Does publicly-funded Adult Social Care impact

informal and unpaid carers’ quality of life in England?

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# Abstract

Informal carers are important for their care recipients, but the burden of care may have a detrimental effect on the carer’s well-being. Publicly-funded Adult Social Care (simply, ASC) in England may alleviate this burden. We therefore investigate whether ASC expenditure improves carers’ quality of life and the channels through which this effect may exist. We analyse data on informal carers from the biennial Survey of Adult Carers in England in 2014/15, 2016/17, 2018/19 and 2021/22. We implement panel data instrumental variables methods that use conditionally exogenous variability in the local taxation to identify the causal effect of ASC expenditure. Our main finding suggests that a £1,000-increase in ASC expenditure per client increases, on average, the carer-reported quality of life score by 0.3, which amounts to 4.2% of its average in 2021/22. Moreover, ASC expenditure has a beneficial impact on informal carers’ care tasks, health, range of employment choices, and finances.

Keywords: Adult Social Care, informal carers, quality of life, panel data, instrumental variable

JEL codes: H51; H53; I38; D24; C23; C26.

# Introduction

Informal and unpaid carers (simply, carers) contribute substantially to the long-term care (LTC) of family and friends alongside publicly- and privately-funded formal LTC. The informal care sector is indeed a substantial part of many economies (Espinola et al., 2023, National Alliance for Caregiving and AARP, 2020, Peña-Longobardo and Oliva-Moreno, 2022). For example, in the UK, informal care is valued between £56.9 and £132 billion per year – which represents a substantial proportion of the economy between 3% and 6.4% of the GDP (Buckner and Yeandle, 2015, Webber and Payne, 2016). In addition to care recipients, informal care can benefit carers themselves, for example, by improving their happiness and sense of self-value (e.g., Brouwer et al., 2005, Toljamo et al., 2012). The burden of care may, however, also have detrimental effects on carers. Caring for someone may mean less time spent at work and, in turn, lower income (e.g., Schneider et al., 2013, Schmitz and Westphal, 2017). Moreover, it may worsen health because of, for example, more stress (e.g., De Zwart et al., 2017, Schmitz and Westphal, 2015), and it may reduce well-being because of, for example, less time for social life (e.g., Urwin et al., 2023, Van den Berg et al., 2014).

Publicly-funded LTC may relieve some of the burden of informal care and may improve carers’ quality of life (QoL). Improving carer QoL is important in its own right and because it can lead, for example, to better labour market outcomes for carers, and better health outcomes for both carers and care recipients which may reduce demand for health and LTC services. By focusing on the public LTC programme in England, called Adult Social Care (ASC), this study investigates whether and to what extent publicly-funded ASC expenditure (simply, ASC expenditure) impacts carers’ QoL. In addition to promoting service users’ well-being, improving carers’ QoL is one of the goals of ASC (Department of Health & Social Care, 2021). This is achieved by providing services directly to carers (e.g., information and respite services) and, indirectly, to their care recipients (e.g., domiciliary care and short-term services to increase independence). Evidence of the carer QoL effects due to changes in ASC expenditure may help inform the policy question on the value of investing money in the public ASC sector. This will add to the growing body of research about the effects of ASC expenditure suggesting that it can improve the care-related QoL of newly eligible and existing service users (Longo et al., 2021, Longo et al., 2023a) as well as their user satisfaction and experience, ability to carry out activities of daily living independently, and general and mental health (Salas‐Ortiz et al., 2024). Moreover, it can reduce population mortality (Martin et al., 2021) although indirectly by allowing the NHS to reallocate resources towards more cost-effective services (Longo et al., 2023b). All this evidence may inform an assessment of the opportunity costs of changes in ASC expenditure, and value-for-money considerations about publicly-funded services within the ASC sector and across public sectors. Furthermore, the present study investigates potential channels through which ASC expenditure might impact carer QoL such as the time spent in caring, the care tasks carried out, and carer’s health, job and finances. This analysis may provide policy-relevant information for the design of targeted interventions for carers as well as understanding the interactions between ASC and other sectors (e.g., health care and private sector).

The economic literature on informal care includes both theoretical and empirical studies (Van Houtven et al., 2019). Theoretical work has focused mostly on strategic decisions about the provision of informal care (e.g., Engers and Stern, 2002, Hiedemann and Stern, 1999), and the relationship between informal care and formal care (e.g., Van Houtven and Norton, 2004) or LTC insurance (e.g., Finkelstein and McGarry, 2006, Pauly, 1990). On the other hand, most of the empirical evidence focuses on the impact of informal care on labour market outcomes, such as employment (e.g., Carmichael et al., 2010), worked hours (e.g., Schmitz and Westphal, 2017), wages (e.g., Van Houtven et al., 2013), and retirement (e.g., Fischer and Müller, 2020). Overall, these studies suggest a detrimental effect of informal care on labour market outcomes. Other empirical studies investigate the impact of informal care on formal LTC and health care utilisation. There are consistent findings suggesting substitution between formal and informal LTC (e.g., Bonsang, 2009, Urwin et al., 2019). However, the picture is more mixed about the relationship between informal care and formal healthcare with some studies suggesting substitution (e.g., Van Houtven and Norton, 2008) and others complementarity (e.g., Bolin et al., 2008). Finally, some studies analyse the impact of informal care on carers’ subjective well-being and health, and on care recipient’s health. Evidence on carers generally suggests a detrimental effect of informal care on subjective well-being (Bobinac et al., 2010, Van den Berg et al., 2014) and mental health (e.g., Schmitz and Westphal, 2015, Heger, 2017). For care recipients, Barnay and Juin (2016) suggest informal care reduces the risk of depression and improves mental health, while other studies suggest that informal care may increase the probability of infections, for example, coronavirus (Madia et al., 2023) or entering formal care in worse health conditions (Gentili et al., 2017).

At the time of writing, there is limited evidence on the causal impact of publicly-funded LTC services on carer QoL. Verbakel et al. (2018) study whether publicly-funded home care in the Netherlands reduces the detrimental impact of the care burden on carers’ subjective well-being. Using data on a sample of 4,717 care recipient-carer dyads, the authors estimate cross-sectional multilevel models and find a positive correlation between home care services and carers’ subjective well-being. Similarly, Zhang et al. (2021) explores the relationship between publicly-funded ASC expenditure and carers’ subjective well-being in England by analysing household longitudinal survey data. They use panel regressions with fixed effects and find a positive correlation between ASC expenditure and subjective well-being for carers providing more than 35 hours of care per week. A study by Rand et al. (2020) examines the relationship between publicly- and privately-funded community-based ASC services on carers’ QoL in England. The authors estimate a cross-sectional regression using a sample of 316 carers and find a positive correlation between community-based ASC services and carers’ QoL.

In this study, we estimate the effect of ASC expenditure per client on carer QoL using data on a sample of carers aged 18 or older in England from a biennial national survey in 2014/15, 2016/17, 2018/19 and 2021/22.[[1]](#footnote-1) These data are combined with local authority (LA) data on ASC expenditure, ASC clients including both service users and carers, and user and population characteristics. Building on previous studies (Longo et al., 2023a, Longo et al., 2021), we implement a panel instrumental variable (IV) approach which uses conditionally exogenous factors such as the number and past sale value of domestic properties and LA type as instruments for ASC expenditure and eligibility. We test the robustness of our results using alternative specifications, for example, by controlling for time-invariant unobserved heterogeneity across LAs using fixed effects, or by using other IVs. Finally, we use our primary model to explore the potential channels that may explain the QoL effect, and estimate the impact of ASC expenditure through these channels.

The reminder of this study is structured as follows. Section 2 and 3 provide information on the institutional background and theoretical framework, respectively. Section 4 describes the data sources (4.1), and the analysis sample and variables (4.2). Section 5 discusses the methods, Section 6 presents the results, and Section 7 concludes.

# Institutional background

### The ASC system in England

Publicly-funded ASC in England aims to promote the well-being and independence of service users with physical and/or mental challenges, and of their carers. There are 152 LAs responsible for ASC. These deliver services, directly or through private providers, in institutional settings (e.g., day centres, care homes) and in the community (e.g., domiciliary care). ASC services for users may differ depending on the need they intend to address. Some may aim to support individuals for an undefined period through continuous long-term support (LTS), for example, professional support at home, or through one-off services, such as the provision of assistive equipment (e.g., fire alarm for deaf users) and home adaptations (e.g., shower chair for disabled users). Others may aim to maximise independence to reduce reliance on LTS through short-term support (STS), such as community-based vision rehabilitation. On the other hand, ASC services for carers may aim to support them directly, such as in the case of professional emotional support, training and respite services, or indirectly through LTS and STS for their care recipient.

Most publicly-funded ASC services in England are means-tested. User and carer eligibility is determined by LAs through assessments, which can be requested free of charge. User assessments evaluate the difficulties that individuals experience with their activities of daily living (e.g., getting in and out of the bed, washing oneself), and the informal care they receive. When the need for ASC is identified, individuals become eligible if the value of their assets is below £23,250.[[2]](#footnote-2) When eligible, users are asked to partially contribute towards the cost of their care if the value of their assets is between £14,250 and £23,250. When ineligible, individuals can still ask LAs to arrange their care services, but they will have to bear the full cost of care. The carer assessment may be carried out together with the (user) assessment of the care recipient. It evaluates how the caring role affects the carer’s physical and mental health, work and leisure time, and relationships. LAs might also provide help with the costs of informal care if the carer meets the same financial eligibility criteria of the user assessment.

### Funding for ASC

According to the Care Act 2014, LAs have the statutory duty of providing a minimum level of ASC services which they fund mostly using local tax revenues and grants from the central government. Among local taxes, council tax is the primary source of funding for ASC. Council tax is on the occupation of domestic properties, and revenues from this tax are determined by two components: council tax base and council tax charge. 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. Instead, choices on the council tax charge are made by LAs depending on their budget requirement, but subject to some restrictions imposed by central government.

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 may imply differences in choices on the council tax charge. The council tax freeze grant scheme is one of these policies, started in 2011/12 and ended in 2015/16. During this period, LAs choosing to join this scheme received a freeze grant equivalent to a certain increase in the council tax charge (e.g., 2.5% in 2011/12) if they refrained from increasing their council tax charge. The freeze grants received during the five years of the scheme are now a permanent part of the funding that every year the central government transfers to LAs, except for the freeze grant in 2012/13, as this was a one-off grant. In addition, during the same years of the freeze grant scheme, LAs’ capacity to raise council tax revenues was restricted by the capping policy. LAs could increase the charge up to a maximum proportion of the charge, the cap, without running a local referendum that could reject increases above the cap. All LAs took the freeze grant in 2011/12 of an amount equivalent to an increase in the charge by 2.5%, although they could have instead increased the council tax charge up to a cap of 3.5%. However, the pattern of choices on the freeze grant varied across LAs subsequently. At the end of the freeze grant scheme, in 2016/17, the capping policy on the council tax charge increase continued which meant that LAs’ future capacity to raise council tax revenues remained constrained. Therefore, after the end of the scheme, LAs that did not increase the council tax charge and took the freeze grant became unable to fully offset this lack of increases that could have been made to past charges.

Another local tax is the business rates tax on the occupation of non-domestic properties (i.e. businesses such as restaurants and barber shops). Revenues from this tax, however, tend to fund ASC to a lesser extent compared to the council tax revenues. User contributions are a minor part of ASC funding, and they can only fund the services for which users are charged. On the other hand, grants from the central government represent a substantial proportion of resources that LAs use to fund ASC services. These may or may not be ring-fenced for ASC, where ring-fenced grants are distributed according to a formula that accounts for the different level of social care needs across LAs (Department for Communities and Local Government, 2014). During the first half of 2010s the central government implemented an austerity policy that reduced these resources distributed across LAs (Seamer et al., 2019). Local taxation, however, was not targeted by these central decisions and, therefore, its importance as a determinant of spending across LAs implicitly increased. To also capitalise on this policy context, our empirical approach uses variability in key elements of the local taxation, such as council tax base or missing council tax revenues, as we discuss in Section 5.

# Theoretical framework

Several factors may contribute to the QoL of carers (e.g., Pearlin et al., 1990, Strazdins et al., 2011) as follows:

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Equation suggests that the QoL of carer *i* (=1,…,I) in LA *j* (=1,…,J) is a function *g* of factors such as the relationship with and the well-being of the care recipient (*care recipientij*), physical and mental health (*healthij*), family relationships (*familyij*), the capacity to be employed (*employmentij*) and to engage in social activities (*social lifeij*), as well as other factors which may be difficult to specify let alone identify theoretically or empirically. ASC services aim to improve carer QoL by having an impact on at least some of these. For example, respite services (e.g., help at home from a paid carer) provide formal support for the care recipient, but may also allow carers to devote more time to paid production and/or social activities. These services may also save the carer from carrying out physically demanding tasks such as personal care, which may help the carer’s physical and mental health. Therefore, we call *channels* all the factors that contribute to the QoL of a carer and through which publicly-funded ASC services may impact carer QoL. We express this impact of ASC (and other) services on carer QoL as follows:

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where carer QoL is now a function *h* of *expijASC* capturing (publicly-funded) ASC expenditure for carer *i* and their care recipient which, in turn, is a function of *clientsj* capturing the proportion of clients (either service users or carers) that is driven by the generosity of the eligibility criteria in LA j (e.g., more generous eligibility criteria imply, for a given ASC budget, lower expenditure for each client but for a greater proportion of clients), and *needij* capturing the social care need of carer and care recipient. Carer QoL is also driven by *expijother* capturing any other publicly or privately-funded service impacting the channels. Finally, *other factorsij* capture any unidentified factors that impact carer QoL through its channels (e.g., carer’s resilience, community solidarity).

We design our empirical analysis (in Section 5) to estimate the *total* effect of ASC expenditure on carer QoL. An illustration of the total effect can be obtained by total differentiating equation as follows:

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where the total effect includes both *direct* and *indirect* effects. The direct effect captures the carer QoL effect generated by the impact of ASC expenditure through all identified and unidentified channels. For example, an increase in the hours of paid care at home for the care recipient may allow the carer to devote more time to social activities (e.g., spending more time with friends and family), which, in turn, may improve carer QoL. On the other hand, the *indirect* effect captures any effect on carer QoL generated by the impact of ASC expenditure on other services that, in turn, impact the channels. These indirect effects may be positive or negative. For example, if an increase in the amount of publicly-funded ASC services leads both carers and care recipients to purchase fewer social care services privately this will reduce carer QoL (the indirect effect), assuming private services are effective. This negative indirect effect may be more than offset by the beneficial (direct) effect of increasing ASC support. In some circumstances, the indirect effect might be positive. For example, the same increase in the hours of paid care mentioned above may imply better physical and mental health for the carer and, in turn, fewer GP and hospital visits producing savings for the NHS. If these savings are reinvested to reduce waiting times for elective surgeries, care recipients and carers might receive their treatment sooner and experience larger health gains, which implies higher carer QoL. Therefore, the total effect is the sum of these direct and indirect effects.

# Data

## Data sources

We collect data from various sources in the public domain. Table A1 of the Appendix provides the links.

### Survey on Adult Carers in England

Data on carers are from the Survey on Adult Carers in England (SACE). This is a biennial survey administered by post (or through face-to-face or telephone interviews if requested by the carer) to more than 100,000 carers since 2012/13 between October and November of the relevant financial year. The *target* population of this survey is broadly defined as all carers aged 18 or older caring for a person aged 18 or older. Each LA, however, draws a random sample from the *survey* population that includes any carers aged 18 or older known to the LA irrespective of the type of support received directly or through their care recipient.[[3]](#footnote-3) Therefore, the survey population excludes carers that did not contact their LA or any third party commissioned by their LA. Through this survey LAs collect a broad range of data about carers including data on demographic and socio-economic characteristics, caring role, QoL, and satisfaction with the services received, as well as on care recipient’s characteristics and services received. These features make SACE well-suited to address our research question about the effect of ASC expenditure on carers’ QoL. Moreover, these data are used to inform national decision-makers and LAs about carers’ outcomes to improve existing services and design new policies and services.

The SACE survey, however, is not free from limitations. The survey response rate has declined over time from 46% (with 125,950 carers sampled) in 2012/13 to 32% (with 133,980 carers sampled) in 2021/22. Moreover, a report by Aznar et al. (2021) highlights that there are some underrepresented sub-groups in the survey both in the sample frame and responding sample. The sample frame tends to underrepresent the youngest and oldest carers, while the responding sample tends to underrepresent also older carers from some ethnic minority background (e.g., Bangladeshi, Pakistani). In Section A1 of the Appendix, we further discuss these limitations and test whether they may impact our results. Finally, SACE was designed to stratify by LA only. This implies that inference from any analysis by carer characteristics is likely to be sample specific rather than generalisable to the survey population.

### Data at the local authority level

We combine these data with LA-level data on (publicly-funded) ASC expenditure from the ASC Finance Return, and on clients from the Short- and Long-Term Support data return. Expenditure data include information on all types of ASC services (including LTS, STS, equipment, adaptations and technologies, information services, need assessments and reviews) and commissioning and delivery services. Data on clients capture the number of service users and carers. We include also data on LTS user characteristics from the Adult Social Care Survey, which we aggregate at the LA level. This is an annual survey of LTS users aged 18 or older collecting data on demographic characteristics, QoL, health, and services received. Moreover, we collect data on council tax and population demographic and socio-economic characteristics from government websites.

## Sample and variables

We use data in four financial years including 2014/15, 2016/17, 2018/19 and 2021/22. After removing carers that did not respond to the questionnaire or to questions that we use to construct variables in our main analysis, the final sample size in each year is 42,439, 39,421, 37,851 and 32,460, respectively.

### Carer-level variables from SACE

Our dependent variable is the carer-reported QoL (Department of Health and Social Care, 2017). This measure covers six domains: occupation (time spent in enjoyable activity), control over daily life, personal care, personal safety, social participation, and encouragement and support. For each domain, there are three possible answers to indicate no unmet need (the ideal state), some need met, and no need met, which are scored two, one and zero, respectively. The carer-reported QoL score varies between zero (worst possible) and 12 (best possible). Carer-reported QoL is an early version of the ASCOT-carer. These sector-specific measures are both designed to capture the effect of social care support on carer QoL and are strongly correlated (Forder et al., 2016, Rand et al., 2015). Unlike ASCOT-carer, however, carer-reported QoL has no preference-based weights. As shown in Table 1, on average, carers report a QoL between 7.841 and 7.229 in the four financial years.

One possible source of variability in carer-reported QoL is heterogeneity in carer characteristics and, therefore, we control for these. Table 1 shows that, in 2021/22 (and similarly in the previous three financial years), most carers are female (70%), aged 65 and older (52%), and of white ethnicity (85%). Most of them have some health condition (61%), did not receive any help to complete the SACE questionnaire (92%), and have been in a caring role for more than six months (99%). Moreover, for most carers, the care recipient is aged 65 or older (65%), lives with the carer (76%), and has a long-standing illness (38%), dementia (35%) and/or problems connected to ageing (31%). Lower proportions of carers care for someone who has sight or hearing loss (28%), a learning disability (24%), a mental health issue (24%), and/or an alcohol or drug addiction (2%). As expected (Blake et al., 2023, p. 25), Table 1 (last column) indicates that these characteristics tend to vary over time.

Other carer-level variables that could explain variability in carer-reported QoL are caring time, care tasks, and whether the caring role impacts the carer’s health, job and finances. Table 2 suggests that, in 2021/22, most carers (60%) spend 35 hours or more per week caring for someone, with 37% of these spending 100 hours or more per week. Most carers perform all types of care tasks mentioned in the questionnaire from personal care (69%) and physical help (58%) to keeping an eye (91%) and giving emotional support (85%). Carer’s health appears to be unaffected by the caring role for only 8% of carers. Because of their caring role, however, carers tend to experience tiredness (79%), disturbed sleep (68%), a feeling of stress (64%) and depression (49%), a short temper (45%), and physical strain (36%). Moreover, of all carers, some develop their own health conditions (24%), see a GP (22%), and experience the deterioration of an existing health condition (23%) and a loss of appetite (14%). Some other are more likely to be retired (56%) or not in paid work (22%). A smaller proportion of carers are employed or self-employed full-time (11%) or part-time (15%), and doing voluntary work (5%). Some carers are not in paid work because of the caring role (22%), while only few carers do not need support with their caring role from their employer (4%), and only few carers can balance their self-employed job and caring role (3%). Finally, the caring role tends to produce financial issues for a substantial proportion of carers (43%).

### Independent variables at the LA level

Our key independent variable is ASC expenditure per client. As carer-level expenditure data are unavailable, this is constructed at the LA level by dividing total ASC expenditure (net of capital charges and income from LA joint arrangements) by the number of clients. The number of clients includes users receiving any type of ASC service (from LTS to universal services) and carers. We also divide the number of clients by population aged 18 or older to obtain the proportion of people receiving ASC services across LAs, which we use as a control variable. As shown in Table 3, on average, LAs spend about £10,000 per client. LAs provide ASC services to about 16,000 clients every year (of which about 2,000 carers) covering 5.6% of the population aged 18 or older.

In addition, we use several control variables capturing both LTS user and population characteristics. We measure the proportion of LTS users who are female, whose ASCS questionnaire was translated into a non-English language, who receive some type of support (e.g., sensory support, learning disability support), and who received no help or some form of help to complete the questionnaire. We capture the socio-economic status of the LA population using the proportion of people who are house owners, who are in a routine occupation or unemployed, the proportion of households with a single person, and population density. We also measure the proportion of people entitled to social benefits relating to disability (disability living allowance and attendance allowance), income (income support, pension credit, and Personal Independence Payment) and employment (employment and support allowance). Further socio-economic variables are the index of multiple deprivation and its income domain. Table 3 provides some summary statistics for these variables.

### Instrumental variables

Finally, we use IVs constructed at the LA level (and discussed in the following Section 5). These are the council tax base per client, metropolitan authority dummy, the amount of missing council tax revenues per client, and the business rates tax base per client. Table 3 suggests that, on average, the council tax base across LAs amounts to almost 148 thousand domestic properties with a sale value between £68 and £88 thousand (according to the 1991 property valuation). Among LAs responsible for ASC, 23.9% of them are metropolitan authorities, while the rest includes unitary authorities (36.9%), London boroughs (21.6%), and counties (17.5%).

Missing council tax revenues across LAs reflect the difference between the actual amount of council tax revenues and the revenues that LAs could have raised had they chosen to increase the past council tax charge by the cap since the introduction of the freeze grant scheme in 2011/12. For example, in 2014/15, the council tax charge of LAs that took the freeze grant every year since 2011/12 (and, hence, never increased the charge) was at the same or lower level than their charge in 2010/11. Therefore, a certain increase of the charge in 2014/15 for these LAs would generate a lower extra amount of revenues compared to that generated by the same current charge increase had these LAs chosen to increase past charges by the cap (rather than taking the freeze grant). On average, since 2011/12, LAs lost almost £11 million (up to almost £800 per ASC client) in council tax revenues due to their past choices on council tax charges and participation in the freeze grant scheme. Finally, there are on average almost 5,000 businesses across LAs.

# Methods

Using the available data, we empirically implement a version of equation that estimates the total effect of ASC expenditure, illustrated in , at the LA level (rather than the carer level) as follows:

 

where *Carer QoLijkt* is the carer-reported QoL score of carer *i* in LA *j,* located in region *k* (=1,…,*K*) at time *t* (=1,…,*T*), *μ1* is the intercept, *expjtASC* is (publicly-funded) ASC expenditure per client (expressed in thousands of pound), *clientsjt* is the proportion of ASC clients over the population aged 18 or older, *Xijt* is a vector of control variables including carer characteristics, LTS users characteristics, and population characteristics (e.g., socio-economic deprivation), φ*1k* and *τ1t* capture region and time fixed effects, respectively, and *ε1ijkt* is the error term.

In , the marginal effect of ASC expenditure per client on carer-reported QoL is of key interest, and this is captured by *β1*+2*γ1*×*expjtASC*. A *β1*+2*γ1*×*expjtASC*>0 implies that a marginal increase in ASC expenditure per client across LAs improves the carer-reported QoL of an average carer. Moreover, this marginal effect can be estimated for both new and existing clients. The marginal effect experienced by new clients, for whom ASC expenditure increases from zero to £1,000, is equal to *β1*, while that experienced by existing clients, for whom ASC expenditure increases from some level by £1,000, is equal to *β1*+2*γ1*×*expjtASC*. In other words, by including ASC expenditure per client and its square, allows us to test the hypothesis of diminishing marginal returns of carer-reported QoL which would be possible if *γ1*<0: the marginal effect of ASC expenditure per client decreases as *expjtASC* increases.

Estimating is however challenging for two reasons. First, ASC expenditure is likely to be endogenous because of unobserved confounders, such as unobserved social care needs determining carer-reported QoL, and reverse causality, since lower outcomes may lead to higher ASC expenditure. Second, as eligibility for most ASC services in England is means-tested, the proportion of clients across LAs is one more endogenous variable to account for: it is a key determinant of ASC expenditure per client (as for a given ASC budget, more clients imply fewer services for each client) and it may potentially drive carer-reported QoL.

Therefore, regression includes three endogenous covariates: ASC expenditure per client, its square and the proportion of ASC clients. Following Longo et al. (2021) and Longo et al. (2023a), we instrument each of these variables using the council tax base per client and its square, and a dummy variable capturing the type of LA equal to one for metropolitan authorities. Longo et al. (2021) argue that the council tax base is likely to be relevant because it is a key determinant of local tax revenues that are used to fund local services such as ASC. Moreover, it is likely to be exogenous conditional on socio-economic status across LAs. LAs with a higher council tax base may attract wealthier populations with higher social care outcomes and lower needs. However, once the socio-economic status across LAs is controlled for, variation in the council tax base across LAs is likely to reflect historical urban features of each LA (e.g., existence of historical buildings, monuments, parks) that are independent from current social care outcomes and needs. Furthermore, the council tax base is unlikely to be endogenous because of its correlation with expenditures for other local non-ASC services. These are unlikely to determine the carer-reported QoL which is an ASC-specific measure of carer QoL.

In addition, following Forder et al. (2014) and subsequent studies (Longo et al., 2023a, Salas‐Ortiz et al., 2024), we use the type of LA as a further source of exogenous variability to instrument the endogenous variables. Forder et al. (2014) argue that the ASC eligibility policy and, in turn, expenditure is likely to vary systematically across LA types (instrument relevance) due to exogenous factors such as innate culture and market conditions that are shared across LAs within each type (instrument exogeneity). We use a dummy indicating only one type of LA, i.e. the metropolitan authority, to obtain a just-identified IV specification with three endogenous variables and three instruments.[[4]](#footnote-4) Unlike an over-identified model, a just-identified one produces estimates that are likely to be approximately unbiased even in the presence of weak instruments (Angrist and Pischke, 2008, 2009), which are a likely consequence in models with multiple endogenous variables (and instruments). With this empirical strategy, we estimate by two-stage least squares (2SLS), weighting observations for their sample probability (i.e. their survey weight), and clustering standard errors within LAs.

## Testing the validity of the instruments

The assessment of instrument strength in the presence of three endogenous variables and heteroscedasticity cannot be carried out using the standard rule of a first-stage F statistic greater than 10 (Andrews et al., 2024). Therefore, we implement the two-step procedure proposed by Andrews (2018), which is also valid in this case.[[5]](#footnote-5) The first step of this procedure estimates a coverage (probability) distortion, where the coverage probability captures the probability that the true parameter of the endogenous variable is included in the estimated Wald confidence interval. Put simply, the coverage distortion is estimated by comparing the Wald confidence interval on the estimated coefficient of the endogenous variables with the weak-instrument-robust confidence interval obtained using a linear combination test. Following Yogo and Stock (2002), we deem the instrument weak if the estimated coverage distortion is greater than 10%. The second step provides the estimated weak-instrument-robust confidence intervals which can be used in the case of a weak instrument.

In addition, we run an over-identification test to check whether the instruments are likely to be exogenous. As we use a just-identified IV specification with three endogenous variables and instruments, we run this test by adding one more LA type dummy equal to one for counties.

## Controlling for LA fixed effects

As a robustness check, we control for unobserved time-invariant heterogeneity across LAs using the following panel IV model:

 

where, now, *Zijt* includes only the variables in *Xijt* that vary over time across LAs, and *α2j* captures LA fixed effects (which absorb the region fixed effects).[[6]](#footnote-6) Again, we estimate by 2SLS, weighting observations for their sample probability, and clustering standard errors within LAs. In , *β2* is our key coefficient of interest capturing the marginal effect of ASC expenditure per client on carer-reported QoL. For example, *β2*>0 implies that £1,000 in ASC expenditure per client improves carer-reported QoL by *β2*.

As includes LA fixed effects, this regression analyses only time-variability in ASC expenditure per client (and the other variables) across LAs. Nonetheless, this variable may still be endogenous. The social care needs of existing clients (that potentially impacts both ASC expenditure and carer QoL) may indeed vary over time because of factors that we do not observe. For example, the unobserved severity of illness of an older care recipient may deteriorate over time determining the need for more expensive nursing care. In turn, moving a care recipient to a nursing home may impact the carer’s QoL.

Moreover, the exogenous variability in council tax base and LA type used to address endogeneity in is mostly between LAs rather than over time. As a consequence, these instruments cannot be used in due to unavailability to predict time-variability in ASC expenditure per client. To address endogeneity in we, therefore, propose a novel time-varying instrument. This is the amount of missing council tax revenues per client. We argue that time-variability in ASC expenditure can be explained by the amount of council tax revenues that were lost due to past decisions on the council tax charge (and participation in freeze grant scheme) over time. Time-variability in missing council tax revenues across LAs exist because choices on the council tax charge varies over time across LAs. We argue that historic decisions on council tax charge determining the participation of a LA in a ‘freeze grant scheme’ and the ‘capping policy’ are the key drivers of this variability since they had unanticipated consequences for the future capacity to raise revenues (as explained in Section 2.1.2). Therefore, conditional on current observed time-varying social care need and unobserved time-invariant heterogeneity across LAs (i.e. LA fixed effects), these historic decisions are unlikely to be related to current social care outcomes and need.

In particular, we argue that LAs that took the freeze grant more often or that increased the council tax charge below the cap were likely to experience a gradually weaker financial position as captured by missing revenues due to past choices on council tax charge. For example, of all LAs, consider two sub-groups in 2014/15 (our first financial year of data): a first sub-group of LAs that took the freeze grant every year since 2011/12 and a second sub-group that took the freeze grant only in 2011/12. The level of the council tax charge for LAs in the first sub-group (that always took the freeze grant up to 2014/15) either stopped at or was reduced below the charge level in 2010/11. Therefore, these LAs could make lower council tax revenues from their tax base in 2014/15 compared to the same LAs had they increased the charge by the cap every year from 2011/12 to 2013/14. For the same reason, they would also receive a lower freeze grant in 2014/15 as this was calculated using the charge in the previous year (2013/14). On the other hand, LAs in the second sub-group (that renounced the freeze grant from 2012/13 to 2014/15) would accumulate the increases in the council tax charge over time and most probably be in a stronger financial position relative to the first sub-group. Nonetheless, if these LAs increased the charge by a proportion below the cap in any year from 2011/12 to 2013/14, they would also experience lower council tax revenues in 2014/15 compared to the same LAs had they increased the charge by the cap every year from 2011/12 to 2013/14. Unsurprisingly, a lower charge last year (2013/14) implies lower revenues for any given charge increase this year (2014/15). On this basis, the time-variability in these missing revenues is mostly driven by past choices on council tax charge and participation to the freeze grant scheme, and by the cap.

Therefore, we use missing council tax revenues per client due to past decisions as an instrument for ASC expenditure per client.[[7]](#footnote-7) On the other hand, in , we now assume that the proportion of ASC clients is exogenous after the inclusion of LA fixed effects. We argue that our time-varying controls are likely to capture all information about service user and carers required by LAs to decide on the eligible needs that determine the *number* of ASC clients. However, the *proportion* of ASC clients (which compares the number of clients with the population) might be correlated with unobserved population characteristics acting as confounders (e.g., unobserved prevalence of dementia). We argue that LA fixed effects are likely to capture any of these potential unobserved confounders. For example, the prevalence of dementia, which is unobserved and probably correlated with the proportion of ASC clients, is likely to be captured by LA fixed effects since it is unlikely to vary rapidly year to year. After accounting for these factors, any residual time-variability in the proportion of ASC clients across LAs is likely to be due to exogenous local decisions (e.g., because of innate culture, market factors).

We test instrument strength and estimate weak-instrument-robust confidence intervals using Andrew’s two-step procedure. We also run an over-identification test by adding the number of businesses per client as an additional time-varying instrument (Longo et al., 2021). The number of businesses within a LA form the business rates tax base, where the business rates tax is another local tax that funds ASC services (see Section 2.1.2).

Finally, we expect the estimated coefficient on ASC expenditure in and to have the same sign. However, the magnitude of these estimates may not be directly comparable. As suggested in the econometric literature (e.g., Houthakker, 1965, Kuh, 1959), marginal effects estimated in a model analysing variability between units (LAs in this case) like is likely to reflect a long-run effect. On the other hand, the same estimate in a model analysing contemporaneous time-variability like is likely to capture a short-run effect. Therefore, we can expect the estimated long-run effect of ASC expenditure from to have the same sign but higher magnitude compared to the estimated short-run effect from .

## Further sensitivity analysis

We test the robustness of our results to alternative instruments in and . In , instead of the council tax base per client (and its square), we use the missing council tax revenues per client in one specification and the business rates tax base per client in another. As the business rates tax base exhibits some variation over time, we use it as an alternative to the missing council tax revenues in . Furthermore, we test the robustness of the results in and to controlling for non-ASC expenditure per capita. Finally, we check whether results change in when we omit the proportion of ASC clients by assuming LA fixed effects capture all its variability, or when we assume it is endogenous together with ASC expenditure per client and, therefore, instrument both these variables using the missing council tax revenues per client and its square.

## Exploring the channels of the carer-reported QoL effect

Regression is our primary specification of interest because it is likely to estimate the long-run carer-reported QoL effect of ASC expenditure per client for both new and existing clients. However, to investigate the potential channels through which this effect may exist additional analysis is needed. Therefore, as an additional analysis, we investigate the effect of ASC expenditure on channels as broadly captured by the domains of the carer-reported QoL measure including occupation, control over daily life, personal care, personal safety, social participation, and encouragement and support (Section 4.2 provides more details on these domains). We carry out this analysis by replacing the dependent variable in , the carer-reported QoL score, with the total (and unweighted) score of each domain.

In addition, we explore whether some potential channels that we observe and are more narrowly defined help explain the estimated QoL effect for each domain. These are caring time, care tasks, whether the caring role affects carer’s health, job and finances, and the average care-related QoL of LTS users across LAs. We include variables capturing these channels as controls to introduce a bad control bias (Angrist and Pischke, 2008, p. 47) in the estimate of the QoL effect for each domain: if ASC expenditure per client impacts carer-reported QoL via these channels, after controlling for them we will no longer estimate a significant coefficient on the ASC expenditure variable itself.

Furthermore, we examine to what extent ASC expenditure per client impacts these channels, except LTS user care-related QoL since analysed in other studies (Longo et al., 2023a, Longo et al., 2021), as follows:

 

where p*lijkt* is the probability that the dummy variable related to channel *l* (=1,…,L) is equal to one conditional on all covariates, and *F* is the cumulative standard normal distribution function. We estimate the probit regressions using a control function approach by maximum likelihood. This estimates simultaneously with three other regressions of *expjtASC*, (*expjtASC*)2 and *clientsjt* on instruments (council tax base per client, its square and the LA type dummy) and controls.

# Results

Table 4 column 1 includes the key results from our primary specification . We find that a £1,000-increase in ASC expenditure for a new client (zero expenditure) increases carer-reported QoL by 0.615 (8.5% of the average carer-reported QoL in 2021/22). For an existing client receiving the least expensive (minimum expenditure) or an average care package (mean expenditure), a £1,000-increase in ASC expenditure per client increases carer-reported QoL, respectively, by 0.558 or 0.303 (7.7% or 4.2% of the average carer-reported QoL). These results are statistically significant at the 5% level and are consistent with diminishing marginal returns to ASC expenditure. For an existing client receiving the most expensive care package (maximum expenditure), a £1,000-increase in ASC expenditure per client decreases carer-reported QoL by 0.362.[[8]](#footnote-8) This result, however, is only weakly statistically significant at the 10% level and it is not robust (unlike the other results) to a logarithmic functional form. Therefore, it should be interpreted with caution as discussed in Section A2.[[9]](#footnote-9)

To assess the validity of this specification, first, we test strength and exogeneity of the instruments. Using Andrews’ test,[[10]](#footnote-10) we estimate a coverage distortion that is always greater than 10%, suggesting that instruments (council tax per clients, its square and metropolitan authority dummy) are overall weak. Therefore, in addition to the standard Wald confidence intervals, we report in Table 4 column 1 95% confidence intervals that are robust to weak instruments. These two types of confidence intervals are substantially overlapping suggesting that standard inference on our key estimates is consistent with weak-instrument robust inference. As also Angrist and Pischke (2008, 2009) point out, this may suggest that estimates from a just-identified IV specification with instruments that have some but weak predictive power like are likely to be approximately unbiased. The Sanderson-Windmeijer under-identification test suggests that instruments have sufficient predictive power for all endogenous variables.

Moreover, Table 4 shows the results of some sensitivity analysis carried out on in column 2, 3 and 4. Results are robust to controlling for non-ASC expenditure (column 2), and the use of other instruments than council tax base per client (and its square) such as the missing council tax revenues per client (column 3) or business rates tax base per client (column 4). The full results of these analyses are in Table A4 and Table A5 and Section A3 provides a full discussion of the first-stage results.

Furthermore, Table 5 column 1 shows the results from regression that controls for LA fixed effects and uses the missing council tax revenues per client as an instrument. By including LA fixed effects, this regression is likely to estimate a short- rather than a long-run effect. We find a statistically significant estimate (at 5%) that, as expected, is lower in magnitude compared to : on average, a £1,000-increase in ASC expenditure per client increases carer-reported QoL by 0.058 (0.8% of the average carer-reported QoL). Also in this case, Andrews’ test[[11]](#footnote-11) suggests that the missing council tax revenues per client is a weak instrument. Thus, we report the 95% weak-instrument-robust confidence intervals which, again, substantially overlap with the Wald confidence intervals. Table 5 column 2 reports the results from using the business rates tax base per client as an alternative instrument to the missing council tax revenues per client. The magnitude of the estimate is robust (0.062) and the weak-instrument-robust confidence intervals suggest that this is statistically significant at the 5% level. Results remain robust to controlling for non-ASC expenditure per capita (column 3) and to assuming that the proportion of ASC clients is fully captured by the LA fixed effects (column 4) or endogenous (column 5). The full results of these regressions are reported in Table A6 and Table A7.

## Explaining the carer quality of life effect

To investigate the potential channels explaining the effect of ASC expenditure per client on carer-reported QoL, we estimate regression after replacing the carer-reported QoL score with the score of each of its domains. The top panel of Table 6 reports the key results of this analysis and suggests that all domains but personal safety are likely to be impacted by ASC services. To further explain these effects, we add additional controls to regression including caring time, care tasks, employment status, whether the caring role affects carer’s health, job and finances, and LTS user care-related QoL.[[12]](#footnote-12) The bottom panel of Table 6 suggests that these variables fully explain only the effect of ASC expenditure that exists via the personal care and social participation domain. However, they only partially explain the effect via the occupation, control over daily life and encouragement and support in the caring role domain.

Furthermore, regressions offers a better insight into the effect of ASC expenditure per client through these more narrowly defined channels. Table 7 shows the results from this regression in terms of the more policy relevant non-marginal changes in ASC expenditure per client, i.e. changes that are larger than £1,000 per client. We focus on non-marginal changes from zero to minimum ASC expenditure per client (amounting to £1,900), which could be thought as providing the least expensive care package to a new client, from zero to mean ASC expenditure per client (amounting to £10,600), which could be thought as providing an average care package to a new client, from minimum to mean expenditure (amounting to £8,700) and from mean to maximum expenditure (amounting to £12,000), which could be both thought as increasing ASC expenditure for an existing client.

We find that an increase in ASC expenditure is unlikely to change caring time patterns among carers. In addition, we find that providing a care package to a new client or increasing care for an existing client (receiving the least expensive care package) may reduce the probability of helping with transport services (e.g., car checks and repairs) and benefits or with paperwork and financial matters, while it may increase the probability of taking the care recipient out. We find also that providing a care package to a new client may reduce the probability to be full-time employed, which might be explained by a higher probability of retiring (although there is only weak statistical evidence), becoming full-time self-employed, and withdrawing from paid employment. Providing a care package to a new client or spending more on an existing client may reduce the probability of feeling tired, depressed, stressed, experiencing disturbed sleep and short temper, and of seeing the GP. Finally, providing a care package to a new client or increasing expenditure for an existing client may reduce the probability of experiencing financial difficulties.

# Discussion and conclusions

ASC services represent an important form of support for both service users and carers. This study finds that (publicly-funded) ASC expenditure per client improves carer-reported QoL. Our primary econometric specification estimates that the effect of ASC support on carers’ QoL is likely to be substantial: on average, £1,000 increase in ASC expenditure per client increases carer-reported QoL by 0.303, which is equal to 4.2% (=0.303÷7.229) of the average (in 2021/22). ASC services can generate this beneficial effect by improving carers’ ability to carry out enjoyable activities, control over their daily life, personal care, social participation, and feeling of being encouraged and supported with their caring role.

With the available data, we can only partially explain this detected carer-reported QoL effect. We find that ASC support is unlikely to change the time spent by carers with their care recipient. This is because it may help carers to substitute time-consuming care tasks such as dealing with transport services, benefits and financial matters with more pleasant tasks such as taking the care recipient out. This suggests the existence of complementarity between formal care and certain informal care tasks. Both theoretical (Stabile et al., 2006) and empirical studies (Balia and Brau, 2014, Carrino et al., 2018) show that this is possible in the presence of unmet need, which are widespread in the UK especially among older people (Ipsos MORI, 2017). ASC support may also improve the carer’s overall health and may reduce their need to see a GP with additional indirect benefits to the NHS. This suggests that ASC may have a direct effect on carers’ health-related QoL by, for example, reducing stress and improving sleep. It also suggests that carers may be a channel through which the ASC sector generates savings in the NHS that, if reinvested in more effective services, may improve population health (Longo et al., 2023b).

Moreover, we find that ASC support may provide carers with a greater range of employment choices, for example, by encouraging some of them to take on a full-time caring role and leave paid employment, by allowing some others to retire earlier or to commit themselves to a self-employed paid job. Finally, ASC support may reduce the carer’s financial difficulties caused by the caring role which suggests that ASC may impact the private economy by providing carers (and possibly their care recipients) with greater consumption opportunities.

In common with other recent estimates of the effects of ASC expenditure on care recipient’s QoL (Longo et al., 2023a), these results suggest that greater benefits for both carers and care recipients are likely to be offered by reallocating existing resources to expanding eligibility and increasing ASC expenditure for those with a currently lower intensity of care. In addition and also in common with more recent analysis of user care-related QoL (Salas‐Ortiz et al., 2024), the exploration of channels of effect suggests that there might be important beneficial effects, such as the impact on health issues due to caring role, which might not be fully captured in the currently available measures of carer QoL.

To our knowledge, this is one of the first studies that estimates the causal effect of publicly-funded ASC expenditure on carers’ QoL and that investigates its possible channels. Its contribution is substantial compared to the existing studies investigating a similar research question. Unlike Verbakel et al. (2018) and Rand et al. (2020) who use cross-sectional models to estimate associations, we implement an IV approach using panel data to estimate a causal effect. Unlike Zhang et al. (2021) who estimate the effect of ASC expenditure by comparing carers with non-carers (where non-carers can include individuals that also benefit from ASC services, such as short- or long-term users), our causal effect is obtained by comparing LAs and estimated counterfactual LAs that have exactly the same social care needs but with marginally different ASC expenditure per client. Moreover, Zhang et al. (2021) use ASC expenditure as a proxy for the ASC provision as a whole in their main analysis and use ASC expenditure per client for an ancillary robustness check. In our analysis, however, ASC expenditure per client is used to identify the causal effect on carer-reported QoL of an increase in either treatment intensity or eligibility. This is possible by modelling the diminishing marginal returns of ASC expenditure per client to carer-reported QoL (see Section 5).

Moreover, this is one of the first studies to analyse a causal impact on carer-reported QoL. This outcome measure was developed to capture carer-specific care-related QoL domains that ASC is expected to impact (Rand et al., 2012). This design makes our measure different from other subjective well-being measures used in the literature. Some studies use measures that are based on a single question asking to rate own life satisfaction (e.g., Chen et al., 2019, Van den Berg et al., 2014) or happiness (e.g., Bobinac et al., 2010, Costa-Font et al., 2023). Other studies use measures based on non-preference-based tools, such as the 12-item scaled version of the General Health Questionnaire (GHQ-12) capturing psychological well-being (e.g., Zhang and Bennett, 2024, Zhang et al., 2021). Unlike these, carer-reported QoL is desirable in the context of our study for three key reasons. First, by capturing care-related domains of QoL, it is more likely to be sensitive to the impact of social care interventions. Second, being sector specific, it helps alleviating the attribution issue, i.e. the possibility to incorrectly attribute changes in QoL that are not caused by ASC to changes in ASC services. This helps our empirical strategy to identify the true effect of ASC. Finally, the carer-reported QoL measure is the precursor of and is closely related to ASCOT-carer (Forder et al., 2016). ASCOT-carer is a validated tool and preference-based outcome measure recommended for the economic evaluation of social care interventions in the UK and other countries (Batchelder et al., 2019, Rand et al., 2015). Given the lack of data on ASCOT-carer in the public domain, carer-reported QoL is the only viable outcome measure for carers that future research can readily map to ASCOT-carer. This makes our results pragmatic to the extent they can reliably inform an assessment of the opportunity costs in the ASC sector.

Finally, our estimates of the causal effect of ASC expenditure on carers’ QoL and its possible channels add an important piece to the overall picture of the beneficial effects of increasing or reallocating public expenditure to ASC. The important and pressing policy question of the appropriate scale of public expenditure on ASC should recognise the likely causal effect on carers and their QoL. It should also account for the growing body of evidence of the range of other beneficial effects of ASC, which includes the impacts on care recipients’ care-related QoL (Longo et al., 2021, Longo et al., 2023a), the impact on other sectors, including NHS outcomes (Longo et al., 2023b, Martin et al., 2021), and on other outcomes such as paid production in the local economy. Therefore, this study contributes an important element to the emerging picture of the social value of the benefits of marginal and non-marginal changes in publicly-funded ASC expenditure, which can contribute to some implicit or explicit assessment of the marginal value of public funds for this sector (Longo et al., 2024) as this policy debate unfolds.

Although we provide estimates that are most relevant to the UK policy debate, the same policy choices are being faced in many other countries. For example, in addition to similar pressures on the public funding of the LTC sector, countries within the Organisation for Economic Co-operation and Development, also face a decline in the availability of informal care over time due to the historical decline in birth rates and the increasing female labour market participation (Joshua, 2017).

Our analysis has some limitations. First, our data on carers are from SACE, the only national survey specifically focusing on carers, which survey population however may under-represent youngest and oldest carers as well as older carers from ethnic minority background (Aznar et al., 2021). As discussed in Section A1, however, we are unable to find evidence suggesting that this under-representation may substantially impact the overall validity of our results. Finally, we are unable to explore the heterogeneity by carer characteristics in the estimated effect of ASC expenditure on carer QoL because the SACE survey is designed to stratify by local authority only. Therefore, the analysis of any sub-sample based on some chosen carer characteristics will lead to results that are unlikely to be representative of the survey or target population. Despite these limitations, SACE is well-suited to achieve our research goals. It provides a large sample of carers which allows us to draw conclusions that can be more safely extended to the target population. In addition, being solely focused on carers, SACE includes a larger amount of information (also on the care recipient) that makes our key identification strategy more secure and allows us to explore the possible channels generating the effect of interest. And, finally, our proposed methods can be applied to future versions of SACE addressing its current limitations as envisaged by Blake et al. (2023).

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# Tables

Table 1 – Descriptive statistics on carer-level variables.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variable | 2014/15 | 2016/17 | 2018/19 | 2021/22 | Diff 21 - 14 |
| Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| Carer | Carer-reported quality of life | 7.841 | 2.657 | 7.671 | 2.667 | 7.451 | 2.708 | 7.229 | 2.701 | -0.612\*\*\* |
| Male (ref) | 33% | 47% | 32% | 47% | 32% | 47% | 30% | 46% | 3.0%\*\*\* |
| Female | 67% | 47% | 68% | 47% | 68% | 47% | 70% | 46% |
| Aged between 18 and 64 (ref) | 50% | 50% | 48% | 50% | 48% | 50% | 48% | 50% | 2.4%\*\* |
| Aged 65 or older | 50% | 50% | 52% | 50% | 52% | 50% | 52% | 50% |
| White ethnicity | 89% | 32% | 89% | 31% | 85% | 36% | 85% | 36% | 3.7%\*\* |
| Non-white or unknown ethnicity (ref) | 11% | 32% | 11% | 31% | 15% | 36% | 15% | 36% |
| With some health condition (ref) | 57% | 49% | 60% | 49% | 62% | 49% | 61% | 49% | -3.7%\*\*\* |
| With no health conditions | 43% | 49% | 40% | 49% | 38% | 49% | 39% | 49% |
| Received help with questionnaire (ref) | 10% | 30% | 9% | 29% | 10% | 29% | 8% | 28% | 2.0%\*\*\* |
| Received no help with questionnaire | 90% | 30% | 91% | 29% | 90% | 29% | 92% | 28% |
| In caring role for less than 6 months | 1% | 7% | 1% | 9% | 0.5% | 7% | 1% | 8% | -0.03% |
| In caring role for more than 6 months (ref) | 99% | 7% | 99% | 9% | 99.5% | 7% | 99% | 8% |
| Care recipient | Aged between 18 and 64 (ref) | 31% | 46% | 33% | 47% | 35% | 48% | 35% | 48% | -3.5%\*\*\* |
| Aged 65 or older | 69% | 46% | 67% | 47% | 65% | 48% | 65% | 48% |
| Living with carer (ref) | 74% | 44% | 75% | 43% | 77% | 42% | 76% | 43% | -2.60%\*\* |
| Not living with carer | 26% | 44% | 25% | 43% | 23% | 42% | 24% | 43% |
| Dementia# | 35% | 8% | 35% | 6% | 35% | 7% | 35% | 9% | -0.2% |
| Sight or hearing loss# | 32% | 4% | 30% | 4% | 29% | 4% | 28% | 4% | -3.4%\*\*\* |
| Mental health problem# | 21% | 6% | 21% | 5% | 23% | 6% | 24% | 7% | 3.7%\*\*\* |
| Problems connected to ageing# | 38% | 6% | 34% | 6% | 32% | 5% | 31% | 6% | -6.6%\*\*\* |
| Learning disability# | 18% | 6% | 21% | 7% | 22% | 7% | 24% | 8% | 5.6%\*\*\* |
| Long-standing illness# | 40% | 5% | 40% | 5% | 39% | 6% | 38% | 5% | -1.9%\*\*\* |
| Alcohol or drug dependency# | 2% | 1% | 2% | 1% | 2% | 1% | 2% | 1% | 0.1% |
| Observations | 42,439 | 39,421 | 37,851 | 32,460 | 74,899 |
| Local authorities | 149 | 149 | 151 | 144 | 155 |
| SD=standard deviation, ref=reference category, Diff 21-14=mean difference between 2021/22 and 2014/15, #=not available at the individual level: 'Mean' and 'SD' are calculated across local authorities |
| Standard errors are clustered within local authorities. \*\*\* p-value<0.01, \*\* p-value<0.05, \* p-value<0.1 |

Table 2 – Descriptive statistics on carer-level variables capturing potential channels.

| Variable | 2016/17 |   | 2018/19 |   | 2021/22 |
| --- | --- | --- | --- | --- | --- |
| Mean | SD |   | Mean | SD |   | Mean | SD |
| Caring time | From 0 to 9 hours per week | 5% | 22% |   | 4% | 20% |   | 5% | 22% |
| From 10 to 19 hours per week | 7% | 25% |   | 6% | 24% |   | 7% | 25% |
| From 20 to 34 hours per week | 7% | 26% |   | 7% | 25% |   | 7% | 26% |
| From 35 to 49 hours per week | 8% | 27% |   | 9% | 28% |   | 9% | 29% |
| From 50 to 74 hours per week | 7% | 25% |   | 7% | 26% |   | 7% | 26% |
| From 75 to 99 hours per week | 8% | 27% |   | 8% | 27% |   | 7% | 26% |
| 100 hours or more per week | 37% | 48% |   | 40% | 49% |   | 37% | 48% |
| Varying time but under 20 hours per week | 3% | 17% |   | 3% | 17% |   | 3% | 17% |
| Varying time but 20 hours or more per week | 7% | 25% |   | 7% | 25% |   | 7% | 26% |
| Other amounts of time | 12% | 32% |   | 10% | 30% |   | 10% | 31% |
| Observations | 40,278 |   | 38,775 |   | 33,241 |
| Care task | Personal care | 69% | 46% |   | 71% | 45% |   | 69% | 46% |
| Physical help | 59% | 49% |   | 60% | 49% |   | 58% | 49% |
| Help with car services and benefits | 86% | 35% |   | 87% | 34% |   | 85% | 36% |
| Help with paperwork and financial matters | 86% | 34% |   | 86% | 34% |   | 86% | 35% |
| Other practical help | 93% | 25% |   | 92% | 27% |   | 94% | 25% |
| Keeping company | 83% | 37% |   | 83% | 37% |   | 84% | 37% |
| Taking out | 77% | 42% |   | 78% | 42% |   | 75% | 43% |
| Giving medicines | 77% | 42% |   | 78% | 41% |   | 77% | 42% |
| Keeping an eye | 91% | 28% |   | 92% | 28% |   | 91% | 28% |
| Giving emotional support | 85% | 36% |   | 85% | 35% |   | 85% | 35% |
| Any other help | 17% | 38% |   | 16% | 37% |   | 16% | 36% |
| Observations | 41,823 |   | 40,030 |   | 34,272 |
| Health issue due to caring role | Feeling tired | 77% | 42% |   | 79% | 41% |   | 79% | 41% |
| Feeling depressed | 44% | 50% |   | 46% | 50% |   | 49% | 50% |
| Loss of appetite | 13% | 34% |   | 14% | 35% |   | 14% | 35% |
| Disturbed sleep | 65% | 48% |   | 67% | 47% |   | 68% | 47% |
| General feeling of stress | 60% | 49% |   | 61% | 49% |   | 64% | 48% |
| Physical strain | 34% | 47% |   | 35% | 48% |   | 36% | 48% |
| Short tempered | 43% | 50% |   | 44% | 50% |   | 45% | 50% |
| Had to see own GP | 30% | 46% |   | 30% | 46% |   | 22% | 41% |
| Developed my own health conditions | 24% | 43% |   | 24% | 43% |   | 24% | 42% |
| Made an existing condition worse | 21% | 41% |   | 21% | 41% |   | 23% | 42% |
| Other issues | 3% | 18% |   | 4% | 18% |   | 3% | 18% |
| Health not affected | 9% | 29% |   | 8% | 28% |   | 8% | 27% |
| Observations | 41,407 |   | 39,662 |   | 34,018 |
| Employment status | Retired | 58% | 49% |   | 57% | 50% |   | 56% | 50% |
| Employed full-time | 8% | 28% |   | 8% | 27% |   | 9% | 29% |
| Employed part-time | 10% | 30% |   | 10% | 30% |   | 11% | 31% |
| Self-employed full-time | 2% | 13% |   | 2% | 13% |   | 2% | 14% |
| Self-employed part-time | 3% | 18% |   | 3% | 18% |   | 4% | 19% |
| Not in paid work | 21% | 41% |   | 22% | 41% |   | 21% | 41% |
| Doing voluntary work | 6% | 23% |   | 6% | 24% |   | 5% | 23% |
| Observations | 41,552 |   | 39,680 |   | 34,029 |
| Job issue | Not in paid employment due to caring role | 21% | 40% |   | 23% | 42% |   | 22% | 41% |
| Not in paid employment due to other reasons (e.g., retired) | 57% | 50% |   | 55% | 50% |   | 55% | 50% |
| No support with caring role needed from employer | 4% | 20% |   | 4% | 19% |   | 4% | 19% |
| Self-employed able to balance work and caring role | 3% | 18% |   | 3% | 16% |   | 3% | 16% |
| Observations | 39,861 |   | 37,846 |   | 32,748 |
| Financial issue due to caring role | 46% | 50% |   | 47% | 50% |   | 43% | 50% |
|   | Observations | 41,108 |   | 39,395 |   | 33,751 |
| Local authorities | 149 |   | 151 |   | 144 |
| SD=standard deviation |
| The number of observations varies across variables because of missing values. |
| Summary statistics for 2014/15 are not reported because the questions used to construct 'Health issue due to caring role', 'Job issue', and 'Financial issue due to caring role' were not included in the questionnaire prior to the 2016/17. |
| The number of local authorities in 2016/17 is 148 for the dummy variables capturing a health issue due to caring role and a job issue due to caring role. |

Table 3 – Descriptive statistics on local authority-level variables.

| Variable | Mean | Overall SD | Between-LAs SD | Within-LAs SD | Min | Max |
| --- | --- | --- | --- | --- | --- | --- |
| ASC-specific variables |
| ASC expenditure (£000) per client | 10.290 | 3.708 | 3.162 | 2.101 | 1.884 | 32.196 |
| ASC clients | 16,065 | 13,664 | 13,041 | 3,503 | 265 | 90,272 |
| Carers aged 18 or older | 2,082 | 2,449 | 1,899 | 1,517 | 45 | 31,775 |
| Prop. of ASC clients | 5.6 | 2.4 | 2.2 | 1.0 | 1.4 | 25.2 |
| Prop. of LTS users who are female | 60.2 | 4.0 | 2.5 | 3.1 | 35.1 | 82.4 |
| Prop. of LTS users whose ASCS questionnaire was not in English | 0.1 | 1.3 | 1.1 | 0.7 | 0.0 | 22.2 |
| Prop. of LTS users receiving sensory support | 1.5 | 1.2 | 0.9 | 0.8 | 0.0 | 7.6 |
| Prop. of LTS users receiving support with memory and cognition | 8.3 | 5.6 | 4.7 | 3.3 | 0.0 | 35.9 |
| Prop. of LTS users receiving learning disability support | 17.2 | 3.5 | 2.8 | 2.2 | 0.0 | 29.3 |
| Prop. of LTS users receiving mental health support | 11.2 | 6.6 | 5.2 | 4.0 | 0.0 | 60.6 |
| Prop. of LTS users receiving social support | 2.2 | 2.2 | 1.7 | 1.6 | 0.0 | 18.1 |
| Prop. of LTS users who received no help with questionnaire | 21.0 | 5.5 | 4.2 | 3.8 | 8.5 | 71.0 |
| Prop. of LTS users whose questionnaire was read by someone else | 46.6 | 5.2 | 3.9 | 3.6 | 13.3 | 65.9 |
| Prop. of LTS users whose questionnaire was translated verbally by someone else | 20.1 | 5.2 | 3.6 | 3.9 | 0.0 | 50.8 |
| Prop. of LTS users whose answers were written by someone else | 38.0 | 5.1 | 3.8 | 3.6 | 13.1 | 55.0 |
| Prop. of LTS users whose talked through the questionnaire with someone else | 28.6 | 4.1 | 3.0 | 2.9 | 0.6 | 45.5 |
| Prop. of LTS users whose questionnaire was completed by someone else | 9.6 | 3.0 | 2.1 | 2.1 | 0.0 | 24.7 |
| Population variables |
| Prop. of households with single person | 30.6 | 3.9 | 4.0 | 0.7 | 22.1 | 56.4 |
| Prop. of people who are house owners | 62.0 | 12.0 | 12.0 | 1.8 | 21.7 | 81.0 |
| Prop. of people who are in routine occupation | 11.4 | 3.4 | 3.4 | 0.5 | 2.5 | 21.0 |
| Prop. of people who never worked and are long-term unemployed | 6.8 | 2.9 | 2.6 | 1.3 | 2.6 | 16.1 |
| Population density (10,000 individuals per km2) | 0.2736 | 0.3191 | 0.3229 | 0.0205 | 0.0063 | 1.6097 |
| Prop. of people aged 18 or older entitled to Disability Living Allowance | 3.4 | 2.1 | 1.2 | 1.7 | 0.5 | 12.6 |
| Prop. of people aged 65 or older claiming Attendance Allowance | 13.6 | 2.3 | 2.1 | 0.9 | 6.3 | 21.2 |
| Prop. of people with income support or pension credit | 4.8 | 1.8 | 1.4 | 1.1 | 1.2 | 11.8 |
| Prop. of people aged 18-64 entitled to employment and support allowance | 5.4 | 2.0 | 1.8 | 0.7 | 1.6 | 12.9 |
| Prop. of people aged 18 or older entitled to Personal Independence Payment | 2.8 | 2.2 | 1.1 | 1.9 | 0.1 | 11.0 |
| Index of multiple deprivation | 23 | 8 | 8 | 1 | 5 | 46 |
| Index of income deprivation | 0.2 | 0.1 | 0.1 | 0.0 | 0.0 | 0.3 |
| Index of income deprivation affecting elderly | 0.2 | 0.1 | 0.1 | 0.0 | 0.1 | 0.5 |
| Region dummies |
| East Midlands | 6.1 | - | - | - | 0 | 1 |
| East of England | 7.3 | - | - | - | 0 | 1 |
| London | 21.6 | - | - | - | 0 | 1 |
| North East | 8.1 | - | - | - | 0 | 1 |
| North West | 15.3 | - | - | - | 0 | 1 |
| South East | 12.8 | - | - | - | 0 | 1 |
| South West | 9.8 | - | - | - | 0 | 1 |
| West Midlands | 9.4 | - | - | - | 0 | 1 |
| Yorkshire and The Humber | 9.6 | - | - | - | 0 | 1 |
| Instrumental variables |
| Council tax base | 147,927 | 117,938 | 116,483 | 5,383 | 8,065 | 683,977 |
| Council tax base per client | 11 | 5 | 4 | 2 | 2 | 38 |
| County | 0.2 | - | - | - | 0 | 1 |
| Metropolitan district | 0.2 | - | - | - | 0 | 1 |
| Unitary authority | 0.4 | - | - | - | 0 | 1 |
| London borough | 0.2 | - | - | - | 0 | 1 |
| Missing council tax revenues (£000) | 10,732 | 10,218 | 9,097 | 4,697 | 220 | 82,441 |
| Missing council tax revenues (£) per client | 799 | 647 | 532 | 392 | 31 | 4,901 |
| Business rates tax base | 4,714 | 4,975 | 4,220 | 2,553 | 490 | 47,728 |
| Business rates tax base per client | 0.4 | 1.0 | 1.1 | 0.2 | 0.0 | 13.6 |
| Observations | 593 |
| Local authorities | 155 |
| Time periods | 3.8 |
| SD=standard deviation, LAs=local authorities, ASC=Adult Social Care, LTS=long-term support, ASCS=Adult Social Care Survey |

Table 4 – Key results from regression and sensitivity analysis.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variable | 1 | 2 | 3 | 4 |
| Regression (4) |
| Council tax base, LA type | Council tax base, LA type | Missing revenues, LA type | Business tax base, LA type |
| ASC expenditure (£000) per client at zero | Coeff | 0.615\*\* | 0.615\*\* | 0.564\*\* | 0.427\*\*\* |
| 95% non-rob CI | (0.117 , | 1.114) | (0.119 , | 1.111) | (0.118 , | 1.010) | (0.109 , | 0.744) |
| 95% robust CI | (0.288 , | 2.301) | (0.289 , | 2.293) | (0.316 , | 0.902) | (0.186 , | 1.084) |
| Cov distortion | 47% | 47% | 5% | 28% |
| ASC expenditure (£000) per client at minimum level | Coeff | 0.558\*\* | 0.558\*\* | 0.508\*\* | 0.385\*\*\* |
| 95% non-rob CI | (0.109 , | 1.007) | (0.110 , | 1.005) | (0.112 , | 0.904) | (0.098 , | 0.672) |
| 95% robust CI | (0.263 , | 2.124) | (0.264 , | 2.072) | (0.288 , | 0.808) | (0.167 , | 0.980) |
| Cov distortion | 48% | 48% | 5% | 28% |
| ASC expenditure (£000) per client at mean level | Coeff | 0.303\*\* | 0.303\*\* | 0.259\*\*\* | 0.199\*\* |
| 95% non-rob CI | (0.064 , | 0.542) | (0.064 , | 0.541) | (0.073 , | 0.445) | (0.042 , | 0.356) |
| 95% robust CI | (0.146 , | 1.161) | (0.146 , | 1.132) | (0.005 , | 0.438) | (0.033 , | 0.698) |
| Cov distortion | 49% | 49% | 16% | 28% |
| ASC expenditure (£000) per client at maximum level | Coeff | -0.362\* | -0.362\* | -0.390 | -0.285\*\* |
| 95% non-rob CI | (-0.759 , | 0.034) | (-0.758 , | 0.034) | (-0.857 , | 0.077) | (-0.519 , | -0.050) |
| 95% robust CI | (-1.463 , | -0.142) | (-1.421 , | -0.142) | (-0.932 , | 0.342) | (-1.007 , | -0.107) |
| Cov distortion | 34% | 34% | 5% | 31% |
| Controls |   | Yes | Yes | Yes | Yes |
| Non-ASC expenditure per capita |   | No | Yes | No | No |
| Year fixed effects |   | Yes | Yes | Yes | Yes |
| Region fixed effects |   | Yes | Yes | Yes | Yes |
| Interaction year and region fixed effects |   | Yes | Yes | Yes | Yes |
| Observations |   | 152,171 | 152,171 | 152,171 | 152,171 |
| Hansen-Sargan over-identification test (p-value) |   | 0.293 | 0.281 | 0.224 | 0.363 |
| ASC=Adult Social Care, Coeff=estimated coefficient, 95% non-rob CI=95% Wald confidence interval, 95% robust CI=95% weak-instrument-robust confidence interval, Cov distortion=coverage distortion |
| The dependent variable is the carer-reported quality of life score. Regressions (4) includes three endogenous variables: ASC expenditure per client, its square and proportion of ASC clients. In column 1, the instruments are council tax base per client, its square and metropolitan authority dummy. The local authority type dummy for counties is added as one more instrument in (4) to run the over-identification test. |
| The controls include six carer-level dummies capturing carer characteristics (female, aged 65 or older, no health conditions, received no help with questionnaire, in caring role for less than 6 months), two carer-level dummies (aged 65 or older, not living with carer) and seven local authority-level continuous variables (proportion of carers with a care recipient having dementia, sight or hearing loss, mental health problem, problems connected to ageing, learning disability, long-standing illness, alcohol or drug dependency) capturing care recipient characteristics, 13 local authority-level continuous variables capturing long-term support user characteristics (proportion of users who are female, whose questionnaire was not in English, receiving sensory support, support with memory and cognition, learning disability support, mental health support, social support, who received no help with questionnaire, whose questionnaire was read by someone else, translated verbally by someone else, answers written by someone else, talked through the questionnaire with someone else, and whose questionnaire was completed by someone else), 11 local authority-level continuous variables (population density, index of multiple deprivation, proportion of households with a single person, people who are house owners, in routine occupation, never worked and are long-term unemployed, aged 18 and older entitled to Disability Living Allowance, aged 65 or older claiming Attendance Allowance, with income support or pension credit, aged 18-64 entitled to Employment and Support Allowance, aged 18 or older entitled to Personal Independence Payment) and six local authority-level dummies (three dummies indicating the more deprived quartiles of the income deprivation domain, and three dummies indicating the more deprived quartiles of the income deprivation affecting the elderly domain) capturing population characteristics. |
| Standard errors are clustered within local authorities. \*\*\* p-value<0.01, \*\* p-value<0.05, \* p-value<0.1 |

Table 5 – Key results from regression and sensitivity analysis.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variable | 1 | 2 | 3 | 4 | 5 |
| Regression (5) |
| Missing revenues | Business tax base | Missing revenues | Missing revenues | Missing revenues |
| ASC expenditure (£000) per client | Coeff | 0.058\*\* | 0.062 | 0.058\*\* | 0.031\*\* | 0.085\* |
| 95% non-rob CI | (0.007 , | 0.110) | (-0.021 , | 0.145) | (0.007 , | 0.109) | (0.002 , | 0.059) | (-0.003 , | 0.173) |
| 95% robust CI | (0.017 , | 0.148) | (0.010 , | 0.552) | (0.017 , | 0.146) | (0.006 , | 0.071) | (0.001 , | 0.371) |
| Cov distortion | 11% | 22% | 11% | 7% | 14% |
| Proportion of ASC clients (assuming endogeneity) |   | No | No | No | No | Yes |
| Proportion of ASC clients (assuming exogeneity) |   | Yes | Yes | Yes | No | No |
| Non-ASC expenditure per capita |   | No | No | Yes | No | No |
| Other controls |   | Yes | Yes | Yes | Yes | Yes |
| Year fixed effects |   | Yes | Yes | Yes | Yes | Yes |
| Local authority fixed effects |   | Yes | Yes | Yes | Yes | Yes |
| Interaction year and region fixed effects |   | Yes | Yes | Yes | Yes | Yes |
| Observations |   | 152,171 | 152,171 | 152,171 | 152,171 | 152,171 |
| Hansen-Sargan over-identification test (p-value) |   | 0.920 | 0.920 | 0.910 | 0.886 | 0.766 |
| ASC=Adult Social Care, Coeff=estimated coefficient, 95% non-rob CI=95% Wald confidence interval, 95% robust CI=95% weak-instrument-robust confidence interval, Cov distortion=coverage distortion |
| The dependent variable is the carer-reported quality of life score. In column 1, regression (5) includes one endogenous variable: ASC expenditure per client. This is instrumented using the missing council tax revenues per client. The business rates tax base per client is added as one more instrument in (5) to run the over-identification test. |
| The controls include six carer-level dummies capturing carer characteristics (female, aged 65 or older, no health conditions, received no help with questionnaire, in caring role for less than 6 months), two carer-level dummies (aged 65 or older, not living with carer) and seven local authority-level continuous variables (proportion of carers with a care recipient having dementia, sight or hearing loss, mental health problem, problems connected to ageing, learning disability, long-standing illness, alcohol or drug dependency) capturing care recipient characteristics, 13 local authority-level continuous variables capturing long-term support user characteristics (proportion of users who are female, whose questionnaire was not in English, receiving sensory support, support with memory and cognition, learning disability support, mental health support, social support, who received no help with questionnaire, whose questionnaire was read by someone else, translated verbally by someone else, answers written by someone else, talked through the questionnaire with someone else, and whose questionnaire was completed by someone else), seven local authority-level continuous variables (population density, index of multiple deprivation, proportion of people who are aged 18 and older entitled to Disability Living Allowance, aged 65 or older claiming Attendance Allowance, with income support or pension credit, aged 18-64 entitled to Employment and Support Allowance, aged 18 or older entitled to Personal Independence Payment) and six local authority-level dummies (three dummies indicating the more deprived quartiles of the income deprivation domain, and three dummies indicating the more deprived quartiles of the income deprivation affecting the elderly domain) capturing population characteristics. |
| Standard errors are clustered within local authorities. \*\*\* p-value<0.01, \*\* p-value<0.05, \* p-value<0.1 |

Table 6 – Key results on the potential channels generating the carer-reported quality of life effect.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Variable | Occupation | Control over daily life | Personal care | Personal safety | Social participation | Encouragement and support in caring role  |
| Without controlling for channels |
| ASC expenditure (£000) per client at zero | 0.120\*\*\* | 0.145\*\*\* | 0.135\*\* | 0.020 | 0.105\*\* | 0.150\*\*\* |
| ASC expenditure (£000) per client at minimum level | 0.106\*\*\* | 0.128\*\*\* | 0.119\*\* | 0.017 | 0.093\*\* | 0.134\*\*\* |
| ASC expenditure (£000) per client at mean level | 0.044\*\*\* | 0.052\*\*\* | 0.047\*\* | 0.005 | 0.040\*\* | 0.060\*\*\* |
| ASC expenditure (£000) per client at maximum level | -0.118\*\* | -0.146\*\* | -0.143\*\* | -0.027 | -0.099\* | -0.132\*\* |
| Observations | 114,061 | 114,864 | 114,916 | 115,200 | 115,115 | 113,941 |
| After controlling for channels |
| ASC expenditure (£000) per client at zero | 0.057\*\* | 0.073\*\* | 0.036 | -0.010 | 0.030 | 0.076\*\* |
| ASC expenditure (£000) per client at minimum level | 0.051\*\* | 0.064\*\* | 0.032 | -0.010 | 0.027 | 0.069\*\* |
| ASC expenditure (£000) per client at mean level | 0.021\*\* | 0.026\*\* | 0.013 | -0.006 | 0.012 | 0.034\*\*\* |
| ASC expenditure (£000) per client at maximum level | -0.057\* | -0.072\*\* | -0.037 | 0.003 | -0.025 | -0.056 |
| Observations | 101,476 | 101,936 | 101,991 | 102,158 | 102,135 | 101,385 |
| Reg=regression, ASC=Adult Social Care |
| The dependent variable is the score of each domain of the carer-reported quality of life measure. Each regression includes three endogenous variables: ASC expenditure per client, its square and proportion of ASC clients. These are instrumented using council tax base per client, its square and metropolitan authority dummy. |
| These regressions include the same controls used in regression (4) as well as year and region fixed effects and their interactions. |
| Standard errors are clustered within local authorities. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1 |

Table 7 – Impact of ASC expenditure per client on potential channels of the carer-reported QoL effect.

| Channel | Reg (6) |
| --- | --- |
| Zero to min ASC expenditure per client | Zero to mean ASC expenditure per client | Min to mean ASC expenditure per client | Mean to max ASC expenditure per client |
|
|  |
| Caring time | From 0 to 9 hours per week | -0.036 | -0.107 | -0.071 | 0.001 |
| From 10 to 19 hours per week | -0.007 | -0.024 | -0.017 | 0.004 |
| From 20 to 34 hours per week | 0.000 | -0.005 | -0.005 | -0.016 |
| From 35 to 49 hours per week | -0.009 | -0.031 | -0.022 | 0.008 |
| From 50 to 74 hours per week | -0.019 | -0.064 | -0.046 | -0.002 |
| From 75 to 99 hours per week | -0.071 | -0.214 | -0.143 | 0.004 |
| 100 hours or more per week | 0.046 | 0.222 | 0.176 | 0.014 |
| Varying time but under 20 hours per week | -0.006 | -0.023 | -0.017 | -0.006 |
| Varying time but 20 hours or more per week | 0.004 | 0.018 | 0.013 | -0.005 |
| Other amounts of time | 0.012 | 0.061 | 0.049 | -0.011 |
| Care task | Personal care | -0.013 | -0.049 | -0.036 | 0.022 |
| Physical help | -0.002 | -0.004 | -0.002 | 0.012 |
| Help with car services and benefits | -0.020\*\*\* | -0.121\*\*\* | -0.101\*\* | 0.047\* |
| Help with paperwork and financial matters | -0.018\*\*\* | -0.141\*\*\* | -0.123\*\*\* | 0.029 |
| Other practical help | -0.001 | -0.142\*\* | -0.141\*\* | 0.104\* |
| Keeping company | -0.007 | -0.019 | -0.013 | 0.031 |
| Taking out | 0.136\*\*\* | 0.617\*\*\* | 0.481\*\*\* | -0.023 |
| Giving medicines | -0.001 | 0.003 | 0.003 | 0.021 |
| Keeping an eye | -0.001 | 0.001 | 0.002 | 0.021 |
| Giving emotional support | -0.004 | -0.014 | -0.010 | 0.014 |
| Other help | -0.088 | -0.287 | -0.199 | 0.048 |
| Employment status | Retired | 0.049\* | 0.184\* | 0.135\* | -0.025 |
| Employed full-time | -0.129\*\* | -0.390\*\* | -0.261\* | 0.018 |
| Employed part-time | -0.013 | -0.045 | -0.033 | 0.004 |
| Self-employed full-time | 0.002\*\*\* | 0.014 | 0.011 | -0.005 |
| Self-employed part-time | 0.004 | 0.021 | 0.017 | -0.008 |
| Not in paid work | 0.009 | 0.034 | 0.024 | -0.023 |
| Doing voluntary work | 0.005 | 0.024 | 0.019 | 0.003 |
| Job issue | Not in paid employment due to caring role | 0.026\*\* | 0.117 | 0.092 | -0.038 |
| Not in paid employment due to other reasons (e.g., retired) | -0.014 | -0.055 | -0.041 | 0.013 |
| No support with caring role needed from employer | 0.004 | 0.022 | 0.018 | 0.002 |
| Self-employed able to balance work and caring role | 0.002 | 0.042\*\* | 0.040\*\* | -0.002 |
| Health issue due to caring role | Feeling tired | -0.027\*\*\* | -0.234\*\*\* | -0.207\*\*\* | -0.001 |
| Feeling depressed | -0.082\*\*\* | -0.421\*\*\* | -0.339\*\*\* | 0.016 |
| Loss of appetite | -0.038 | -0.125 | -0.087 | 0.027 |
| Disturbed sleep | -0.047\*\*\* | -0.280\*\*\* | -0.232\*\* | 0.000 |
| General feeling of stress | -0.051\*\*\* | -0.389\*\*\* | -0.338\*\*\* | 0.048 |
| Physical strain | -0.077\* | -0.294\* | -0.217 | 0.071\* |
| Short tempered | -0.087\*\*\* | -0.475\*\*\* | -0.389\*\*\* | -0.006 |
| Had to see own GP | -0.108\*\*\* | -0.433\*\* | -0.324\*\* | 0.013 |
| Developed my own health conditions | -0.045 | -0.158 | -0.113 | 0.038 |
| Made an existing condition worse | -0.046 | -0.166 | -0.120 | 0.017 |
| Other issues | -0.067 | -0.178 | -0.112 | -0.002 |
| Health not affected | 0.005 | 0.124\*\*\* | 0.119\*\*\* | 0.011 |
| Financial issue due to caring role | -0.086\*\*\* | -0.444\*\*\* | -0.358\*\*\* | 0.020 |
| The non-marginal change in ASC expenditure per client from zero to minimum level is about £1,900, from zero to mean level is about £10,300, from minimum to mean level is about £8,400, and from mean to maximum level is about £21,900. |

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1. The 2020/21 survey was postponed to the following year due to the Covid pandemic. [↑](#footnote-ref-1)
2. The definition of assets changes with the type of service to be provided. In the assessment of the eligibility for residential or nursing care, both savings and property’s value are considered ‘assets’, while only savings are taken into account for community-based social care. [↑](#footnote-ref-2)
3. Until 2014/15, the survey population included only carers known to the LA who received a need assessment or review in the 12 months prior to the sample being extracted by the LA (between June and September). From 2016/17 the survey population was extended to include all carers known to the LA regardless of the need assessment or review. [↑](#footnote-ref-3)
4. To test the robustness of the results to this choice, we also estimate an over-identified specification including all possible LA type dummies as instruments. These include the county dummy in addition to the metropolitan authority dummy, with the unitary authority dummy being the reference category. The London borough dummy is excluded from the instruments set because it is perfectly collinear with the London region dummy which is used as a control variable. [↑](#footnote-ref-4)
5. We implement this procedure using the Stata command twostepweakiv (Sun, 2018). [↑](#footnote-ref-5)
6. Regression does not include the square of ASC expenditure per client like in because an F-test of joint significance of the estimated coefficients does not reject at the 5% level the null hypothesis of no joint effect of ASC expenditure per client and its square, which instead is rejected in . [↑](#footnote-ref-6)
7. Following Longo et al. (2021), we divide the missing council tax revenues by the number of clients to replicate LAs’ funding approach as closely as possible. LAs in England are expected to allocate funding by prioritising services that must be guaranteed by law. ASC is one of these services and, therefore, LAs allocate to this sector a great part of the council tax revenues (Department for Communities and Local Government, 2017). The exact proportion of council tax revenues that LAs allocate to ASC is likely to be determined by the expected number of clients rather than people. Moreover, as expectations on clients are driven by local eligibility policy and level of need observable to LAs, once these have been accounted for, as we do, the number of clients can be argued to be exogenous to LAs given the legal requirements. [↑](#footnote-ref-7)
8. These results are robust to using all possible LA type dummies as instruments, i.e. the metropolitan authority and county dummy with the unitary authority dummy being the reference category (and the London borough dummy being part of the controls). [↑](#footnote-ref-8)
9. Table A2 includes the results of regression estimated by OLS. In this case, the estimated coefficient on ASC expenditure per client is downwardly biased as expected (Longo et al., 2021, p. 2565). [↑](#footnote-ref-9)
10. To implement Andrew’s test in , we assume the parameter on the proportion of ASC client (one of the three endogenous variables) is strongly identified implying that the test focuses on the parameter of the remaining two endogenous variables: ASC expenditure per client and its square. Therefore, the test is carried out using a bidimensional grid of parameters with its two dimensions as large as five times the Wald confidence interval of the parameter to test. Each dimension of the grid includes 100 nodes (i.e. parameters to test) such that, overall, the grid includes 10,000 nodes. The assumption of strong identification of the proportion of ASC client’s parameter helps us to reduce computational time. To test this assumption, we relax it and define a tri-dimensional grid (one dimension for each endogenous variable) including 1,000,000 nodes (100 nodes for each dimension). We find that results, available upon request, are robust. [↑](#footnote-ref-10)
11. To carry out Andrew’s test in , which has only an endogenous variable, we define an unidimensional grid that is as large as five times the Wald confidence interval on the estimated parameter and includes 1,000 nodes. [↑](#footnote-ref-11)
12. This regression analyses data from 2016/17, 2018/19 and 2021/22. This is because the 2014/15 SACE questionnaire did not include the questions that allow us to construct the additional controls capturing these channels. [↑](#footnote-ref-12)