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Home care market dynamics in England

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Executive summary

Introduction

- The market in England for home care, that is services provided to help with supporting the social care needs of individuals, is large, and worth upwards of £3bn a year. In 2020, there were over 10,000 providers of home care in England, employing over half a million people.
- However, despite this, little research exists as to the drivers of home care supply. Existing research in to the home care market is mainly of a qualitative nature, outlining the importance of the workforce and how geographical factors, e.g. urban/rural, local population needs, also affect supply. The quantitative literature has tended to focus on the impact of home care supply on health care utilisation, and has often used LA adult social care expenditure as the measure of supply.
- This report analysed the extent of the home care market in England, examining the market at a national, regional, local authority (LA) and small area level. Further, the report quantitatively analysed the drivers of supply at small area level and the factors which determined the likelihood of closure of a home care provider.

Analysis of home care supply in England

- The measure of supply utilised throughout was the count of the number of providers registered with the Care Quality Commission (CQC) to provide home care services. This measure does not include certain providers of home care that do not have to legally register with the CQC to provide care, e.g. personal assistants. Nonetheless, this measure is likely to be highly representative of supply overall. For example, we find that the count of providers at LA-level is highly positively correlated with both adult social care expenditure and social care workforce estimates.
- Using data on the number of providers in England for 2014-2018, we found that nationally there was a 15.6% rise in the number of providers, from 7,852 to 9,079. Despite this large level of growth, there was still a lot of turnover of firms: nationally, around one in six providers closed each year for 2014 to 2016, although this fell to almost one in ten for 2017. The level of openings and closures of home care providers in this period tended to be higher than the birth and death rates of all businesses in England.
- Regionally, the differences in growth of home care supply were stark: East of England, East Midlands, West Midlands and London had very strong growth of over 20%, whilst other regions had limited (South West), no (North West) or even negative (North East) growth.
- The average LA had 60 providers of home care in 2018, an increase of eight providers from 2014. Growth of home care provision was stronger in LAs with higher supply. Thirty-five LAs, mainly in

the North West and North East, had a fall in the number of home care providers and nineteen LAs had a very high growth rate in providers of more than 43.4%.

- However, whilst those LAs with negative growth did have above average closure rates, some LAs with high growth still had very high levels of provider closure. Thirty-nine LAs had a year where more than one in four providers closed and there were nine LAs where this occurred in two years (Bracknell Forest, Bury, Halton, Middlesbrough, South Tyneside, Tameside, Warrington, West Berkshire, Westminster). In contrast, 29 LAs had very high levels of openings of almost 30% or more, with five LAs having this occur twice (Bracknell Forest, Milton Keynes, Richmond upon Thames, Southwark and Warrington).
- Importantly, these findings could be as a result of market shaping and commissioning decisions, which do not necessarily indicate that the level of care provided had fallen (or increased). Overall, this provides an indication that there was less (or more) choice for service users in these LAs.
- Changes to home care supply are likely to be caused by changes in factors which drive the market, such as demand (e.g. population, needs), local authority policies (e.g. expenditure) and supply factors (e.g. unemployment).
- There is a strong correlation between population of older people (65+) in a LA and both the number of home care providers and openings and closures of providers. There is a weak positive correlation between growth rates in older population and home care supply. There is a weak negative correlation between LA adult social care expenditure and both home care supply and turnover of providers – where less is spent there is a higher supply and a greater number of closures and openings. When separating LAs by demand or LA expenditure quartile, there is a positive correlation between level of supply and number of closures.
- At small area market level, there is evidence that the availability of choice of home care provider is strong. A large percentage of small markets (41.6%) have no providers of home care located within them and 84.8% of small markets have two or fewer providers. However, whilst the average small area market has only 1 provider located within it, there are on average 11, 32 and 60 providers within 5, 10 and 15 minutes of the small market, respectively. At a radius of 15 minutes, only 2.2% of small markets have access to two or fewer providers.

Quantitative analysis of home care supply and likelihood of provider closure

- From theoretical models of supply and probability of closure, we developed the following hypotheses to analyse using quantitative methods: 1) that the bigger the market the more the number of firms; 2) that the higher the costs the fewer the number of firms; 3) the higher the

quality of a provider the lower the likelihood of closure; and 4) the greater the level of home care competition faced by a provider the greater the likelihood of closure.

- For the small area supply analysis, we found that demand (population, population 85+ rate, measures of income and need) and supply factors (rurality) in the small area or LA it was located in significantly influenced supply. This confirmed hypotheses 1 and 2.
- We further found that higher levels of supply in the vicinity of the small market reduced the level of supply (hypothesis 4). However, at greater distances to the market, i.e. above 30 minutes, greater nearby supply increased the level of supply in the small market. This may provide indication of average market size of a provider being around 30 minutes in distance, wherein any further expansion of supply beyond this requires an organisation to set up a new location to supply from.
- The marginal effects of competition were fairly strong: a one per cent rise in the supply of time-weighted providers within 10 minutes of the small market would reduce supply in the market by 6.9%. This indicates that it would require 6 new providers to locate at a 10 minute distance of the average small market to reduce by one the number of providers in the small market.
- These findings were robust to the inclusion of additional variables (level of informal care, LA unit cost of home care provision) and to controlling for the simultaneity between supply in the small market and nearby using instrument variables (IV) methods, including a dynamic panel model which included previous year's supply at small area level as an independent variable.
- Results from the closure analysis confirmed hypotheses 3 and 4: home care providers with higher quality are significantly less likely to close and those facing higher levels of competition significantly more likely to close.
- Higher needs levels of the population significantly reduced the likelihood of closure, whilst providers part of bigger organisations were more likely to close than single owned providers. Greater nearby care home bed supply also significantly reduced the likelihood of closure.
- The marginal effects of competition suggested that a one per cent increase in the number of time-weighted providers within 10 minutes of the location of a provider would increase the likelihood of that provider closing by 4.4%. These suggest that if a new provider located next to the existing provider the likelihood of the existing provider closing would increase by 25.5%. A new provider locating 10 minutes from the existing provider would increase likelihood of closure by 8.1%.
- These results were found using IV methods which controlled for the simultaneity between provider closure and both quality and competition. The results were also robust to the inclusion

of additional variables that could influence closure (median LA wage, age of provider, Carers' allowance uptake, LA unit cost).

Policy implications

- Despite good access to home care supply for much of the country, there are areas where there is a lack of choice of provider. These areas are more likely where there is a lower demand for home care. Policy to target areas of lower demand/supply may be required.
- High levels of competition in the supply of home care will put pressure on the supply of social care workforce. There is high turnover of staff in social care and much of the workforce that moves jobs will remain in social care. It is possible that higher competition could drive down the price for home care whilst driving up local social care wage, putting further pressures on local home care market supply.
- It is tentatively suggested from the findings that average market size is around 30 minutes from the location of the home care provider. This will vary given staff do not necessarily need to be located close to the provider's registered location.
- The results suggest that the CQC quality rating system successfully works as a system for providing quality information to consumers in the home care market. Closure occurs for those home care providers that have poorer quality, because of consumer choice and/or through the CQC regulatory process. Closure of providers have implications for continuity of care.
- Higher competition from alternative providers increased the likelihood of closure of a provider.
- A good level of firm turnover is indicative of a healthy market. However, continuity of care is an important part of (high quality) social care provision. As such, the juxtaposition between continued improvement via Schumpeterian creative destruction and high quality, continuous, care suggests that home care markets would appear to be difficult for LAs to market shape.
- Overall, markets need to be carefully managed if they are to a) provide choice to the consumer b) create a market with continuous improvement and c) be able to provide continuity of care without providers being driven out of the market.

1. Introduction

Social care policy in the UK, and elsewhere, has increasingly moved toward the provision of care in the home (Pavolini and Ranci, 2008; Gori et al., 2015). Approximately 240,000 people a week in England receive (public-funded) home care support for their social care needs, helping to improve their outcomes (UKHCA, 2019; Forder et al., 2018). Yet, despite this, very little is known about the supply dynamics of home care providers in England. This report assesses the extent of the market and quantitatively analyses the determinants of market supply and of provider closure.

1.1 Demand for home care

Demand for social care comes from both public and private sources. Spending on adult social care from the public purse amounted to over £20bn in 2016/17, with short and long term support provided to over one million people aged 18 and over (NAO, 2018). The majority of these were supported in their own home and over £7bn of total adult social care spend was on the provision of support at home in the short and long term, £2.4bn directly on home care (NAO, 2018). The size of the private market for adult social care is unknown, although it was estimated at £10.9bn for all adult social care in England for 2016/17 with the home care market estimated at £660m for 2017/18 (NAO, 2018; UKHCA, 2019). The private side of the market is a conventional market system, with private consumers sourcing their care from available providers of care, albeit that purchasing decisions are often made under distress (Forder and Allan, 2014). The public side of the market is a quasi-market (Bartlett et al., 1994).

Local authorities (LAs) have a statutory responsibility to support those requiring care. Under the Care Act 2014, support from LAs is subject to meeting needs and means eligibility criteria.[1] LAs are likely to have a dominant purchasing position in local markets because of the size of their demand (Allan et al., 2021). Commissioners from LAs tender for services competitively, usually under a 'time-and-task' process where providers will be paid a per-hour rate for tasks that need to be completed in a specified time. Some LAs are modifying their approach, e.g. outcomes based approaches (Bennett et al., 2018). Many individuals supported by their LA will receive a Direct Payment, allowing them to personally decide on how to spend their funds. In 2016/17, £1.8bn was paid directly to service users to spend on their social care needs (NAO, 2018). Similarly, individual service funds enable a lump sum of care funds to be given to the provider and then decisions on how best to meet a service

[1] National eligibility criteria are used to assess if people have needs which are eligible for social care, although LAs can provide care to those below this threshold of needs. In terms of the financial assessment, individuals with more than £23,250 in savings, excluding the property they live in for home care, will have to pay for their own care. Individuals with savings between £14,000 and £23,250 will be supported by LAs but will contribute to the costs of their care and those with savings under £14,000 will be fully supported by LAs (National Audit Office, 2018).

user's needs given the providers' ability to supply services can be established in discussions between the two parties. These alternative methods can be better from the provider point of view, as they can provide more certainty, therefore enabling them to better reward staff, e.g. salaried contracts, training, higher pay.

1.2 Supply of home care

The supply of home care is disaggregated with over 10,000 providers providing care at the end of 2020. As elsewhere, e.g. USA, the number of home care providers has increased rapidly over time (Wang et al., 2017; Allan, Roland, et al., 2021). In the US the median size of home care markets, measured as the median distance from provider to service user, is around 20 miles and the number of very local areas not served by providers has decreased over time (Wang et al., 2017). However, for England there is a lack of information available on the size of providers and the market served. Previous research of home care providers showed that although many supplied services within LA boundaries, a number also worked across LAs (Matosevic et al., 2001).

Staff are the main component in the supply of home care. Over half a million people were employed in the provision of home care across England in 2019/20, and this was an increase of a fifth from 2012/13 (Skills for Care, 2020). Almost half of these staff were employed on zero hours contracts, i.e. no guaranteed hours of work, and the average wage of a care worker in the independent sector of home care was £8.94 per hour (Skills for Care, 2020). However, as is the case for many other countries, the size of the adult social care workforce has not kept pace with the population growth of older people (OECD, 2020). There is also a high level of staff turnover and job vacancies across adult social care in England and these are particularly high in home care (Skills for Care, 2020).

In addition to those employed by home care providers, personal assistants (PAs) are alternative providers of social care services in the home. PAs are directly employed by service users or self-employed. PAs are treated differently to home care providers in that they do not need to be registered with the national regulator to provide care (see below). This is a growing market, with an estimated 105,000 PAs employed in 130,000 jobs and only a small amount of information is available about this market (Skills for Care, 2019; Skills for Care, 2020).

Providers of home care in England are regulated by the Care Quality Commission (CQC). Not all providers of home care need register to provide home care services, such as PAs who are directly employed by service users. Providers that employ staff to supply home care services to individuals must register with the CQC by law, and as such, the national register of health and social care providers contains information on all registered providers of home care, i.e. all organisations employing staff to provide home care services.

Home care providers are given a rating at to their quality of care and can be rated as 'Inadequate', 'Requires improvement', 'Good' or 'Outstanding'. The vast majority of home care providers are rated as 'Good', 82% in 2019 and 2020, with only a small proportion rated as either 'Inadequate' or 'Outstanding' (CQC, 2020a). However, changes in ratings do occur over time, .e.g. 56% (22%) of providers originally rated as 'Requires improvement' ('Good') were rated as 'Good' ('Requires improvement') upon a second rating (CQC, 2017).

The CQC monitors the quality of all adult social care providers in the same way using required information from providers, feedback from service users, ongoing monitoring and inspections (CQC, 2020b). The CQC has powers to take enforcement action (civil or criminal proceedings) where providers are in breach of regulations or certain aspects as set out in law where individuals are in danger of harm. If a provider is failing to meet, or not meeting regularly, the legal standards required then they must provide an action plan to outline how they will improve and will be reinspected. Providers providing a service considered 'Inadequate' overall or consistently for one key area of care over time will be placed into special measures. Ultimately, the CQC can close an adult social care provider (CQC, 2020b).

1.3 Previous literature

There is a small, but growing, literature analysing home care supply in the UK. At a descriptive level there is evidence that workforce issues are fundamental for home care providers, e.g. changes to minimum wage, payments for travel time, recruitment and retention (Bottery et al., 2018; Allan and Darton, 2020). In addition to this, location was also raised as a potential problem for providers, with rurality increasing travel time costs and ability to provide a service, multicultural locations requiring bilingual staff and deprived areas potentially requiring a doubling up of staff and increased social care needs of service users, i.e. complications from comorbidities (Bottery et al., 2018).

Given the lack of information on home care provision in England, most of the empirical literature looking at home care supply in England to date has utilised public funding data, e.g. LA expenditure on adult social care services or number of people/hours supported, i.e. met demand, as the indicator of supply (e.g. Fernandez and Forder, 2008; Seamer et al., 2019). The pro to this measure is that it can include expenditure on direct payments and so will to some extent include the PA home care market. The major cons to this measure of home care is that there is no indication of how supply differs across markets, i.e. number and size of providers, nor is there any inclusion of the self-funder side of the market. A few studies have utilised workforce as a measure of home care or adult social care at the LA-level (Hall et al., 2017; Liu, 2021) and two studies have utilised counts of providers as a measure of home care supply (Allan, 2021; Allan, Roland et al., 2021). The former measure will

take into account the self-funder portion of the market, but these studies are at LA-level and therefore differences in supply at a smaller level are more difficult to ascertain. The latter measure of home care supply directly measures the number of providers, i.e. competition, as well as controlling for the self-funder side of the market. Given the location of providers, the measure can also be used at a much more granular level. The drawbacks to this measure are that it will not take into account the PA market nor does it provide any information on the size of the providers. Nonetheless, this is the best measure of home care supply available for all providers in England currently used in the empirical literature.

Most of the quantitative analyses examining home care supply have done so through incorporating it in an overall assessment of the impact of adult social care supply as a whole on health care use (Crawford et al., 2021; Seamer et al., 2019; Liu et al., 2021). These have found limited evidence of the impact of social care on health care utilisation. For example, Liu et al. (2021) found no consistent evidence that adult social care expenditure or workforce supply reduced hospital admissions or stays. Two studies have considered the effect of residential care and home care supply on health care separately (Fernandez and Forder, 2008; Allan, Roland et al., 2021). Forder and Fernandez (2008) found that social care reduced health care use, measured by length of stay, readmission rates and delayed discharges, with residential and nursing home supply having a greater impact than home care, which weakly influenced emergency readmission rates. Allan, Roland et al. (2021) measured home care supply using a distance-weighted count of the number of providers and, controlling for LA adult social care expenditure per capita, found that home care supply in England significantly reduced delayed transfers of patients from hospital. A further study found some evidence of a complementary relationship between care homes and home care, with performance of the former, measured inversely with closures, being improved by greater home care presence when controlling for quality, needs and income (Allan, 2021). This is contrary to the substitution that has occurred between the use of home- and community-based services over time and nursing home stays (Kane et al., 2013; Young et al., 2015).

One analysis to date has looked to assess the reason for differences between home care supply and demand (Hall et al., 2017). The authors used each LA's share of national workforce hours as a measure of supply and Relative Needs Formula share as the measure of demand. Their analysis found that in areas with higher demand than supply there were significantly greater additional hours worked (i.e. not contracted hours), fewer adult social care job vacancies and staff had been in post for a shorter period of time.

This report extends the existing literature for England on the supply of home care. First, we look to describe the market in detail at national, regional, local authority (LA) and small area level, examining differences in availability of home care provision and potential reasons for the differences, in particular demand, policy and supply factors. Second, we report on the findings from a small area quantitative analysis of market supply, analysing the relationship that local and nearby demand and supply factors have on the number of providers of home care in a market. Third, we report on a quantitative analysis at the provider level examining the factors that influence the likelihood of closure of a home care provider. As outlined above, the size of home care providers and where they provide services is unknown. We utilise regulator data on the number of providers and their location to describe and measure home care supply, noting the caveats to this measure described above.

The rest of the report is organised as follows. Theoretical models of home care supply and closure are considered in the next section, including discussion of both provider location and quality. A description of the data used in the analyses that follow is then provided, including discussion of how home care supply was measured. The empirical strategy for the two quantitative analyses is then briefly discussed before the findings are presented for each of the three analyses: 1) descriptive analysis of home care markets at national, regional, local and small area level; 2) quantitative analysis of market supply; and 3) quantitative analysis of the determinants of closure. These findings are then discussed before a brief conclusion to the report.

2. Theoretical considerations

In the publicly-funded part of the market, where LAs will have a dominant position, domiciliary care providers could be considered price takers to a large extent and therefore are more likely to compete in quantity. Costs will tend to be homogenous, with staff paid at or close to the National Living Wage (NLW) and two similarly located providers will face similar transport costs (also see discussion of provider location below). Further, given the product, no arbitrage is possible, i.e. one cannot buy the service and then sell it elsewhere. As such, we can generalise the market for home care following a simplified Cournot model as developed by Sutton (2007).

Consider a two-stage game where N_a firms ($N_a \geq 2$) decide whether to enter or not enter the market for domiciliary care. Any provider that chooses not to enter earns zero economic profit. Providers that enter the market face an entry cost ω from stage one, and in stage two the providers that enter compete for consumers. Providers produce a homogenous product and face constant marginal costs $w \geq 0$.

Assume that consumers each have a Cobb-Douglas utility of the form:

$$U = dc^{\delta} z^{1-\delta} \quad (1)$$

Where dc is the consumption of domiciliary care and Z the consumption of all other goods. Consumers will spend a constant proportion δ of their income on domiciliary care, i.e. irrespective of the price of domiciliary care.[2]

Total consumer expenditure on domiciliary care is M, which is a measure of market size and therefore market demand can be represented as:

$$DC = \frac{M}{p} \quad (2)$$

Where $DC = \sum dc_i$ is the total quantity of domiciliary care consumed and therefore also equals the total supplied by all firms. Assuming firms enter stage two of the game, profits for firm j are equal to:

$$\pi_j = \left(\frac{M}{\sum dc_i} - w\right).dc_j \quad (3)$$

Differentiating with respect to quantity produced for the first order condition to maximise profits gives:

$$\frac{\partial \pi}{\partial dc_j} = -\frac{M}{(\sum dc_i)^2}.dc_j + \frac{M}{\sum dc_i} - w = 0 \quad (4)$$

Given $\sum dc_i = DC$ and $dc_j = \frac{DC}{N}$ and summing over all j we find that:

$$DC = \frac{M}{w}.\frac{N-1}{N} \quad (5)$$

Which implies that:

$$dc_j = \frac{M}{w}.\frac{N-1}{N^2} \quad (6)$$

And:

$$p = w.\frac{N}{N-1} \quad (7)$$

Substituting (4), (5) and (6) into (2), remembering that $N \geq 2$ and solving gives:

[2] It is assumed, for the case where only one firm enters, that there is an alternative (perfect) substitute for domiciliary care, where at a price p_{CH} consumers will be indifferent between receiving domiciliary care and the substitute. In the market for domiciliary care we can consider this alternative substitute to be a move in to a care home. If $p > p_{CH}$ no purchases of dc will be made.

$$\pi_j = \frac{M}{N^2} \tag{8}$$

The profits of firm j that enters the market will be dependent on market size (total consumer expenditure) and number of providers, subject to the entry costs involved. The total number of firms in the market will depend on market size, price (marginal costs) and the entry cost, i.e. firms will enter so long as $\frac{M}{N^2} \geq \omega$. The number of providers is thus endogenous to the model.

This simple theoretical model of domiciliary care has two implications. First, in equilibrium, as the number of providers increase so price falls to the perfectly competitive price, i.e. equal to marginal cost, and second, that increases in market size increase the number of providers, although less than proportionately, i.e. output per firm also increases (e.g. Campbell and Hopenhayn, 2005).[3]

A further consideration is that in the model price will freely move towards marginal cost as N increases. Yet, as we alluded to earlier in the section, in the observed market LAs will have a dominant purchasing position and greatly influence price. There have been suggestions that LAs are not paying a 'fair' price for care and only cover marginal costs (Bolton and Townson, 2018). This model shows how prices in a social care market could naturally fall to the competitive marginal cost price even if LAs did not have a dominant purchasing position (although price at marginal cost includes normal profit).

2.1 Provider location

In addition to market size, where providers will locate is also of interest for home care. Generally, if there is price competition, then firms producing the same (undifferentiated) product will be driven to locate as far away as possible from each other and serve distinct markets (d'Aspremont et al., 1979). It has been argued above that it is more likely that home care providers are competing in quantity rather than price and further providers will compete with one another in overlapping markets, i.e. supply services across markets from one location. Andersen and Neven (1991) developed a Cournot model where all firms faced constant marginal costs and supplied across a geographical market with linear demand. Supplying the good is subject to transport costs which further make arbitrage impossible (fitting with the home care market).[4] In the n-firm model with linear transport costs, i.e. increasing linearly in distance, the authors proved that market equilibrium will have all firms centrally located and earning zero economic profits. This finding is subject to price

[3] We are unable to examine this empirically given the data available, i.e. the unit of measurement for size of supply in the analysis that follows is number of providers.

[4] This considers a market to be of size X, which in the price competition models discussed would be separated in to distinct markets of size x_1, x_2,…x_n by n firms.

being sufficiently high relative to transport costs. Therefore, where transport costs are sufficiently high, a lack of agglomeration is possible.

Gupta et al. (1997) extended this finding of agglomeration for a wider distribution of consumer demand, i.e. not just linear, finding central location agglomeration only occurs if demand is symmetrically distributed. Mayer (2000) showed that when production costs vary across the geographic market (in addition to transport costs) then the central agglomeration finding will not hold unless the central location is where production costs are minimised. With linear production costs, i.e. increasing across the geographical market from one end point to the other, there is a tendency to agglomeration where costs are lowest. With concave production costs, as might be expected in the real world, e.g. higher wages in a large city, Mayer found that firms will disperse geographically, although higher transport costs will reduce the level of dispersion.

2.2 Provider quality

The model developed in Mayer (2000) allowed production costs to vary, which is likely to occur if there is quality differentiation in a market. The model developed and presented earlier in this section assumed a lack of difference in quality, i.e. a homogenous product. For home care generally in England there is likely to be little difference in the production costs to firms within the same market, e.g. staff being incentivised to move providers for a few pence an hour extra (Bottery et al., 2018). However, there is evidence for some areas that it is difficult to recruit staff due to high employment (Bottery et al., 2018; Allan and Darton, 2020). This latter finding may suggest production cost differences could exist within geographical markets, yet we would propose that areas facing specific issues are likely to be fairly distinct markets on the whole, i.e. not separable into further smaller markets.

Nonetheless, as outlined in the introduction, there are variations in observed quality ratings between providers, suggesting that the market could be considered vertically differentiated. With both costs and revenue rising with quality the relationship between profits and quality is not simple (Tirole, 1988). However, it has been shown that with vertical differentiation price above marginal cost is possible with a range of quality and profits being made by firms given certain assumptions (e.g. Shaked and Sutton, 1982; Gal-Or, 1983).

2.3 Provider withdrawal

As price falls, as has been seen on the public-funded side of the market in recent years, economically one might expect the market to diminish in size as firms will no longer be able to afford to stay in the market. However, it has been shown there need not be immediate withdrawal of firms because of an hysteresis effect on investment decisions if there is either a sunk cost to (re-)entry or an exit cost

associated with withdrawal from the market, or both (Dixit, 1989). This could explain why in social care there seems to be the constant threat of provider withdrawal – public funding commissioning decisions can be made which keep the price at a point where active firms remain active despite being below variable costs, but not low enough to lead to withdrawal from the market.

The self-funding market will also explain in part why withdrawals do not occur – prices in this section of the market can be above perfectly competitive levels because of asymmetric information (Akerlof, 1970; Salop, 1976; Allan et al. 2021). The extent to which providers will use this market power is unknown. As in the English care homes market (Forder and Allan, 2014), the majority of providers are for-profit. The motivation of providers is unknown, but evidence suggests that there is likely to be at least some level of altruistic motive in provision, subject to profits being made (Matosevic et al., 2001; Kendall et al., 2003; Schlesinger and Gray, 2006; Allan and Darton, 2020). Generally, therefore, social care providers have tended not to be purely driven by profit (Knapp et al., 2001; Netten et al., 2001; Kendall et al., 2003), although this may increasingly be open to question with the increasing presence of large chain providers (Burns et al., 2016). Overall, we would expect at least some use of market power by providers and this could potentially be caused by providers being pushed towards charging higher prices through the effect of public authority commissioning decisions on price (Allan et al., 2021).

Whether there are differences in the ability to use market power between care home and home care providers is also unknown. Certainly, one would expect that longer term support at home would allow individual consumers to gain knowledge of the market. Further, the ability to change provider is a lot more prevalent than in care homes, where moving home is difficult and can have negative implications which need to be carefully considered (Jolley and Holder, 2012). However, for short term, unexpected, demand for home care from self-funders it is likely that the same forms of asymmetric information could exist, at least to some extent.

In addition to economic unsustainability, regulation of quality is a second reason why provider withdrawal may occur (see section 1.2 above). We can assume that the probability of closure of a home care provider is equal to:

$$prob(C_j = 1) = 1 - \Big(prob(\pi_j \geq 0).prob(A_j = 0)\Big) = 1 - \pi_j^0(1 - r) \qquad (9)$$

Where $C_j = 0$ where a home care firm survives and $C_j = 1$ if it closes, π_j is (long-term) profitability of the firm and r is the probability of direct regulatory action from CQC, A. The probability of regulatory action depends on observed quality at the time of inspection, $\widetilde{q_j}$, which is the actual

optimal quality of the firm, q_j^*, plus an (external) quality error term, q_j^e (Allan and Forder, 2015).[5] The likelihood of direct regulatory action is inversely related to quality, i.e. $\frac{\partial r}{\partial \tilde{q}} < 0$.

2.4 Hypotheses

From the above discussion, we can postulate the following hypotheses to be tested in the analysis that follows:

H1: The number of firms in a market will depend on market size, $\frac{\partial N}{\partial M} > 0$.

H2: The number of firms in a market will depend on costs, $\frac{\partial N}{\partial w} < 0$.

H3: (Better) quality will have a negative effect on the likelihood of firm closure, $\frac{\partial C}{\partial q^*} < 0$.

H4: Competition will have a positive effect on the likelihood of firm closure, $\frac{\partial C}{\partial N} > 0$.

3. Data

3.1 Identifying home care supply

To analyse the English home care market we used the CQC register of providers of health and social care for September of the years 2014-2018. Generally, as discussed in the introduction, the registration of health and social care services with CQC is mandatory, although there are exceptions, e.g. personal assistants employed directly by the person they are caring (CQC, 2015). We proceeded assuming that the CQC register of health and social care providers was a good measure of home care supply. However, it should be noted that the heterogeneous presence of PAs in markets could influence the findings reported.

We included in the analysis all providers of home care registered with CQC as providing social care services to any service users, including older people, those living with dementia, learning disabilities, physical disabilities, children and working age adults. We joined the data on providers over time first using CQC provider identifier and name and address of the service. The great difficulty with the data was that home care providers often moved the location of their registered address and when doing so the CQC provider identification number of many providers also changed. Ideally we would want to measure these as a continued service, i.e. not a closure, if the provider has stayed in the same area to provide their services – even with a change of name the registered owner of the service would be the same. Where there had been a change in both provider identifier and name and

[5] There is anecdotal evidence of what might be considered quality errors, see for example Allan and Darton (2020).

address of the service we identified continued service provision using owner identifiers, i.e. an identifier of overall ownership where an owner can own and provide services from more than one site, where possible. Where this occurred we then linked new to old provider identifiers across time.

3.2 Closures and openings

Given we measured supply of home care as any provider that is registered with the CQC, we proceeded with counting a closure to be a provider that is no longer registered with the CQC. Similarly, any new providers registered with the CQC that were not previously registered in the previous year are treated as being a new opening. It must be noted that whilst the process of identifying home care providers outlined above was thorough, this was achieved by hand and there is a likelihood of type I and type II errors in the data, e.g. of misidentifying a provider that is still open as a closure and *vice versa*. Overall, we believe the likelihood of this to be small and at an acceptable level for analysis.

3.3 Home care competition

At national, regional and local authority levels we measured home care supply as the count of providers. This assumed that all providers are of equal size, and therefore the Herfindahl-Hirschman Index (HHI) for a local provider market would be: $HHI = 1/n$.[6] This is an important caveat for the analysis that follows of the size of home care markets, particularly at LA-level. For example, some LAs may have fewer, larger providers.

Alternative measures of home care supply could be utilised in an analysis. For example, the number supported/hours of support provided by LAs is a measure of the size of demand met used in the literature as a supply measure, e.g. Fernandez and Forder (2008). An additional alternative measure of supply would be measures of the workforce employed. The downside of the former is that it only includes the public-supported demand/supply for the market and so would not give a full representation of the market. The latter would theoretically include the private market as well, but a further downside, which is also suffered by the former alternative supply measure, is that these data are only available at local authority level. We therefore preferred the use of home care providers' location as the measure of supply. Using home care providers location meant that a more granular analysis could take place, which could also be aggregated to the LA-level. In robustness checks, we assessed the validity of using the count of providers by comparing it to these other potential measures of supply.

[6] The HHI is a measure of concentration (inverse competition) often employed in the literature and competition regulators, see for example Competition and Markets Authority (2020, 2021).

At the local level, we measured competition between home care providers using the weighted count of providers within a certain radius of each provider's registered location, i.e. weighted supply:

$$DC_j^x = \sum_{i=1}^{n} y_{ji} n_i \,, \forall\, j \neq i \qquad (10)$$

Where DC_j^x is equal to the i providers that are within x radius of home care provider j, weighted by y. We utilised speed data to be able to measure the radius in time. To create this measure, we converted the (straight-line) distance between home care providers' registered locations in km to time using a predicted travel time per km for each Middle layer Super Output Area (MSOA) in England: $\Delta d_{ji} = \left|d_j - d_i\right|\left|0.5t_j + 0.5t_i\right|$ for all i.[7] Finally, we used an inverse square root of travel time to weight DC_j, i.e. $y_{ji} = 1/\sqrt{\Delta d_{ji}}$. There is no information on expected size of markets for providers. As such, we explored this in the market supply analysis that follows. At the provider level, for the closure analysis we used radius x equal to 10 minutes, but we allowed for this radius to alter in robustness checks.

3.4 Quality

The CQC inspects and rates home care providers as to their quality based on the 'mum test' with each provider receiving a quality rating of either 'Inadequate', 'Requires improvement', 'Good' or 'Outstanding'. There is growing evidence supporting a relationship between the overall rating of a care home and residents' quality of life (Towers et al., 2019; Towers et al., Forthcoming). Only a small proportion of home care providers are rated as 'Inadequate' (e.g. 0.94 per cent in September 2017) and 'Outstanding' (1.84 per cent) and as such for the analysis we utilised a binary variable indicating high quality, i.e. 0 if a home was rated 'Inadequate' or 'Requires improvement', 1 if a home was rated 'Good' or 'Outstanding'.

The rating system began in late 2014 and just over 1,000 providers had been rated by (September) 2015. We included quality in some estimations, but also included a predicted quality measure for all providers in the years 2015-2017 using a regression of quality ratings which was performed on all the independent variables included in the main analysis.

[7] Specifically, we used average speed data for 2015-2018 at the LA-level, which we converted to time and then created predicted travel time per km for each MSOA. Predicted travel time per km was generated from a GLM regression with log link and gamma distribution of travel time on population density, its square, average house price, its square and then variables to control for region and year. We did not have data for 2014 and therefore used predicted 2015 travel time per km for 2014 data.

3.5 Demand factors

In addition to quality, we included further measures as controls for the demand side of the home care market: as proxies for market size we included total population and rate of population over 85; attendance allowance uptake was included as a proxy for needs and pension credit uptake as a proxy measure for (lack of) income, all at Lower layer Super Output Area (LSOA). At LA-level, we included the total number of hip fractures suffered by those aged over 65 as a further proxy for needs and real LA gross expenditure on non-residential care as a measure of public spending.

3.6 Supply factors

In addition to competition, we included a number of measures of supply in the analysis: female Job seeker's allowance (JSA) uptake at LSOA-level and the real median hourly wage at LA-level as indicators of labour supply availability and cost; average house price at MSOA-level as a proxy for the cost to locating in the area by a provider; and for the closure analysis the total number of (distance-weighted) care home beds within 10 minutes of the home care location as a measure of an alternative form of social care (Allan, 2021). An indicator of rurality is included, as an indicator of difficulty of supply, e.g. increased cost to provide a service – specifically a dummy variable indicating that the MSOA is classified as rural (or, if not, urban).

The CQC register provides information on the service users providers are registered to support and we included the following registration types in the analysis: those aged over 65, those living with dementia, those with learning disabilities, mental health issues, younger adults and children. We also included an indicator on the number of home care providers that an organisation owned: 1, 2-9, 10-19 and 20 or more. Finally, we included controls for region of England (East of England, East Midlands, London, North East, North West, South East, South West, West Midlands and Yorkshire and Humberside) and the year.

4. Empirical methodology

4.1 Market supply

The model developed in section 2 for home care in England supports that the number of providers in a market will be dependent on the size of the market (demand) and cost factors, with $\frac{\partial N}{\partial M} > 0$ and $\frac{\partial N}{\partial w} < 0$.[8] We therefore estimated a reduced form model of supply in market k:

[8] From section 3, we know that price increases as N falls, so for a higher marginal cost so N will also fall (see also Schmalansee, 1992).

$$N_{kt} = F(m_{kt}, m_{-kt}, n_{-kt}) \quad (11)$$

Where m_{kt} are exogenous demand and supply factors in market k at time t, and $-k$ subscript indicates nearby markets which influence the supply in market k. The size of a market is unknown. We analyse home care markets at MSOA-level and allow for each market to be influenced by the areas around each MSOA, as measured by time/distance radii. We estimated the model of market supply using OLS, but also used Poisson distribution and negative binomial models, which specifically allowed for the count nature of the dependent variable. We took account of the panel nature of the data by using both population average (PA) and random effects (RE) specifications, the latter to take into account any random differences between MSOA markets.

4.2 Closure

Assuming c_j is the latent probability of closure, i.e. a function of expected (negative) profits as described in (9), then a partial reduced form model of closure can be given by:

$$c_j = c_j\left(q_j^*, N_j, m_j, e_j\right) \quad (12)$$

Where m_i are exogenous demand and supply factors and e_i are unobservable exogenous factors that are inherent to the local market, e.g. local productivity rates. We estimated the stochastic equivalent to (12):

$$\Pr\left(c_{jt}^* = 1\right) = F\left(x_{jt}'\beta + \mu_{jt}\right) \quad (13)$$

Where $t = 1,2,\ldots,5$ is the wave of observation, x_{jt}' is the vector of competition, quality, demand and supply variables included in the model and μ_{jt} is an error term dependent on the unobservable dependent factors e_j.[9]

As shown in the theoretical model developed in section 2, it is likely that the probability of closure will be endogenous to the competition from alternative providers and also to the quality of providers. We used an instrumental variables (IV) approach to address potential simultaneity. For supply of alternative providers, we utilised supply measures at higher geographies (i.e. greater radii around the provider) as instruments, assuming that any effect of supply at higher geographies would only affect likelihood of closure through its impact on supply at a lower geography, i.e. smaller radius around the provider. Specifically, for the number of (distance-weighted) alternative providers within

[9] Strictly, as is generally the case in the closure literature, we observe the t+1 status of provider and assume that $c_{jt+1}^* = c_{jt+1}^*(x_{jt})$. This method of modelling may naturally help mitigate endogeneity issues from omitted variables if they are not time varying.

a 10 minute radius of provider *j* we used the number of (distance-weighted) providers within 10-15, 15-20 and 40-50 minutes radii of provider *j* as the instruments.

We included two instruments in estimating predicted quality, utilising a similar geographical argument to that used for competition. Specifically, the instruments used were average LA quality rating, excluding the quality rating of the provider, and female JSA rate at MSOA-level, excluding the LSOA-level female JSA rate in which the provider was located. As such, it was assumed that these the effects of quality and female JSA rates impacted on home care supply only through local area effects.

We estimated closure using probit models given the binary nature of the dependent variable. Specifically, we estimated instrumental variables (IV) probit models including manually estimated predicted quality and with errors clustered on providers. We then estimated the closure model taking advantage of the panel nature of the data to model for provider-level effects, specifically using population-average (PA) and random effects (RE) probit models, the latter allowing for random variation in provider effects which would make the PA model inconsistent. These models included manually estimated predicted measures for both competition and quality and these were estimated with heteroscedasticity robust standard errors. Our assessment of the adequacy of the instruments for competition and quality followed that utilised in Allan and Forder (2015).

5. Findings

5.1 Supply of home care in England

5.1.1 Overall supply of providers – national and regional level

Table 1 shows the number of registered providers of home care in England over the period 2014-2018. Overall, there has been a consistent rise in home care providers for the country as a whole, which numbered more than 9,000 by September 2018. The rise over this time is somewhat smaller than the rise (in older people registered services) observed from 2011 to 2016 (Allan, Roland et al., 2021). The rapid rise in provider numbers nationally is not consistent across the regions of England, however. The national growth in providers is driven in large part by growth in four regions which grew by around a quarter in the five year period: East of England, East Midlands, London and West Midlands. The South West region only grew by 4%, the North West had virtually no change whilst providers in the North East shrank in number over 2014-18.

A successful market will have births and deaths of firms over time. We next outline the number and rate of closures and openings in England and by region. Because of the time frame of analysis, 2014-2018, we were able to identify closures of firms that were providing services in year t that

subsequently closed in year t+1, t+2, etc. and did not provide services again. Therefore, we could not identify closures of home care providers that were providing services in 2018.

Table 1: Number of home care providers in England by region, 2014-2018

	2014	**2015**	**2016**	**2017**	**2018**	**Net change**
East of England	871	928	980	1002	1080	24.0%
East Midlands	692	735	807	829	873	26.2%
London	1090	1143	1190	1296	1414	29.7%
North East	322	316	309	303	301	-6.5%
North West	1027	1051	1033	1019	1025	-0.2%
South East	1322	1338	1377	1426	1497	13.2%
South West	876	887	898	913	911	4.0%
West Midlands	920	983	1043	1098	1155	25.5%
Yorkshire & Humber	732	762	758	782	823	12.4%
England	**7852**	**8143**	**8395**	**8668**	**9079**	**15.6%**

Table 2 shows the number and rate of closures of providers by year, with the measure counting the number of existing providers in year t which closed sometime between year t and year t+1. Nationally, the closure of home care providers is high, with generally more than 1 in 6 providers closing in any given year, although this reduced to nearly 1 in every 10 in 2017. Closures occurred reasonably consistently across all regions. However, East of England and London had below national average closures for all four years observed and North East had above national average closures.

Similar to closures, we identified openings as new providers that exist in time t that did not exist in time t-1, and therefore we could not identify any new providers that opened for 2014. As Table 1 showed, there has been steady growth in the number of home care providers nationally, and so the number of new providers of services outweighs the closures, as shown by Table 3. Nationally, almost one in five providers were newly registered with the CQC in the last year. Regionally, the North East, North West and South West had below national average openings across all four years. London was the only region with consistently above national average openings across the same timeframe.

The preceding tables have shown how the home care market in England has been growing over time but with closures of providers underlying this. To show how the home care sector compares to overall business turnover, Figure 1 compares the birth and death rates for home care providers in England, shown with blue lines, with national birth and death rates for all business, shown with red lines. A caveat on comparing is that the home care closure and birth rates are by provider (i.e. separate registered geographic sites) whereas birth and death rates for England are for businesses

as a whole that could, for example, own a number of home care providers that are registered to provide care. However, only a small number of businesses in total operate in more than one site in UK – 2.2% in 2020 (ONS, 2020a). Given this caveat, we might expect a potentially higher number of births and deaths for home care in this case. As would be expected given the rapid growth in home care, the birth rate of providers is greatly above the national rate, by about 4% per year. Deaths have also been above well above the national rate in general, although in 2017 this trend was reversed.

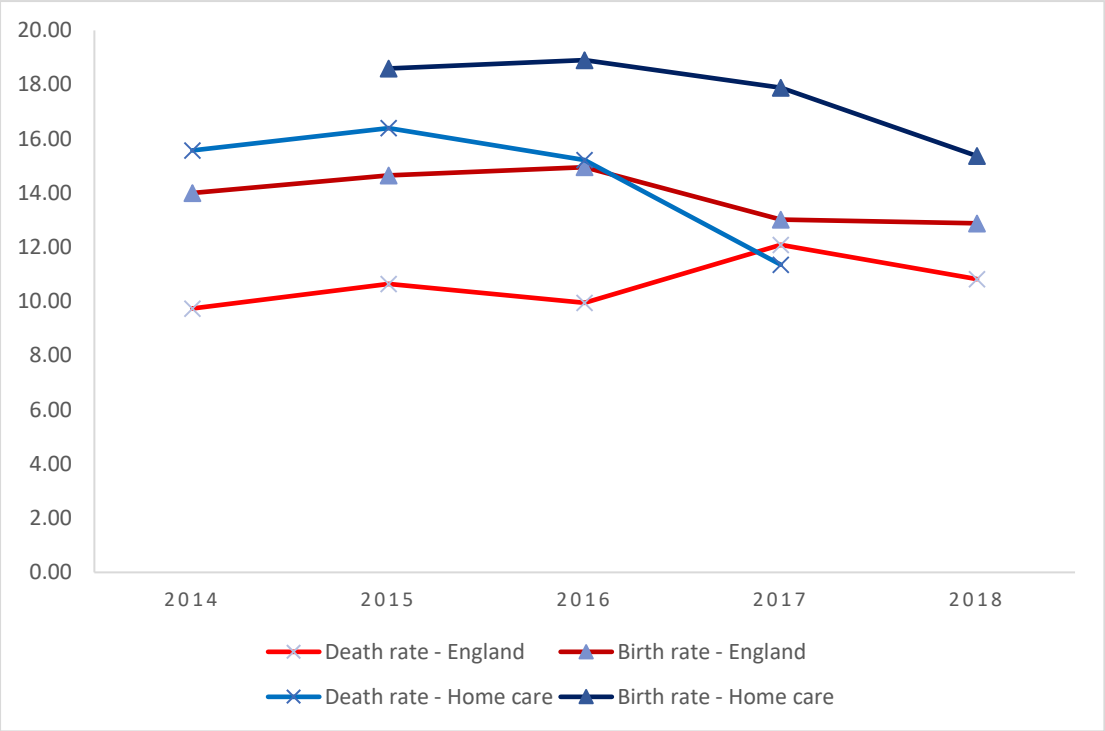
Table 2 Closures of home care providers in England by region, 2014-2017

	2014	**2015**	**2016**	**2017**
	Total (Per cent rate)	Total (Per cent rate)	Total (Per cent rate)	Total (Per cent rate)
East of England	119 (13.7)	150 (16.2)	138 (14.1)	108 (10.8)
East Midlands	123 (17.8)	122 (16.6)	122 (15.1)	109 (13.2)
London	165 (15.1)	176 (15.4)	171 (14.4)	132 (10.2)
North East	58 (18.0)	52 (16.5)	53 (17.2)	40 (13.2)
North West	157 (15.3)	199 (18.9)	157 (15.2)	123 (12.1)
South East	224 (16.9)	209 (15.6)	227 (16.5)	161 (11.3)
South West	124 (14.2)	129 (14.5)	132 (14.7)	109 (11.9)
West Midlands	143 (15.5)	163 (16.6)	156 (15.0)	109 (9.9)
Yorkshire & Humber	110 (15.0)	135 (17.7)	121 (16.0)	93 (11.9)
England	**1223 (15.6)**	**1335 (16.4)**	**1277 (15.2)**	**984 (11.4)**

Table 3: Openings of home care providers in England by region, 2015-2018

	2015	**2016**	**2017**	**2018**
	Total (Per cent rate)	Total (Per cent rate)	Total (Per cent rate)	Total (Per cent rate)
East of England	178 (19.2)	201 (20.5)	158 (15.8)	185 (17.1)
East Midlands	165 (22.4)	195 (24.2)	144 (17.4)	151 (17.3)
London	219 (19.2)	226 (19.0)	275 (21.2)	252 (17.8)
North East	53 (16.8)	46 (14.9)	46 (15.2)	39 (13.0)
North West	183 (17.4)	181 (17.5)	143 (14.0)	128 (12.5)
South East	239 (17.9)	248 (18.0)	279 (19.6)	229 (15.3)
South West	136 (15.3)	139 (15.5)	147 (16.1)	106 (11.6)
West Midlands	205 (20.9)	223 (21.4)	213 (19.4)	170 (14.7)
Yorkshire & Humber	136 (17.8)	128 (16.9)	145 (18.5)	135 (16.4)
England	**1514 (18.6)**	**1587 (18.9)**	**1550 (17.9)**	**1395 (15.4)**

Figure 1: Birth and death rates in England, home care and all businesses



Note: Source for birth and death rates (all businesses): Own calculations from ONS (2020b).

5.1.2 Supply of providers by LA

The home care market for England overall and by region has shown a general growth in supply of providers over the period 2014-18, although there was some indication of a stagnation or fall in services in Northern England. We next looked at home care supply at LA-level. This provided a greater level of disaggregation and allowed to assess where supply is changing and consider potential reasons for these changes. For all analysis of LA-level home care provision, we did not include the Isles of Scilly given the unique nature of this LA.

Table 4 provides descriptive statistics of number of providers overall and by registration type for LAs in 2018. Note for this table that home care providers can register to provide services to multiple categories of service users. The average LA has 60 home care providers, but this varies greatly across the country, from 7 in the LA with the fewest providers (Halton, see Table 5) and 265 providers in the LA with the most providers (Essex, also see Table 5). The average LA has 52 providers registered to support older people and/or those living with dementia (87% of providers in the average LA), whilst 35 (57%) are registered to provide care for those with mental health disorders.

Table 4: Descriptive statistics of LA provider supply by registration type, 2018

Variable	n	Mean	Std. Dev.	Min	Max	Per cent change 2014-18
Older people/dementia	151	52.37	42.45	6	228	25.7
Learning disability	151	38.91	30.59	4	171	16.3
Mental health	151	34.76	27.04	3	147	21.3
Young adult	151	44.05	36.22	3	191	29.4
Overall total	**151**	**60.12**	**48.53**	**7**	**265**	**15.6**

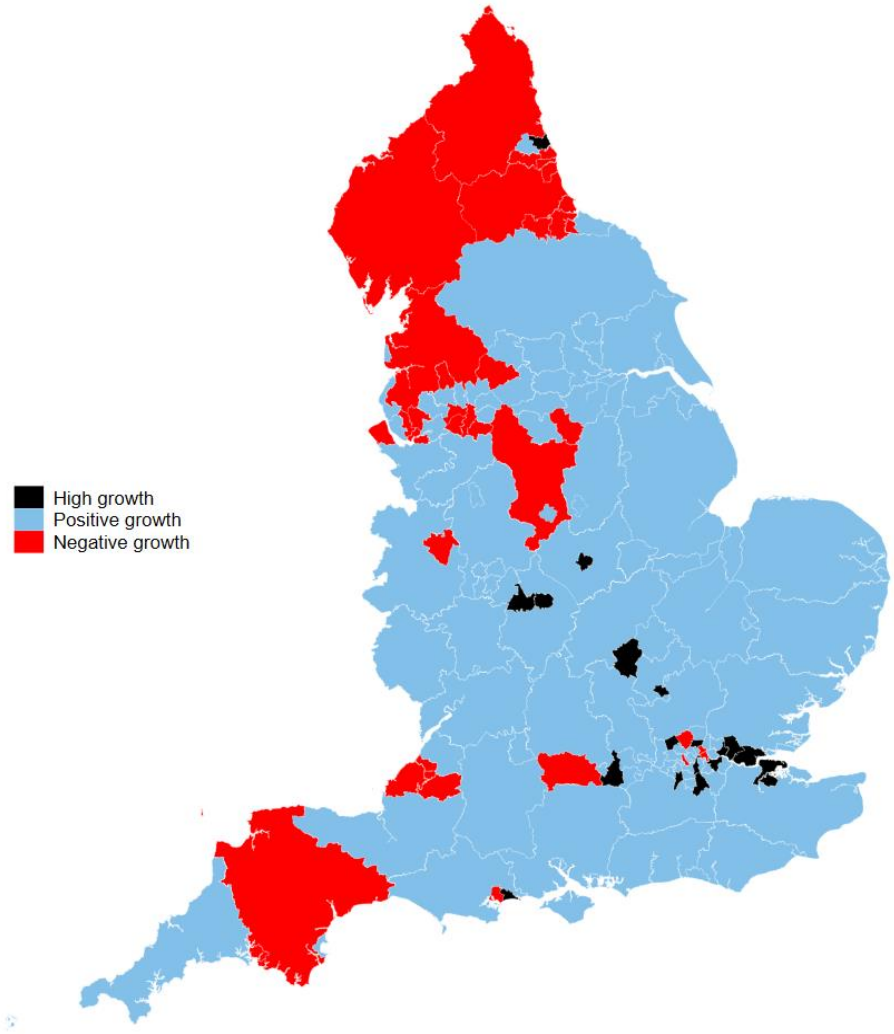
The variation in size of home care markets, when measured by number of providers, is shown in more detail in Table 5, which presents the smallest and largest LAs by home care provision in 2018. Unsurprisingly, large county councils tended to have the largest number of providers, with large cities such as Birmingham, Leicester and Leeds being exceptions. The smallest LAs by home care providers are mixed in location and are almost evenly split between unitary authorities and metropolitan boroughs.

Table 5: Smallest and largest LAs by number of home care providers, 2018

Smallest			Largest		
Rank	**LA**	**Number of providers**	**Rank**	**LA**	**Number of providers**
1=	Halton	7	**1**	Essex	265
	City of London	7	**2**	Kent	240
3=	Rutland	10	**3**	Birmingham	221
	South Tyneside	10	**4**	Hampshire	218
5=	Redcar and Cleveland	12	**5**	Surrey	208
	Hartlepool	12	**6**	Lancashire	197
7	Knowsley	15	**7**	Northamptonshire	172
8	Hammersmith and Fulham	16	**8**	Hertfordshire	170
9=	Richmond upon Thames	17	**9**	Suffolk	159
	Windsor and Maidenhead	17	**10**	West Sussex	150
11=	Bath and North East Somerset	18	**11**	Norfolk	139
	Bracknell Forest	18	**12**	Devon	133
	Middlesbrough	18	**13**	North Yorkshire	130
	North East Lincolnshire	18	**14**	Leicester	124
15	Tameside	19	**15**	Nottinghamshire	123
16=	Kensington and Chelsea	20	**16**	Staffordshire	118
	Darlington	20	**17**	Gloucestershire	117
18=	Salford	21	**18**	Leeds	116
	Hackney	21	**19**	Derbyshire	113
	Westminster	21	**20**	Oxfordshire	109

Figure 2 shows the growth rates of home care providers by LA between 2014 and 2018. Generally this reflects the national situation with the vast majority of LAs having an increase in number of home care providers over time, with 19 LAs having a very high growth rate of home care supply, defined as one standard deviation above the mean LA growth rate. However, 35 LAs had a reduction in the number of providers over the period 2014-18. Overall, whilst the figure does show falls and growths across the country, there is some evidence of a reduction in services in the North and greater growth in the South. Table 6 shows the LAs with the highest fall and growth in provider numbers, which shows more of the North/South divide, with the largest growth rates mainly in London boroughs. Also, only 1 shire county (Cumbria) is listed in Table 6.

Figure 2: Growth of home care provision 2014-18, by LA



Note: High growth defined as 43.4% or greater, i.e. 1 standard deviation above the mean level of growth.

Note again that in the cases of a fall in number of providers (and even growth) this does not necessarily reflect a fall in those supported, merely that the choice as to which provider supplies the service reduced.

Table 6: LAs with largest falls and rises in providers 2014-18, by rate of growth

Rank	Fall		Rank	Rise	
1	Halton	-46.2%	**1**	City of London	133.3%
2	South Tyneside	-33.3%	**2**	Milton Keynes	94.9%
3	West Berkshire	-28.1%	**3**	Barking and Dagenham	92.1%
4	Salford	-27.6%	**4**	Lambeth	90.9%
5	Middlesbrough	-25.0%	**5**	Greenwich	83.3%
6	Stockton-on-Tees	-21.4%	**6**	Kingston upon Thames	73.7%
7	Plymouth	-20.5%	**7**	Thurrock	70.6%
8	Hammersmith and Fulham	-20.0%	**8**	Havering	70.0%
9	Cumbria	-19.0%	**9**	Harrow	61.5%
10 =	Knowsley/Trafford	-16.7%	**10**	Leicester	57.0%

Table 7 presents information on the distribution of number of providers of home care in LAs over the years 2014-2018 as well as average rate of closures and openings of home care providers by LA. Again, the growth in home care provision can be seen over time with the average LA home care market growing from 52 providers to over 60. However, Table 7 further shows that the dispersion between LAs has increased, the interquartile range grew from 40 to 47, and there was further larger growth in providers at the high extreme of the distribution of LAs but not at the lower end of the distribution. Table 7 also shows that the average LA had an average closure rate of nearly 15%, with the LAs with the largest rate having more than one in five providers close on average. The average LA had an average opening rate of over 17.5%, with the strongest LAs in terms of provider births having more than one in four providers open on average over the period 2014-18.

Figures 3 and 4 present information on the closure and openings of providers by LA for 2014-18. Average closure and opening rates are presented by shades in each figure. For Figure 3, LAs which had a given year where the closure rate was 24.9% or above, i.e. 3 standard deviations above the mean closure rate, are shown with yellow dots (at their geographic centre points). The same method for assigning LAs with a high opening rate above 29.3% in a given year is presented in Figure 4 with blue dots. Figure 3 shows that those LAs with falls in the number of providers over time generally had average closure rates above the mean. However, what is also noticeable is that a number of LAs with high growth still endured high average home care provider turnover. Further, 39 LAs had a year in the period examined where more than 1 in 4 home care providers closed, with 9 of these LAs

having two years where this happened (Bracknell Forest, Bury, Halton, Middlesbrough, South Tyneside, Tameside, Warrington, West Berkshire, Westminster).

Table 7 Distribution of number of providers by LA and average closure and opening rates, 2014-18

	2014	2015	2016	2017	2018	Average closure rate (Per cent)	Average opening rate (Per cent)
Mean	52	53.93	55.59	57.40	60.12	14.91	17.66
Standard deviation	41.69	43.10	44.72	45.95	48.53	3.34	3.87
5th percentile	15	16	17	17	16	10.43	11.73
25th percentile	26	27	27	28	29	12.71	14.69
Median	38	39	41	41	44	14.45	17.29
75th percentile	66	67	69	71	76	16.83	20
95th percentile	143	144	144	152	170	20.83	24.63
n	151	151	151	151	151	151	151

Figure 4 shows that whilst there is some consistency, the opening of providers by LA does not match closures completely; some LAs had high levels of openings and closures, whereas for other LAs there were high levels of closure which were not matched by openings. 29 LAs had a year where growth in providers was very high, with five of these having two years where this happened (Bracknell Forest, Milton Keynes, Richmond upon Thames, Southwark and Warrington), and there is more indication that these years of high growth are London-centred.

Tables 8 and 9 present the LAs with the highest and smallest number of provider closures and openings over the period 2014-18, respectively. Again, unitary authorities and metropolitan boroughs have the smallest number of closures and county councils tend to have the highest number of closures. There is a good level of connection between number of closures and openings (Tables 8 and 9) and size of the provider market in LAs (see Table 5).

Figure 3: Mean closure rates, by LA

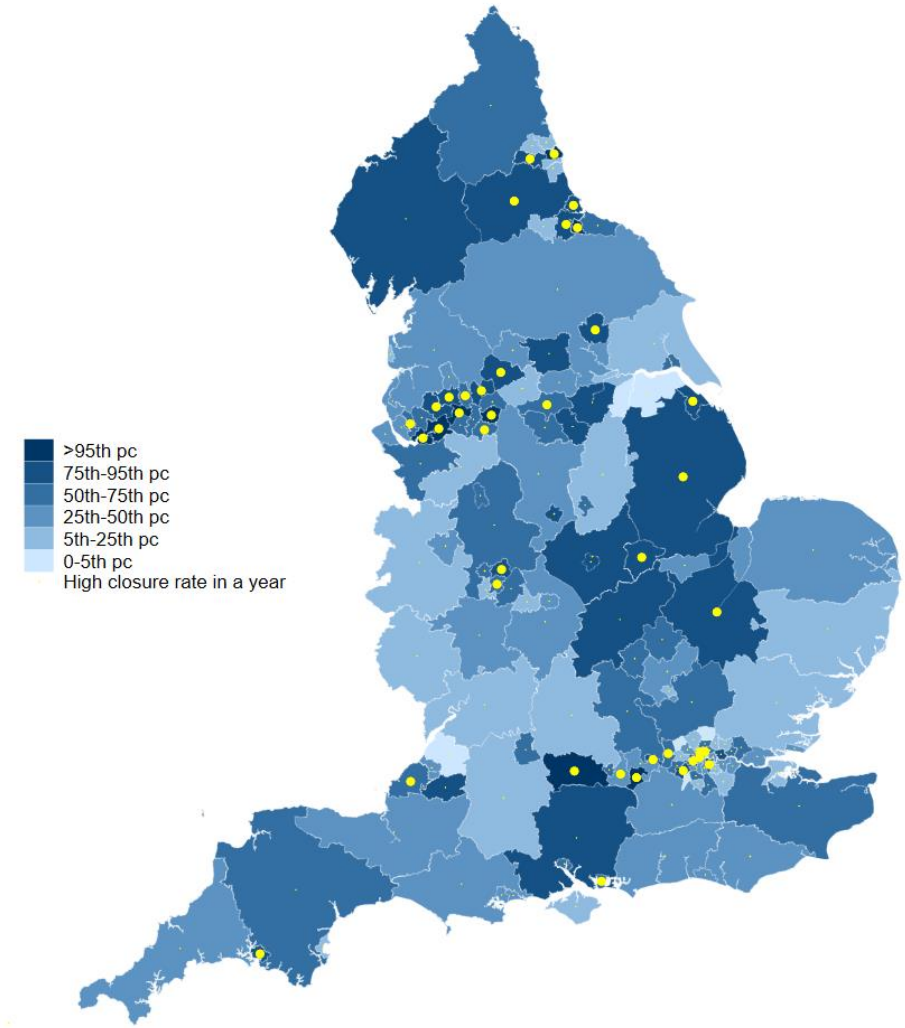
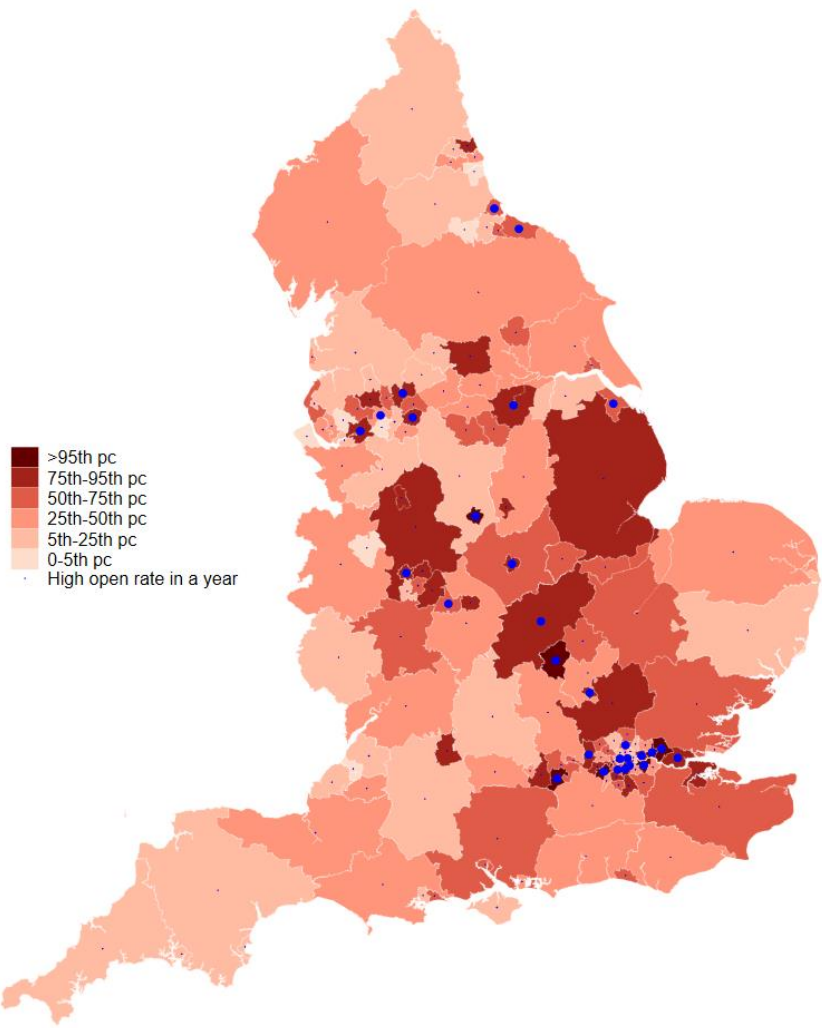


Figure 4: Mean opening rates, by LA



Notes: High closure (open) rate defined as 24.9% (29.3%) or higher, i.e. 3 s.d. above mean average closure (open) rate.

Table 8: Lowest and highest total closures by LA, 2014-18

Rank	LA	Total closures	Rank	LA	Total closures
1	City of London	0	**1**	Hampshire	142
2	North Lincolnshire	6	**2**	Kent	133
3=	Kingston upon Thames	8	**3**	Birmingham	115
	Rutland	8	**4**	Surrey	113
	Redcar and Cleveland	8	**5**	Essex	111
6=	Darlington	9	**6**	Lancashire	109
	Kensington and Chelsea	9	**7**	Northamptonshire	96
8=	Blackpool	10	**8**	Devon	89
	Halton	10	**9**	Hertfordshire	87
	Islington	10	**10**	West Sussex	79

Table 9: Lowest and highest total openings by LA, 2014-18

Rank	LA	Total openings	Rank	LA	Total openings
1=	Halton/City of London	5	**1**	Essex	186
3	South Tyneside	8	**2**	Birmingham	168
4	Rutland	8	**3**	Kent	162
5	Darlington	9	**4**	Hampshire	153
6=	Redcar and Cleveland/Hartlepool	10	**5**	Northamptonshire	143
8=	North Lincolnshire	11	**6**	Hertfordshire	130
	Knowsley	11	**7**	Surrey	129
10=	Kensington and Chelsea	12	**8**	Leicester	111
	Blackburn with Darwen	12	**9**	Lancashire	103
	Blackpool	12	**10**	Leeds	97

5.1.3 Reasons for differences in home care provision between LAs

The previous section has shown that there is a large variation in the size of home care markets in LAs measured by the number of providers, and that births and deaths of providers also varies strongly across LAs. There are likely to be a number of reasons for this, including demand, supply and LA policy and expenditure, which are all interrelated.

Demand Tables 5, 8 and 9 of the previous section showed that home care providers and births and deaths were much higher in county councils. This is likely to be because of a much higher demand for services due to higher populations. To assess this descriptively, we examined the relationship between older population and size, closures and openings of home care providers. Figures 5, 6, 7 and Table 10 present information on the distribution of home care provision, births and deaths over time for LAs by size of their older population.

Figure 5 shows that there is a positive relationship between population, total provision and the birth and death of providers by LA over the period 2014-18. Figure 6 splits LAs by their older population in to quartiles for 2017, as the most recent year in the data where all relevant figures are available, i.e. no closure information for 2018. This shows that the LAs with the highest older population have by far and away the largest average number of providers, and these higher population markets also tend to have more turnover of firms. Table 10 presents the average number of providers, closures and openings by LA when split according to older population quartile for 2017. There were significant differences in overall supply and provider turnover for LAs by older population quartile. The table additionally shows that there is a great deal of difference between LAs in the same older population quartile, i.e. there is a dispersion in home care supply between LAs of similar populations, adding to what is visually presented to a certain extent in Figure 5. Finally, Figure 7 shows that there is a slight positive relationship between the growth rates of older population and home care provision in LAs between 2014 and 2018.

Table 10: Relationship between LA population and supply of home care in 2017, by older population quartile

Older population (65+)	**Total providers**			**Closures**			**Openings**		
Quartile	**Average (s.d.)**	**Min.**	**Max.**	**Average (s.d.)**	**Min**	**Max**	**Average (s.d.)**	**Min**	**Max**
Bottom quartile	27.81 (13.48)	7	66	3.54 (2.43)	0	12	5.38 (3.80)	0	20
3rd quartile	33.00* (11.86)	17	61	3.82^{NS} (2.48)	0	10	6.44^{NS} (3.06)	2	14
2nd quartile	51.63*** (20.05)	29	126	5.61** (3.46)	1	17	9.21*** (5.01)	2	26
Top quartile	116.37*** (52.43)	34	244	13.03*** (7.03)	2	29	19.89*** (11.87)	5	49

Notes: s.d. is standard deviation, min. is minimum and max. is maximum. NS, *, **, and *** indicate not significant and significance at the 10%, 5% and 1% levels, respectively of the t-test of the difference between population quartile n and population quartile n+1.

Figure 5: Total provision and provider turnover by LA older population, 2014-18

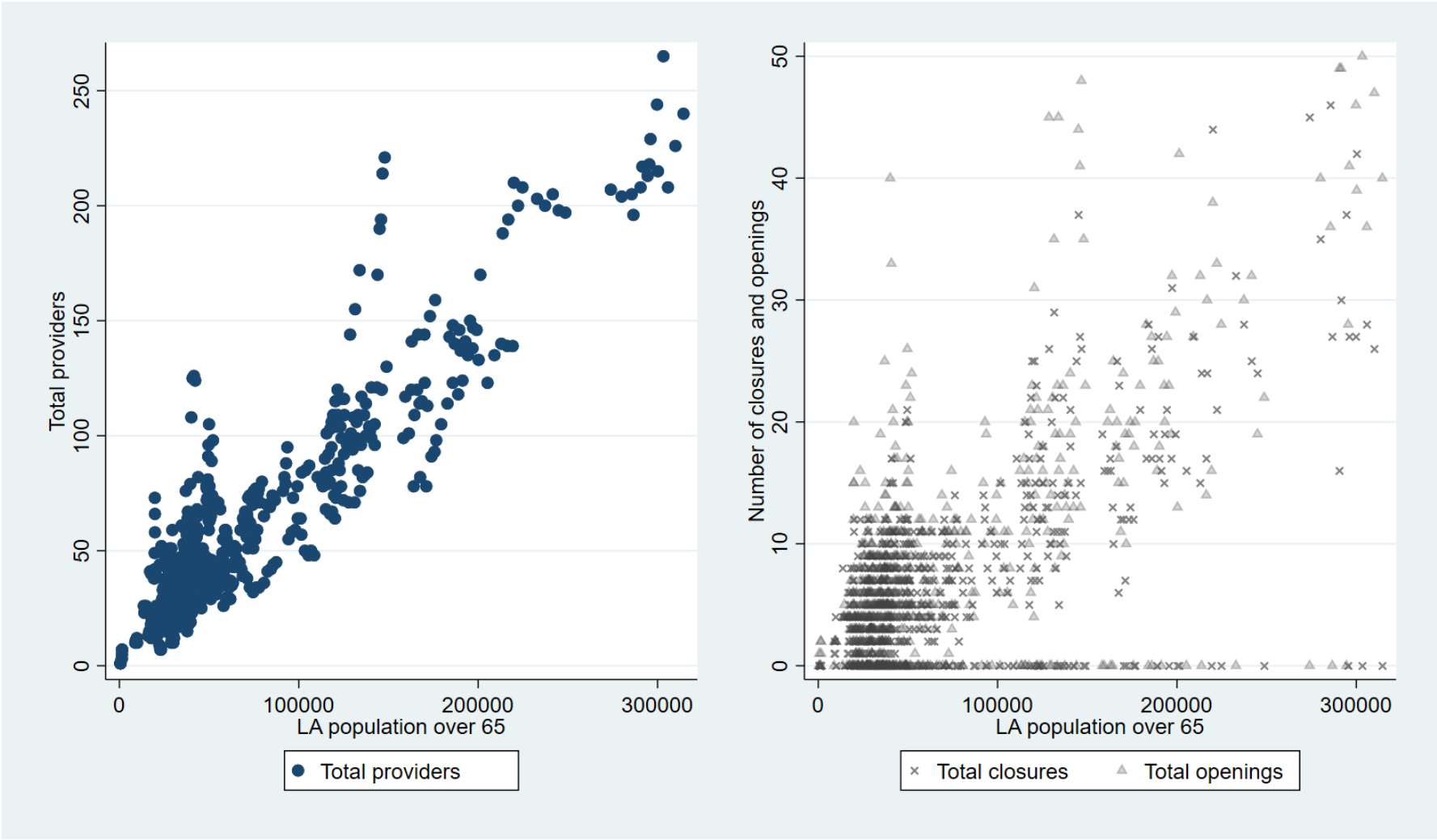


Figure 6: Average provision, births and deaths of providers for LAs by older population quartile, 2017

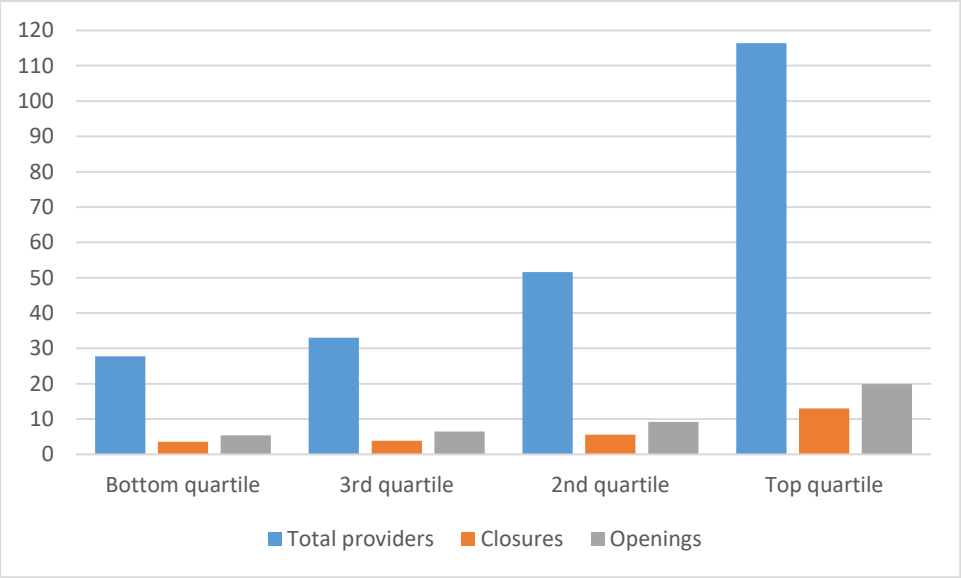
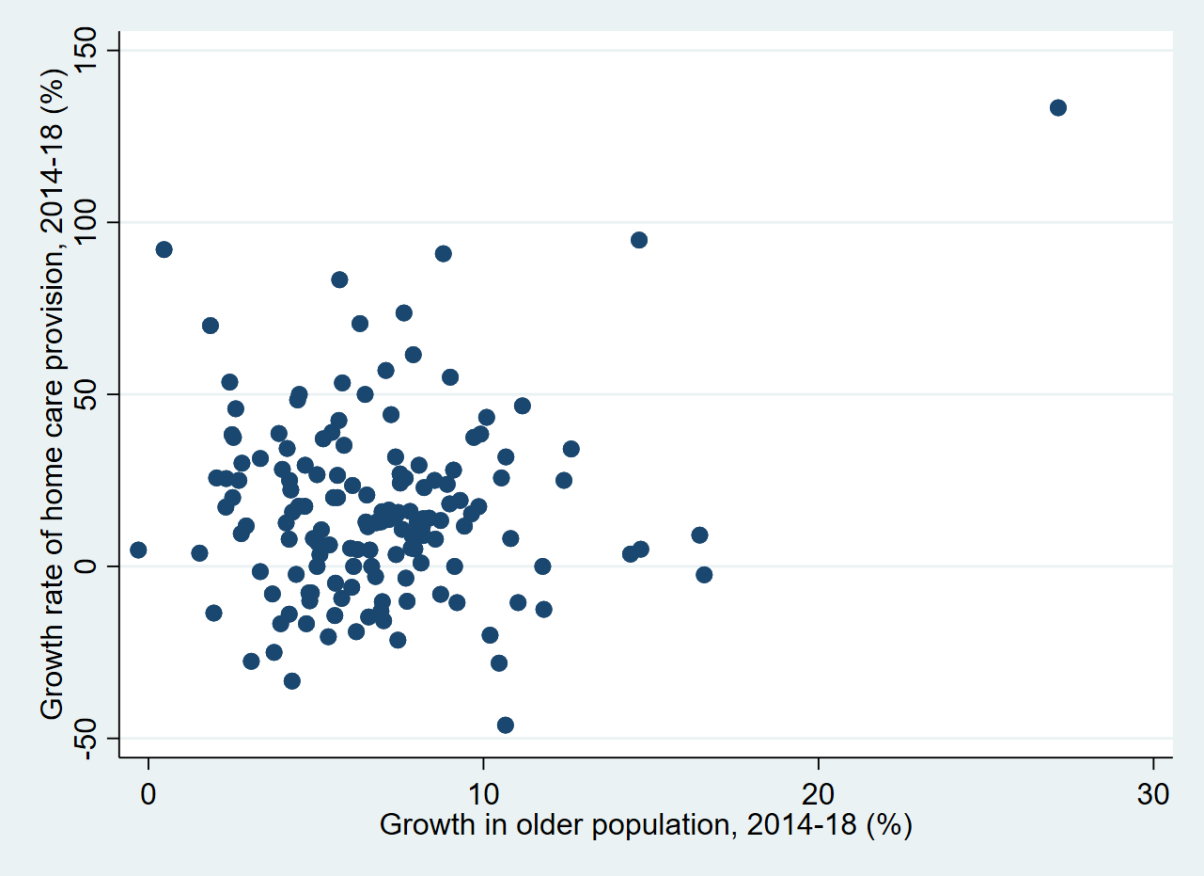


Figure 7: Relationship between growth rates in LA older population and home care provision



Local authority policy A further reason for potential differences in home care provision at LA-level is LA policy on adult social care including public expenditure on community services. Differences in policy will mean that certain LAs may, for example, focus on fewer core providers of home care services or place greater emphasis on the provision of care homes relative to other LAs. The previous section showed that many LAs had a large turnover of firms for certain years, which may be indicative of this. To assess the effect of LA policy we looked at LA expenditure on community services descriptively. Figures 8, 9, 10 and Table 11 present information on the distribution of home care provision, births and deaths over time for LAs by the size of LA expenditure on adult social care community care services. Public expenditure by LAs is largely dependent on population size, so to control for this we examine gross expenditure on community services per older person by LAs. In addition, we control for inflation so the figures are in real terms, i.e. equivalent across years.

Figure 8 shows some indication that market size may be slightly negatively related to expenditure per person, with an indication that turnover of firms is greater where there is less spend per person on community services. There is a great dispersion in LAs however, as confirmed by Table 11, which shows little raw correlation with turnover of firms and expenditure per person on community services for 2017. Figure 9 also seems to show little in the way of a clear relationship between expenditure and overall market size and turnover of home care providers. As such, it is likely that market shaping is playing a role in this – how the LA has decided to operate the market.

Finally, Figure 10 also shows little in the way of correlation between the growth in expenditure on community services and either total provision in 2014 nor the growth in provision of home care from 2014-18. A t-test of the difference between LAs with negative and positive real growth in community service expenditure per person over the period 2014-18 and total number of providers in 2014 was significant at 10% (t-stat = 1.95, p = 0.0536) with growth in positive expenditure LAs having fewer providers in 2014. A similar t-test between LAs with negative and positive growth expenditure and growth in home care provision was not significant (t-stat = 0.92, p = 0.36).

Supply For both population in particular, and to some marginal extent for LA expenditure on community services, we have shown that total provision and the number of closures and openings have been positively related. This could therefore also be explained as competition between home care providers causing churn in the market. In the previous section, tables (e.g. Tables 5, 7, 8 and 9) have shown that there appears to be a link between size of home care market by number of providers and number of closures. Tables 10 and 11 have further shown that there would appear to be a degree of dispersion in provision and turnover of home care firms within LAs grouped by population and community service expenditure. To further assess this link, Figure 11 therefore

presents the relationship between total providers and closure of home care firms by quartiles of older population and gross current expenditure on community care services in the left hand and right hand side diagram, respectively. Both diagrams show the positive relationship between closure and number of providers within the population and LA expenditure quartiles. However, to fully assess this relationship, and the earlier relationships, requires quantitative regression analysis.

Table 11: Relationship between LA community care expenditure and supply of home care by community expenditure quartile, 2017

	Total providers			Closures			Openings		
LA adult social care community expenditure	**Average (s.d.)**	**Min**	**Max**	**Average (s.d.)**	**Min**	**Max**	**Average (s.d.)**	**Min**	**Max**
Bottom quartile	76.24 (51.52)	7	226	7.78 (6.11)	0	26	13.08 (10.65)	1	49
3rd quartile	51.24** (43.90)	17	244	6.16^{NS} (5.94)	0	29	8.61** (8.35)	2	46
2nd quartile	54.26^{NS} (46.77)	13	200	6.39^{NS} (5.97)	0	24	9.74^{NS} (7.54)	1	33
Top quartile	48.34^{NS} (37.08)	7	214	5.76^{NS} (4.93)	0	26	9.71^{NS} (8.74)	0	48

Notes: s.d. is standard deviation, min. is minimum and max. is maximum. NS, *, **, and *** indicate not significant and significance at the 10%, 5% and 1% levels, respectively of the t-test of the difference between community expenditure quartile n and community expenditure quartile n-1

Figure 8: Total provision and provider turnover by real LA gross current expenditure on community services, 2014-18

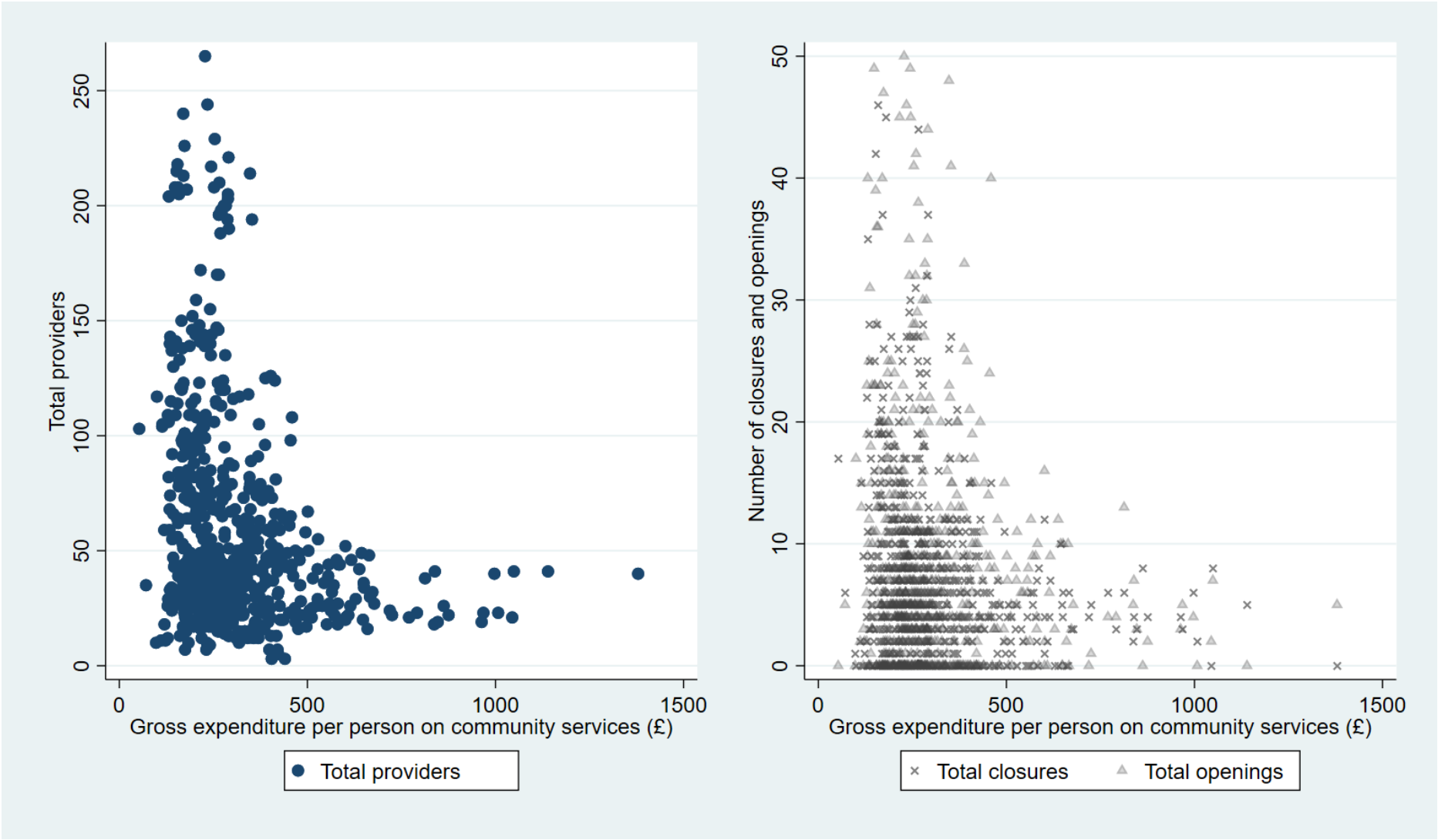


Figure 9 Average provision, births and deaths of providers for LAs by community expenditure quartile, 2017

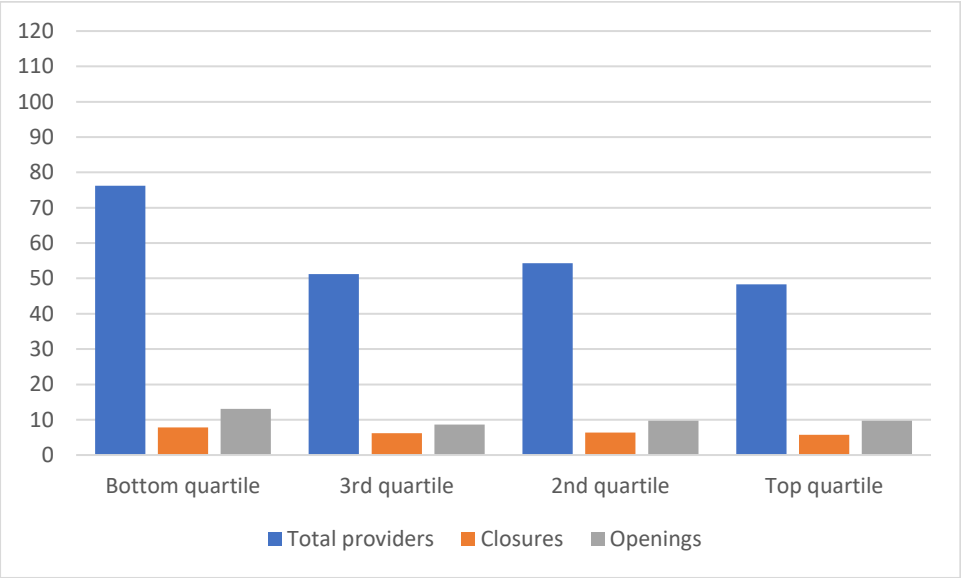


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Figure 10: Relationship between growth rate in LA expenditure on community services and home care provision 2014 and growth rate over time

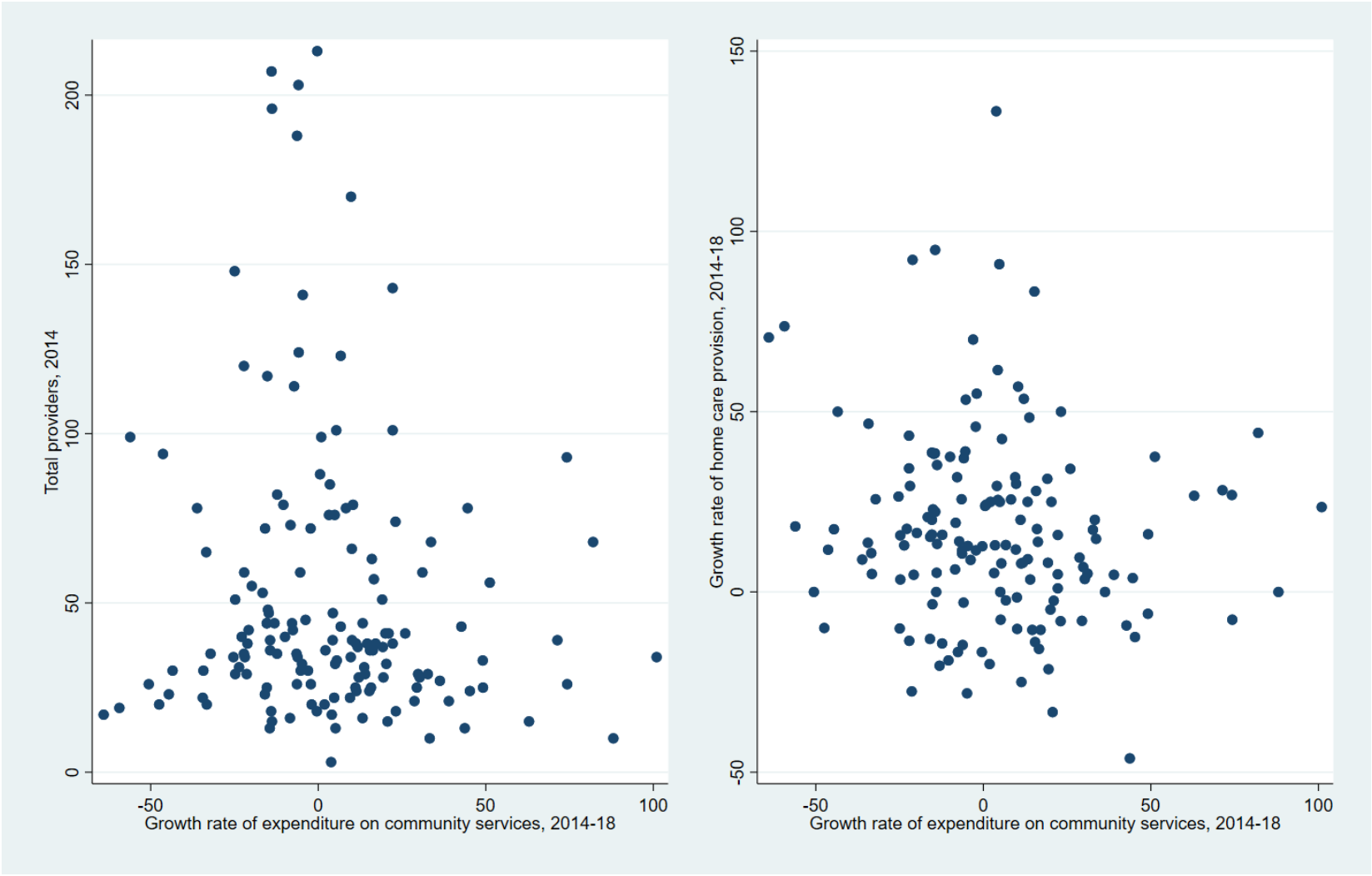
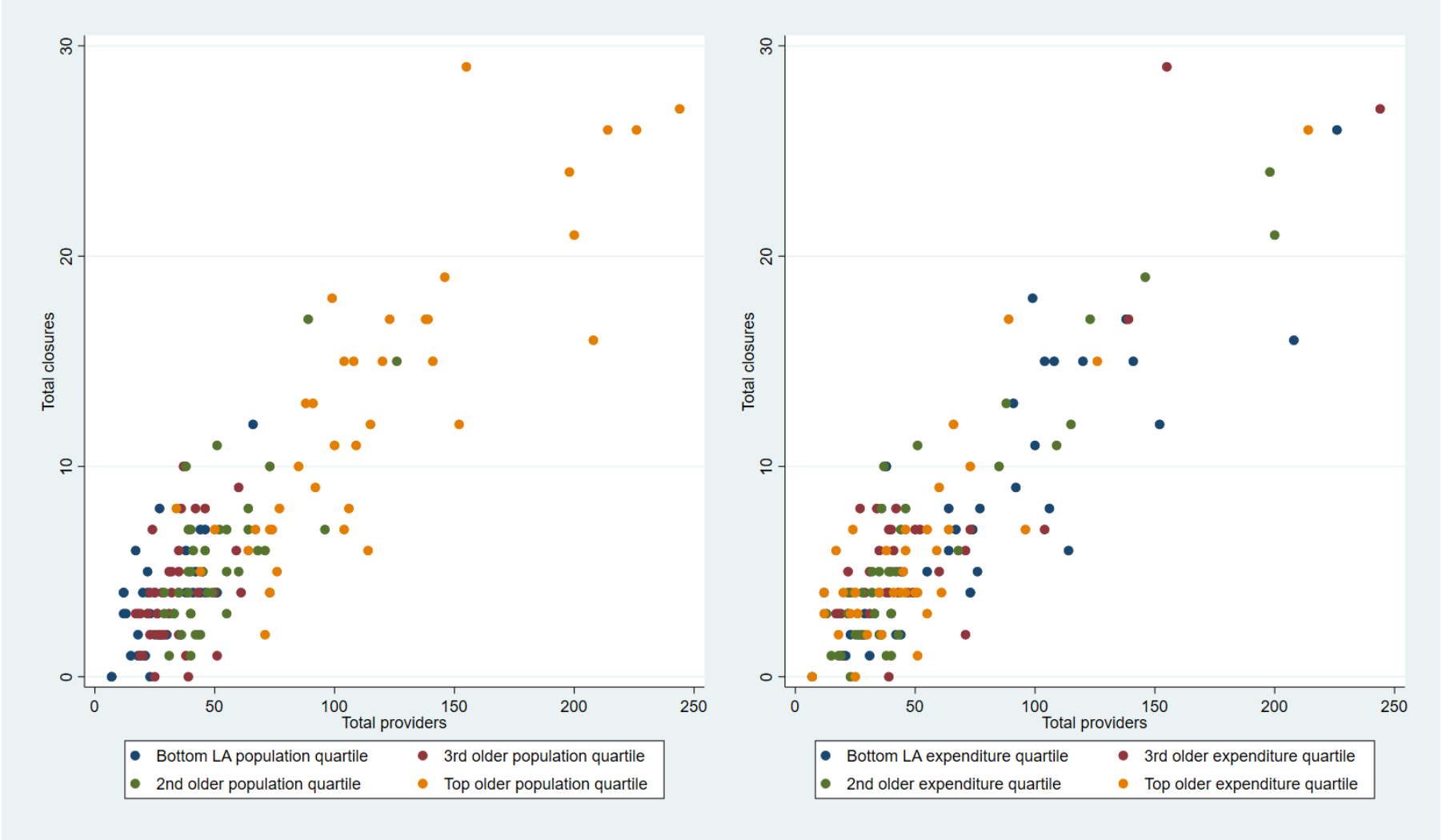


Figure 11: Relationship between total number and closures of home care providers by older population and LA community services expenditure quartile, 2014-18



5.2 Market size analysis

Table 12 presents descriptive statistics on the number of providers at MSOA level and within certain time radii of the MSOA. For 2018, the average MSOA has just over 1 home care provider located within it. However, there is a large level of dispersion in this, with one MSOA with 28 providers located within it, whilst 41.6% of MSOAs have no home care providers located within their boundaries and 84.8% have only 2 or fewer home care providers. The number of MSOAs with no providers has fallen by 2.4 percentage points. Access to home care need not be limited to those providers located in the MSOA in which someone is resident. As such, Table 12 also presents details on the number of providers that are within the MSOA plus a time radius of 5, 10 and 15 minutes. These show that availability of home care provision would appear to be very strong. At a radius of 5, 10 and 15 minutes, 6.3%, 1.5% and 0.3% of MSOAs have no providers of home care, respectively, and 20.2%, 5.5% and 1.5% of MSOAs have two or fewer providers of home care, respectively.

Table 13 presents the descriptive statistics for home care market analysis at MSOA-level. There are 1.2 providers located within the average MSOA, with 29.3 located 10-15 minutes outside of the MSOA (from the central location of the MSOA) and 119.1 located 40-50 minutes outside the MSOA. Of the MSOAs in England, 17.5% are classified as rural. The average MSOA has a population of almost 8,100 people of which 2.5% are over 85, a house price of £0.23m, a female JSA rate of 1.1%, Attendance Allowance and Pension Credit uptake of 13.4% and 14.8%, respectively, and is located in an LA that has 246 over 65s with hip fractures a year and spends around £25m a year on adult social care services in the community.

Table 14 presents the results of models of the number of providers at MSOA-level, using OLS (i.e. assuming the dependent variable is continuous) and count models (i.e. Poisson and negative binomial) which specifically take into account that the dependent variable is a count and cannot be negative. All models take into account panel effects, the OLS specification allowing for random effects, as does the first Poisson specification presented in the 2nd column, with the latter two columns presenting results of population averaged Poisson and negative binomial specifications, respectively.

The results are largely consistent, showing demand and supply factors at MSOA-level to be very important in determining the number of providers in each MSOA. The results tend to support hypotheses: higher demand at local level increases the number of providers and higher costs, from e.g. more rural locations, are associated with lower number of providers.[10] Demand factors at higher

[10] However, we note that higher unemployment rate, which should be inversely related to wage, and average house price have the opposite signs to what would be expected, *a priori*. The latter may be picking up a

levels, e.g. hip fractures at LA-level, population, pension credit and 85+ population rate at 10 minutes radius, all also significantly influence number of providers. In terms of competition, the results are broadly consistent across all specifications. The greater the provision at a 10 minute radius of the MSOA, the lower the number of providers in a MSOA, but at greater radii (30-40 and 40-50 minutes) higher number of providers positively influences the number of providers in a MSOA. This may point to expansion activities by firms and suggest that the (average) market size of home care provision for a given location is likely to be something in the region of a 10-30 minute radius.

Table 12: Number of providers at MSOA level, by year

Year	Obs	Mean	Std. Dev.	Min	Max	<3 providers	Zero providers
MSOA							
2014	6,790	1.156	1.630	0	18	5,877	2,987
2015	6,790	1.199	1.721	0	23	5,822	2,958
2016	6,790	1.236	1.785	0	27	5,784	2,915
2017	6,790	1.276	1.846	0	27	5,739	2,883
2018	6,790	1.337	1.976	0	28	5,761	2,825
MSOA + 5 mins							
2014	6,790	9.997	8.729	0	69	1,399	442
2015	6,790	10.441	9.419	0	80	1,363	436
2016	6,790	10.608	9.884	0	86	1,360	419
2017	6,790	10.928	10.214	0	89	1,331	410
2018	6,790	11.177	10.688	0	92	1,373	430
MSOA + 10 mins							
2014	6,790	29.056	22.164	0	144	392	103
2015	6,790	30.409	24.118	0	158	370	94
2016	6,790	30.768	24.929	0	161	367	93
2017	6,790	31.727	25.613	0	158	361	91
2018	6,790	32.547	26.712	0	161	371	100
MSOA + 15 mins							
2014	6,790	54.328	40.286	0	233	83	23
2015	6,790	56.810	43.144	0	243	94	19
2016	6,790	57.394	43.891	0	251	98	19
2017	6,790	59.188	45.435	0	261	92	24
2018	6,790	60.639	47.642	0	277	104	21

demand (income) effect and a more suitable measure of operational costs may be required. The former finding could be reconciled if we assume that those unemployed could gain work relatively easily in social care. With higher reservation wages, i.e. those unemployed are unwilling to work in social care at the going wage rate, then higher unemployment (indicating a higher reservation wage) can lead to fewer providers.

Table 13: Descriptive statistics, MSOA market analysis

Variable	Mean	Std. Dev.	Min.	Max.
Supply				
Providers, MSOA	1.217	1.748	0	27
Providers, 10mins (non-MSOA)	12.65	10.23	0	73.44
Providers, 10-15mins (non-MSOA)	7.49	6.87	0	44.15
Providers, 15-20mins (non-MSOA)	7.98	7.08	0	48.48
Providers, 20-30mins (non-MSOA)	16.90	13.43	0	69.11
Providers, 30-40mins (non-MSOA)	17.70	14.12	0	78.83
Providers, 40-50mins (non-MSOA)	17.76	13.90	0	71.89
Other supply				
Average house price, MSOA	229632.5	158387.7	27513.9	3549680
Female JSA rate (%), MSOA	1.10	0.96	0	9.35
Female JSA rate (%), 10mins radius (non-MSOA)	1.12	0.68	0	4.65
Female JSA rate (%), 10-15mins radius (non-MSOA)	1.05	0.65	0	4.16
Female JSA rate (%), 15-20mins radius (non-MSOA)	1.05	0.63	0	4.24
Female JSA rate (%), 20-30mins radius (non-MSOA)	1.06	0.55	0	3.60
Female JSA rate (%), 30-40mins radius (non-MSOA)	1.05	0.50	0	3.55
Female JSA rate (%), 40-50mins radius (non-MSOA)	1.03	0.47	0	3.47
Rural, MSOA	0.175	0.380	0	1
Demand				
Total population, MSOA	8099.46	1801.72	4939	23150
Total population, 10mins radius (non-MSOA)	191532	136621.7	0	671747
Total population, 10-15mins radius (non-MSOA)	186902	155320.5	0	826002
Total population, 15-20mins radius (non-MSOA)	235828.8	197747.2	0	1024016
Total population, 20-30mins radius (non-MSOA)	600770.8	486948.2	0	2584042
Total population, 30-40mins radius (non-MSOA)	736382.4	600574.2	0	2809921
Total population, 40-50mins radius (non-MSOA)	828322.3	665361.4	0	3525158
Hip fractures 65+, LA	246.21	175.91	35	967
ASC community expenditure, LA (£000s)	24787.28	17456.28	497.99	75786.15
Population 85+ rate (%), MSOA	2.45	1.17	0.030	11.89
Population 85+ rate (%), 10mins radius (non-MSOA)	2.32	0.80	0	9.51
Population 85+ rate (%), 10-15mins radius (non-MSOA)	2.41	0.79	0	8.13
Population 85+ rate (%), 15-20mins radius (non-MSOA)	2.42	0.74	0	7.51
Population 85+ rate (%), 20-30mins radius (non-MSOA)	2.44	0.64	0	5.98
Population 85+ rate (%), 30-40mins radius (non-MSOA)	2.44	0.60	0	6.11
Population 85+ rate (%), 40-50mins radius (non-MSOA)	2.45	0.54	0	5.67
Attendance Allowance 65+ rate (%), MSOA	13.42	3.533248	0	33.84615
Att. Allowance 65+ rate (%), 10mins radius (non-MSOA)	13.06	2.735323	0	21.94093
Att. Allowance 65+ rate (%), 10-15mins radius (non-MSOA)	12.77	2.44	0	19.62
Att. Allowance 65+ rate (%), 15-20mins radius (non-MSOA)	12.73	2.26	0	19.10
Att. Allowance 65+ rate (%), 20-30mins radius (non-MSOA)	12.84	1.62	0	17.97
Att. Allowance 65+ rate (%), 30-40mins radius (non-MSOA)	12.76	1.44	0	17.50
Att. Allowance 65+ rate (%), 40-50mins radius (non-MSOA)	12.70	1.23	0	17.07
Pension Credit 60+ rate (%), MSOA	14.84	8.96	0	66.55
Pension Credit 60+ rate (%), 10mins radius (non-MSOA)	18.43	7.93	0	54.45
Pension Credit 60+ rate (%), 10-15mins radius (non-MSOA)	17.31	7.32	0	47.12
Pension Credit 60+ rate (%), 15-20mins radius (non-MSOA)	17.13	6.77	0	45.36
Pension Credit 60+ rate (%), 20-30mins radius (non-MSOA)	17.11	5.50	0	36.06
Pension Credit 60+ rate (%), 30-40mins radius (non-MSOA)	16.84	4.76	0	32.52
Pension Credit 60+ rate (%), 40-50mins radius (non-MSOA)	16.55	4.19	0	33.18

Notes: std. dev. is Standard deviation, Min. is minimum and Max. is maximum; n=27,160 in all cases except hip fractures (n=27,034). All variables labelled with (non-MSOA) are weighted by time from MSOA centroid.

Table 14: Results, MSOA home care provider analysis

VARIABLES	(1) OLS RE	(2) Poisson RE	(3) Poisson PA	(4) Neg. Binomial PA
MSOA-level				
Total population (log)	1.796***	1.337***	1.286***	1.284***
	(0.116)	(0.0705)	(0.0875)	(0.0820)
Population 85+ rate (%)	0.0666***	0.0996***	0.0709***	0.0738***
	(0.0189)	(0.0141)	(0.0145)	(0.0145)
Attendance Allowance 65+ rate (%)	-0.115**	-0.0802*	-0.115**	-0.0815*
	(0.0573)	(0.0453)	(0.0479)	(0.0461)
Pension Credit 60+ rate (%)	0.0172***	0.0145***	0.0126***	0.0104**
	(0.00532)	(0.00472)	(0.00401)	(0.00432)
Average house price (log)	0.0310***	0.0297***	0.0261***	0.0268***
	(0.00403)	(0.00289)	(0.00275)	(0.00274)
Female JSA rate (%)	-0.0385**	-0.0163	-0.0158	-0.0184
	(0.0152)	(0.0133)	(0.0119)	(0.0123)
Rural MSOA	-0.274***	-0.175***	-0.286***	-0.256***
	(0.0535)	(0.0519)	(0.0512)	(0.0506)
LA-level				
Hip fractures, 65+ (log)	0.0607*	0.0666**	0.0581**	0.0538**
	(0.0323)	(0.0283)	(0.0262)	(0.0264)
ASC community expenditure (log)	0.0218	0.0182	0.0152	0.0199
	(0.0222)	(0.0211)	(0.0190)	(0.0191)
10min radius				
Providers (log)	-0.0711***	-0.0257	-0.0625***	-0.0587***
	(0.0230)	(0.0179)	(0.0180)	(0.0180)
Total population (log)	0.0839***	0.0597***	0.0693***	0.0602***
	(0.0211)	(0.0187)	(0.0189)	(0.0183)
Population 85+ rate (%)	-0.0307**	-0.0297***	-0.0200*	-0.0225**
	(0.0128)	(0.0106)	(0.0111)	(0.0109)
Attendance Allowance 65+ rate (%)	0.00534	0.0154	0.00695	0.0107
	(0.0132)	(0.0115)	(0.0109)	(0.0110)
Pension Credit 60+ rate (%)	-0.0230***	-0.0234***	-0.0218***	-0.0196***
	(0.00651)	(0.00544)	(0.00532)	(0.00545)
Female JSA rate (%)	-0.0229	-0.0190	-0.0124	0.00477
	(0.0346)	(0.0292)	(0.0287)	(0.0286)
10-15min radius				
Providers (log)	-0.00851	-0.0113	-0.00673	-0.00557
	(0.0191)	(0.0155)	(0.0149)	(0.0155)
Total population (log)	-0.0349	-0.0291*	-0.0254	-0.0247
	(0.0226)	(0.0176)	(0.0172)	(0.0174)
Population 85+ rate (%)	0.0154	0.00522	0.0101	0.00776
	(0.0101)	(0.00759)	(0.00741)	(0.00736)
Attendance Allowance 65+ rate (%)	0.000797	0.00286	0.00162	0.00385
	(0.0143)	(0.0120)	(0.0112)	(0.0112)
Pension Credit 60+ rate (%)	0.00586	0.00210	0.00397	0.00445
	(0.00743)	(0.00595)	(0.00607)	(0.00632)
Female JSA rate (%)	-0.0174	-0.0240	-0.0134	-0.0308
	(0.0361)	(0.0313)	(0.0300)	(0.0303)
15-20min radius				
Providers (log)	-0.00801	-0.00637	-0.0124	-0.0124
	(0.0208)	(0.0166)	(0.0159)	(0.0161)
Total population (log)	-0.0324	-0.00427	-0.0207	-0.0158
	(0.0279)	(0.0210)	(0.0215)	(0.0207)
Population 85+ rate (%)	0.0169*	0.0101	0.0112	0.00996
	(0.00935)	(0.00740)	(0.00701)	(0.00702)
Attendance Allowance 65+ rate (%)	0.00540	0.00180	0.00620	0.00821

	(0.0161)	(0.0134)	(0.0128)	(0.0128)
Pension Credit 60+ rate (%)	-0.00497	-0.00726	-0.00490	-0.00641
	(0.00771)	(0.00689)	(0.00650)	(0.00657)
Female JSA rate (%)	0.0394	0.0202	0.0199	0.0144
	(0.0383)	(0.0335)	(0.0313)	(0.0308)
20-30min radius				
Providers (log)	0.0275	0.0156	0.0222	0.0364
	(0.0348)	(0.0339)	(0.0261)	(0.0264)
Total population (log)	-0.0398	-0.0521	-0.0350	-0.0492
	(0.0510)	(0.0519)	(0.0331)	(0.0325)
Population 85+ rate (%)	0.00404	0.00624	0.00342	0.00462
	(0.0132)	(0.00977)	(0.00973)	(0.00953)
Attendance Allowance 65+ rate (%)	-0.0187	-0.00705	-0.0132	-0.0141
	(0.0221)	(0.0191)	(0.0181)	(0.0185)
Pension Credit 60+ rate (%)	-0.0113	-0.00441	-0.0108	-0.00958
	(0.0109)	(0.00911)	(0.00910)	(0.00894)
Female JSA rate (%)	0.0401	0.00115	0.0205	0.0223
	(0.0529)	(0.0470)	(0.0443)	(0.0447)
30-40min radius				
Providers (log)	0.117***	0.0683**	0.0849***	0.0785**
	(0.0377)	(0.0308)	(0.0301)	(0.0309)
Total population (log)	-0.0248	0.0129	-0.0110	-0.0194
	(0.0481)	(0.0363)	(0.0328)	(0.0356)
Population 85+ rate (%)	0.00320	0.00161	0.00377	0.00168
	(0.0109)	(0.00783)	(0.00813)	(0.00815)
Attendance Allowance 65+ rate (%)	-0.0397	-0.0534**	-0.0368*	-0.0311
	(0.0253)	(0.0221)	(0.0206)	(0.0208)
Pension Credit 60+ rate (%)	0.00768	0.00951	0.00947	0.00656
	(0.0126)	(0.0105)	(0.0105)	(0.0104)
Female JSA rate (%)	-0.0694	-0.0316	-0.0643	-0.0637
	(0.0599)	(0.0514)	(0.0497)	(0.0500)
40-50min radius				
Providers (log)	0.121***	0.0720*	0.0881***	0.0873***
	(0.0412)	(0.0394)	(0.0324)	(0.0334)
Total population (log)	-0.124**	-0.0657	-0.0712*	-0.0736*
	(0.0570)	(0.0587)	(0.0416)	(0.0444)
Population 85+ rate (%)	0.0105	0.00485	0.00692	0.00564
	(0.0100)	(0.00786)	(0.00741)	(0.00726)
Attendance Allowance 65+ rate (%)	0.000177	-0.00200	0.00600	-0.00206
	(0.0244)	(0.0216)	(0.0205)	(0.0206)
Pension Credit 60+ rate (%)	0.0222*	0.0129	0.0153	0.0160*
	(0.0117)	(0.00974)	(0.00982)	(0.00961)
Female JSA rate (%)	-0.0705	-0.0347	-0.0451	-0.0227
	(0.0560)	(0.0483)	(0.0465)	(0.0460)
East Midlands	0.0934	0.0727	0.0731	0.0684
	(0.0936)	(0.0669)	(0.0719)	(0.0683)
London	0.0555	0.0967	0.0911	0.0759
	(0.112)	(0.0915)	(0.0924)	(0.0893)
North East	-0.136	-0.180	-0.186	-0.200*
	(0.129)	(0.111)	(0.116)	(0.114)
North West	-0.0899	-0.0764	-0.123	-0.107
	(0.101)	(0.0799)	(0.0831)	(0.0813)
South East	-0.0529	-0.0433	-0.0429	-0.0335
	(0.0740)	(0.0573)	(0.0585)	(0.0570)
South West	-0.0171	-0.00843	-0.0121	-0.00183
	(0.0898)	(0.0691)	(0.0697)	(0.0684)
West Midlands	0.162	0.159**	0.121	0.132*
	(0.103)	(0.0748)	(0.0771)	(0.0735)
Yorkshire & Humberside	-0.111	-0.0923	-0.122	-0.101

	(0.100)	(0.0803)	(0.0823)	(0.0821)
2015	-0.00611	-0.00540	-0.00706	-1.62e-05
	(0.0192)	(0.0158)	(0.0159)	(0.0163)
2016	-0.00648	-0.00800	-0.0103	0.000711
	(0.0310)	(0.0253)	(0.0255)	(0.0259)
2017	0.0181	0.00857	0.00727	0.0195
	(0.0403)	(0.0328)	(0.0330)	(0.0335)
Constant	-12.95***	-11.03***	-10.06***	-10.19***
	(1.437)	(1.135)	(1.108)	(1.067)
Observations	27,034	27,034	27,034	27,034
Number of MSOAs	6,790	6,790	6,790	6,790

Notes: Robust standard errors in parentheses. Neg. is Negative. *** p<0.01, ** p<0.05, * p<0.1.

5.2.1 Extensions

Endogeneity It is likely that the number of providers in a market is endogenous to the market system (see Section 2). As such, we looked to address this effect in the analysis. We did this in a number of ways. First, given the exploratory nature of the analysis, we looked to include those distinct time radii spatial lags of control variables which were not significant in the main analysis as instruments for supply at each respective time radii. The argument for their inclusion as instruments is that any effect they have on MSOA supply is only felt through their effect on supply at each specific time radii. We used female JSA rate and AA uptake for supply measures at most time radii, with the exception of 30-40 and 40-50 minutes where pension credit uptake was utilised as an additional instrument with AA uptake not used as an instrument for the supply of the former of these two time radii. The first section of Table 15 presents this specification. The overall findings are comparable and so only the coefficients and standard errors for the supply measures are reported, along with indicators of the quality of the instruments. These show that MSOA home care supply is negatively affected by supply in a 10-15 minute radius and positively affected by supply in a 40-50 minute radius. The instruments used are strong, with the possible exception of those for supply at a 40-50 minute radius and there is no evidence of over identification. Further, there is also no evidence of endogeneity of the supply at each time radii. When we used a random effects Poisson specification, we found no significant negative effect for the lower time radii.

A second set of instruments were also utilised, specifically time lags. We used the 1-year and 2-year lag of the supply measures at each specific time radii. We did not include the other demand and supply measures at the time radii in this specification, assuming that demand and supply factors at each time radii would only affect MSOA supply through supply at each specific time radii. This specification therefore only included MSOA-level and LA-level variables utilised in the main analysis, and only included MSOAs over two years, 2015-2016, because of the time lags utilised. The results for the supply measures are presented in the second section of Table 15, along with tests for the

appropriateness of the instruments. Overall, the time lag instruments are adequate and explain supply at each time radii extremely strongly. There was also evidence of endogeneity for some of the supply measures at specific time radii. Overall, all supply up to 20-30 minutes negatively effects MSOA home care supply. At distances greater than 30 minutes supply positively effects MSOA home care supply. These results were also broadly the same when using a random effects Poisson specification.

Table 15: Results of MSOA home care supply model with instruments of nearby supply, by time radii

Specification	10mins	10-15mins	15-20mins	20-30mins	30-40mins	40-50mins
Spatial lag instruments						
PA	-0.88	-0.084***	0.048	-0.089	0.114	0.748***
	(0.087)	(0.029)	(0.087)	(0.297)	(0.169)	(0.280)
RE	-0.131	-0.029	0.052	-0.179	0.205	0.626**
	(0.086)	(0.029)	(0.087)	(0.332)	(0.179)	(0.293)
Weak instruments	186.38***	55.28***	192.36***	60.21***	81.40***	8.24***
Overidentification	0.03^{NS}	1.25^{NS}	0.70^{NS}	0.50^{NS}	1.15^{NS}	0.88^{NS}
Endogeneity	-1.15^{NS}	1.20^{NS}	-0.26^{NS}	0.37^{NS}	-1.51^{NS}	1.29^{NS}
Time lag instruments						
PA	-0.005	-0.049***	-0.049***	-0.063**	0.053*	0.058**
	(0.018)	(0.016)	(0.017)	(0.024)	(0.029)	(0.028)
RE						
Weak instruments	42,143.3***	25,979.5***	21,425.0***	42,137.1***	24,032.9***	27,547.8***
Overidentification	2.25^{NS}	1.63^{NS}	0.73^{NS}	0.42^{NS}	0.12^{NS}	0.35^{NS}
Endogeneity	-1.39^{NS}	1.71*	2.83***	2.03**	-1.33^{NS}	-0.56^{NS}

Notes: Robust standard errors in parentheses. PA = Population averaged, RE = Random effects, NS = Not significant. *** p<0.01, ** p<0.05, * p<0.1. Spatial lag instruments: model includes all covariates included in main findings with the exception of the instruments outlined, i.e. Attendance Allowance uptake (not used for 30-40mins) and Job Seeker's Allowance rate at each time radii, with Pension credit uptake used additionally for 30-40mins and 40-50mins.

Finally, we used a dynamic panel model where there is a dynamic adjustment in the number of providers in small markets by using lags of the dependent variable. We estimated a two-step GMM process which produces consistent estimates for models with a small number of waves and large number of units of observation and is more efficient than a one-step procedure (Arellano and Bond, 1991; Blundell and Bond, 1998; Roodman, 2009).[11] We included the 1-year lag of home care and instrumented this with previous years' observations. We also instrumented competition at nearby radii using their time lags. The results are reported in Table 16. Three specifications are presented

[11] This model is looking at differences between years and so as such does not include region or rural indicator since these did not change over time. We also did not include Attendance Allowance uptake in this model to maximise observations.

with a reduction in number of variables included in the model (and hence number of instruments). Nearby competition at up to 10 minutes radius has a negative effect on number of providers in an MSOA, but for all other further radii the effect on the number of providers is positive (15-20 is only marginally significant in two specifications and 30-40 minutes is not significant). There are negative effects of significant demand factors at greater time radii, i.e. above 20-30 minutes. The two-year time lag instruments included the model are valid in terms of the over identification (Hansen) test and the model is also valid as the Arellano-Bond test shows no autocorrelation at AR(2) level in the time varying error term.

Informal carers It is likely that the level of informal caring could influence the supply of home care in a market, and also vice versa. Given the endogenous nature of this relationship, we included Carer's Allowance (CA) uptake at LA-level for the years 2015-2017 to examine if this influenced any findings. We found the expected significant inverse relationship between CA uptake and home care supply (results not reported), but acknowledge that the causality of this relationship is unknown. The findings for the other variables in the model were broadly similar, although there was evidence that LA adult social care expenditure on non-residential care is significant in the home care supply model when including carer's allowance, with a 1% increase in expenditure raising the number of providers by 7%, everything else equal. Given this finding, we experimented with interactions between these two variables, finding that the effect of LA adult social care expenditure grows as Carer's Allowance uptake increases.

LA unit cost of home care provision We utilised an alternative measure of adult social care expenditure which was not available for all LAs across all years. Specifically, we utilised the average unit cost of home care provision by external providers paid by each LA from 2015-2017. We found that this had no relationship with home care supply in the main model nor when using spatial lag instruments, but did have a significant positive effect on MSOA home care supply in the models where home care supply at time radii was instrumented with time lags and also the dynamic panel models. In the former case, the size of effect was such that a £1 rise in cost per hour of home care provision to the LA increased home care supply in the average MSOA by 0.8%, other things equal.

Table 16: Results, MSOA home care provider analysis, two-step GMM dynamic panel model

VARIABLES	(1)	(2)	(3)
MSOA-level			
Number of providers (1-year lag)	0.480***	0.469***	0.499***
	(0.101)	(0.101)	(0.0959)
Total population (log)	0.770*	0.819*	0.779*
	(0.445)	(0.442)	(0.441)
Population 85+ rate (%)	-0.0213	-0.0242	-0.0246
	(0.0400)	(0.0398)	(0.0392)
Pension Credit 60+ rate (%)	-0.0460	-0.0528	-0.0124
	(0.0949)	(0.0924)	(0.0914)
Average house price (log)	-0.00568	-0.00284	-0.00131
	(0.00806)	(0.00734)	(0.00692)
Female JSA rate (%)	0.00974	0.0112	0.0108
	(0.0178)	(0.0169)	(0.0166)
LA-level			
Hip fractures, 65+ (log)	-0.0432	-0.0376	
	(0.0551)	(0.0545)	
ASC community expenditure (log)	0.00577	0.00246	
	(0.0343)	(0.0341)	
10min radius			
Providers (log)	-0.485***	-0.426**	-0.521***
	(0.172)	(0.169)	(0.171)
Total population (log)	0.0295		
	(0.0492)		
Population 85+ rate (%)	-0.0141		
	(0.0302)		
Pension Credit 60+ rate (%)	0.00482		
	(0.00941)		
Female JSA rate (%)	0.0255		
	(0.0375)		
10-15min radius			
Providers (log)	0.258***	0.270***	0.289***
	(0.0937)	(0.0914)	(0.0895)
Total population (log)	-0.0538		
	(0.0350)		
Population 85+ rate (%)	0.0404***	0.0267***	
	(0.0155)	(0.00978)	
Pension Credit 60+ rate (%)	0.0140		
	(0.00867)		
Female JSA rate (%)	0.0172		
	(0.0438)		
15-20min radius			
Providers (log)	0.133*	0.0883	0.122*
	(0.0795)	(0.0763)	(0.0732)
Total population (log)	0.0552*	0.0321*	
	(0.0294)	(0.0174)	
Population 85+ rate (%)	-0.0116		
	(0.0137)		
Pension Credit 60+ rate (%)	0.00115		
	(0.00825)		
Female JSA rate (%)	-0.0783*		
	(0.0447)		
20-30min radius			
Providers (log)	0.390**	0.349**	0.418***
	(0.159)	(0.136)	(0.138)
Total population (log)	0.0814		
	(0.0793)		
Population 85+ rate (%)	-0.0412**	0.000783	
	(0.0194)	(0.0706)	
Pension Credit 60+ rate (%)	-0.0262*	-0.0148	

	(0.0134)	(0.0109)	
Female JSA rate (%)	0.00781		
	(0.0597)		
30-40min radius			
Providers (log)	0.125	0.103	0.201
	(0.146)	(0.147)	(0.135)
Total population (log)	-0.0455		
	(0.0564)		
Population 85+ rate (%)	0.00390		
	(0.0163)		
Pension Credit 60+ rate (%)	-0.000752		
	(0.0141)		
Female JSA rate (%)	0.0526		
	(0.0648)		
40-50min radius			
Providers (log)	0.748***	0.652***	0.437***
	(0.221)	(0.194)	(0.121)
Total population (log)	-0.750***	-0.655***	
	(0.250)	(0.232)	
Population 85+ rate (%)	-0.00225		
	(0.0160)		
Pension Credit 60+ rate (%)	-0.00407		
	(0.0164)		
Female JSA rate (%)	0.0406		
	(0.0608)		
2015	0.0107	0.0600	-0.0352
	(0.0789)	(0.0566)	(0.0261)
2016	0.00925	0.0346	-0.0230
	(0.0498)	(0.0342)	(0.0181)
2017	0.000662	0.0142	-0.0214*
	(0.0259)	(0.0187)	(0.0112)
Observations	19,884	19,884	20,370
Number of MSOAs	6,790	6,790	6,790
Hansen test	53.04^{NS}	51.78^{NS}	53.57^{NS}
Arellano-Bond AR(1) test	-5.08***	-4.98***	-5.61***
Arellano-Bond AR(2) test	-0.04^{NS}	-0.03^{NS}	0.17^{NS}
Number of instruments	94	75	68
Wald test	383.17***	365.62***	373.11***

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

5.2.2 Marginal effects

The marginal effects of nearby home care supply on MSOA home care supply are presented in Table 17 for the specifications presented in Tables 14 and 15. Also included are the marginal effect of nearby homecare supply from a random effects tobit specification of the main model, which censors MSOA home care supply at zero. Looking at the population-averaged Poisson specification, a 1% rise in the number of time-weighted home care providers within a 10 minute radius of the MSOA would decrease MSOA home care providers by 6.9%, ceteris paribus. To put this in to context, for the average MSOA almost six new providers would need to locate at a 10 minute radius to the MSOA to reduce MSOA providers by one.[12] The marginal effects from the spatial lag specifications for home

[12] A 6.9% fall in MSOA providers is equivalent to a fall of 0.17 providers for every extra provider located 10 minutes away. This is calculated as $\Delta N_j = \frac{ME*(1/(\overline{n_{10}}*0.01)}{\sqrt{d}}$, where ME = marginal effect, $\overline{n_{10}}$ is the average

care supply in a 40-50 minute radius are very large, indicating that every 1.5 or two new providers located 50 minutes away would increase the MSOA home care supply by 1 provider, dependent on the specification. Overall, these would appear to be an outlier.[13] Home care supply up to 20 minutes in radius has a negative association with MSOA home care supply fairly consistently and that over 30+ minutes out usually has a positive association. The marginal effect of supply in the 20-30 minutes radius on MSOA home care supply becomes negative when instrumenting for endogeneity.

Table 17: Marginal effects of nearby supply on MSOA home care supply, by time radii

Specification	10mins	10-15mins	15-20mins	20-30mins	30-40mins	40-50mins
OLS, RE	-0.0711***	-0.0085	-0.0080	0.0275	0.1169***	0.1209***
Poisson, RE	-0.0257	-0.0113	-0.0064	0.0156	0.0683***	0.0720*
Poisson, PA	-0.0685***	-0.0074	-0.0136	0.0243	0.0931***	0.0966***
Neg. binomial, PA	-0.0643***	-0.0061	-0.0136	0.0398	0.0860***	0.0956***
Tobit, RE	-0.1286***	0.0024	-0.0154	0.0502	0.1908***	0.1823**
Poisson, PA (Spatial lags)	-0.0966	-0.0917***	0.0530	-0.0980	0.1251	0.8201***
Poisson, RE (Spatial lags)	-0.1306	-0.0292	0.0521	-0.1787	0.2048	0.6257***
Poisson, PA (Time lags)	-0.0058	-0.0553***	-0.0558***	-0.0712**	0.0603*	0.0663***
Poisson, RE (Time lags)	0.0066	-0.0575***	-0.0376*	-0.0647***	0.0484	0.0638*

Notes: Marginal effects at means. *** p<0.01, ** p<0.05, * p<0.1

5.3 Closure analysis

Descriptive statistics for the closure analysis are presented in Table 18. 14.2% of home care providers closed over the 3 year period. The average home care provider was located: within 10 minutes of 17 time-weighted alternative providers and 618 time-weighted care home beds; in an LSOA with a population of 1,830 of which 2.6 per cent were over 85, 1.1 percent of women were claiming JSA and 14 per cent of over 60s and 24 per cent of over 65s were claiming needs and income benefits, respectively; in an MSOA with an average house price of £0.213m; and in an LA with almost 250 hip fractures a year for over 65s and an average spend on community adult social care of over £25m a year. The majority (61.9 per cent) of providers were sole organisations, with

number of providers in a 10 minute radius of MSOA j and d is distance in time to the new provider from the MSOA, with $d = 1$ for any time less than 1 minute. If the new providers were locating 5 minutes from the MSOA centroid, just over 3 new providers would lead to a one provider reduction in MSOA provider home care supply.

[13] Although note the size of effect in the dynamic panel models. Also, the quality of the spatial instruments for home care providers in a 40-50 minutes time radii were relatively weak and may influence this finding (see Table 15).

11.2 per cent of providers being part of an organisation with 20 or more providers. Eighty-one per cent of providers were registered to provide services to older people and 14.6 per cent were registered to provide services to children.

Table 18: Descriptive statistics, closure analysis

Variable	n	Mean	Std.Dev.	Min.	Max.
Dependent variable					
Home care provider closed	24,710	0.142	0.349	0	1
Endogenous variables					
Number of Providers, 10mins (weighted)	24,710	17.22	13.83	0	89.84
Quality	11,151	0.798	0.401	0	1
Independent variables - demand					
Total population (LSOA)	24,710	1830.1	493.9	840	11514
Population 85+ rate (LSOA)	24,710	2.637	1.988	0	18.82
Attendance allowance 65+ rate (LSOA)	24,710	14.18	5.211	0	46.36
Pension credit 60+ rate (LSOA)	24,710	23.81	16.15	0	123.31
Hip fractures 65+ (LA)	24,710	247.8	178.7	38	967
LA non-residential care ASC expenditure (£000s)	24,710	25111.5	17628.5	590.7	75135.6
Independent variables - supply					
Care home beds, 10mins (weighted)	24,710	618.0	351.7	0	2225.0
Female JSA rate (LSOA)	24,710	1.123	1.121	0	9.615
Average house price, £ (MSOA)	24,710	213365	141621	27513.9	2872631
Size of organisation, 1 provider	24,710	0.619	0.486	0	1
Size of organisation, 2-9 providers	24,710	0.216	0.412	0	1
Size of organisation, 10-19 providers	24,710	0.052	0.222	0	1
Size of organisation, 20+ providers	24,710	0.112	0.316	0	1
Registration: Older people	24,710	0.810	0.392	0	1
Registration: Dementia	24,710	0.676	0.468	0	1
Registration: Learning disability	24,710	0.641	0.480	0	1
Registration: Mental health	24,710	0.559	0.497	0	1
Registration: Younger adults	24,710	0.697	0.460	0	1
Registration: Children	24,710	0.146	0.353	0	1
Instruments					
Number of providers, 10-15mins (weighted)	24,710	7.396	7.388	0	43.54
Number of providers, 15-20mins (weighted)	24,710	7.614	7.232	0	44.08
Number of providers, 40-50mins (weighted)	24,710	17.84	14.01	0	71.04
Average LA quality	24,710	0.755	0.165	0	1
Female JSA rate (MSOA)	24,710	1.300	1.072	0	9.652

Notes: Std. Dev. = standard deviation, Min. = minimum, Max. = maximum. LSOA = Lower layer Super Output Area, MSOA = Middle layer Super Output Area, LA = Local authority, JSA = Job Seeker's Allowance.

Table 19 provides the results of estimating the closure model. As outlined, we instrumented for the number of providers within 10 minutes radius using the number of providers within 10-15, 15-20 and 40-50 minutes radius, assuming these to have a relationship with number of providers in the vicinity of home care provider i but that these do not have an influence on the likelihood of closure directly. We also instrumented for quality using the average quality level at LA-level, excluding the quality level of the provider j, and MSOA-level pension attendance allowance uptake, excluding the uptake in the LSOA where the provider is located. Again, it was assumed that any effects of these variables on closure are only through their effect on home care provider quality. To assess the quality of the models, we followed the methods employed in Allan and Forder (2015). Specifically, we assessed for the quality of instruments using an F-test of the instruments in a first stage regression of home care supply and quality. We assessed for over identification using an F-test of residuals from 1st stage included in the model of closures. Endogeneity was assessed using either a Wald test provided in the IV probit model (column 1) or from assessing the significance of instruments when included in a regression of the residuals from the closure model. Finally, we assessed in the PA and RE models the quality of the specification using a test of the significance of the square of predicted closures when included in the model of closures. Overall, the instruments are strong, but there is likely over identification in the quality instruments in two of the three models. There is evidence of endogeneity in the model and there is only weak evidence of their being random effects in the model. Table 20 presents the first stage models of home care provider supply.

Overall, the results are as expected. Greater competition in terms of the number of providers located nearby increased the likelihood of closure, whereas good quality significantly decreased the likelihood of closure. These confirm the theoretical hypotheses. Other demand factors which significantly influenced the likelihood of closure are measures of need, i.e. attendance allowance uptake and hip fractures at LA-level, with higher levels of both reducing the likelihood of closure. On the supply-side, providers which are part of an organisation were much more likely to close than sole run providers. This may suggest a difficulty in expansion within the market or a collation of services from one location. The results also show that providers registered to provide care to younger adults were more likely to close than those registered to provide care to older people. Finally, the number of care home beds in the market significantly reduced the likelihood of closure. This suggests a complementary relationship and is in line with analysis of care home closures (Allan, 2021; see also Toivanen and Waterson, 2005).

Table 19: Results, closure model

VARIABLES	(1) IV Probit	(2) PA Probit	(3) RE Probit
Home care supply			
Providers, 10mins (log)	0.198**		
	(0.0887)		
Providers, 10mins (predicted)		0.203**	0.214**
		(0.0904)	(0.0970)
Home care quality			
Quality (predicted)	-0.355***	-0.363***	-0.378***
	(0.0699)	(0.0695)	(0.0738)
Demand			
Total population (log)	-0.0463	-0.0461	-0.0478
	(0.0477)	(0.0477)	(0.0509)
Population 85+ rate	0.00753	0.00821	0.00909
	(0.00842)	(0.00861)	(0.00922)
Attendance allowance 65+ rate	-0.00713***	-0.00733***	-0.00776***
	(0.00264)	(0.00264)	(0.00283)
Pension credit 60+ rate	0.000628	0.000659	0.000762
	(0.00132)	(0.00131)	(0.00141)
Hip fractures (log)	-0.0420**	-0.0412*	-0.0429*
	(0.0212)	(0.0212)	(0.0225)
LA non-residential care expenditure (log)	0.0169	0.0161	0.0183
	(0.0185)	(0.0183)	(0.0196)
Supply			
Care home beds, 10mins (log)	-0.177**	-0.181**	-0.192**
	(0.0792)	(0.0804)	(0.0863)
Female JSA rate	0.0155	0.0152	0.0157
	(0.0120)	(0.0120)	(0.0127)
Average house price (log)	0.00788	0.0104	0.0108
	(0.0353)	(0.0351)	(0.0373)
Size of organisation, 2-9	0.394***	0.397***	0.425***
	(0.0249)	(0.0248)	(0.0327)
Size of organisation, 10-19	0.437***	0.440***	0.468***
	(0.0425)	(0.0422)	(0.0483)
Size of organisation, 20+	0.259***	0.262***	0.279***
	(0.0322)	(0.0322)	(0.0359)
Registration: Dementia	0.00925	0.00916	0.00990
	(0.0249)	(0.0249)	(0.0266)
Registration: Learning disability	-0.0307	-0.0304	-0.0319
	(0.0236)	(0.0236)	(0.0252)
Registration: Mental health	-0.0339	-0.0344	-0.0368
	(0.0242)	(0.0241)	(0.0260)
Registration: Young adult	0.0425*	0.0427*	0.0435*
	(0.0239)	(0.0239)	(0.0255)
Registration: Children	0.0405	0.0392	0.0439
	(0.0289)	(0.0290)	(0.0312)
Constant	0.0232	0.0152	-0.00351
	(0.735)	(0.729)	(0.781)
Observations	24,710	24,710	24,710
Number of home care providers		11,183	11,183
Wald	507.01***	501.94***	431.58***
Weak instruments (Competition)	642.05***	699.58***	699.58***
Weak instruments (Quality)	542.30***	542.30***	542.30***
Over identification (Competition)	0.59^{NS}	1.37^{NS}	0.49^{NS}
Over identification (Quality)	7.92***	0.34^{NS}	8.05***
Endogeneity (Competition)	3.59*	-1.90*	1.87*
Endogeneity (Quality)	-11.67***	-11.66***	-9.21***
Specification		-0.84^{NS}	-1.12^{NS}
LR test of random effects			2.38*

Notes: Robust standard errors in parentheses, controls for region and year included. Omitted variables: Size of organisation, 1 and Registration: Older people. Weak instruments is an F-test of instruments from first stage; Over

identification is an F-test of residuals from 1st stage included in model of closures; Endogeneity test is Wald test of exogeneity (column 1, competition) and Z-value of instruments when included in regression of the residuals from model of closures; Specification test is Z-value of square of predicted closures when included in the model of closures (see Allan and Forder, 2015). NS indicates not significant and *** p<0.01, ** p<0.05, * p<0.1.

Table 20: First stage results

VARIABLES	(1) Quality	(2) Competition	(3) Competition (IV probit first stage)
Home care supply instruments			
Number of providers, 10-15mins		0.0254***	0.0258***
(weighted)		(0.000567)	(0.00106)
Number of providers, 15-20mins		-0.0144***	-0.0151***
(weighted)		(0.000598)	(0.00104)
Number of providers, 40-50mins		0.00259***	0.00270***
(weighted)		(0.000288)	(0.000560)
Home care quality instruments			
Quality (predicted)			-0.0399
			(0.0279)
Average LA quality	0.984***		
	(0.0299)		
Attendance allowance 65+ rate,	-0.00229**		
MSOA	(0.00108)		
Demand			
Total population (log)	-0.0188	0.154***	0.156***
	(0.0124)	(0.0112)	(0.0224)
Population 85+ rate	0.00353**	-0.0606***	-0.0586***
	(0.00164)	(0.00155)	(0.00313)
Attendance allowance 65+ rate	0.00175**	0.00170***	0.000825
	(0.000729)	(0.000628)	(0.00109)
Pension credit 60+ rate	-0.000205	0.00816***	0.00846***
	(0.000328)	(0.000257)	(0.000438)
Hip fractures (log)	0.00154	0.00420	0.00890
	(0.00575)	(0.00517)	(0.0115)
LA non-residential care expenditure	-0.00326	-0.105***	-0.112***
(log)	(0.00446)	(0.00400)	(0.00765)
Supply			
Care home beds, 10mins (log)	0.00491	0.833***	0.832***
	(0.00400)	(0.00380)	(0.0193)
Female JSA rate	-0.00186	-0.0178***	-0.0190***
	(0.00354)	(0.00275)	(0.00450)
Average house price (log)	0.00651	0.0626***	0.0775***
	(0.00994)	(0.00855)	(0.0184)
Size of organisation, 2-9	0.148*	0.0229***	0.0287**
	(0.0777)	(0.00618)	(0.0118)
Size of organisation, 10-19	0.195**	0.0503***	0.0556***
	(0.0781)	(0.0112)	(0.0205)
Size of organisation, 20+	0.161**	0.0287***	0.0388**
	(0.0778)	(0.00805)	(0.0151)
Registration: Dementia	-0.0666***	-0.0113*	0.0274**
	(0.00628)	(0.00589)	(0.0138)
Registration: Learning disability	0.0107*	0.0268***	-0.0125
	(0.00645)	(0.00568)	(0.0122)
Registration: Mental health	-0.0212***	0.00495	0.0296**
	(0.00645)	(0.00585)	(0.0115)
Registration: Young adult	0.00146	0.0131**	0.0149
	(0.00634)	(0.00572)	(0.0115)
Registration: Children	0.00320	0.0361***	0.00220
	(0.00812)	(0.00713)	(0.0121)
Constant	-0.0405	-3.762***	-3.880***

	(0.190)	(0.149)	(0.336)
Observations	17,657	41,438	24,710
R-squared	0.100	0.731	

Notes: Robust standard errors in parentheses, controls for region and year included. Omitted variables: Size of organisation, 1 and Registration: Older people. *** p<0.01, ** p<0.05, * p<0.1.

Marginal effects of home care provider competition are presented in Table 21. From the PA probit model, a 1 per cent increase in time-weighted home care providers increased the likelihood of closure by 4.4 per cent, although the 95% confidence interval is fairly broad (0.6% to 8.3%). The random effects model is similar, although the marginal effect from the IV probit model is not significant. These marginal effects suggest that one new provider locating next to an existing provider increased the likelihood of closure of the existing firm by 25.5%, everything else being equal. This effect diminishes as time to new provider increased, e.g. to 8.1% if the new provider were to locate 10 minutes away from the existing provider.[14] The table also shows the effects when different time radii were used around home care locations in the closure model, 2.5, 5, 7.5, 15 and 20 minutes. We found that 5 and 7.5 minute radii have a similar sized effect for the mean home care provider, whereas briefer and longer time radii do not significantly influence likelihood of care home closure.

Table 21: Marginal effects of home care competition on closure

Competition time radius (Model)	Marginal effect	95% Confidence interval
10mins (IV)	0.0044	-0.0038 – 0.013
	(0.0042)	
10mins (PA)	0.0444**	0.0056 – 0.083
	(0.0198)	
10mins (RE)	0.0457**	0.0052 – 0.086
	(0.0207)	
2.5mins (PA)	0.0504	-0.017 – 0.118
	(0.0344)	
5mins (PA)	0.0500**	0.0009 – 0.099
	(0.0250)	
7.5mins (PA)	0.0452**	0.0044 – 0.086
	(0.0208)	
15mins (PA)	0.0555	-0.049 – 0.160
	(0.0533)	
20mins (PA)	0.0821	-0.047 – 0.211
	(0.0659)	

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

[14] This is calculated as $\Delta \Pr(c_j) = \frac{ME*(1/(\overline{n_{10}}*0.01)}{\sqrt{d}}$, where ME = marginal effect, $\overline{n_{10}}$ is the average number of providers in a 10 minute radius of MSOA j and d is distance in time to the new provider from the MSOA, with $d = 1$ for any time less than 1 minute.

5.3.2 Robustness checks

We performed a number of robustness checks. Additional PA probit models of closure are presented in Table 22. In the first column, the actual quality rating of providers is included, which limits observations. In the second model, quality ratings are excluded which increases the sample size to include 2014 observations. In the final two columns are models with additional variables included to the models presented in Table 19, column 2. A model with median female hourly wage in 2015 prices at LA-level is included in the third column, and a proxy for age, measured using date of registration of the location, is included in the final column.[15] All the findings are similar to those in the main analysis, with marginal effects slightly greater in size (range of 0.047-0.058). The effect of age of registration on closure was similar to that found for care homes with a quadratic relationship that is opposite to the general closure literature: newer providers were less likely to close than older providers (see Allan and Forder, 2015). However, the effect is quadratic in nature and the chance of closure was maximised for providers that had been registered for 3 years at 15.4% (see Table 23).

Further models were estimated with both measures of Carers Allowance uptake and LA average unit costs per hour of home care, both at LA-level. The former could be endogenous to the model with carers more likely where the supply of formal home care is lower. The latter could also be endogenous to the model and is included as an alternative indicator of LA expenditure in the market in place of per capita spend on non-residential social care. The findings are not reported but the overall results did not change markedly and neither additional variable significantly influenced the likelihood of closure.

[15] The date of registration is left censored as registration under new regulations only began in October 2010.

Table 22: Additional results, closure model (PA probit models)

VARIABLES	(1) Quality included	(2) Quality excluded	(3) Median LA wage included	(4) Registration age included
Home care supply				
Providers, 10mins (predicted)	0.242*	0.158**	0.192**	0.239***
	(0.142)	(0.0806)	(0.0908)	(0.0896)
Home care quality				
Quality	-0.458***			
	(0.0372)			
Quality (predicted)			-0.354***	-0.261***
			(0.0697)	(0.0676)
Demand				
Total population (log)	-0.0883	-0.0467	-0.0435	-0.052
	(0.0773)	(0.0421)	(0.0478)	(0.0477)
Population 85+ rate	0.00277	0.00167	0.00892	0.0104
	(0.0137)	(0.00757)	(0.00862)	(0.0086)
Attendance allowance 65+ rate	-0.00964**	-0.00745***	-0.00729***	-0.0074***
	(0.00440)	(0.00224)	(0.00264)	(0.0026)
Pension credit 60+ rate	-0.00112	0.000990	0.000380	0.0004
	(0.00216)	(0.00112)	(0.00132)	(0.0013)
Hip fractures (log)	-0.0297	-0.0335*	-0.0422**	-0.037*
	(0.0338)	(0.0181)	(0.0212)	(0.0212)
LA non-residential care expenditure (log)	0.0136	0.0191	0.0154	0.021
	(0.0296)	(0.0158)	(0.0183)	(0.018)
Supply				
Care home beds, 10mins (log)	-0.201	-0.136*	-0.174**	-0.212***
	(0.127)	(0.0716)	(0.0806)	(0.0797)
Female JSA rate	0.0140	0.0154*	0.0153	0.016
	(0.0206)	(0.00926)	(0.0120)	(0.0120)
Average house price (log)	0.0265	0.0121	-0.0109	0.008
	(0.0560)	(0.0306)	(0.0374)	(0.0352)
Female median hourly wage, £			0.0154	
			(0.00962)	
Size of organisation, 2-9	0.424***	0.361***	0.396***	0.394***
	(0.0396)	(0.0213)	(0.0248)	(0.025)
Size of organisation, 10-19	0.525***	0.386***	0.439***	0.437***
	(0.0658)	(0.0355)	(0.0422)	(0.042)
Size of organisation, 20+	0.326***	0.282***	0.259***	0.253***
	(0.0498)	(0.0277)	(0.0322)	(0.032)
Registration: Dementia	-0.0448	0.0219	0.00928	0.0186
	(0.0389)	(0.0211)	(0.0249)	(0.0249)
Registration: Learning disability	-0.0407	-0.0440**	-0.0304	-0.0286
	(0.0379)	(0.0204)	(0.0236)	(0.0237)
Registration: Mental health	-0.0244	0.000787	-0.0346	-0.0315
	(0.0392)	(0.0209)	(0.0241)	(0.0242)
Registration: Young adult	0.0666*	0.0549***	0.0423*	0.0299
	(0.0386)	(0.0205)	(0.0239)	(0.0244)
Registration: Children	0.0916**	0.0735***	0.0396	0.0414
	(0.0453)	(0.0246)	(0.0290)	(0.0291)
Age (of registration)				0.103***
				(0.0183)
Age (of registration) squared				-0.0203***
				(0.0033)
Constant	0.243	-0.505	0.0925	-0.0345
	(1.163)	(0.641)	(0.730)	(0.727)
Observations	11,159	32,760	24,710	24,710
Number of home care providers	6,830	12,443	11,183	11,183

Notes: Robust standard errors in parentheses, controls for region and year included. Omitted variables: Size of organisation, 1 and Registration: Older people. *** p<0.01, ** p<0.05, * p<0.1.

Table 23: Likelihood of closure of average provider by age of registration (PA probit model)

Age of registration	Probability of closure	Standard Error
0	0.1255	0.0042
1	0.1435	0.0031
2	0.1533	0.0036
3	0.1537	0.0037
4	0.1446	0.0033
5	0.1273	0.0038
6+	0.1039	0.0060

5.3.3 Validity of home care competition measure

The analyses above have utilised the count of home care providers as a measure of supply/competition, assuming that all providers are of equal size. A drawback to using the CQC register of homecare providers registered with the CQC is that although it provides a count of the number of suppliers it does not give any indication as to the number of people they support or hours of support provided. Alternative measures of supply could have been utilised in the analysis, such as number supported/hours of support provided by LAs or counts of the workforce employed.

To assess the validity of the count of home care providers as a measure of supply, we performed at LA-level pairwise correlations with number of home care providers and both: non-residential expenditure by LAs for 2014-2018 (adjusted for inflation to 2015 levels) from LA Adult Social Care Finance Returns (ASC-FR) and Skills for Care estimates of LA-level direct care workforce for 2018 (workforce total and whole time equivalent jobs). The correlations reported in Table 24 are all strongly positive and significant. Table 24 also presents the coefficients and R^2 of regressions between these alternative measures of home care supply. First, a regression of the natural logarithm of total home care providers in each LA with the natural logarithm of gross non-residential expenditure as the sole dependent variable, and then regressions of the natural logarithm of total workforce/jobs with the natural logarithm of home care as the sole independent variable.[16] A one percent rise in non-residential expenditure by the average LA increased the number of home care providers by 0.3 per cent and non-residential expenditure explained almost 70 per cent of the variation of home care providers. For the workforce regressions, a one per cent rise in the number of home care providers increased workforce and jobs by 0.84 per cent and 0.88 per cent, respectively, and the number of home care providers explained 84 to 87 per cent of the variation of the

[16] These are theoretical direction of the relationships we might expect, i.e. expenditure (demand) influences number of providers which in turn influences size of workforce.

respective dependent variables. Overall, there is evidence that the counts of home care providers is a viable measure of home care supply.

Table 24: Relationship between home care provider count and alternative supply measures, LA-level

	LA Gross expenditure on non-residential services (£000s)[a]	Total workforce (permanent and temporary)[b]	Total whole time equivalent jobs[b]
Correlation coefficient	0.882***	0.956***	0.947***
Regression coefficient	0.285***	0.838***	0.881***
(Standard Error)	(0.076)	(0.032)	(0.027)
Regression R^2	0.692	0.863	0.872

Notes: Correlation coefficient reports the Pearson's correlation coefficient between Total home care providers and: LA Gross expenditure (2014-18) and both total workforce and whole time equivalent jobs (2018). [a] Regression of ln(total home care providers) with ln(LA gross expenditure on non-residential services as independent variable using *xtreg* command in Stata 16 with standard errors clustered by LAs, n=750. [b] Regression of ln(workforce/whole time equivalent jobs) with ln(total home care providers) as independent variable using *reg* command in Stata 16 with standard errors robust to heteroscedasticity, n=150. *, **, and *** indicate significance at the 10%, 5% and 1% levels, respectively.

6. Discussion

With a growing elderly population and policy looking to support people with their care needs at home and in the community the market for home care has been rapidly growing. However, as yet, little is known about the supply dynamics of home care in England, with most research being at the descriptive level and the quantitative literature that does exist has tended to focus on the effect of home care supply on health care utilisation. This report extends the research for home care in England. We have utilised national registration data on the number and location of providers to explore the distribution of home care across the country at regional, local authority and small market level. We have also quantitatively assessed the drivers of home care supply at small area level and the causes of closure at provider level.

Much of the quantitative literature has utilised LA adult social care expenditure as a measure of supply, i.e. met demand. This measure of home care supply has a number of disadvantages such as ignoring the self-funder side of the market, keeping the effect of competition between providers in a 'black box', and restricting the level of analysis to local authorities when many home care providers will serve markets that lie across LA boundaries. We have measured supply of home care using a count of providers by their location. This measure of supply naturally lends itself to measuring the effect of competition and allows for markets to be defined at various levels, from nationally to provider level. Given this, we have measured home care supply using the number of providers within

a radius of a defined market or provider. Utilising the number of home care providers as the measure of supply will also mean that the self-funder side of the market is included in the analysis. A caveat to this is any employment of personal assistants by self-funders and those who receive direct payments from their LA. Little information on the personal assistant market is available since they are not regulated, but it is estimated that there is a growing supply of PAs employed across the country (Skills for Care, 2020).

We developed a home care dataset for 2014-2018 using national regulator data on registered providers of home care in England. We were able to match providers over time using regulator ID for provider and organisation as well as location and provider name. Using this dataset, our findings showed that whilst overall the number of providers in England is rapidly growing, there are large differences in this growth across regions of England, with some indication of a north-south divide. The North West region has seen no change and the North East region a reduction in the number of providers over time. The rise in the number of providers also masks that there is a large level of provider turnover in the market, with openings and closures of providers that are above the national average for all businesses. Whilst the Schumpeterian process of creative destruction can be considered an indication of a successful market, the extent to which this applies in a market where the services provide care is open to question, particularly where continuity of care is an important factor in care quality (Brown Wilson and Davies, 2009; Brown Wilson et al., 2009).

At LA level, many markets have high levels of provider openings and closure in a given year. This could be an indication of market shaping policies and/or commissioning decisions influencing markets. Further research on specific LAs would be required to assess this in more detail. Further, there has been an increasing dispersion in the distribution of providers by LA with those LAs with higher numbers of providers growing at a faster rate than LAs with smaller numbers of providers. This may provide evidence of the difficulty to provide home care services in certain areas and potentially the market shaping decisions that LAs make to enable adequate provision in these markets, e.g. commissioning a few providers to provide a large proportion of LA-funded care. At a small area level, generally there is access to a number of providers for most of the population of England, although a few markets do not have easy access to home care supply. Further investigation is required to assess equity in access to home care.

The descriptive analysis also provided indication that market size, LA-funding and supply could all impact on the size of supply in LA markets. To assess this more fully we performed a quantitative analysis of market supply at small area (MSOA) level. We used a count of providers located in MSOAs and analysed the effect that demand and supply characteristics of MSOAs and nearby, e.g.

population, needs indicators and female unemployment rates, as well as the number of providers nearby to MSOAs, i.e. within certain time/distances. The analysis provided evidence that demand and supply factors are important in determining the size of markets. Confirming theoretical hypotheses, population size increased, and nearby competition reduced, supply in small markets. We further found evidence that at greater distances competition increases small market supply. This finding may indicate that expansion of providers takes place locally moving in to new markets; it also suggests that market size of the average provider may be limited to 30 minutes around their location.

A further quantitative analysis at provider-level analysed the determinants of closure. Both quality and competition significantly influenced the likelihood of closure, with (high) quality decreasing and competition increasing closure probability, confirming hypotheses. The size of effect of competition can be fairly large, with a new provider locating next to an existing provider increasing the probability of closure by a quarter. There was also indication that providers are less likely to close in areas with high levels of need, e.g. attendance allowance uptake and hip fractures, and in areas with higher levels of care home supply. This latter finding, given the analysis has controlled for needs, could be an indication that providers are locating in markets where successful alternative providers of care already exist (e.g. Toivanen and Waterson, 2005). The analysis also found that those providers registered to provide care for children were more likely to close than those registered to provide care for older people.

This work is important to increase the available research knowledge on English home care markets and its findings are of use for policy to consider the market dynamics of home care. We have quantified the effect of the demand- and supply-side drivers of home care supply. Quantifying the effect of competition on market dynamics in home care markets is important for policy in terms of the commissioning of services. We have shown that encouraging market growth will bring increased competition which will lend itself to creating increased provider turnover. Markets need to be carefully managed if they are to provide choice to the consumer, create a market with continuous improvement and be able to provide continuity of care without driving providers out of the market (Needham et al., 2020). Further, providers in competition with one another for demand of their services are also likely to be in competition with one another for staff; the majority of recruitment of staff comes from within adult social care (Skills for Care, 2020; Allan and Darton, 2020). Competition between providers could therefore see both a drive down of price to the consumer, which any dominant purchasing power of LAs will exacerbate if not carefully managed, and a drive up of wages to their staff. Higher competition for staff could ultimately lead to reductions in care quality (Allan and Vadean, 2021).

We have confirmed that the CQC quality rating system successfully works as a system for providing quality information to consumers in the market. Closure occurs for those home care providers that have poorer quality, because of consumer choice and/or through the CQC regulatory process. This supports previous research for care homes in England (Allan and Forder, 2015). Importantly, closure of a home care provider is likely to mean a change in circumstance for those that were supported by the firm and this could have welfare implications. However, whilst there is evidence on the impact on outcomes of care home closures (e.g. Holder and Jolley, 2012), the extent of outcomes being disrupted by changes in home care provision is unknown. It is also certainly feasible in this market that there could be a consistency in provision through staff, either moving to a new provider or, potentially, through becoming a personal assistant. The likelihood of staff continuity would be much reduced for those that are LA-funded and not in receipt of a direct payment.

We note a number of limitations to the analyses. First, the construction of the panel of home care providers means that errors in the identification of closures is certainly feasible, although we do not believe it to be large. Second, closures are identified as complete closures, i.e. the provider is no longer registered to provide services. It is certainly feasible that other changes in provider structure, e.g. a change of ownership, will have effects on the outcomes of those receiving care and is something that could be addressed in future research. Third, the measure of supply used in the analyses, the count of home care providers, gives no indication as to the *size* of the providers. Therefore markets with the same number of providers are assumed to be equally competitive, whereas there are likely to be potentially marked differences in the competitive nature of the markets, e.g. a market with one or two large providers and a few smaller providers versus a market with many equally small providers. However, the measure also assumes that all the markets are at their most competitive state, i.e. providers have equal shares of the market. As such, the effects of competition are likely to be underestimated. Fourth, we note the use of instrumental variables used in both analyses to try and address the endogeneity issues likely to be present in the model of home care supply, the success of which depends on the quality of the instruments.

Fifth, we are missing important information which could influence the market, e.g. information on price and staffing. We have looked to address these by including relevant control variables such as small area level unemployment rates and median hourly female wage at LA-level for staffing. For the likely price observed in the market we included as an indicator the average unit cost paid by LAs for an hour of care, but we note that this was only available at a high level of aggregation. More granular information on price and staffing at provider-level would improve analysis of home care market dynamics in the future.

Finally, we further have been unable to assess the potential relationship that may exist between the PA market and the supply of home care. For example, it would be interesting to assess whether areas with lower supply of regulated home care providers have a greater supply of PAs. Overall, we would expect the extent of our findings on home care competition to remain robust to the inclusion of PA data.

7. Conclusion

Home care is an important part of the English social care market and yet, to date, little has been known about the dynamics of the supply side of this market in which over £3bn a year is spent. This report has shown how the market is changing over time at national, regional and local level, with differences across markets, including a growing disparity in the size of markets. Demand and supply factors such as population, needs, rurality and competition play an important role in market supply and likelihood of provider closure. The findings of this report have important implications for national and local policy for home care.

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