\* |
| Prop. LTS users with questionnaire translated by someone |  | 18.928 |
| Prop. LTS users with questionnaire written by someone |  | -12.118 |
| Prop. LTS users with questionnaire talked through with someone |  | 3.546 |
| Prop. LTS users with questionnaire answered by someone without user |  | 50.845 |
| Prop. LTS users receiving the easy-read version of the questionnaire |  | -22.122 |
| Carer characteristics | Prop. carers whose questionnaire was in English | 66.658 | 76.811 |
| Prop. carers who received no help with questionnaire | 3.699 | 8.835 |
| Prop. carers who do not live with care recipient | -22.840\* | -54.190\*\*\* |
| Prop. carers with physical impairment or disability | -41.571 | -53.166 |
| Prop. carers with sight or hearing loss | -21.050 | -47.392 |
| Prop. carers with mental health problem | 5.614 | 17.111 |
| Prop. carers with learning disability | 50.165 | 53.017 |
| Prop. carers with long-standing illness | 0.676 | 19.860 |
| Prop. carers with other health condition | -13.181 | -11.093 |
| Prop. carers with no particular health condition | -27.583 | -29.396 |
| Prop. carers with care recipient that has dementia | -10.280 | -3.990 |
| Prop. carers with care recipient that has a physical disability | -5.726 | -1.138 |
| Prop. carers with care recipient that has sight or hearing loss | -13.357 | -5.840 |
| Prop. carers with care recipient that has a mental health problem | -24.717 | -29.605 |
| Prop. carers with care recipient that has problems connected to ageing | 6.404 | 12.730 |
| Prop. carers with care recipient that has a learning disability | -27.237\*\* | -25.842\* |
| Prop. carers with care recipient that has long-standing illness | -29.619\*\* | -69.294\*\*\* |
| Prop. carers with care recipient that has terminal illness | 30.669 | 30.022 |
| Prop. carers with care recipient that has alcohol or drug dependency | -64.908 | 8.301 |
| Neighbours' carer characteristics | Prop. carers whose questionnaire was in English |  | 22.850\* |
| Prop. carers who received no help with questionnaire |  | 127.291\* |
| Prop. carers who do not live with care recipient |  | -40.767 |
| Prop. carers with physical impairment or disability |  | -40.504 |
| Prop. carers with sight or hearing loss |  | -213.983\*\* |
| Prop. carers with mental health problem |  | 19.516 |
| Prop. carers with learning disability |  | -234.570\* |
| Prop. carers with long-standing illness |  | 30.089 |
| Prop. carers with other health condition |  | 104.004 |
| Prop. carers with no particular health condition |  | 64.410 |
| Prop. carers with care recipient that has dementia |  | 145.397\* |
| Prop. carers with care recipient that has a physical disability |  | 116.970 |
| Prop. carers with care recipient that has sight or hearing loss |  | 36.935 |
| Prop. carers with care recipient that has a mental health problem |  | -108.133\* |
| Prop. carers with care recipient that has problems connected to ageing |  | -76.763 |
| Prop. carers with care recipient that has a learning disability |  | 172.443\*\*\* |
| Prop. carers with care recipient that has long-standing illness |  | -107.284 |
| Prop. carers with care recipient that has terminal illness |  | 351.685\*\* |
| Prop. carers with care recipient that has alcohol or drug dependency |  | 874.169\*\*\* |
| Pop. Char. | Prop. people with disability living allowance aged 18 or older | -923.674\* | -1,240.937\*\* |
| Prop. people aged 18 or older entitled to Personal Independence Payment | -1,136.643\*\* | -1,548.275\*\* |
| Prop. people aged 18-64 entitled to Employment and Support Allowance (ESA) | -422.588\*\* | -133.424 |
| Prop. people with ESA assessment outcome of severe functional disability | 434.142 | 189.250 |
| Prop. people aged 65 or older claiming Attendance Allowance | -48.701 | -359.867\* |
| Neig. Pop. Char. | Prop. people with disability living allowance aged 18 or older |  | -2,537.285\* |
| Prop. people aged 18 or older entitled to Personal Independence Payment |  | -3,065.475\*\* |
| Prop. people aged 18-64 entitled to employment and support allowance (ESA) |  | 1,711.090\* |
| Prop. people with ESA assessment outcome of severe functional disability |  | -396.402 |
| Prop. people aged 65 or older claiming Attendance Allowance |  | -2,164.315\*\* |
| Financial year | Financial year 2015/16 | 453.359 | 199.234 |
| Financial year 2016/17 | 933.381\* | 427.116 |
| Financial year 2017/18 | 749.881 | -131.577 |
| Financial year 2018/19 | 936.699 | -598.691 |
| Financial year 2019/20 | 1,038.509 | 146.370 |
| Year and region interactions | East Midlands region x 2015/16 | 139.545 | 133.384 |
| East Midlands region x 2016/17 | -181.050 | -186.990 |
| East Midlands region x 2017/18 | 201.719 | 217.585 |
| East Midlands region x 2018/19 | 121.283 | 628.184 |
| East Midlands region x 2019/20 | 385.366 | 1,342.964 |
| East of England region x 2015/16 | 202.015 | -61.160 |
| East of England region x 2016/17 | 83.452 | -992.104 |
| East of England region x 2017/18 | 1,187.923\*\*\* | 93.638 |
| East of England region x 2018/19 | 263.146 | -883.338 |
| East of England region x 2019/20 | 162.576 | -669.333 |
| North East region x 2015/16 | 435.253 | 385.300 |
| North East region x 2016/17 | -351.605 | -328.440 |
| North East region x 2017/18 | 163.376 | 2,008.755\* |
| North East region x 2018/19 | -345.684 | 3,407.094\*\* |
| North East region x 2019/20 | -185.227 | 5,095.538\*\* |
| North West region x 2015/16 | 466.389 | 253.179 |
| North West region x 2016/17 | 254.258 | 285.276 |
| North West region x 2017/18 | 446.165 | 180.275 |
| North West region x 2018/19 | -152.268 | 185.692 |
| North West region x 2019/20 | 361.225 | 828.601 |
| South East region x 2015/16 | 644.032\*\* | 1,100.095\*\*\* |
| South East region x 2016/17 | 311.317 | 973.553 |
| South East region x 2017/18 | 709.461 | 1,257.996\*\* |
| South East region x 2018/19 | 819.100\* | 1,921.834\*\*\* |
| South East region x 2019/20 | 1,267.409\*\* | 2,293.980\*\*\* |
| South West region x 2015/16 | 247.517 | 1,545.308\*\* |
| South West region x 2016/17 | 28.911 | 935.382 |
| South West region x 2017/18 | 632.263 | 1,093.720 |
| South West region x 2018/19 | 227.326 | 908.269 |
| South West region x 2019/20 | 445.001 | 912.584 |
| West Midlands region x 2015/16 | 213.966 | 351.432 |
| West Midlands region x 2016/17 | 26.308 | -1,404.417 |
| West Midlands region x 2017/18 | 229.982 | -1,482.448 |
| West Midlands region x 2018/19 | 98.806 | -762.604 |
| West Midlands region x 2019/20 | -142.749 | -478.606 |
| Yorkshire and the Humber region x 2015/16 | 750.941\*\*\* | 1,431.772\*\*\* |
| Yorkshire and the Humber region x 2016/17 | 339.946 | 1,898.071\*\* |
| Yorkshire and the Humber region x 2017/18 | 753.726 | 2,156.909\*\* |
| Yorkshire and the Humber region x 2018/19 | 97.666 | 1,863.499\* |
| Yorkshire and the Humber region x 2019/20 | 992.013\* | 5,138.722\*\*\* |
| Rate of convergence | | 0.322\*\*\* | 0.323\*\*\* |
| Long-run effect of ASC expenditure per capita | | 669.868\*\*\* | 1161.052\*\*\* |
| [165.805, 1173.931] | [288.164, 2,033.94] |
| Observations | | 694 | 694 |
| Arellano-Bond test for AR(2) in first difference | | 0.285 | 0.279 |
| Hansen test of over-identifying restrictions | | 0.262 | 0.296 |
| ASC=Adult Social Care, Prop.=proportion, LTS=long-term support, Pop. Char.=population characteristics, Neig.=neighbours' | | | |
| All variables in this regression are first-differenced. We weight observations by population and employ a two-step variance estimator with Windmeijer correction. | | | |
| We use 12 of the 18 available moment conditions to instrument the first lag of Gross Value Added per capita, and missing council tax revenues per client and its square to address endogeneity also in ASC expenditure per client and proportion of ASC clients. | | | |
| Standard errors are clustered within local authorities. Square brackets include 95% confidence intervals. \*\*\* p-value<0.01, \*\* p-value<0.05, \* p-value<0.1 | | | |

Table A3 – Full results from the ‘naïve’ first-stage of regression .

| Variable | | Naïve first stage of (1) | |
| --- | --- | --- | --- |
| ASC expenditure per client | Prop. of ASC clients |
| Instruments | Missing council tax revenues per client at mean level | 0.003\*\*\* | -0.002\*\*\* |
| Missing council tax revenues per client squared | -0.000004\*\*\* | 0.000001\*\* |
| Gross Value Added per capita in 2019, lag at t─2 | -0.0001 | 0.0001 |
| Gross Value Added per capita in 2019, lag at t─3 | 0.0001 | -0.0001 |
| Gross Value Added per capita in 2019, lag at t─4 | -0.00003 | 0.000001 |
| Gross Value Added per capita in 2018, lag at t─2 | 0.00002 | 0.00004 |
| Gross Value Added per capita in 2018, lag at t─3 | -0.0001 | 0.000004 |
| Gross Value Added per capita in 2018, lag at t─4 | 0.0001 | -0.00003 |
| Gross Value Added per capita in 2017, lag at t─2 | 0.0001 | 0.0001 |
| Gross Value Added per capita in 2017, lag at t─3 | -0.0001 | -0.00003 |
| Gross Value Added per capita in 2017, lag at t─4 | 0.0001 | -0.00004 |
| Gross Value Added per capita in 2016, lag at t─2 | -0.0002 | 0.0001 |
| Gross Value Added per capita in 2016, lag at t─3 | 0.0002 | -0.0001 |
| Gross Value Added per capita in 2015, lag at t─2 | -0.000003 | 0.00001 |
| Gross Value Added per capita at t─2 | | -0.000004 | -0.0001 |
| Council tax base per capita | | -32.836 | 16.054 |
| Council tax base per capita squared | | -2,510.018 | 1,324.883 |
| LTS user characteristics | Prop. LTS users who are female | -0.015 | -0.028 |
| Prop. LTS users who are aged 65 or older | -0.00002 | -0.005 |
| Prop. LTS users with sensory support | 0.009 | 0.079 |
| Prop. LTS users with support with memory and cognition | 0.006 | 0.002 |
| Prop. LTS users with learning disability support | 0.033 | 0.022 |
| Prop. LTS users with mental health support | -0.007 | 0.021 |
| Prop. LTS users with social support | -0.014 | 0.032 |
| Prop. LTS users who received no help with questionnaire | 0.007 | -0.001 |
| Prop. LTS users with questionnaire read by someone | -0.011 | -0.011 |
| Prop. LTS users with questionnaire translated by someone | 0.010 | -0.005 |
| Prop. LTS users with questionnaire written by someone | -0.003 | 0.014 |
| Prop. LTS users with questionnaire talked through with someone | 0.010 | -0.022 |
| Prop. LTS users with questionnaire answered by someone without user | 0.005 | -0.0002 |
| Prop. LTS users receiving the easy-read version of the questionnaire | 0.001 | -0.001 |
| Carer characteristics | Prop. carers whose questionnaire was in English | -0.159 | 0.052 |
| Prop. carers who received no help with questionnaire | -0.039 | 0.022 |
| Prop. carers who do not live with care recipient | -0.003 | 0.014 |
| Prop. carers with physical impairment or disability | -0.024 | 0.025 |
| Prop. carers with sight or hearing loss | 0.008 | 0.007 |
| Prop. carers with mental health problem | 0.001 | -0.013 |
| Prop. carers with learning disability | -0.017 | 0.034 |
| Prop. carers with long-standing illness | 0.017 | 0.007 |
| Prop. carers with other health condition | -0.003 | 0.017 |
| Prop. carers with no particular health condition | -0.009 | 0.015 |
| Prop. carers with care recipient that has dementia | 0.016 | -0.012 |
| Prop. carers with care recipient that has a physical disability | -0.011 | -0.006 |
| Prop. carers with care recipient that has sight or hearing loss | 0.014 | -0.002 |
| Prop. carers with care recipient that has a mental health problem | -0.023 | 0.020 |
| Prop. carers with care recipient that has problems connected to ageing | -0.052 | 0.021 |
| Prop. carers with care recipient that has a learning disability | -0.005 | 0.003 |
| Prop. carers with care recipient that has long-standing illness | 0.010 | 0.003 |
| Prop. carers with care recipient that has terminal illness | -0.034 | 0.026 |
| Prop. carers with care recipient that has alcohol or drug dependency | -0.045 | 0.009 |
| Pop. Char. | Prop. people with disability living allowance aged 18 or older | -0.385 | 0.789 |
| Prop. people aged 18 or older entitled to Personal Independence Payment | -0.413 | 0.883 |
| Prop. people aged 18-64 entitled to employment and support allowance (ESA) | 0.016 | 0.364 |
| Prop. people with ESA assessment outcome of severe functional disability | 0.066 | -0.240 |
| Prop. people aged 65 or older claiming Attendance Allowance | -0.425 | 0.314 |
| Financial year | Financial year 2015/16 | 0.188 | -0.503\*\* |
| Financial year 2016/17 | -0.037 | -0.522\* |
| Financial year 2017/18 | -0.097 | -0.483\* |
| Financial year 2018/19 | -0.471 | 0.011 |
| Financial year 2019/20 |  |  |
| Year and region interactions | East Midlands region x 2015/16 | 0.867\* | -0.247 |
| East Midlands region x 2016/17 | 1.710\*\* | -0.415 |
| East Midlands region x 2017/18 | 2.585\*\*\* | -0.848 |
| East Midlands region x 2018/19 | 4.021\*\*\* | -1.418\*\* |
| East Midlands region x 2019/20 | 5.351\*\*\* | -2.078\*\*\* |
| East of England region x 2015/16 | 1.560 | -0.701 |
| East of England region x 2016/17 | 1.850\* | -0.592 |
| East of England region x 2017/18 | 2.849\*\* | -1.129\* |
| East of England region x 2018/19 | 2.482 | -0.989 |
| East of England region x 2019/20 | 3.429\* | -1.236 |
| North East region x 2015/16 | 0.987\* | -0.395 |
| North East region x 2016/17 | 2.207\*\*\* | -0.215 |
| North East region x 2017/18 | 3.327\*\*\* | -1.087\* |
| North East region x 2018/19 | 4.939\*\*\* | -1.712\*\* |
| North East region x 2019/20 | 6.184\*\*\* | -2.230\*\* |
| North West region x 2015/16 | 0.733 | -0.223 |
| North West region x 2016/17 | 1.362\*\* | -0.292 |
| North West region x 2017/18 | 2.437\*\*\* | -0.556 |
| North West region x 2018/19 | 3.850\*\*\* | -1.009\* |
| North West region x 2019/20 | 4.744\*\*\* | -1.261\*\* |
| South East region x 2015/16 | 1.194\*\* | -0.889 |
| South East region x 2016/17 | 2.282\*\*\* | -1.416\* |
| South East region x 2017/18 | 3.681\*\*\* | -1.924\*\* |
| South East region x 2018/19 | 4.923\*\*\* | -2.525\*\* |
| South East region x 2019/20 | 6.185\*\*\* | -2.975\*\*\* |
| South West region x 2015/16 | 0.169 | -0.664 |
| South West region x 2016/17 | 0.975 | -0.740 |
| South West region x 2017/18 | 2.190\*\* | -1.135 |
| South West region x 2018/19 | 3.484\*\*\* | -1.823\*\* |
| South West region x 2019/20 | 4.511\*\*\* | -1.829\*\* |
| West Midlands region x 2015/16 | 1.102\*\* | -0.419 |
| West Midlands region x 2016/17 | 1.649\*\*\* | -0.358 |
| West Midlands region x 2017/18 | 2.605\*\*\* | -0.661 |
| West Midlands region x 2018/19 | 3.927\*\*\* | -1.165\*\* |
| West Midlands region x 2019/20 | 4.772\*\*\* | -1.491\*\*\* |
| Yorkshire and the Humber region x 2015/16 | 1.357\*\*\* | -0.673\*\* |
| Yorkshire and the Humber region x 2016/17 | 2.572\*\*\* | -1.348\*\* |
| Yorkshire and the Humber region x 2017/18 | 3.508\*\*\* | -1.345\*\* |
| Yorkshire and the Humber region x 2018/19 | 5.114\*\*\* | -1.465 |
| Yorkshire and the Humber region x 2019/20 | 6.475\*\*\* | -3.223\*\*\* |
| Intercept | | -1.413\*\*\* | 0.580\*\*\* |
| Observations | | 694 | 694 |
| R-squared | | 0.693 | 0.346 |
| ASC=Adult Social Care, Prop.=proportion, LTS=long-term support, Pop. Char.=population characteristics | | | |
| All variables in this regression are first-differenced. We weight observations by population and cluster standard errors within local authorities. | | | |
| We use 12 of the 18 available moment conditions to instrument the first lag of Gross Value Added per capita, and missing council tax revenues per client and its square as instruments. | | | |
| \*\*\* p-value<0.01, \*\* p-value <0.05, \* p-value <0.1 | | | |

Table A4 – Results from the falsification test.

| Variable | | Gross Value Added per capita |
| --- | --- | --- |
| ASC expenditure (£000) per client | | 3,332.173\*\* |
| Prop. ASC clients | | 5,885.106 |
| LTS user characteristics | Prop. LTS users who are female | -412.257 |
| Prop. LTS users who are aged 65 or older | -675.811 |
| Prop. LTS users with sensory support | -786.108 |
| Prop. LTS users with support with memory and cognition | -617.529 |
| Prop. LTS users with learning disability support | -673.975 |
| Prop. LTS users with mental health support | -198.747 |
| Prop. LTS users with social support | -1,526.002 |
| Prop. LTS users who received no help with questionnaire | 118.999 |
| Prop. LTS users with questionnaire read by someone | 459.762 |
| Prop. LTS users with questionnaire translated by someone | -43.892 |
| Prop. LTS users with questionnaire written by someone | -141.165 |
| Prop. LTS users with questionnaire talked through with someone | -118.498 |
| Prop. LTS users with questionnaire answered by someone without user | -323.379 |
| Prop. LTS users receiving the easy-read version of the questionnaire | -272.196 |
| Carer characteristics | Prop. carers whose questionnaire was in English | 487.399 |
| Prop. carers who received no help with questionnaire | -907.099 |
| Prop. carers who do not live with care recipient | -131.788 |
| Prop. carers with physical impairment or disability | -605.570 |
| Prop. carers with sight or hearing loss | -1,858.931 |
| Prop. carers with mental health problem | -640.965 |
| Prop. carers with learning disability | -1,182.907 |
| Prop. carers with long-standing illness | -89.471 |
| Prop. carers with other health condition | -1,020.023 |
| Prop. carers with no particular health condition | -1,701.577 |
| Prop. carers with care recipient that has dementia | -371.579 |
| Prop. carers with care recipient that has a physical disability | 467.290 |
| Prop. carers with care recipient that has sight or hearing loss | 64.319 |
| Prop. carers with care recipient that has a mental health problem | -12.936 |
| Prop. carers with care recipient that has problems connected to ageing | 656.935 |
| Prop. carers with care recipient that has a learning disability | 251.278 |
| Prop. carers with care recipient that has long-standing illness | -705.892 |
| Prop. carers with care recipient that has terminal illness | 2,624.615 |
| Prop. carers with care recipient that has alcohol or drug dependency | -358.970 |
| Pop. Char. | Prop. people who are female | -3,670,020.000 |
| Prop. people aged 65 or older | -48,057.918 |
| Prop. people of British white ethnicity | -53,323.395 |
| Prop. households with single person aged 0-64 | 10,028.438 |
| Prop. households with single person aged 65 or older | 10,811.499 |
| Prop. household deprived in 3 dimensions | -1,099,210.000 |
| Prop. household deprived in 4 dimensions | 284,944.219 |
| Population density (per 10,0000 individuals) | -54,503.082 |
| Index of deprivation | -4,586.474 |
| Index of education deprivation | 1,120.515 |
| Index of income deprivation | 365,291.531 |
| Index of health and disability deprivation | -20,587.184 |
| Prop. people with disability living allowance aged 18 or older | 12,297.841 |
| Prop. people aged 18 or older entitled to Personal Independence Payment | 17,304.857 |
| Prop. people aged 18-64 entitled to employment and support allowance (ESA) | -9,144.231 |
| Prop. people with ESA assessment outcome of severe functional disability | -1,670.930 |
| Prop. people aged 65 or older claiming Attendance Allowance | -33.918 |
| Prop. people aged 18 or older with some form of income support | 6,912.372 |
| Region | East Midlands | -43,179.262 |
| East of England | -43,408.746 |
| North East | -34,979.531 |
| North West | -28,101.893 |
| South East | -33,961.352 |
| South West | -47,662.594 |
| West Midlands | -33,575.684 |
| Yorkshire and The Humber | -43,781.605 |
| Financial year | Financial year 2015/16 | -7,874.348 |
| Financial year 2016/17 | -6,566.652 |
| Financial year 2017/18 | -8,173.367 |
| Financial year 2018/19 | -4,882.846 |
| Financial year 2019/20 | -17,843.264 |
| Year and region interactions | East Midlands region x 2015/16 | 9,830.105 |
| East Midlands region x 2016/17 | 11,154.966 |
| East Midlands region x 2017/18 | 9,440.403 |
| East Midlands region x 2018/19 | 797.231 |
| East Midlands region x 2019/20 | 7,641.956 |
| East of England region x 2015/16 | 11,169.811 |
| East of England region x 2016/17 | 12,665.687 |
| East of England region x 2017/18 | 10,959.575 |
| East of England region x 2018/19 | 4,937.141 |
| East of England region x 2019/20 | 17,762.781 |
| North East region x 2015/16 | 6,493.786 |
| North East region x 2016/17 | -1,213.314 |
| North East region x 2017/18 | -4,354.532 |
| North East region x 2018/19 | -14,353.322 |
| North East region x 2019/20 | 67.397 |
| North West region x 2015/16 | 5,996.203 |
| North West region x 2016/17 | 8,836.778 |
| North West region x 2017/18 | 4,517.340 |
| North West region x 2018/19 | -9,441.060 |
| North West region x 2019/20 | 3,446.356 |
| South East region x 2015/16 | 8,013.424 |
| South East region x 2016/17 | 6,038.126 |
| South East region x 2017/18 | 3,672.364 |
| South East region x 2018/19 | -2,824.783 |
| South East region x 2019/20 | 15,551.995 |
| South West region x 2015/16 | 21,743.109 |
| South West region x 2016/17 | 18,871.742 |
| South West region x 2017/18 | 16,085.473 |
| South West region x 2018/19 | 5,642.891 |
| South West region x 2019/20 | 13,340.406 |
| West Midlands region x 2015/16 | 8,670.157 |
| West Midlands region x 2016/17 | 10,718.539 |
| West Midlands region x 2017/18 | 10,339.711 |
| West Midlands region x 2018/19 | 2,740.632 |
| West Midlands region x 2019/20 | 17,340.977 |
| Yorkshire and the Humber region x 2015/16 | 10,914.953 |
| Yorkshire and the Humber region x 2016/17 | 9,538.702 |
| Yorkshire and the Humber region x 2017/18 | 4,708.896 |
| Yorkshire and the Humber region x 2018/19 | -7,623.619 |
| Yorkshire and the Humber region x 2019/20 | 13,654.350 |
| Intercept | | 1,856,540.000 |
| Observations | | 845 |
| Kleibergen-Paap first-stage F statistic | | 20.6 |
| ASC=Adult Social Care, Time-inv pop char=time-invariant population characteristics, Pop. Char.=population characteristics | | |
| This regression is estimated by 2SLS. It has two endogenous variables, ASC expenditure per client and proportion of ASC clients. These are instrumented using council tax per client and its square. | | |
| We weight observations by population and cluster standard errors within local authorities. | | |
| \*\*\* p-value<0.01, \*\* p-value <0.05, \* p-value <0.1 | | |

1. These LAs are also known as CASSRs (Councils with Adult Social Services Responsibilities). [↑](#footnote-ref-2)
2. De Henau et al. (2016) define direct effects the number of jobs directly generated by an equivalent extra investment in the ASC sector, indirect effects the number of jobs generated in the sectors of the ASC suppliers, and induced effects the number of jobs generated because of the increase in consumption due to the above direct and indirect effects on employment. [↑](#footnote-ref-3)
3. We do not include data prior to 2014/15 because of a change in the collection method of the activity data used to obtain the number of clients, a key variable in our analysis. Specifically, from 2014/15 onwards, the SALT collection replaced the RAP and ASC-CAR collections. As data from these collections are not directly comparable, including data prior to 2014/15 is likely to introduce measurement error bias. [↑](#footnote-ref-4)
4. By ‘per capita’ we mean per head of LA population. [↑](#footnote-ref-5)
5. The ONS constructs the GVA time series at the local authority level based on the most recent LA boundaries. At the time of data download, the GVA data was reported according to 2020/21 LA boundaries. Therefore, no information on GVA is available for LAs that existed only prior to 2020/21. [↑](#footnote-ref-6)
6. The hypothesis of a non-linear relationship between missing council tax revenues and ASC expenditure is based on the constraint that LAs cannot legally reduce ASC services below a statutory minimum level. This non-linearity implies that, as missing revenues increase and services approach the minimum level, LAs reduce expenditure at a progressively slower pace. This approach is consistent with that used by Longo et al. (2025) and Salas‐Ortiz et al. (2024). [↑](#footnote-ref-7)
7. Moreover, as expected in the case of a serially uncorrelated idiosyncratic error term, the correlation coefficient between the Δ*yit* and Δ*yit-1* is not statistically different from -0.5, i.e. -0.412 with bootstrapped 95% confidence intervals of [-0.587, -0.237]. [↑](#footnote-ref-8)