The effect of care home closures on the quality of care homes nearby*

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Abstract

Ensuring an adequate provision of care home places is essential for preserving the access to long term care services. This paper is the first to present evidence for the English care homes market on the causal effect of care home closures on other care homes in the market. The effect is a priori ambiguous. To identify the effect of closures I use an IV strategy on public administrative data that exploits the fact that care homes closures may be the result of a consolidation strategy from their care provider group to preserve its financial situation and carry on with its long term care activities. The main results show that incumbent care homes downgrade their quality after the closure of a care home nearby. The effect is moderate and decreases over time. I explore several explanations for this finding investigating mechanisms based on the frequency of quality inspections carried out by the regulator and alternative destinations where residents may go in the event of closure. I find an increase in the number of inspections of remaining care homes whereas I do not find evidence of an increase in the proportion of people providing informal care in the local authority or in emergency admissions of the nearest healthcare centre to the closed care home.

Keywords: Care homes, quality, long-term care, England, closures , market

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1 Introduction

During the first half of 2018, almost a third of the English local authorities experienced a closure of a care home affecting about 3,300 people in total (see Association of Directors of Adult Social Services (2018)). Ensuring an adequate provision of care home places is essential for preserving the access to long term care for the older and more dependent population. The lack of available places in long-term premises is also a key determinant of delayed discharges from acute care wards in hospitals[1]. Given their importance, the implications of care home closures are an increasing public concern. Whilst most of the sparse literature addressing the consequences of care home closures has been focused on the distress produced on care home residents (see for example Netten et al. (2003)), less is known about the consequences on other care homes[2].

This paper investigates the effects of care home closures on the quality of long-term care services. Generally, changes in the market structure alter the competition between the firms in the market and elements such as the quality of the services also change. Thus, changes in the market structure that lead to less competition between firms may result in a decrease in the quality of services. In healthcare markets, when prices are regulated, most theoretical models find this result[3]. In such cases quality is the only dimension that firmss can exploit to attract consumers and consequently have the incentive to invest in quality. Yet, if the price-cost margin decreases, firms may be disincentived to invest in quality (Gaynor and Town, 2011). When prices are not regulated, competition may have an ambiguous effect on quality leading to too high or too low levels of quality (Propper, 2018). The empirical literature studying the health sector provides mixed evidence regarding the effect of competition on quality (Castle et al., 2007; Grabowski, 2004; Forder and Allan, 2014).

The market for long-term care in England is fairly competitive and prices are not subject to regulation so the effect of closures is a priori ambiguous. If closures are driven by care

[1] Gaughan et al. (2015) and Gaughan et al. (2017) conclude that the provision of care homes affects the bed blocking in near hospitals.

[2] Glasby et al. (2018) highlight the lack of formal evidence about what happens when care homes close.

[3] As Propper (2018) notes, a growing body of theoretical models are showing different results by introducing further assumptions such buyers with constrained budgets (Brekke et al., 2015) or altruistic providers (Brekke et al., 2018)

homes that are not efficient nor competitive enough to maintain quality standards, a higher consolidation in the market may have positive effects on quality. The remaining care homes would compete on quality to attract clients and increase both their market share and profit (Netten et al., 2005). Castle et al. (2007) find evidence supporting this argument showing that higher concentration in the market is associated with an increase in care home quality. Grabowski (2004) also finds a positive association between concentration and a number of outcomes that include number of patients with pressure sores and registered nursing staff. Closures may also have negative consequences for the quality of incumbent care homes. Particularly, with sudden closures, if there is a lack of coordination between the parties involved in the process and existing care homes operate at their maximum capacity. In such cases, an increase of residents from a forced relocation may imply a reduction of the time dedicated to caring by the staff of incumbent care homes. This would lead to reductions in the quality of the service[4]

Empirically, determining the effects of a closure on the quality of the care homes within the same local market is difficult. There may be unobserved costs and demand shocks that can impact simultaneously the market structure and the quality of the services (Bresnahan, 1989). Considering the market for care homes in England, the decision to close may be determined by unobserved factors in the local market that also affect the quality of the remaining homes masking the effect of closures. For instance, long term care providers may decide to close in those areas where they expect to obtain lower returns. A simple comparison of the quality between care homes that have a closure nearby and care homes that do not may provide a spurious effect without causal interpretation.

I tackle this endogeneity problem and identify the impact of closures by exploiting the fact that care homes closures may be the result of a business strategy from their care group. Concretely, there may be long term care providers with several care homes across the country that may decide to consolidate and reduce their capacity, expressed by the number of care homes in the care group, to preserve their financial situation and carry on with

[4]There is a wide consensus on the positive relationship between nursing staffing levels and quality (Harrington et al., 2016). Lin (2014) for example, uses an instrumental variables approach on american nursing homes data and finds that an increase of 0.3 hours a day of registered nurses increases the quality of care more than 16%.

their activities. Using this rationale, I define a "consolidation" variable that operates as instrument for care home closures and which is independent to unobserved determinants of the quality in care homes nearby. To use only plausibly exogenous variation, I focus on relevant consolidations of active providers that involve the closure of care homes located in different local authorities and different regions of the country.

Using this identification strategy on a sample composed primarily of administrative data on quality ratings from inspections of the Care Quality Commission (CQC), the regulator of long-term care services, I am able to disentangle the effect of closures from other confounding factors. I find that closures negatively affect the quality of care homes nearby. In particular, relative to those care homes that do not have a closure, closures result in quality deteriorations expressed as decreases in their quality rating. This effect, however, is moderate (about 15% of a standard deviation in our baseline specification) and decreases over time. Further, the effect remains when considering wider local markets that entail a greater catchment area. The results suggest that regulators and local authorities could be aware of the negative implications resulting from closures and anticipate the potential adverse effects, carrying out actions to mitigate problems during a closure. I explore this argument by analysing the effect of closures on the number of total inspections conducted on a care home. I find that closures operate as an "alarm system" that lead to more inspections of the nearest incumbent care homes. Likewise, I investigate the effect of care home closures on other potential destinations of displaced patients in addition to a care home. In particular, I analyse the effects of closures on providers of informal care in the local authority and on the admissions of older patients (aged 70 or more) to emergency wards of hospitals near the closing care home. Results from these analyses show evidence of a negative effect on informal care and no effect on emergency admission resulting from closures.

This study is primarily related to the body of literature that analyses the effect of the market structure on the quality of long term care services. It contributes to the literature by being the the first study to analyse the English care home market. To this extent, this paper complements other studies that have been focused on the US market (see for example Ching et al. (2015), Lin (2015) or Bowblis and Vassallo (2014)). Indeed, the closest

reference to this paper is Bowblis and Vassallo (2014) who analyse the effect of closures on the quality of rural nursing homes in the US. This paper, however, diverges from this analysis in a number of ways. Firstly, it extends the analysis by focusing on the whole set of registered care homes in England, regardless of whether they are located in rural or urban areas. Secondly, instead of an instrumental variables approach, Bowblis and Vassallo (2014) use the difference-in-differences approach that compares the quality of care homes that are in the same and different geographic markets as the closing care homes to identify the effect of closures. By using this approach, they assume that closures are exogenous. Thirdly, Bowblis and Vassallo (2014), as with most studies in the literature, examine the quality of care homes on the basis of heterogenous indicators such as clinical measures or nursing staffing levels. This paper uses a quality rating released by the CQC that reflects the multidimensional characteristics of long term care services. The use of this type measure, which is collected systematically, may allow for more conclusive results and avoid problems of mixed evidence dependent on the choice of the quality measure (Grabowski, 2001).

This paper also adds to the literature by analysing the market structure through closures instead of measures of concentration[5]. Most of the literature using the former has focused on the causes of failure (see Allan and Forder (2015) or Machin and Wilson (2004) studying the case of England). Yet, there is a lack of evidence on the implications derived from these procedures for the remaining care homes in the market. Moreover, this paper is also linked to the empirical literature that has examined the interactions between competition and quality in the care-homes market (Forder and Allan, 2014; Netten et al., 2003). Forder and Allan (2014), suggest that more competition does not lead to more quality in scenarios where prices can only pay for the provision of minimum quality and buyers are not interested in quality but only in cost. Unlike this research, the findings of this paper reveal that less competition leads to decreases in quality.

This paper proceeds as follows. Section 2 provides the main characteristics of the institutional framework of long-term care services in England. Section 3 describes the

[5]As noted by Forder and Allan (2014) or Forder and Allan (2011), most of the studies analysing the links between market competition and quality, predominantly measure market concentration by a county level Herfindhal index

data used for the analysis. Section 4 explains the identification strategy and section 5 presents the results. Section 6 concludes.

2 Long term care in England

2.1 Institutional background

The analysis uses data on care homes. Care homes are, with home care, the main ways individuals receive formal, paid, long term care in England. The market is composed mainly of for profit providers (about a 90%). The remaining 10% is composed of public and voluntary providers. Furthermore, the set of private providers is divided by those providers that have a significant capacity in terms of beds[6], and those that have a small capacity and are mainly family businesses. Lievesley et al. (2011) argue that this type of familiar businesses are normally the care homes that exit the market. In addition to being small, these facilities have low occupancy levels and often are the only care home in the care group.

The demand for care homes distinguishes two types of residents. On the one hand, there are residents that self-fund their care. These have a solid financial position that enables them to afford their care needs. The other part of the demand are residents who cannot afford their care and therefore receive some degree of public support. For individuals to be eligible for public support for their care home costs, they must pass a means test that determines their financial capacity. If patients are below a certain threshold, they receive some sort of support. For these clients the market operates as a quasi-market where the local authority commissions (i.e. purchases) care on their behalf.

Care homes normally host both sorts of residents. Yet, considering the same type of service, the prices paid by self-funded residents normally exceed the prices paid by publicly supported residents[7]. Allan et al. (2017) assess empirically the determinants for this difference in the fees paid by self-funded and publicly-supported residents concluding

[6]The top 25 biggest providers account for 31% of all beds. Within that group, half of the beds correspond to the *"Big Four"* (Jarret, 2018).

[7]This difference in prices is also prevalent in other markets such as the US. Private self-funded residents pay a 30% more than publicly Medicaid residents (Mukamel and Spector, 2002; Grabowski, 2004)

that the main driver for the gap, which is estimated in about £40 a week, is based on the local authorities' market power applied in the negotiation of the contracts for publicly-supported residents. This result had been previously developed theoretically by Hancock and Hviid (2010) for the English care home market. Allan et al. (2017) also explore other aspects such the vertical quality differentiation by which self-funded residents would have a greater preference and an increased willingness to pay for quality. Although they find a positive effect derived from this mechanism, the magnitude is small.

There are 152 local authorities responsible for the management of long term care. In addition to funding care in some cases, they also provide care and manage patients in the events of care-homes closures. Hence, if a care home closes, the corresponding local authority where it is located needs to preserve the provision of care to displaced patients and ensure that they receive care in a suitable place. Yet, local authorities are not required to fund the long term care services for these displaced residents unless they are subject to some sort of public support.

2.2 Quality of long term care services

Since October 2014, care homes are inspected according to a new inspection system monitored by the CQC, the independent for long-term care services in England. The main difference compared to previous systems, is that the new system implemented more systematic inspections driven by five so called *key lines of enquiry (KLOEs)* that structure the inspections in sets of 5 key questions. These questions are associated with issues that determine to what extent services are safe, effective, caring, responsive to people's needs and well-led. In addition to the assessment of each of these dimensions, the CQC also releases an overall rating. Both the overall rating and each of the other 5 questions are rated according to four possible categories: outstanding, good, requires improvement and inadequate.

An important component of the system is that the inspections are carried out without prior announcement. Also, the frequency of inspections is determined by the rating obtained. Thus, worse ratings lead to more frequent inspections. Obtaining an "Inadequate" rating implies the adoption of special measures, close monitoring and a re-inspection in 6

months (Care Quality Commission, 2015)[8]. The information used to derive the ratings is obtained from different sources that include quantitative measures, the direct observation from the inspectors and the feedback from both patients, relatives and staff working in the care homes (Barron and West, 2017).

3 Data

As outlined in the previous section, this analysis observes care homes over a period that starts in October 2014, the date when the new quality system was implemented, and ends in March 2018. The data consist of 30,061 administrative records referring to daily inspections of 17,104 care homes. The main source of information consists of the registry of registered and deactivated care providers released by the CQC. Next subsections provide further details on the main variables of the analysis.

3.1 Quality inspections and downgrades

The main dependent variables are the number of inspections and the deterioration on quality ratings. Both are obtained from the directory of registered care providers. This is a publicly available dataset that reports monthly comprehensive information on active care providers. The analysis only considers information referred to care homes[9].

The main characteristics of the care home other than its identification code and name include details of the location, date of registration in CQC, main service provided, number of beds, local authorities where the care home is located (local authority responsible for social services) as well as a set of characteristics related to the provider. Likewise, and key for the analysis, it contains information on the overall rating corresponding to the last quality inspection in the care home. This overall rating summarises the performance of several issues of the care home and addresses the multidimensional nature of quality

[8] If after 6 months bad ratings persist, the CQC may take a series of actions to stop or limit the service (Care Quality Commission, 2015).

[9] In addition to care homes, this register contains information on acute hospitals, acute services that are not hospitals, ambulance services, community services, dentists, GP practices, hospice services, independent consulting doctors, mental health, out of hours, remote clinical advice, substance misuse services and urgent care services.

in the care home (Bowblis and Vassallo, 2014). Also, by collecting monthly records, it is possible to track and measure the number of inspections carried out in a care home during the period of analysis. Each inspection is associated with a rating namely: "Outstanding", "Good", "Requires improvement" or "Inadequate". To obtain a measure of quality deterioration I create a dummy variable defined as 1 if the care home moves from "Outstanding" or "Good" to "Requires Improvement" or "Inadequate" and 0 otherwise. Gonzalo-Almorox et al. (2018) use a similar measure to assess the effect of changes in local public budgets on the quality of care homes.

I supplement the former information regarding the characteristics of the care home with the postcode directory from the Office of National Statistics as of November of 2017. This dataset gives information about the geographical coordinates (e.g longitude and latitude) of the care home and it is used to construct the main explanatory variable, *care home closures*, and the instrument, *care home consolidation*.

3.2 Care home closures and care home consolidations

To obtain the care home closures and care home consolidations I use information from the directory of deactivated care providers also released by the CQC on a monthly basis. This dataset presents similar characteristics to the directory of registered care providers in terms of the information released. The main additional information that this dataset includes is the date of care home deactivation since 2010. In the analysis, I take this date as the closure date of a care home. As we shall see in section 4, the analysis considers different time windows of 3, 6 and 12 months between a care home closure and the inspection of an active care home. For calculating closures I remove those records that represent a deactivation but are originated by administrative changes in the care home such as modifications in the ownership or in the number of beds. Although registered as deactivated, these records do not represent real closures but a recoding of the care home identification.

To determine the degree of closeness, I firstly group active and closed care homes located in the same local authority with responsibilities for long-term care services. I

use this definition of local authority instead of districts[10] since these deal with care home contracts and are also responsible for the reallocation of patients in the case of care home closures. Secondly, I determine the catchment areas by calculating the geodesic distance[11], which is the shortest curve between the geographical coordinates of a closing care home and the active care homes within a geographic radius of 5, 10, 15 and 20 kilometres in the local authority. Finally, considering each catchment area, I define a nearby closure by calculating the distance between an active care home and the nearest care home that closes.

Figure 1 shows two snapshots of the spatial variability of care home closures across English local authorities for a catchment area of 20 kilometres. Considering all local authorities, closing care homes are on average about 9 km away from active care homes. Not surprisingly, care homes located in London have nearer closures than care homes in other parts of the country. This pattern of closing care homes nearby is also found in several local authorities of the North and to a lesser extent in some areas of the South. Looking at the number of care homes closed, there is more heterogeneity. Local authorities placed in East and Northwest regions, show fewer care homes closing (between 1 and 5). Conversely, areas in the North, West and South East present the greater levels of care home closures (between 14 and 53 care homes).

As outlined before, the directory for unregistered care homes also gives information on the care home providers. Therefore, it is possible to know the number of care homes that a provider deactivates in a period of time, as well as when and where these deactivations take place. This is valid information to determine whether the provider is carrying out a consolidation of the group by reducing the number of active care homes. Section 4 discusses in further detail the rationale of the instrument.

The analysis also incorporates several variables used as controls for the composition of local demand and supply of long term care. These variables are collected from the Census and the Department of Work and Pensions and include the share of elderly population

[10]Districts represent the local authorities at the lower level responsible for managing local policies such as housing. England has 325 local authorities operating at this level. Hence, some districts may share the local authority that is in charge of long-term care services and which operates at upper (e.g. county) level.

[11]These distances are calculated in R using the distGeo function from the geosphere package (Hijmans et al., 2012)

(e.g. aged 85 or more) and share of people with care allowance over the total adult population. These are proxies for the demand and the level of need for long-term care services that have been used in the literature previously (see Fernandez and Forder (2015) for example). Also, given that long-term care is a labour intensive activity where much of the labour force is paid at around the minimum wage (see Machin et al. (2003), Machin and Wilson (2004) or more recently Giupponi and Machin (2018) for analyses of the UK care home market), I follow the literature and use the share of claimants for job allowance to characterise the supply of long term care services.

Further, since bad ratings are associated with more frequent inspections and care home closures (Allan and Forder, 2015), I use as control the total number of inspections rated as "Inadequate" or "Requires improvement" in the local authority where the care home is located. It is important to note that I consider the bad inspections that occur before the closure. Otherwise, including contemporaneous bad inspections, could raise concerns about their correlation with both the closures and the consolidations. Hence, I include the number of bad inspections that occur three months before the closure. Finally, to control for the influence of other care homes in the market, I also include the number of competing care homes to the care home analysed within the same local authority,

Given the different number of inspections carried out in each care home, our sample of analysis corresponds to an unbalanced panel. Table 1 presents descriptive statistics of the variables used for the analysis. On average up to March 2018, care homes are inspected twice. Nonetheless, there are some unsual cases where a care home has been inspected 8 times during the period of analysis. About one fifth of the observations in the sample, report quality deterioration. This figure is similar to the figures released by the CQC in their state of health and social care for 2017[12]. There are large differences across local authorities regarding the provision of formal and informal care. In particular, some local authorities only composed of 1 care home without competing care homes and no claimants for informal care benefits.

[12]See page 29 in https://www.cqc.org.uk/sites/default/files/20171123_stateofcare1617_report.pdf for further details.

4 Empirical framework

To assess empirically the impact of care home closures, I use linear regression models with the following specification

$$Y_{clt} = \alpha_c + \theta_t + \beta_{clos} Closure_{jlt} + \lambda X_{lt} + \epsilon_{clt} \tag{1}$$

where Y represents outcomes of interest, e.g, number of inspections and quality deterioration for care home c at time t in local authority l. The specification also includes two sets of fixed effects: Care home fixed effects α to capture factors happening in the care home that are time invariant and year fixed effects θ to incorporate common shocks for all local authorities that occur during a year such as political changes at national level. $Closure$ is a dummy variable equal to 1 if there is a care home j in the same local authority l that closes near care home c in a period of time t and 0 otherwise. As described in the previous section, the analysis considers various time windows of 3, 6 and 12 months between the closure and the inspection. The parameter of interest is β_{clos}, which I intend to interpret as the causal effect of care home closure.

The specification considering solely care home and year fixed effect would be sufficient for a valid identification of the effect of the care home closures. Yet, as outlined in the introduction, this cannot be taken as given since there may be aspects that may raise endogeneity concerns and that may invalidate such interpretation. For instance, there may be local shocks that may affect the composition of the potential local clientele. These may influence both the quality of the services in local care homes as well as their profitability. Under that situation, some providers may decide to close care homes in certain areas whereas at the same time other providers may modify their business model and therefore alter the quality of the services they deliver. Equation 1 also incorporates a time varying vector X with the local variables discussed in section 3 to control for potential selection of local variables and to improve the efficiency. Thus, X includes the share of elderly population, the share of people with care allowance, the share of claimants for job seekers allowance, the number of bad inspections (e.g. inspections rated as "Inadequate" or

"Requires improvement") in the local authority before the closure as well as the number of care home rivals to the active care home.

Despite controlling for the former local variables, there may be still unobservable factors that may cause omitted variable bias. To generate plausibly exogenous variation in the incidence of care home closures, I exploit the fact that closures may be part of a consolidation strategy in their corporate group. In this business strategy, care home providers decide to close several care homes to reduce their capacity and preserve their financial sustainability. In this case, the decision of closure may be motivated by external factors (business strategy) rather than local elements of the market. Considering this rationale, Equation 1 is complemented with a first stage regression.

$$Closure_{cilt} = \gamma_c + \kappa_t + \beta_{cons} Consolidation_{lt} + \delta X_{lt} + u_{cilt} \tag{2}$$

where consolidation is a dummy variable that indicates whether a care home closure is part of a consolidation ($Consolidation = 1$) and 0 otherwise and the parameter β_{cons} measures the effect of consolidation on care home closures, relative to care homes that close but not as a consequence of a consolidation. In the context of this identification strategy, a reasonable concern is to think that some local factors may remain as drivers for the consolidations. Providers may decide to close those care homes that have the worst performance within the group and this performance may be influenced by local factors.

To address this potential problem and use only plausibly exogenous consolidations, I focus on consolidations that meet three specific criteria. First, the provider that carries out the consolidation must be active by the end of the period of analysis (i.e. March 2018). This rules out the idea that a consolidation is the preceding stage of a closure. Second, the provider has to undertake closures in 3 or more different local authorities with responsibility on long term care services within the same year. To avoid that consolidations are carried out in neighbouring local authorities and consequently the decision to consolidate is somehow localised in a particular area of the country, the third condition establishes that the local authorities where consolidations are undertaken must correspond to at least

3 different regions. Table 2 shows descriptive statistics for the two types of providers that close care homes using data from the directory of registered care homes and considering local authorities at their lower level (e.g. district level). The 12 providers that carry out consolidations are large institutions with an average of 62 care homes operating in almost 10% of the districts and with a widespread presence over the country (in average 6 regions out of 9). On the other hand, most providers that close have only 1 care home and operate in a district. The former suggests that the majority of care homes that close are likely to be family businesses as suggested by Lievesley et al. (2011).

The validity of this empirical strategy relies on two main identifying assumptions. The first assumption is that consolidations are not correlated with ϵ. The inclusion of care home fixed effects alleviates potential concerns concerning the correlation between the instrument and the error. Also, by including these fixed effects the timing between the closure and the inspection, rather than the location of the closing care home, becomes random conditional to other local characteristics. The plausibility of this assumption entails that the instrument is as good as randomly assigned. In the framework of this paper, this assumption implies that districts with and without consolidated care homes do not present a priori significant differences in their background characteristics. Otherwise, providers that consolidate could motivate their decision based on particular characteristics of certain local authorities and that would invalidate the validity of the instrument. Considering the definition of the local authority at the lowest level, I test this assumption by comparing a number of observable characteristics associated with care homes from districts that have a consolidation and districts that do not. Table 3 reports the results of these comparisons. In general, we do not observe significant differences between the two types of districts. The only exception remains the share of old people but the magnitude of the difference is small (0.2 percent points)[13].

The second assumption entails that a random decision of consolidation in the group of the closing care home affects the quality deterioration of the care homes nearby only through the closure of the care home. This assumption implies that a consolidation only affects the quality of neighbouring care homes by the change produced in the

[13] Appendix B presents further evidence testing the validity of the instrument.

market structure. In Table 4 I test whether the consolidation affects other variables that could potentially influence the quality of a care home: the proportion of claimants for allowance, the proportion of job seekers and the proportion of people older than 85. The coefficients for consolidation are in general statistically insignificant with the exception of the proportion of job seekers. Yet, the effect is a 10% of a standard deviation. Further, this assumption could be violated if the consolidation in the closing care home group affected several markets due to a lack of confidence by the patients that resulted in an emptying of the care homes belonging to the group. In the care homes sector this situation is unlikely. Similar situations represented by collapses of big providers, in 2011 and 2013, have have led to the acquisition of the failed care homes by other providers but not relocated patients[14]. In addition, since 2014 the CQC has implemented a regulation aimed at preventing such failure[15].

Equation 1 is transformed into the following reduced form

$$Y_{clt} = \alpha_c + \theta_t + \beta_{clos}\widehat{Closure}_{jclt} + \lambda X_{lt} + \epsilon_{clt} \tag{3}$$

Equation 3 regresses quality deterioration against the predicted number of closures ($\widehat{Closure}$) estimated in Equation 2. The parameter β_{clos} yields the effect of care home closures on the probability of quality deterioration in the care homes.

5 Results

5.1 Effects of closures on the quality deterioration

Table 5 presents the baseline results relative to the effect of closures on the quality deterioration of care homes within a catchment area of 5 km. The upper panel shows OLS

[14] A report about the stability of the care homes market, providers did not find evidence about a risk of contagion in case of failure. It concludes that failures normally respond to market corrections (Institute of Public Care, 2014)

[15] Further details about the Market Oversight regime by the CQC can be found in https://www.cqc.org.uk/guidance-providers/market-oversight-corporate-providers/market-oversight-adult-social-care

estimates of Equation 1. It seems plausible that incumbent care homes react differently depending on when the care closes. Hence, the first column shows results for a time window of 3 months between the closure and the inspection and columns 2 and 3 show estimates for periods of 6 and 12 months respectively. All estimations include local controls and fixed effects at the year and care home level. Furthermore, errors are clustered at the level of the care home. The results show a positive association of the care home closure and the deterioration of quality in the care homes nearby that diminishes when the time window between the closure and the inspection increases. Regardless of the period considered, these relationships are not statistically significant.

As explained above, the OLS results are likely to be biased because of the influence of confounding local factors that hinder the identification of the closure's effect. Panels (B) and (C) of Table 5 show two stage and first stage estimates of care homes closures on the quality deterioration of nearby care homes (Equations 2 and 3). The values of the *Kleibergen-Paap F* statistics associated with each specification exceed the critical value of 16.38 proposed by Stock and Yogo (2005) for one endogenous variable and one instrument. Therefore, the null hypothesis that the instrument is weak can be rejected. Also the results show a significant positive association between the consolidations and the closures that increases with the time between the closure and the inspection.

Looking at the Panel (B) of Table 5 we observe a positive effect of closures on the quality deterioration of care homes nearby. When the closure occurs within the three months before the inspection, the quality deteriorates by 0.190 points. This effect shrinks progressively over time being 0.0661 when the inspection occurs within a year since the closure. In terms of standard deviations (0.39), results range from about 50% to a 15% of a standard deviation in twelve months. Despite of decreasing in magnitude, results are only significant at a 10% significance for those closures that occur 12 months before the inspection. Results are similar when including local authority fixed effects at a wider level and with different error specifications (see Tables 11 and 12 in Appendix C).

Comparing the results from the OLS and IV estimates, we can see that IV coefficients are generally larger (in particular for shorter periods of time between the closure and the inspection). This can be explained by the fact that the OLS estimation includes lo-

cal factors that may improve the quality and partially offset the negative effect from closures found when applying the instrument. For example, the literature has identified several local factors such as a better inclusion of the care home in the community (wiener2003assessment) and a better coordination among the different stakeholders (e.g. NHS services and primary care GPs) involved in the process of care (baylis2017enhanced) as key elements to enhance the quality of care homes. A more coordinated and integrated system may contribute to contain costs and therefore preserve the financial sustainability of care homes (Forder et al., 2018)[16]. Williams et al (2002) report that cost implications are a leading driver in the decision of care home closure.

These results indicate that treated care homes, care homes with a closing care home nearby, are negatively affected in the short-run. A potential explanation could be that incumbent care homes do not have a suitable set of resources to offset an unexpected increase in the demand and address a potential forced relocation of the patients from the closing care home. For example, issues such as the number and conditions of staff are important determinants for the level of quality. Bearing in mind that long term care is a labour internse activity, if care workers from incumbent care homes feel more pressure, the quality of the service they provide is likely to decrease. Other studies, such as allan2017impact have addressed this issue and analysed how working conditions affect the level of quality. They conclude that poor conditions such as low payments or high turnover rates, affect negatively the quality of care homes.

A potential concern of this analysis is that results may differ when varying the size of the catchment area. I define a wider care home catchment area within the local authority responsible for long term care services and re-run the analysis to check the robustness of results in Table 5. Results in Table 6 consist of a catchment area of 15 km and are similar in magnitude to the results obtained in Table 5. Yet, they improve the statistical significance. The similarity of the results for catchment areas of 5 and 15 km respectively is puzzling and suggests that closing care homes may be clustered. Actually, considering the sample of care homes that have a neighbouring care home that close, in 70% of the cases the

[16] As these authors conclude, the lack of a single definition of integrated care and the number of processes and models involved lead to challenging comparisons and conclusions about the cost effects of greater coordination of health and social care services.

nearest neighbouring care home that closes is the same for both catchment areas.

In general, the weak statistical significance of the baseline result suggests that the effect of closures does not vary significantly between care homes that have a closing care home nearby and a those do not have a closing care home. One explanation to this result would be related to the procedures of closing care homes. As outlined before, in the event of closure, local authorities are responsible for the allocation of displaced patients. It seems plausible that in such an event, local authorities allocate displaced patients to those care homes that have enough capacity to provide care under the minimum quality standards imposed by the CQC.

5.2 Effects of closures on the number of inspections

Another explanation for the low significance of results in Table 5 may be that closures operate as an *"alarm system"* for the CQC. Given the positive association between quality downgrades and closures shown by Allan and Forder (2015), the CQC would give more attention to those local markets where there is a closure. The rationale would be to anticipate potential negative consequences on incumbent care homes' quality derived from closures of care homes nearby. Consequently, the CQC would inspect more frequently care homes nearby and ensure that minimum quality standards are met. Also, if care homes are aware of this increase in the inspections by the CQC when there is a closure, it is possible that they prepare for a more likely inspection.

I test these conjectures by investigating the effect of closures on the total number of inspections carried out in the nearest registered care home. Results are reported in Table 7 and estimates are obtained by re-estimating Equations 1, 2 and 3 using now the number of total inspections carried out in a care home as the outcome variable. Furthermore, the analysis is based on catchment areas of 10 and 20 km respectively. These distances better approximate the area of action for CQC inspectors in local long term care markets. The structure of Table 7 is similar to previous tables and displays results in terms of 3, 6 and 12 months since the care home closure.

From Panel B, considering a catchment area of 10 km, we observe that closures increase the number of inspections by 0.316 points (a 39% of a standard deviation) in the first 3

months. This effect shrinks as time goes by and results in increases of 0.108 points (a 13% of a standard deviation) in the 12 months after the closure. These findings, which are significant at the 5% level for inspections 12 months after the closure, confirm the idea that the CQC increases its control over the incumbent local care homes when there is a closure of a care home nearby. Results for a catchment area 20 km also decrease for wider time windows between the closure and inspection, are smaller in magnitude and no statistically significant.

5.3 Effects on informal care

Another argument to explain the main results in Table 5 consists of looking at alternatives for displaced patients. The natural option for displaced patients from a closed home would be another care home. This conjecture could be tested by using information on care home attendances. However, there is no publicly available information on the number of patients referred to each care home. In case there are not available places in a care home, displaced patients may be cared for informally. As in other countries such as Spain or the US, this is the most common form of long term care giving in England (Sole-Auro and Crimmins, 2014)[17].

In this subsection I explore the effects of closures on the proportion of people of the adult population that provide informal care in the district. Results are shown in Table 8 considering a catchment area of 5 Km for periods of 3, 6 and 12 months since the care home closure. Estimates from Panel B show a reduction in the proportion of people that provide informal care as a consequence of the closures. In terms of the patterns in the results, the effect of the closure decreases over time. Regardless of the time between the closure and the inspection the effect is small (between a 2% and 0.6% of a standard deviation) and it is only statistically significant at 10% level.

There are several reasons that may explain these findings. One explanation concerns the perspective of informal carers in cases of care home closures. Considering case studies based on the UK, Williams et al. (2003) report that normally most residents moved to

[17]The Office of National Statistics estimate that informal carers were providing care worth £57 billion (Office National Statistics, 2017)

other care homes but with different owners (84% of their sample). Another explanation would be associated with the distance between potential informal carers and displaced residents. Given that the geographical distance between generations is increasing for the UK (Chan and Ermisch, 2015)[18] and that an important part of informal care is provided by daughters (Hoff (2015), Della Giustia and Jewell, 2014)[19], it seems plausible that in case displaced residents received informal care as a consequence of a care home closure, it could be in a different local authority where the care home was located.

5.4 Effects on the A&E departments

Results from section 5.3 do not support the hypothesis that displaced patients return to their home and receive informal care. In this section I explore whether displaced patients may be referred to other facilities such as A&E wards. England has registered an increase of emergency admissions of 42% over the last twelve years (Steventon et al., 2018). An important part of those have been admissions which could be avoided by an effective community care and case management (National Audit Office, 2018). Considering patients coming from care homes, Smith et al. (2015) focus conclude that such patients experienced between 40% and 50% more admissions to A&E departments than other patients.

I investigate the effect of closures on attendances of the A&E wards of the nearest hospital. For this analysis I use information from the NHS Digital for years 2014 to 2017 concerning 170 health centres[20]. In particular, I use aggregate information on attendances of patients who are aged 70 or more. Patients over this age range are more likely to be affected by a care home closure. This analysis is carried out through Equation 4 which is similar to Equation 1

$$Y_{ilt} = \alpha_l + \theta_t + \beta_{clos} Closure_{jclt} + \lambda X_{lt} + \delta h_{lt} + \epsilon_{clt} \tag{4}$$

[18] Using the first wave of Understanding Society these authors show that intergenerational proximity is based primarily on the moves of the younger generation. To this extent, the authors argue that as parents get older, the distance between where they live and where they children live tends to increase.

[19] Daughters mainly care for the oldest patients. Wives are the main providers in cases of married older people (Hoff, 2015).

[20] Appendix D provides further details and summary statistics for this sample

where Y represents the A&E attendances of patients of different age groups in hospital i in local authority l during year t. $Closure$ represents a dummy variable that indicates whether a care home closed near that hospital ($Closure = 1$) . Yet, unlike Equation 1, Equation 4 incorporates h_{lt} which is a control that indicates whether the second closest hospital to the closing care home is within a catchment area of 5 Km.

Results are displayed in Table 9. Columns 1,2,3 and 4 present information for the whole sample of patients and subsequently patients aged 70 to 80, 80 to 89 and 90 or more. Results, with the exception of admissions of patients who are 80-89 years old, reveal a general negative and statistically insignificant effect derived from care home closures.

6 Discussion and conclusion

The closure of a care home may have important implications for long term care services. Yet there is little evidence assessing the consequences of closures. Whereas most evidence has been focused on the consequences for displaced residents, the effects on other care homes in the market have been less researched. This paper is the first attempt to address this question for the case of the English care-home market by looking at the effects on the quality of the remaining care homes.

This paper finds some evidence associated with a negative effect on the quality of the care homes in a market as a consequence of a closure in a care home nearby. Considering the baseline specification, this effect decreases over time reaching a 15% of a standard deviation when care homes are inspected after a year from the closure in the neighbouring care home. Results are similar for wider catchment areas suggesting that care homes could be clustered in local areas. These findings are consistent to the results found by Bowblis and Vassallo (2014) who show declines in the staffing levels after the closure in the remaining care homes. These authors, however, find positive effects in other non-staffing quality measures.

I examine several hypotheses that help to explain the results in more detail. First, I evaluate how closures affect the control by CQC by looking at the inspections carried out by the regulator in the incumbent care homes. I argue that closures may be a signal

to pay particular attention to and to tackle potential quality deteriorations. In addition, I check the implications on other destinations where displaced residents from closing care homes could potentially be referred to. Considering the levels of informal care, I observe some significant evidence of a decrease of the people providing informal care in the same district where the closing care home is located. I also look at emergency services in hospitals and do not observe significant evidence changes in the number of A&E admissions in the hospitals near a closing care home. These of results suggest that in case of care home closure, displaced residents are likely to move to another care home and receive similar formal care.

Bearing in mind the former points, the main findings suggest that the quality of incumbent care homes is hardly affected by closures. Since local authorities are in charge of managing the process of closure, a plausible explanation is that patients may be allocated to facilities that can cope with the new demand without sacrificing their quality. In these cases, incumbent care homes are likely to redefine its capacity to accommodate the new demand and preserve the levels of quality. Indeed, for most providers quality is the main motivation of their business – beyond profit (Knapp et al., 2001; Matosevic et al., 2008).

A limitation of this study is the lack of information regarding the type of residents in closing and remaining care homes. This implies that it is not possible to know how the proportion of self-funded and publicly-supported residents affects quality. This is an important point given the likely different valuation and willingness to pay for quality of both kinds of residents. For example, self-funded clients may value quality and be willing to pay for higher levels of quality. In cases when the core clientele of the remaining care homes is composed mainly by self-funded residents, providers may differentiate vertically and discriminate in prices according to different levels of quality. Having this possibility would temper the negative effect on quality derived from a closure nearby.

Linked to that, it may be possible that care homes simply rely more on the self-funded segment of the market to cross-subsidise the lower prices paid by public residents. In such cases, an event of closure with a fair proportion of publicly supported clients may exacerbate the knock-on effect discussed by Allan et al. (2017) by which care homes exploit

their market power over self-funded residents to extract their rents.

The findings in this paper may contribute to inform the design of policies to enhance the competition in the long term care market. They may also help to understand better the effects of the market structure on quality and the mechanisms by which care homes provide quality in their services.

References

Allan, S. and J. Forder (2015). "The determinants of care home closure". *Health economics* 24, pp. 132–145.

Allan, S., K. Gousia, and J. Forder (2017). "Explaining the fees gap between funding types in the English care homes market". *Not published*.

Association of Directors of Adult Social Services (2018). "ADASS Budget Survey". *Association of Directors of Adult Social Services Budget Survey*.

Barron, D. N. and E. West (2017). "The quasi-market for adult residential care in the UK: Do for-profit, not-for-profit or public sector residential care and nursing homes provide better quality care?" *Social Science & Medicine* 179, pp. 137–146.

Bowblis, J. R. and A. Vassallo (2014). "The Effect Of Closure On Quality: The Case Of Rural Nursing Homes". *Journal of Competition Law and Economics* 10.4, pp. 909–931.

Brekke, K. R., L. Siciliani, and O. R. Straume (2018). "Can competition reduce quality?" *Journal of Institutional and Theoretical Economics JITE, 174(3), 421-447.*

Brekke, K. R., L. Siciliani, and O. R. Straume (2015). "Hospital competition with soft budgets". *The Scandinavian Journal of Economics* 117.3, pp. 1019–1048.

Bresnahan, T. F. (1989). "Empirical studies of industries with market power". *Handbook of industrial organization* 2, pp. 1011–1057.

Care Quality Commission (2015). *Enforcement policy*. Tech. rep. Care Quality Commission.

Castle, N. G., J. Engberg, and D. Liu (2007). "Have Nursing Home Compare quality measure scores changed over time in response to competition?" *BMJ Quality & Safety* 16.3, pp. 185–191.

Chan, T. W. and J. Ermisch (2015). "Residential proximity of parents and their adult offspring in the United Kingdom, 2009–10". *Population studies* 69.3, pp. 355–372.

Ching, A. T., F. Hayashi, and H. Wang (2015). "Quantifying the impacts of limited supply: The case of nursing homes". *International Economic Review* 56.4, pp. 1291–1322.

Fernandez, J.-L. and J. Forder (2015). "Local Variability in Long-Term Care Services: Local Autonomy, Exogenous Influences and Policy Spillovers". *Health economics* 24, pp. 146–157.

Forder, J. and S. Allan (2011). "Competition in the English nursing homes market". *University of Kent: PSSRU*.

— (2014). "The impact of competition on quality and prices in the English care homes market". *Journal of Health Economics* 34, pp. 73–83.

Gaughan, J., H. Gravelle, R. Santos, and L. Siciliani (2017). "Long-term care provision, hospital bed blocking, and discharge destination for hip fracture and stroke patients". *International journal of health economics and management* 17.3, pp. 311–331.

Gaughan, J., H. Gravelle, and L. Siciliani (2015). "Testing the bed-blocking hypothesis: Does nursing and care home supply reduce delayed hospital discharges?" *Health economics* 24, pp. 32–44.

Gaynor, M. and R. Town (2011). "Handbook of Health Economics. Vol, 2". Ed. by T. McGuire, M. Pauly, and P. Barros. Elsevier. Chap. Competition in health care markets, pp. 499–657.

Giupponi, G. and S. J. Machin (2018). "Changing the Structure of Minimum Wages: Firm Adjustment and Wage Spillovers". *Centre for Economic Performance*.

Glasby, J., K. Allen, and S. Robinson (2018). ""A game of two halves?" Understanding the process and outcomes of English care home closures: Qualitative and quantitative perspectives". *Social Policy & Administration*.

Gonzalo-Almorox, E., N. Braakmann, and J. Wildman (2018). "Local budgets and care homes quality in England: a duration analysis". *Unpublished*.

Grabowski, D. C. (2001). "Medicaid reimbursement and the quality of nursing home care". *Journal of health economics* 20.4, pp. 549–569.

— (2004). "A longitudinal study of Medicaid payment, private-pay price and nursing home quality". *International journal of health care finance and economics* 4.1, pp. 5–26.

Hancock, R. and M. Hviid (2010). *Buyer power and price discrimination: the case of the UK care homes market*. Tech. rep. ISER Working Paper Series.

Harrington, C., J. F. Schnelle, M. McGregor, and S. F. Simmons (2016). "Article Commentary: The Need for Higher Minimum Staffing Standards in US Nursing Homes". *Health services insights* 9, HSI–S38994.

Hijmans, R., E. Williams, and C. Vennes (2012). "2012. geosphere: Spherical Trigonometry. R package version 1.2–28." *CRAN. R-project*.

Hoff, A. (2015). *Current and future challenges of family care in the UK*. Research rep. Foresight, Government Office for Science.

Institute of Public Care (2014). *The Stability of the Care Market and Market Oversight in England*. Tech. rep. Oxford Brookes University.

Jarret, T. (2018). *Social care: care home market – structure, issues, and cross-subsidisation*. Tech. rep. Commons Library Briefing. House of Commons.

Knapp, M., B. Hardy, and J. Forder (2001). "Commissioning for quality: ten years of social care markets in England". *Journal of social policy* 30.2, pp. 283–306.

Lievesley, N., G. Crosby, C. Bowman, and E. Midwinter (2011). "The changing role of care homes". *Centre for Policy on Ageing*.

Lin, H. (2014). "Revisiting the relationship between nurse staffing and quality of care in nursing homes: An instrumental variables approach". *Journal of health economics* 37, pp. 13–24.

— (2015). "Quality choice and market structure: A dynamic analysis of nursing home oligopolies". *International Economic Review* 56.4, pp. 1261–1290.

Machin, S., A. Manning, and L. Rahman (2003). "Where the minimum wage bites hard: Introduction of minimum wages to a low wage sector". *Journal of the European Economic Association* 1.1, pp. 154–180.

Machin, S. and J. Wilson (2004). "Minimum wages in a low-wage labour market: Care homes in the UK". *The Economic Journal* 114.494, pp. C102–C109.

Matosevic, T., M. Knapp, and J. Le Grand (2008). "Motivation and commissioning: perceived and expressed motivations of care home providers". *Social Policy & Administration* 42.3, pp. 228–247.

Mukamel, D. B. and W. D. Spector (2002). "The competitive nature of the nursing home industry: price mark ups and demand elasticities". *Applied Economics* 34.4, pp. 413–420.

National Audit Office (2018). *Reducing emergency admissions*. Tech. rep. National Audit Office.

Netten, A., R. Darton, and J. Williams (2003). "Nursing home closures: effects on capacity and reasons for closure". *Age and Ageing* 32.3, pp. 332–337.

Netten, A., J. Williams, and R. Darton (2005). "Care-home closures in England: causes and implications". *Ageing & Society* 25.6, pp. 319–338.

Office National Statistics (2017). *Unpaid carers provide social care worth £57 billion*. Health and life expectancies bulletin. Office of National Statistics.

Propper, C. (2018). "Competition in health care: lessons from the English experience". *Health Economics, Policy and Law*, pp. 1–17.

Smith, P., C. Sherlaw-Johnson, C. Ariti, and M. Bardsley (2015). "Focus on: Hospital admissions from care homes". *London: The Health Foundation*.

Sole-Auro, A. and E. M. Crimmins (2014). "Who cares? A comparison of informal and formal care provision in Spain, England and the USA". *Ageing & Society* 34.3, pp. 495–517.

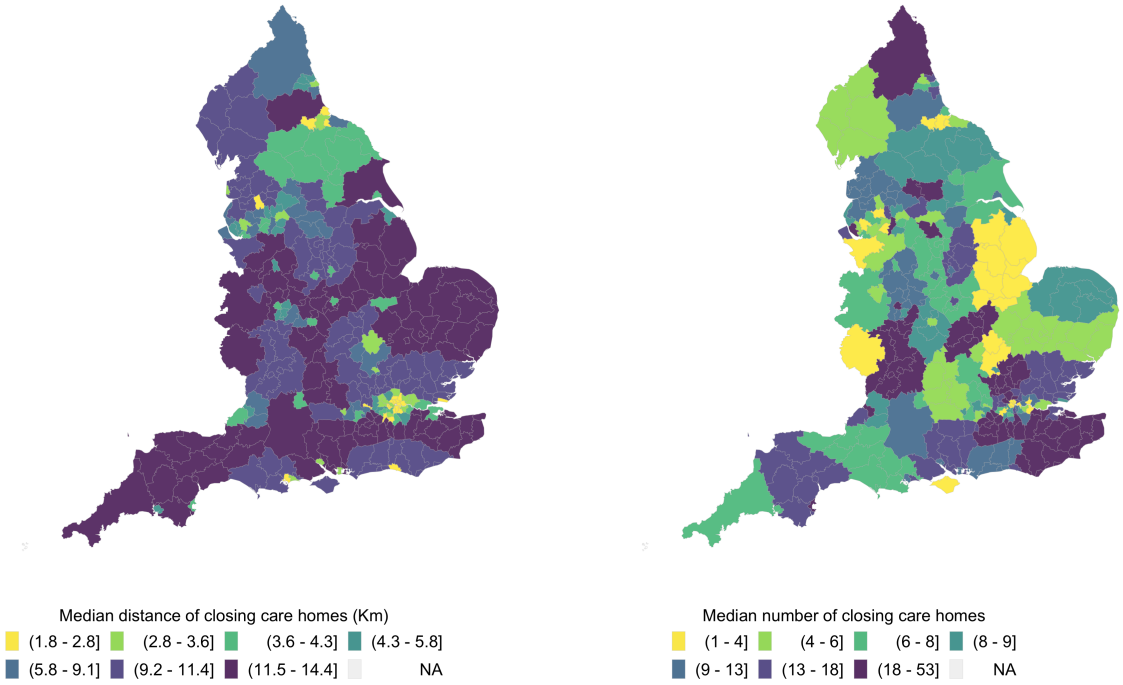
Steventon, A., S. Deeny, R. Friebel, T. Gardner, and R. Thorlby (2018). "Briefing: Emergency hospital admissions in England: which may be avoidable and how?"

Stock, J. H. and M. Yogo (2005). "Testing for Weak Instruments in Linear IV Regression". *Identification and Inference for Econometric Models: Essays in Honor of Thomas Rothenberg*. Ed. by D. W. K. Andrews and J. H. Stock. Cambridge University Press, pp. 80–108. DOI: 10.1017/CBO9780511614491.006.

Williams, J., A. Netten, and P. Ware (2003). "The closure of care homes for older people: relatives' and residents' experiences and views of the closure process".

7 Figures

Figure 1: Descriptive statistics of care home closures



Note: CQC and ONS, author's own calculations. Figures represent median distance between active care homes and nearest closing care home and median number of closing care homes in the local authority. Figures are expressed in terms of local authorities at district level.

8 Tables

Table 1: Summary statistics

	Mean	S.d	Min	Max
Quality deterioration (1 = yes)	0,19	0,39	0	1
Closure within 3 months (1 = yes)	0,04	0,19	0	1
Closure within 6 months (1 = yes)	0,08	0,27	0	1
Closure within 12 months (1 = yes)	0,15	0,36	0	1
Consolidated (1 = yes)	0,01	0,09	0	1
Number of inspections care home	1,58	0,81	1	8
Number of informal carers	224762,85	176418,83	0	1073045
Proportion of carers allowance	0,01	0,004	0	0,03
Proportion of job seekers	0,01	0,01	0	0,36
Proportion people 85+	0,03	0,01	0	0,05
Rival care homes in local authority	207,94	156,18	0	633
Number bad inspections 6 months before closure	0,66	0,66	0	2
Number bad inspections 9 months before closure	0,61	0,65	0	2
Number bad inspections 15 months before closure	0,49	0,63	0	2
Observations	30061			
Care homes	17104			
Local authorities	152			

Table 2: Local characteristics of closing care homes

	Consolidated n = 222		No consolidated n = 2899		
	Mean	S.d	Mean	S.d	p.value
Proportion Job seekers	0,006	0,005	0,006	0,005	0,235
People providing informal care	234461	202853,466	230738,851	176807,713	0,338
Number bad inspections district	0,82	0,944	0,844	1,054	0,309
Proportion people 85+	0,025	0,006	0,027	0,008	0,001
Proportion claimants allowance	0,012	0,005	0,012	0,004	0,432
Average IMD score district	21,43	9,455	21,079	8,014	0,935

Table 3: Summary statistics of consolidated and non consolidated providers

	Consolidated providers n = 12			No consolidated providers n =7755		
	Mean	Max	Min	Mean	Max	Min
Number of beds	1128	6844	101	58	10668	0
Number of care homes	70	254	16	2	167	1
Number of districts operating	39	114	6	1	113	1
Number of regions operating	6	8	3	1	8	1

Table 4: Placebo tests of care home closures on other outcomes

	(1) Claimants allowance	(2) Job seekers	(3) People 85+	(4) Claimants allowance	(5) Job seekers	(6) People 85+
	OLS	OLS	OLS	FE	FE	FE
Consolidation	-0.000299	0.000193	-0.00252***	-7.17e-05	-0.00112***	4.25e-05
	(0.000277)	(0.000356)	(0.000409)	(5.71e-05)	(0.000309)	(5.33e-05)
Time controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	30,061	30,061	30,061	30,061	30,061	30,061
R-squared	0.063	0.008	0.063	0.823	0.046	0.893
Number of care homes				17,104	17,104	17,104

Note: CQC, DWP and Census, author's own calculations. Robust errors are calculated at care home level. $^{***}p < 0.01$,$^{**}p < 0.05$, $^{*}p < 0.1$.

Table 5: Effects of closures on quality of nearby care homes

	Quality deterioration in care home (1 = yes) in...		
	(1)	(2)	(3)
Panel A. OLS	3 months	6 months	12 months
Closure	0.00617	0.00272	0.00357
	(0.0116)	(0.00875)	(0.00674)
Observations	30,061	30,061	30,061
R-squared	0.109	0.109	0.108
Panel B. 2SLS	Quality deterioration in care home (1 = yes) in...		
	3 months	6 months	12 months
Closure	0.190	0.118	0.0661*
	(0.117)	(0.0727)	(0.0391)
Observations	22,625	22,625	22,625
Number care homes	9,668	9,668	9,668
R-squared	0.187	0.191	0.194
Panel C. First stage	Closure nearest care home within 5 km in...		
	3 months	6 months	12 months
Consolidation	0.323***	0.528***	0.971***
	(0.0361)	(0.0378)	(0.0117)
Kleibergen-Paap Wald rk F statistic	80.04	194.80	6882.43
Partial R squared	0.021	0.029	0.053

Note: CQC, DWP and Census, author's own calculations. Robust errors are calculated at care home level. $^{***}p < 0.01$,$^{**}p < 0.05$, $^{*}p < 0.1$.

Table 6: Effects of closures on quality of nearby care homes

	Quality deterioration in care home (1 = yes) in…		
	(1)	(2)	(3)
Panel A. OLS	3 months	6 months	12 months
Closure	0.00739	0.00323	0.00666
	(0.00978)	(0.00744)	(0.00579)
Observations	30,061	30,061	30,061
R-squared	0.109	0.109	0.108
Panel B. 2SLS	Quality deterioration in care home (1 = yes) in…		
	3 months	6 months	12 months
Closure	0.188*	0.117*	0.0651**
	(0.101)	(0.0627)	(0.0331)
Observations	22,625	22,625	22,625
Number care homes	9,668	9,668	9,668
R-squared	0.185	0.189	0.193
Panel C. First stage	Closure nearest care home within 15 km in…		
	3 months	6 months	12 months
Consolidation	0.320***	0.516***	0.971***
	(0.0303)	(0.0321)	(0.00987)
Kleibergen-Paap Wald rk F statistic	111.34	257.83	9681.96
Partial R squared	0.02	0.027	0.051

Note: CQC, DWP and Census, author's own calculations. Robust errors are calculated at care home level. $^{***}p < 0.01$,$^{**}p < 0.05$, $^{*}p < 0.1$.

Table 7: Effects of care home closures on total number of inspections in care homes nearby

	Total number of inspections			Total number of inspections		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. OLS	3 months	6 months	12 months	3 months	6 months	12 months
Closure	0.0182	0.00183	0.00314	0.00207	-0.00336	0.00207
	(0.0207)	(0.0148)	(0.0123)	(0.0101)	(0.0128)	(0.0101)
Observations	30,061	30,061	30,061	30,061	30,061	30,061
R-squared	0.358	0.358	0.361	0.361	0.358	0.361
Panel B. 2SLS	Total number of inspections			Total number of inspections		
	3 months	6 months	12 months	3 months	6 months	12 months
Closure	0.316*	0.197*	0.108**	0.201	0.126	0.0712
	(0.168)	(0.102)	(0.0551)	(0.134)	(0.0828)	(0.0443)
Observations	22,625	22,625	22,625	22,625	22,625	22,625
Number care homes	9,668	9,668	9,668	9,668	9,668	9,668
R-squared	0.693	0.694	0.700	0.695	0.696	0.700
Panel C. First stage	Closure nearest care home within 10 km in...			Closure nearest care home within 20 km in...		
	3 months	6 months	12 months	3 months	6 months	12 months
Consolidation	0.323***	0.528***	0.971***	0.320***	0.516***	0.971***
	(0.0361)	(0.0378)	(0.0117)	(0.0303)	(0.0321)	(0.00987)
Kleibergen-Paap Wald rk F statistic	80.04	194.80	6882.43	111.34	257.83	9681.96
Partial R squared	0.021	0.029	0.053	0.020	0.027	0.051

Note: CQC, DWP and Census, author's own calculations. Robust errors are calculated at care home level. $^{***}p < 0.01$,$^{**}p < 0.05$, $^{*}p < 0.1$.

Table 8: Effects of care home closures on informal care

	Number of people providing informal care		
	(1)	(2)	(3)
Panel A. OLS	3 months	6 months	12 months
Closure	-4,633	-2,827	-1,297
	(4,053)	(2,961)	(2,194)
Observations	30,061	30,061	30,061
R-squared	0.360	0.358	0.344
Panel B. 2SLS	Number of people providing informal care		
	3 months	6 months	12 months
Closure	-3,716*	-2,193*	-1,167*
	(2,038)	(1,228)	(666.0)
Observations	22,625	22,625	22,625
Number care homes	9,668	9,668	9,668
R-squared	0.627	0.626	0.627
Panel C. First stage	Closure nearest care home within 5 km in...		
	3 months	6 months	12 months
Consolidation	0.323***	0.528***	0.971***
	(0.0361)	(0.0378)	(0.0117)
Kleibergen-Paap Wald rk F statistic	80.04	194.80	6882.43
Partial R squared	0.021	0.029	0.053

Note: CQC, DWP and Census, author's own calculations. Robust errors are calculated at care home level. $^{***}p < 0.01$,$^{**}p < 0.05$, $^{*}p < 0.1$.

Table 9: Effects of care home closures on A&E admissions

	Total number of A & E admissions			
	(1)	(2)	(3)	(3)
Panel A. OLS	All admissions	Age 70 - 79	Age 80 - 89	Age 80 - 89
Closure	-20.54	-148.7	80.46	47.69
	(967.9)	(429.4)	(408.9)	(141.6)
Observations	617	617	617	617
R-squared	0.094	0.065	0.052	0.076
Panel B. 2SLS	Total number of A & E admissions			
	All admissions	Age 70 - 79	Age 80 - 89	Age 80 - 89
Closure	-70.76	-54.38	0.475	-16.85
	(555.3)	(355.4)	(194.3)	(56.34)
Observations	607	607	607	607
Number hospitals	160	160	160	160
R-squared	0.317	0.283	0.302	0.317
Panel C. First stage	Closure nearest care home within 5 km			
	All admissions	Age 70 - 79	Age 80 - 89	Age 80 - 89
Consolidation	0.882***	0.882***	0.882***	0.882***
	(0.118)	(0.118)	(0.118)	(0.118)
Kleibergen-Paap Wald rk F statistic	55.583	55.583	55.583	55.583
Partial R squared	0.083	0.083	0.083	0.083

Note: CQC, DWP and Census, author's own calculations. Robust errors are calculated at care home level. $^{***}p < 0.01$,$^{**}p < 0.05$, $^{*}p < 0.1$.

A Theoretical model

To understand the association between the market structure and quality, this section sketches a simple model following Forder and Allan (2014). A care home i has an objective function U that is composed by the profits obtained π and a factor m that characterises their altruistic behaviour and depends positively on the quality of the service. As Brekke et al. (2018) argue this assumption is relevant not only for models on long term care but also in healthcare, education and other sectors in public economics where individuals are mission oriented.

$$U_i(\pi_i, q_i) = \pi_i + m_i(q_i)X_i \tag{5}$$

Taking into account the institutional characteristics discussed in Section 2, the demand (X) for this care home is composed by two types of residents: self-funded (X^s) and publicly funded (X^p). Since self-funded residents value quality q, the price they are willing to pay depends on the level of quality provided. Hence, their price is expressed as $p^s(q_i)$. Also, the prices paid by publicly-funded residents are determined by the local authorities that are only interested in meeting the minimum quality standard so that their prices p^p are exogenous to the levels quality beyond the minimum standard. There are marginal and fixed costs (C_i and F_i respectively) that increase with quality. Considering these aspects it is possible to introduce the profits function and re-define Equation 5 as:

$$U_i = P_i^p X_i^p(q_i, P_i^p) + P_i^s(q_i)X_i^s(q_i, P_i^s) - C(q_i)(X_i^p + X_i^s) - F(q_i) + m_i(q_i)(X_i^p + X_i^s) \tag{6}$$

Maximising the objective function with respect to quality (q_i), we get first-order condition for care home i:

$$\frac{\partial U_i}{\partial q_i} = P_i^p \frac{\partial X_i^p}{\partial q_i} + (m_i - C_i)\frac{\partial X_i^p}{\partial q_i} + \frac{\partial X_i^s}{\partial q_i} X_i^s + P_i^s \frac{\partial X_i^s}{\partial q_i} + (m_i - C_i)\frac{\partial X_i^s}{\partial q_i} + \\ + \left[\frac{\partial m}{\partial q_i} - \frac{\partial C}{\partial q_i}\right](X_i^s + X_i^p) - \frac{\partial F}{\partial q_i} = 0 \tag{7}$$

The effect of the number of care homes in market (N) on the quality of care home i is obtained by solving Equation 7 for N.

$$\frac{\partial U_i}{\partial q_i \partial N} = \frac{\partial P_i^p}{\partial N}\frac{\partial X_i^p}{\partial q_i} + P_i^p \frac{\partial X_i^p}{\partial q_i \partial N} + \frac{\partial P_i^s}{\partial q_i \partial N} X_i^s + \frac{\partial P_i^s}{\partial q_i}\frac{\partial X_i^s}{\partial N} + \frac{\partial P_i^s}{\partial N}\frac{\partial X_i^s}{\partial q_i} + \\ + P_i^s \frac{\partial X_i^s}{\partial q_i \partial N} + (m_i - C_i)\left[\frac{\partial X_i^p}{\partial q_i \partial N} + \frac{\partial X_i^s}{\partial q_i \partial N}\right] + \left[\frac{\partial m_i}{\partial q_i} - \frac{\partial C_i}{\partial q_i}\right]\left[\frac{\partial X_i^p}{\partial N} + \frac{\partial X_i^s}{\partial N}\right] \tag{8}$$

Since $\frac{\partial P_i}{\partial N} < 0$ and $\frac{\partial X_i}{\partial N} < 0$ the sign of this effect is ambigous and depends on how responsive the demand is with regards to prices. In cases with low price elasticity, the increase in competition may lead to increases in quality (Gaynor and Town, 2011). This would be plausible in cases were prices are regulated such as for example hospitals in England.

B Further evidence on the validity of the instrument

To be valid, an instrument should not be correlated with the error term nor with ommited variables. To examine the validity in further detail Table 10 presents several specifications considering various sets of controls. If the instrument is valid, including more controls in the specification should not modify the results of the second and first stage.

Table 10: Tests on the instrument

	No controls			Demand controls			Supply controls		
Panel A. 2SLS	Quality deterioration in care home (1 = yes) in…			Quality deterioration in care home (1 = yes) in…			Quality deterioration in care home (1 = yes) in…		
	(1) 3 months	(2) 6 months	(3) 12 months	(4) 3 months	(5) 6 months	(6) 12 months	(7) 3 months	(8) 6 months	(9) 12 months
Closure	0.190	0.116	0.0633	0.204*	0.125*	0.0682*	0.176	0.108	0.0585
	(0.118)	(0.0732)	(0.0394)	(0.117)	(0.0727)	(0.0390)	(0.118)	(0.0731)	(0.0393)
Time controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	22,625	22,625	22,625	22,625	22,625	22,625	22,625	22,625	22,625
Number care homes	9,668	9,668	9,668	9,668	9,668	9,668	9,668	9,668	9,668
R-squared	0.183	0.185	0.188	0.183	0.186	0.189	0.187	0.189	0.192
Panel B. First stage	Closure nearest care home within 5 km in…			Closure nearest care home within 5 km in…			Closure nearest care home within 5 km in…		
	3 months	6 months	12 months	3 months	6 months	12 months	3 months	6 months	12 months
Consolidation	0.324***	0.529***	0.971***	0.325***	0.529***	0.973***	0.323***	0.527***	0.970***
	(0.0361)	(0.0378)	(0.0114)	(0.0361)	(0.0378)	(0.0115)	(0.0361)	(0.0378)	(0.0115)
Kleibergen-Paap Wald rk F statistic	80.64	195.77	7239.10	80.70	196.45	7132.40	79.95	194.06	7126.21
Partial R squared	0.021	0.029	0.053	0.021	0.029	0.0528	0.021	0.029	0.052

Note: CQC, DWP and Census, author's own calculations. Robust errors are calculated at care home level. $^{***}p < 0.01$,$^{**}p < 0.05$, $^{*}p < 0.1$.

C Additional robustness checks

This section presents further analysis and robustness checks in the main specifications considering (i) fixed effects at the lower level of the local authority (i.e. districts) and (ii) fixed effects at the upper level of the local authority (i.e. counties) which are the type of local authorities with responsibility in long-term care service. The analysis is based on the baseline specification that uses a catchment area of 5km between a care home that is inpsected and its nearest closing care home. Estimates also include time periods of 3, 6 and 12 months between the date of care home closure and the date of inspection of the neighbouring care home.

Table 11: Effects of care home closures on quality deterioration with local authority fixed effects

Panel A. 2SLS	Quality deterioration in care home (1 = yes)			Quality deterioration in care home (1 = yes) in..		
	(1)	(2)	(3)	(4)	(5)	(6)
	3 months	6 months	12 months	3 months	6 months	12 months
Closure	0.196*	0.129*	0.0609*	0.217*	0.144*	0.0672*
	(0.115)	(0.0752)	(0.0353)	(0.113)	(0.0742)	(0.0345)
Observations	30,061	30,061	30,061	30,061	30,061	30,061
R-squared	0.493	0.495	0.497	0.487	0.489	0.492
Panel B. First Stage	Closure nearest care home within 5 km			Closure nearest care home within 5 km		
	3 months	6 months	12 months	3 months	6 months	12 months
Consolidation	0.111***	0.196***	0.399***	0.122***	0.184***	0.394***
	(0.0127)	(0.0164)	(0.0185)	(0.0198)	(0.0234)	(0.0277)
Kleibergen-Paap Wald rk F statistic	66.12	141.99	465.05	33.273	49.320	106.977
Partial R squared	0,015	0,026	0,057	0.0082	0.0101	0.0248
Fixed effects (district)	Yes	Yes	Yes	No	No	No
Fixed effects (local authority LTC)	No	No	No	Yes	Yes	Yes
Fixed effects (year)	Yes	Yes	Yes	Yes	Yes	Yes

Note: CQC, DWP and Census, author's own calculations. Robust errors are calculated at care home level. $^{***}p < 0.01$,$^{**}p < 0.05$, $^{*}p < 0.1$.

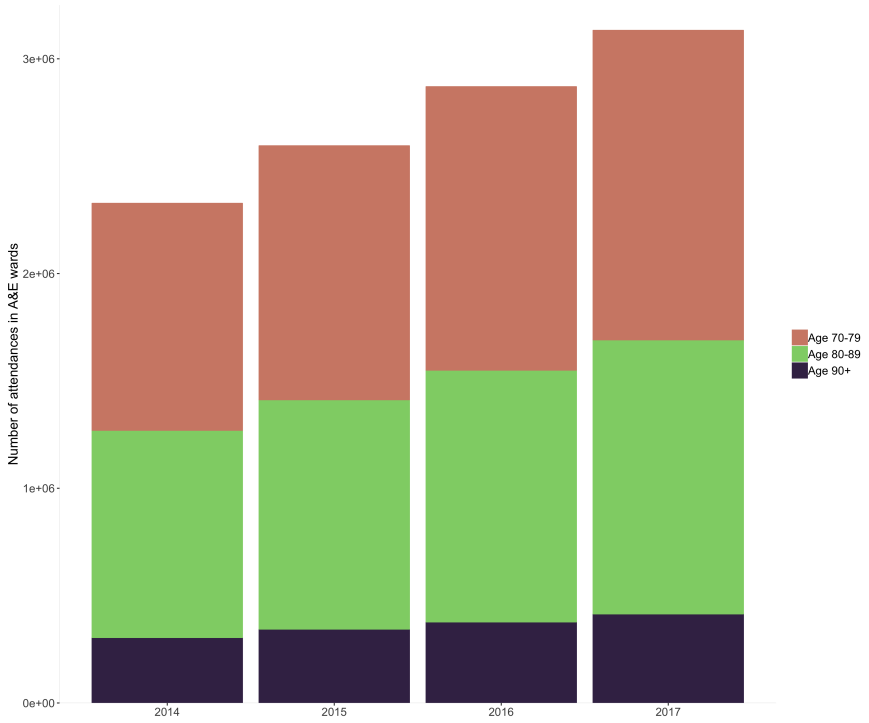
D Data regarding A&E attendances

In this section I describe the data sources used in section 5.4. Data are obtained from the Health Care and Social Care Information Centre (HCSIC) and NHS Digital. The information collected concerns statistics from the Hospital Episode Statistics and the Accident and Emergency statistics.

Data are collected on a fiscal year basis (starting in April) at the level of the health provider (e.g hospitals). The sample of analysis comprises 170 health centres on 137 districts. To calculate the nearest closing care home I use geodesic distance on a similar basis as described in section 3.2 and subset by those care homes that have the minimum distance. The average distance between a closing care home and the nearest hospital acute ward is 1.75 km. The maximum distance is 59.4 km and there are 2 closing care homes that are in the same building as the acute ward. To calculate control hospitals (h in Equation 4), I select the second nearest hospital to the closing care home.

Figure 2 shows the yearly attendances over the period of 2014-2018. There has been an increase in the attendances driven specially by attendances of people within the range of 70-79 years old.

Figure 2: Yearly attendances in A&E wards - England



Note: HSCIC and NHS Digital, author's own calculations. Figures represent A&E attendances for years 2014-2018. Attendances are represented by patient age group.