The effect of house prices on the long-term care market: Evidence from England*

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Abstract

High house prices are often considered to be beneficial for the elderly due to the accumulation of wealth. However, as land is an input in the provision of public services, the elderly might be harmed by them, for example, due to a shortage of local care homes. Alternatively, care home providers might be attracted by asset-rich potential clients, which could lead to a positive effect of house prices on the provision of care. Applying an instrumental variables approach on English data, we show that higher house prices lead to fewer care homes, fewer entries into the market as well as fewer available beds. Yet, we also show a positive effect on the proportion of care homes with high quality.

Keywords:Care homes, house prices, long-term care, England

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1 Introduction

Between 1997 and 2016, whilst the median price of residential properties in England increased by almost 260%, experiencing the fastest growth in real prices of all OECD countries, the median individual earnings increased by 68% (Henretty, 2017). The main consequence of this process has been an affordability crisis that has affected particularly young and first time buyers (Hilber, 2017; Hilber and Vermeulen, 2016). The other side of the coin concerns the elderly homeowners who bought house cheaply and have benefited from subsequent increases and accumulation in their housing wealth (Attanasio and Weber, 1994; Attanasio et al., 2009).

Long-term care offers an ideal setting to analyse the effects associated with the variation of house prices. Housing wealth is a key determinant of long-term care choices (Davidoff, 2010)[1] since it constitutes a core source for funding future needs (Costa-Font et al., 2018). Analysing the relationship between house prices and long-term care is particularly relevant for the case of England where the demand for long-term care is growing due to the ageing in the population and the shift from informal care within the (extended) family towards paid nursing and residential care homes (Kaschowitz and Brandt, 2017; Groenou and De Boer, 2016).

This paper studies how house prices affect the local provision of care homes. To do so, it exploits the variation of house prices over time, determined by the property transactions carried out in England, and the changes in the market structure of English care home. The direction of this effect is a priori ambiguous. Higher house prices may have positive effects on existing homeowners who accumulate more housing wealth to fund their present and future long-term care needs (Venti and Wise, 1990; Darton et al., 2010; Costa-Font et al., 2018). Consequently, care home providers may be incentivised to

[1]There is an extensive literature examining the changes of house prices in a range of decisions taken by the household such as labour supply (Disney and Gathergood, 2018; Begley and Chan, 2018), education (Lovenheim, 2011; Lovenheim and Reynolds, 2013), health (Fichera and Gathergood, 2016), divorce (Farnham et al., 2011) or fertility (Lovenheim and Mumford, 2013; Dettling and Kearney, 2014)

deliver services in these areas. On the other hand, higher house prices may also increase the development costs for care home providers. In this situation, providers could lower the supply of care homes for a given demand and consequently reduce the long-term care choices for people living in these areas. If this is the case, the elderly, in spite of being benefited by increases in their housing wealth, may also be harmed by the shortage, delay in the access and/or relocation of a service that are likely to demand. Therefore, the overall effect of higher house prices on the provision of social care depends on the relative size of the former two effects.

Examining how house prices affect the provision of long-term care is an empirical question that poses challenges. For instance, a potential concern, normally considered in hedonic price models, is that there are many environmental variables that cannot be observed or measured but which may affect the variables of interest (Rosenthal, 2003). In the case of this paper, long-term care providers may choose local markets based on unobservable variables that also affect the house prices. If this is the case, the correlations between house prices and the rate of care homes may be not interpreted causally. To overcome this problem, we follow the identification strategy proposed by Hilber and Vermeulen (2016) that exploits the exogenous variation of English local authorities regarding the adoption of a planning reform, the vote share and the historical population density to analyse the effect of regulatory constraints on the sensitivity of house prices to changes in the demand. In our case, we use the former set of instruments to eliminate endogenity concerns in the house prices and estimate their effects on the provision of long-term care.

We use the former identification on a sample of English local authorities that combines information on care homes from the Care Quality Commission (CQC), the regulator of long-term care services in England, and data on property transactions from the Land Registry. We find that higher house prices lead to fewer and smaller care homes. Moreover, we also find some evidence of quality upgrading. Particularly, areas where house prices are higher have more care homes rated as "outstanding" and fewer that require improve-

ments or are inadequate. These results are consistent with the previous international evidence for the case of nursing homes and assisted living facilities (McMillen and Powers, 2017; Stevenson and Grabowski, 2010).

The contribution of this study follows two main directions. Firstly, it complements previous work on the long-term care market in England. By focusing on the housing market, this paper provides the first empirical evidence for a causal link between house prices and long-term care provision. Former empirical research has used house prices to define the composition of the market when examining the effects of competition in care home prices and quality. Forder and Allan (2014), for instance, find that house prices were positively associated with care home prices and to less extent with quality. Yet, since the main focus is on competition as measured by a concentration index, this study does not address explicitly potential endogeneity concerns associated with house prices.

Secondly, this paper sheds light on the interactions between house prices and quality of residential long-term care services. As other studies analysing the quality of long-term care services in England (see for example Forder and Allan (2014) or Barron and West (2017)), our quality measure is based on quality ratings of the overall care home performance. To this regard, this study diverges from previous research that has measured quality on the basis of inputs of the process such as the number of rooms or staff, and/or on some type of health outcome such as mortality rates. By using a rating measure we overcome problems of mixed evidence depending on the quality measure chosen[2] and the insensitivity specially referred to some input measures (Yang et al., 2017). Unlike previous work using quality ratings on the English long-term care market, our study is based on the most recent quality regulatory framework implemented by CQC in 2014.

The provision of long-term care in England has been analysed by a number of authors. Thus, our paper is close to Machin et al. (2003) who provide evidence on factors related to entries into the care home market. Their results suggest that the introduction of

[2]For example, Grabowski (2001) finds mixed evidence on the effects of Medicaid reimbursements on the quality of nursing homes depending on the quality measure used.

the UK national minimum wage had a negative, but statistically insignificant effect on care home entries. Along the same lines, Giupponi and Machin (2018) study a more recent reform consisting of an increase of the national minimum wage introduced in 2015. Their findings suggest that this reform has not affected significantly the entry of care homes in the market nor in the closures. Regarding the former, there is some research exploring the causesthat lead to care home closures. Netten et al. (2003) and Netten et al. (2005) find that closures may be associated with the lower prices set in the care homes. Similarly, Allan and Forder (2015) show that poorer quality and more competitive markets are elements that increase the probability of market exits.

The remainder of the paper is organised as follows. Section 2 provides background information on the institutional setup and discusses the organisation of local planning process and long term care in England. Section 3 presents the characteristics of the data and section 4 describes the empirical strategy. Section 5 discusses the results and section 6 concludes.

2 Institutional background

In England, urban planning and long-term care are organised on the level of local government. Local authorities are roughly comparable to US counties and usually encompass one city or some larger rural area. Some areas have a two-tier structure with some decisions taken at the (lower) district council level and others at the (higher) county council level. Other authorities are unitary and combine both tiers. The local availability of care homes and the house prices present wide spatial disparities across English districts (see Figure 1)

2.1 Urban planning

Districts design and implement planning policies according to the National Planning framework. An important constraint on the housing supply, leading to increases in house prices, is the design of local planning policies (Kok et al., 2014; Jackson, 2016; Davis et al., 2017). Although some types of development have permitted development rights, most development projects require a planning permission. Districts normally manage the decisions regarding the applications. The decisions are taken after considering the feedback from a 21 day period of public consultation. Apart from the merits of the application, the considerations during this period concern mainly the use and development of the land. Depending on the type of development project, districts have different periods to make a decision. In the case of minor applications, districts have up to 8 weeks to make a decision. Alternatively, for cases of major development[3] local authorities can spend up to 13 weeks to make a decision. The latter limit was implemented by the Labour Government in 2002 to speed up the planning process (Hilber and Vermeulen, 2016). As we shall discuss further in section 4, one of the instruments used in our empirical strategy to identify the effect of house prices is based on this reform. Once the planning permission is granted, the development of the project must start within three years.

English planning regulations are particularly restrictive compared to other countries (Cheshire, 2009; Hilber, 2015) and in some cases lead to incentives for existing homeowners to promote "not in my backyard" policies that restrict local development and consequently the supply of local housing. These tighter regulations imply increases in the land value of those areas already developed and costs for owners in less developed areas (Hilber and Robert-Nicoud, 2013). The effects of planning regulations have been also studied in other sectors such as retail (see for example Cheshire et al. (2015), Griffith and Harmgart (2008), Haskel and Sadun (2012), Sadun (2015) for the UK, Bertrand and Kramarz (2002) for France Schivardi and Viviano (2011) or Sanchez-Vidal (2016) for Spain)

[3]Minor development projecst include householder cases and major development involve major housing and or business sites.

2.2 Long term care

There are 152 local authorities managing long-term care at the upper - council level[4]. Their main responsibility consists of commissioning (i.e., the purchase) care services on behalf of those clients eligible for public support. The provision of long-term care operates according to market mechanisms where the *for profit* private sector constitutes the main provider. In 2014, 74% of the total care homes belonged to a private provider compared with 8% provided by the public sector. The voluntary sector provides the remaining 18% of the places.

There are 19 private and 6 voluntary providers that have a combined market share of about 30% of the beds available. Within these, 4 providers are big chains with a combined market share of 15% of the beds available. Smaller providers that individually provide no more than 0.4% of the beds each, serve the remaining 70% of the market share. The resulting market is considered to be competitive, but also regionally fragmented with the South East having more than 1,000 registered compared to the 360 in the North East.

The composition of long-term care recipients in each local authority is a key factor of the regional discrepancies in the market. Care homes may have private clients who purchase and fund their care individually, based on their willingness to pay for different types of services, as well as clients partially or fully funded by the local authorities. The eligibility and degree of this public support consists of a means test that assesses the recipient financial capacity. The market for this type of client is a quasi-market where local authorities purchase care services from private providers on behalf of the clients (Le Grand, 1991). Barron and West (2017) find that care homes operating in these markets are, on average, of higher quality than those operated by for profit providers. Care homes normally have a higher proportion of publicly funded clients than self-funded clients (Jarret, 2017).

The fact that local authorities purchase care on behalf of a significant part of the

[4]These were implemented with the Social Care Act in 2014 and replaced the former Primary Care Trusts for the management of public health issues.

demand, suggests that they may have certain buyer power when negotiating the fees applied to publicly funded clients. It is possible that such buying power, reduces the fees paid by the local authorities for the same services that private payers receive, resulting in a potential cross subsidisation of privately funded clients to publicly funded clients[5].

3 Data

3.1 Care home variables

In our analysis we observe 315 local authorities at district level for 4 annual periods from January 2014 to December 2017. We collapse monthly information from the directories of active, inactive and rated care homes released by the CQC. Our initial sample is composed by 3,270 recordds corresponding to care homes registered for the practice of a legal activity regulated by the CQC.

Our main dependent variable is the number of care homes per 1000 population that are aged 65 or over in the local authority. Tokunaga and Hashimoto (2013) use a similar variable for analysing the entry of private providers in the Japanese long-term care market. We assume that a care home is active once it is registered and we drop those registrations that occur due to organisational reasons, such as changes in the address or take overs from a different provider. Geurts and Van Biesebroeck (2016) show that neglecting this issue when considering this type of data, may lead to measurement errors and incorrect conclusions about the performance and dynamics of the firm. In particular these spurious entries and exits in the market may lead to overstimations of the firm dynamics and employment. The population data correspond to the projections of the Office of National Statistics corresponding to mid-year estimates as of 30^{th} of June for the years 2014 to 2016.

We also use the date of registration to define the entry rates (E). Particularly, we

[5]Several authors have documented this situation for the English long-term care market (Forder and Allan, 2014; Hancock and Hviid, 2010; Office of Fair Trading, 2005). Other studies have also such a situation for the US market (Grabowski, 2004; Mukamel and Spector, 2002).

adopt an ecological approach by which we consider the number of new registered care homes (I_t) relative to the number of incumbents at the beginning of each period (I_{t-1}) as follows: $E = \frac{I_t}{I_{t-1}}$. This is a relative measure that allows us to compare the process of entry between markets of different sizes (Audretsch and Fritsch, 1994). Further, we use information on the number of beds in each care home, the postcode and postal address, the city and region where the care home is located as well as the local authority that is responsible for commissioning social care services to generate two additional outcomes associated with the capacity of the care home, namely the number of newly registered beds in a period and the average size of existing care homes.

We also use information on care homes' quality ratings from the inspection system implemented by the CQC since 2014. This new system implied more systematic and structured inspections conducted without prior announcement. Evaluations explicitly consider five quality components of the services that include the safety, effectivity, level of care and response to people's needs, as well as the management and leadership of the services. These dimensions are complemented with an overall evaluation of the services that we use for our analysis. Quality assessments are rated according to four possible ratings namely *outstanding, good, requires improvement or inadequate*. We analyse the effect of house prices on the outstanding and bad dimensions (i.e. requires improvement and inadequate).

3.2 House prices and instruments

We obtain information on property prices from the price paid dataset released on a monthly basis by the Land Registry. This dataset registers all the transactions involving properties in England and Wales since 1995. In addition to the price paid and the exact date of the transaction, the dataset includes further information such as the type of property, the address, the city, district and region where the property is located as well as whether the location was newly built and whether the property was under leasehold or freehold.

We aggregate this information on the same level as the care home and obtain the average price for each year. We apply the geometric mean which is the method adopted by the Land Registry to correct the potential skewness from high property values.

For identifying the effect of house prices we use information concerning historical planning decisions at local level. This information comes from the data of Hilber and Vermeulen (2016) and it is referred to local authorities at district level for the period from 1974 to 2008. We consider the information related to the instruments used in this paper. Concretely, we use information on the time variation in the acceptance period for the planning applications outlined in section 2.1, the share of Labour voters and the historical population density. We discuss the rationale for these instruments in further detail in section 4.

The sample presents some caveats. First, it includes only those local authorities that did not undergo any changes after the reform in the English Local Government in 2009 by which some local authorities changed their status becoming single unitary authorities or were split into several local authorities[6]. Second, the analysis begins in 2014 due to the availability of the information of some outcomes. Data in the directory of active care homes contain registrations of care homes since 2010, the year when it became a legal requirement. The majority of the registrations (16,054) were carried out during 2010 and the first two months of 2011. In additional analyses shown below, we test the validity of the results on some outcomes considering the period from March 2011 to December 2017 and March 2011 to December 2013.

4 Empirical strategy

We estimate regressions that follow the general form

[6]Cheshire council split into Cheshire East and Cheshire West and Chester and Bedforshire council became Bedford borough and Central Bedforshire.

$$Y_{irt} = \alpha_r + \theta_t + \beta_{prices} logP_{irt} + \lambda X_{irt} + \epsilon_{irt} \tag{1}$$

where Y is the respective outcome variable i.e., proportion of care homes per 1000 population over 65, care homes entry rates, number of newly registered beds and average size of entrant care home, for a local authority i in region r time period t. P is the average house price. We incorporate X as the share of people over 65 in the local authority to control for the demographic composition. We also include δ and η which are dummy variables for the local authority region and for the time period. The rationale of these variables is to control for all those factors, observed and unobserved, that are constant within region and time.

We are interested in estimating β_{prices}. OLS estimates of β_{prices} in equation 1 are likely to be biased as there may be unobserved factors, as for instance the general wealth in an area, that may influence both house prices and the provision of care homes. In addition, we can also imagine potential reverse causality between the number of care homes and the level of house prices if care homes are a (dis-) amenity that changes the quality of the neighbourhood and potentially the values of the properties in an area. Potentially, we could address this problem controlling for the index of multiple deprivation (IMD). However, it is likely that the IMD's link to the house prices could exacerbate the endogeneity concerns. To tackle with these concerns, we complement Equation 1 with the following first stage regression.

$$logP_{irt} = \gamma_r + \kappa_t + \delta Z_{irt} + \eta X_{irt} + \epsilon_{irt} \tag{2}$$

where Z is a variable associated with instruments for the house prices. In particular, we obtain a source of exogenous variation in the house prices, making use of an identi-

fication strategy from Hilber and Vermeulen (2016) who study the effect of supply side constraints, such as the available land and the tightness of planning regulations to assess the response of house prices to changes in the demand. They find that tighter supply constraints, such as less available land and more restrictive planning regulations, lead to increases in the prices. Concretely, in areas with more regulatory constraints, demand changes given by changes in local earnings lead to substantial positive effects on house prices. The authors argue that direct measures of supply constraints, such as the refusal rates, may be subject to endogeneity due to their pro-cyclical association with the business cycle or the developer attitudes once they know the restrictiveness of the planning local authority. Whilst averaged values could mitigate the former, dealing with developer attitudes is more challenging and could effectively result in an underestimation of the real level of tightness in the planning authority. To overcome these limitations they propose three instruments that we shall describe below.

Hilber and Vermeulen (2016) instrument for the supply constraints to assess their impact on house prices. We do not instrument for the supply constraints. Rather, we use the instruments used by Hilber and Vermeulen (2016) to identify the house prices, which is the treatment variable in our case. Hilber and Vermeulen (2016) show in their first and second stage estimates that there is a valid set of instrumental variables (I) that addresses the endogeneity produced by confounding variables (u) when establishing the causal link between the supply constraints (S) and the house prices (P) (see solid arrows in Figure 2). Our identification strategy uses their set of instruments in (I) to deal with similar confounding variables (ε) in the causal link between the house prices and the proportion of care homes (C) (see dashed arrows in Figure 2)

We can do this because Hilber and Vermeulen (2016) use two instruments for the tightness of local planning regulations. The first is based on the impact of a planning reform aimed at speeding up the planning processes of local authorities at that we have outlined in section 2.1. Set in 2002, this reform aimed to avoid delays of major projects and

included an explicit target for their conclusion. Local authorities had incentives to meet this target since funds from the central government could be retained otherwise. Hilber and Vermeulen (and us) use as an instrument the change in the delay rate of major projects pre- and post-reform. The rationale is that in order to meet the target, restrictive local authorities, which were more prone to delay projects before the reform, had to change their behaviour after the reform compared to more permissive local authorities. A potential criticism of this instrument is that this regulation could affect also the development of care homes. Thus, local authorities with greater differences in their delay rates would be those more restrictive and in principle would reject more planning projects - including those involving care homes. Figure 3 shows the weak relationship ($\rho = 0.0061$) between the average delay rates and the number of care homes per 1000 people older than 65 for each local authority.

Two reasons may explain this low association. First, major projects and more generally the design of planning regulations, mostly refer to houses. Care homes are normally considered within a category that integrates care facilities. The applications are not tested with the housing development plans and conversely may be approved despite the limits imposed by future settlements (King, 2017). Second, the development of care homes planning also involves local authorities at different levels. In two-tier authorities, the aims of local authorities with responsibilities in long term care for meeting the demands of long term care for the old population may clash with the strategy of local planning authorities which decide about the development of care homes. Most local plans that define the planning framework fail at addressing the needs for the provision of care homes or similar facilities such as retirement houses[7].

The second instrument is the vote share of the Labour party in the General Election of 1983 at the local district level and links local planning regulations to local political

[7]In a study conducted over the planning documents of all local authorities in England, about a 66% did not have a explicit policy for the elderly or allocated sites devoted to the development of care homes whereas only a 10% had both (Branson, 2017). Also, some argue the lack of recognition of old population growth in Local Plans (Campbell, 2015).

power. In addition to Hilber and Vermeulen (2016), this strategy has been used in the literature before (Bertrand and Kramarz, 2002; Sadun, 2015). The logic of this instrument is that Labour voters were, historically, predominantly low- and middle-income, and working-class. These voters gain from additional construction activity, both through more affordable homes and additional jobs. Furthermore, they were unlikely to own (more expensive) houses that could depreciate.

Using data from a general election ensures that very localised concerns, such as those related to housing, do not play a dominant role in voters' decisions. We additionally include a contemporaneous Labour vote share (based on the general election in June 2015) to control for changes in the demographic composition of areas that may lead to a more Labour-friendly population and consequently alter the voting behaviour and the corresponding local policies. Cheshire et al. (2015), for example, allude to the case of some neighbourhoods in London receiving important proportions of new wealthy residents when analysing the relationship between supply restrictions and housing vacancies.

Hilber and Vermeulen also regard physical constraints as another mechanism that may restrict the supply of houses. The share of developed land can be endogenous given that local authorities may discretionarily determine it. To correct for this problem, they use the population density in 1911 under the rationale that land is more expensive in historically more densely populated areas.

A final concern is that the location decisions of the elderly may be associated with the instruments. It could happen that a potential client would want to move to an affordable area with lower living cost and a more affordable access to care. Whilst a plausible case, evidence show that care home choices are normally driven by the proximity to the original residence of the client (Zwanziger et al., 2002; Shugarman and Brown, 2006).

Table 1 displays the descriptive statistics for our estimation sample. On average, over the period of analysis there were almost 2 care homes per 1000 population over 65. There is a surprisingly low number of inspected care homes rated as outstanding

per population over 65 (0.01). Conversely, the average number of care homes that are rated either inadequate or require improvement are more than 20%. Likewise, regarding the dynamics of the market, we can see that entry rates as defined in section 3.1 vary substantially across the sample with an average of 5% and some local authorities reaching values as high as 40%. The average size of new care homes since January 2014 is 27 beds with a minimum of zero (equivalent to no new homes entering) and a maximum of 156. Local authorities gain on average 76 new care home beds per year. House prices are also highly variable across regions with an average of £247,835, but a range at the lower end of £71,650 and more than £1M for some local authorities in London.

Table 2 shows the results corresponding to the first stage statistics for our estimation combining different sets of instruments. Columns 1 to 3 present estimates using each instrument described above individually. Column (4) considers the whole set of instruments and represents our preferred specification. Given that the variables used as instruments do not vary over time, Hilber and Vermeulen (2016) interact the instruments with a time varying variable, the annual local earnings, to instrument for the refusal rate, their measure of planning constraints, and use the predictions in their second stage to estimate the house prices. In our case, we include time effects to produce variations over time on the resulting predicted house prices. Otherwise, the estimates would not explain the effects of house prices on care homes provision. Also, we include fixed effects at regional level. Unlike Hilber and Vermeulen (2016) we do not use fixed effects at a lower geographical level (e.g. the local planning authority) since it poses problems with collinearity. There are some aspects such as productivity which differ at regional level and that are difficult to capture using observed data. Some works have proposed approaches to compare changes in productivity of social care. For instance, Yang et al. (2017) show discrepancies of regional productivity growth for social care during the period of 2010-12.

Like Hilber and Vermeulen (2016), our estimates suggest that the relaxation of planning constraints lowers house prices, while higher (historical) population densities

increase them. The results also confirm the negative relationship between Labour voters and house prices presented before. The bottom of Table 2 presents Sanderson-Windmeijer (2016) multivariate F-tests for the excluded instruments. These tests overcome the problem that simple F-tests have in the case of multiple instruments which can be misleading as they could mask a combination of strong and weak instruments. Results for our preferred specification are displayed in Column 4 and indicate the absence of weak identification problems for all our endogenous regressors. In particular, the F statistics are above 10 which is the value suggested by Staiger and Stock (1997)[8] as acceptable to reject the null hypothesis of weak instruments.

5 Results

Table 3 looks at the link between contemporaneous house prices and the number of care homes per 1000 population over 65, as well as the rate of market entry. In both panels, the first column reports OLS estimates. The remaining columns present results considering all the instruments[9] (column 4 in table 2) and different sets of controls. Our estimates imply that higher house prices decrease the number of care homes and the entries into the market. In our preferred specification, including time and regional controls, an increase of a 10% in the level of prices entails a reduction of 0.06 care homes per 1000 population over 65. In terms of standard deviations, our results suggest that a 1% increase in the log of the house prices lowers the number of care homes by 107% of a standard deviation. These findings suggest that the effect of higher production costs derived from higher house prices dominates any eventual demand effect operating through potential clients becoming wealthier.

As we can see in the right panel in Table 3, house prices also affect negatively the entry rates of care homes. Yet this effect is not significant under our preferred specification.

[8]Stock and Yogo (2005) propose a critical value of 22.30 for the case of three instruments and one endogenous variable. Our preferred estimate in Column 4 of Table 2 is also above that level.

[9]Appendix A presents results with alternative specifications based on different sets of instruments.

It is plausible that the decision of entry is based on historical information on the housing market. Furthermore, the dates of care home registration and the purchase of the property may differ. Table 4 explores these issues and shows the effects of lagged house prices 1, 2 and 3 years respectively, on the number of care homes and entry. These lags fit the timeframe required for setting up and opening a care home in England which in addition to the construction of the building, involves the application for a "statement of purpose" and the confirmation of a registration. The effects of lagged prices are similar to the findings presented in Table 3, These findings therefore indicate that different time frames do not affect our analysis.

These results suggest that the provider's decision of entry to local markets may respond mainly to financial incentives that determine the cost of development. Investing in the development of a care home in areas where the value of alternative uses of land, such as housing, are high, may also entail high opportunity costs. Developers may prefer to develop houses instead of care homes despite having a potential demand. Furthermore, there may be competition between care home developers and house builders to get the available land. Since house builders have greater profit margins, they may be able to pay higher prices for a site. Finally, public finance programmes at local and national level may disincentivise and jeopardise the development of care homes. For instance, local programmes such as the Community Infrastructure Levy charge for additional spaces of a care home that are not subject to rental revenues (Campbell, 2015). Also, national grants such as the New Homes Bonus support local councils for building new houses in their area.

5.1 Alternative mechanisms

In Table 5 we present results of the effect of house prices on the care homes capacity measured by the total number of new beds and the average size of care homes registered in the local authority. Higher house prices lead to the registration of fewer beds and

smaller care homes. A 10% increase in the house prices implies a reduction of about 1 new bed registered in the local authority per year. In terms of the standard deviations, a 1% increase in house prices implies a reduction in the average size of the newly registered care home of about a 103% of a standard deviation. These results imply that older populations living in areas where house prices are high would face a restriction in the long-term care choices available to them based on fewer beds available for them.

Yet, despite having fewer options regarding the provision of care, the services could be of better quality. Bigger care homes tend to have lower levels of quality since they encounter more difficulties to provide a more personalised care (Barron and West, 2017). We explore this quality aspect in further detail. In addition to quality variations because of different care home sizes, house prices may influence the quality level in the care home. Evidence suggests that care homes rely on self-funded clients to cross-subsidize publicly-funded clients and preserve their financial viability (Humphries et al., 2016). Therefore, areas with more clients that self-fund their care should be more attractive for long-term care providers. Further, as price takers, self-funded clients can choose which care home they use and prefer better care homes. If higher house prices imply more asset-rich clients who can afford better care, care homes can execute a vertical quality differentiation in those areas and set higher fees for services of better quality. If this occurs, we would expect a positive effect of house prices on the quality of care homes in an area[10].

Table 6 reports the results of the effect of house prices on the number of care homes per old population by quality rating. The information displayed is based on care homes rated as outstanding, require improvement or inadequate. IV estimates reveal a positive effect of the house prices on the proportion of outstanding care homes and a negative effect on those rated badly. Specifically, a 1% increase in house prices leads to an increase in the number of outstanding care homes by approximately a third of a standard deviation. Regarding the number of care homes that require improvement or are inadequate, a

[10]This effect would be similar to the effect found with other institutions such as schools. See Black and Machin (2011) for a review.

similar increase in house prices leads to a negative and statistically significant effect of around 50% of a standard deviation (46% and 56% respectively). The greater proportion of care homes that are inadequate may explain why their effect is greater. These findings are consistent with the argument that care homes would be upgrading and improving their quality to capture asset-rich private clients.

There may be concerns associated with the external validity of our results given the three-year period that composes our main sample of analysis. We examine the validity of our results considering samples with diffrent sizes for those outcomes where we have additional information. Particularly, the number of care homes, the entry rates, the newly registered beds and the average size. We use a sample that includes the period 2011-17 covering the years since the registration in the CQC was compulsory and prior to the establishment of the quality rating. Further, we also consider a sample containing only the years before the quality system was established (2011-13). The specifications include both time and region fixed effects and results are reported in Table 7. Our findings are consistent with those shown in previous tables, although they generally increase in magnitude, especially for the sample considering the period before 2014.

6 Discussion and conclusion

This study adds to the literature on long-term care by investigating the causal link between house prices and the provision long-term care in England. Our findings suggest that high house prices have a hitherto unexplored social cost that implies a reduction in the provision of local long-term care. Likewise, we find a negative effect of the prices on the number of new registered beds and the average size of care homes. Therefore, areas where higher house prices have fewer care homes that are also smaller. These results provide evidence to inform future challenges faced by local authorities to meet the long-term care needs of their populations and particularly relevant given the analyses that estimate the

need of 70,000 extra residential beds for 2025 in England (Kingston et al., 2017).

A potential implication of these results is that high house prices are not as uniformly beneficial to older homeowners as often implied in public debates. That being said, we do find evidence that higher house prices go hand in hand with better quality rated care homes, suggesting that care home providers might be motivated by a desire to attract asset-rich private clients. These findings are consistent with evidence found for other countries such as the US. McMillen and Powers (2017) show the prevalence of nursing care homes to locate in areas with older and wealthier people and Stevenson and Grabowski (2010) find similar results for the case of assisted living facilities. An alternative potential implication derived from the increases in housing wealth that we do not explore in this paper, is that the demand of residential care could be substituted by alternative formulas of care. Costa-Font et al. (2018) find that increases in wealth do not increase the demand of residential care but rather lead to greater demand more personalised care as home care or informal care. In such cases, residential care would be considered as an inferior good. This paper lacks information regarding the types of demand that populate the care homes and alternative ways of formal provision such as home care or even informal care. Considering these elements, in combination with information on residential care, may define one avenue for future studies.

Our findings also support the idea that financial incentives are a key driver of care homes development. High house prices suggest that projects with alternative developments to care homes, such as building domestic houses, constitute a more attractive option for developers' investment. This is because of two core reasons. Housing development entails fewer opportunity costs and higher profit margins that lead to better bargaining power for accessing to available developable land. Likewise, the development of care homes is associated with fewer fiscal incentives, both at local and national level. Regarding this, our findings illustrate important interactions between various areas, that are responsibility of different local authorities. Our results can contribute to policy re-

forms that involve the housing market and aim to increase local government funding. For instance, the introduction of new national grants, such as the New Homes Bonus in 2011, has encouraged the development of new residential properties. Although these development projects could potentially compromise the provision of long-term care, the funding derived from these grants might alleviate the current funding needs in long-term care. Disentangling these relationships, given the context of constant reforms in the local public finance, may be another area for future research.

We should read these findings alongside the funding schemes for long-term care where the value of the properties plays a key role, especially for those people residing in care homes. In these cases, the value of the property is included for the assessment of the means test that determines the public support by the local authorities. Likewise, the value of the property is considered for assuming the cost of deferred payments for those patients that are in a care home and decide to postpone the payment of their care. Under these situations, homes can be sold to pay the local authorities. Hence, from the perspective of a local authority, higher house prices would entail greater revenues that could be used to meet its funding requirements.

Likewise, higher house prices could also contribute to increase the council tax, which is the main source of local revenue and is partially used for meeting the needs of local governments in terms of long-term care. Despite the fact that long-term care has been an area relatively protected from the budgetary constraints occurred since 2010 (Smith et al., 2016), both local authorities and national government need to agree in a funding scheme to meet the rising needs and the challenges derived from the provision and funding of long-term care in residential care homes.

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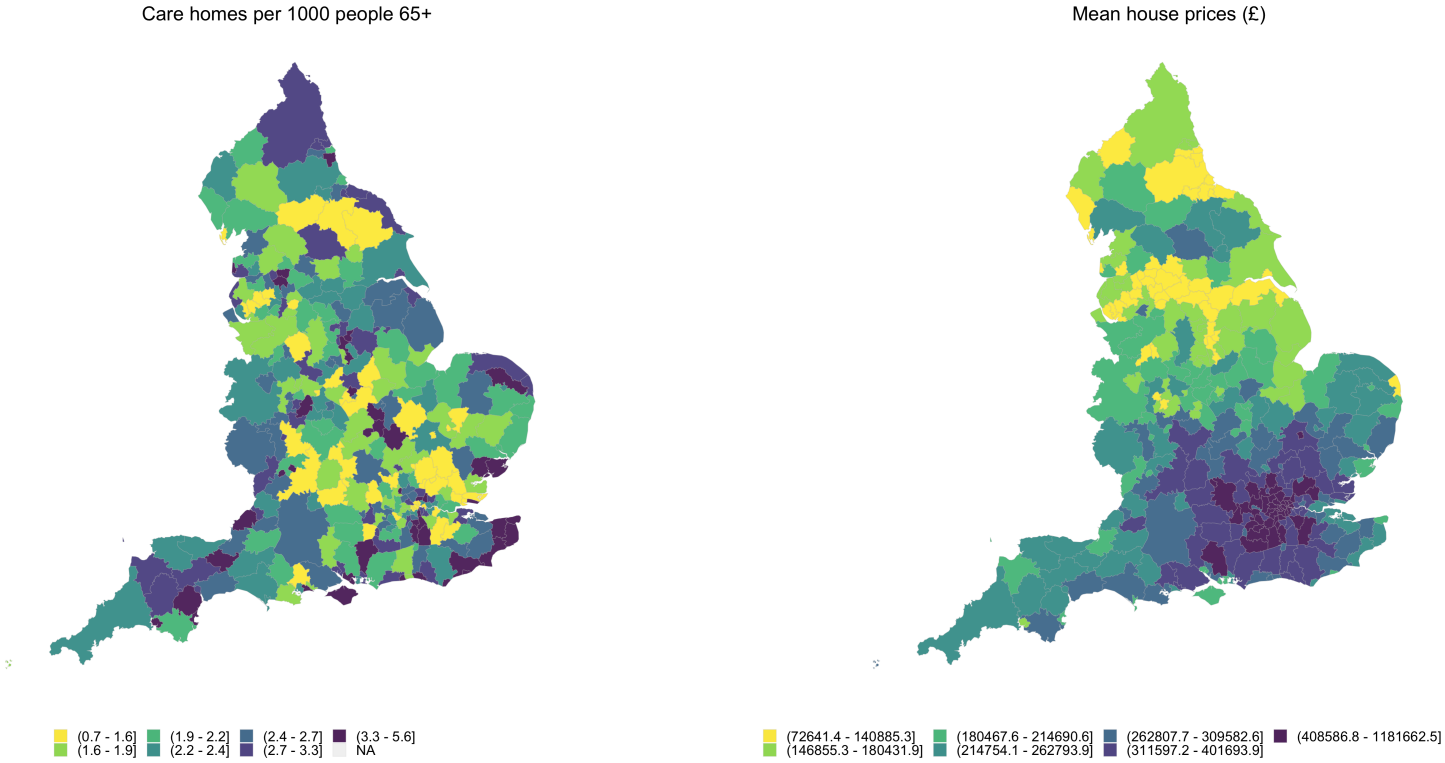
7 Figures

Figure 1: Distribution of care homes and house prices



Note: Distribution of care homes per 1000 population 65 years old and mean house prices. English districts for 2016.

Figure 2: Causal links between instruments

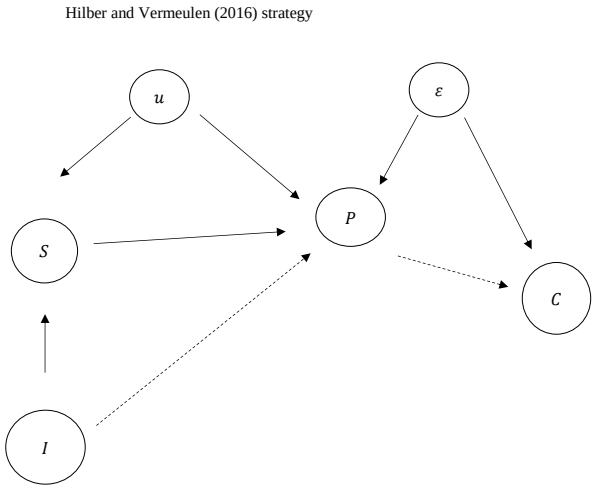
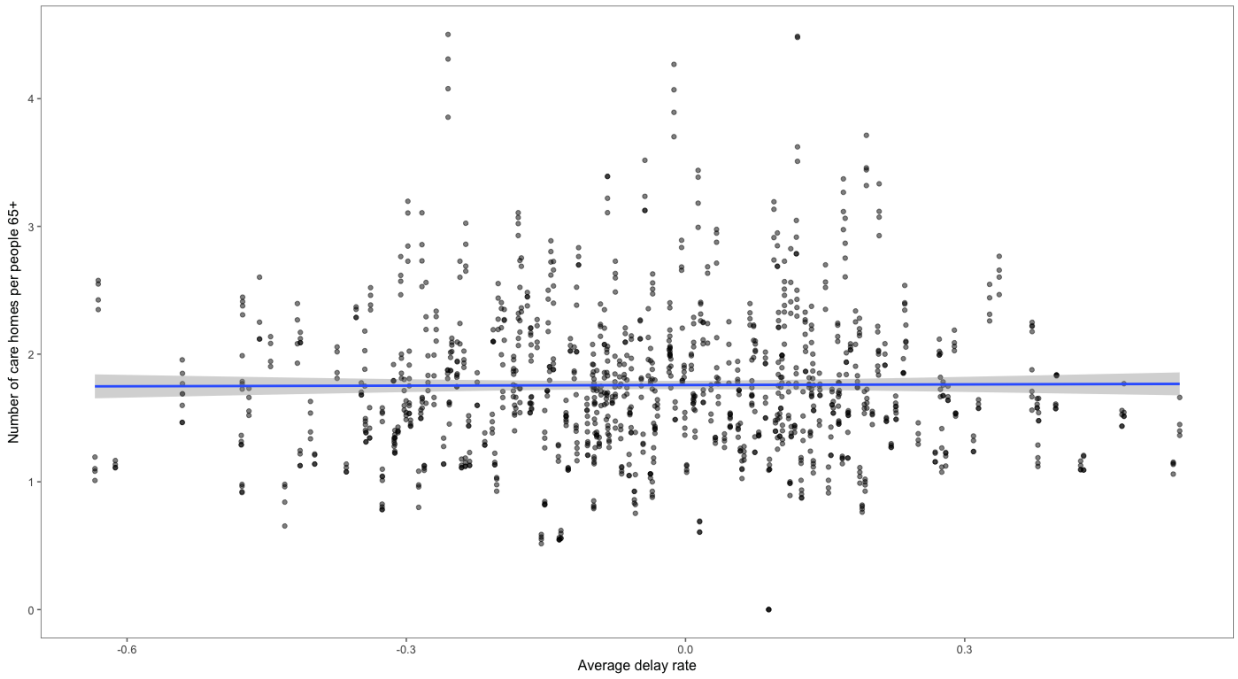


Figure 2: Causal links between instruments

Note: Causal links for the identification strategy.

Figure 3: Care homes and delay rates



Note: This figure shows association between the number of care homes per pople older than 65 and the average rate of delay. Figure is based on observations of English districts from 2014 to 2017.

8 Tables

Table 1: Summary statistics

	Mean	S.d	Min	Max
Care homes per 1000 population 65 +	1,76	0,58	0	4,5
Entry rates	0,05	0,04	0	0,4
New registered beds	76,61	95,15	0	862
Average size (# beds)	26,64	24,92	0	156
Care homes quality (outstanding)	0,01	0,02	0	0,16
Care homes quality (requires improvement)	0,2	0,18	0	1,7
Care homes quality (inadequate)	0,02	0,04	0	0,34
Average house price (£)	247,835	134,049	71,65	1,276,781
Historical share of Labour votes	0,16	0,09	0	0,41
Share Labour votes (June 2015)	0,28	0,14	0,07	0,73
Change delay rate	-0,04	0,22	-0,63	0,53
Population density 1911	774,67	2633,05	3,25	22028,8
Share population 65+ (%)	19,13	4,79	6	33,3
East Midlands (1 = yes)	0,13	0,33	0	1
East of England (1 = yes)	0,14	0,35	0	1
London (1 = yes)	0,1	0,3	0	1
North East (1 = yes)	0,03	0,18	0	1
North West (1 = yes)	0,12	0,32	0	1
South East (1 = yes)	0,21	0,41	0	1
South West (1 = yes)	0,11	0,31	0	1
West Midlands (1 = yes)	0,09	0,29	0	1
Yorkshire and the Humber (1 = yes)	0,07	0,25	0	1
Observations	1260			
Local authorities (districts)	315			

Note: CQC, DWP and Census.

Table 2: First stage results

	Average house prices (log)			
	(1)	(2)	(3)	(4)
Change delay rate	-0.135**			-0.0919***
	(0.0678)			(0.0294)
Historical share of Labour votes		-0.941***		-1.088***
		(0.276)		(0.135)
		(0.218)		(0.0970)
Historical density population			3.64e-05***	4.47e-05***
			(8.66e-06)	(3.10e-06)
Time FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
Observations	1260	1260	1260	126 0
Number of local authorities	315	315	315	315
Sanderson-Windmeijer test of excluded instruments	3.97**	49.2***	17.64***	36.67***

Note: CQC, DWP and Census, author's own calculations. Robust standard errors at the LSOA level are in parentheses. Table provides estimates of the first stage equation 2 where the dependent variable is average of the logged house prices in the local area. Controls share of old population, contemporaneous share of Labour votes and region and year fixed effects. $^{***}p < 0.01$,$^{**}p < 0.05$, $^{*}p < 0.1$.

Table 3: Effect of house prices on number of care homes and rate of market entry

	Number of care homes per 1000 population 65+			Entry rates		
	(1)	(2)	(3)	(4)	(5)	(6)
Average house prices (log)	-0.780***	-0.107	-0.622***	-0.00385	-0.0103**	-0.00652
	(0.118)	(0.0898)	(0.178)	(0.00478)	(0.00406)	(0.00868)
Estimation	OLS	IV	IV	OLS	IV	IV
Time FE		Yes	Yes		Yes	Yes
Region FE		No	Yes		No	Yes
Observations	1260	1260	1260	1260	1260	1260
Local Authorities	315	315	315	315	315	315
R-squared	0.209	0.043	0.204	0.021	0.014	0.048

Note: CQC, DWP and Census, author's own calculations. Robust standard errors at the LSOA level are in parentheses. Table provides estimates of the second stage equation 1 where the dependent variable is number of care homes per 1000 population 65 or older and the care homes entry rates. Controls are the share of old population, contemporaneous share of Labour votes, region and year fixed effects. $^{***}p < 0.01$,$^{**}p < 0.05$, $^{*}p < 0.1$

Table 4: Effect of lagged house prices on number of care homes and rate of market entry

	Number of care homes per 1000 population 65+			Entry rates		
	(1)	(2)	(3)	(4)	(5)	(6)
Average 1-year lag house prices (log)	-0.627***			-0.00652		
	(0.174)			(0.00865)		
Average 2-year lag house prices (log)		-0.631***			-0.00659	
		(0.173)			(0.00870)	
Average 3-year lag house prices (log)			-0.642***			-0.00663
			(0.177)			(0.00884)
Estimation	OLS	IV	IV	OLS	IV	IV
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes
F statistic of instruments	36.44***	36.13***	36.2***	36.44***	36.13***	36.2***
Observations	1260	1260	1260	1260	1260	1260
Local Authorities	315	315	315	315	315	315
R-squared	0.204	0.202	0.201	0.020	0.020	0.021

Note: CQC, DWP and Census, author's own calculations. Robust standard errors at the LSOA level are in parentheses. Table provides estimates of the second stage equation 1 where the dependent variable is number of care homes per 1000 population 65 or older and the care homes entry rates. Controls are the share of old population, contemporaneous share of Labour votes, region and year fixed effects. $^{***}p < 0.01$,$^{**}p < 0.05$, $^{*}p < 0.1$

Table 5: Effect of house prices on care homes capacity

	New registered beds			Care home average size		
	(1)	(2)	(3)	(4)	(5)	(6)
Average house prices (log)	-38.08***	-65.47***	-98.42***	0.0839	-5.893***	-9.259**
	(9.407)	(11.29)	(21.95)	(2.673)	(2.028)	(4.228)
Estimation	OLS	IV	IV	OLS	IV	IV
Time FE		Yes	Yes		Yes	Yes
Region FE		No	Yes		No	Yes
Observations	1260	1260	1260	1260	1260	1260
Local Authorities	315	315	315	315	315	315
R-squared	0.121	0.087	0.094	0.058	0.036	0.048

Note: CQC, DWP and Census, author's own calculations. Robust standard errors at the LSOA level are in parentheses. Table provides estimates of the second stage equation 1 where the dependent variables are newly registered beds in the local authority and the average size of new registered care home measured by the number of beds. Controls are the share of old population, contemporaneous share of Labour votes, region and year fixed effects. $^{***}p < 0.01$,$^{**}p < 0.05$, $^{*}p < 0.1$

Table 6: Effects of house prices on care homes by quality rating

	Outstanding			Requires improvement			Inadequate		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Average house prices (log)	3.70e-05	0.00432***	0.00675**	-0.115***	-0.0310**	-0.0825***	-0.0197***	-0.0111***	-0.0227***
	(0.00185)	(0.00130)	(0.00300)	(0.0217)	(0.0136)	(0.0303)	(0.00446)	(0.00284)	(0.00648)
Estimation	OLS	IV	IV	OLS	IV	IV	OLS	IV	IV
Time FE		Yes	Yes		Yes	Yes		Yes	Yes
Region FE		No	Yes		No	Yes		No	Yes
Observations	1,260	1,260	1,260	1,260	1,260	1,260	1,260	1,260	1,260
Local Authorities	315	315	315	315	315	315	315	315	315
R-squared	0.115	0.094	0.107	0.467	0.430	0.464	0.176	0.130	0.175

Note: CQC, DWP and Census, author's own calculations. Robust standard errors at the LSOA level are in parentheses. Table provides estimates of the second stage equation 1 where the dependent variable is the share of care homes with an outstanding rating, requires improvement or inadequate. Controls are the share of old population, contemporaneous share of Labour votes, region and year fixed effects. $^{***}p < 0.01$,$^{**}p < 0.05$, $^{*}p < 0.1$

Table 7: Effects of house prices on several care homes outcomes

	Care homes	Entry rates	Registered beds	Average size
Average house price (log) - sample 2011-17	-0.715***	-0.0166	-126.7***	-3.726
	(0.194)	(0.0104)	(24.44)	-3.212
Observations	2,205	2,205	2,205	2,205
R-squared	0.241	0.404	0.256	0.049
Average house price (log) - sample 2011-13	-0.846***	-0.0289	-164.9***	3.249
	(0.222)	(0.0182)	(33.31)	-3.999
Observations	945	945	945	945
R-squared	0.222	0.435	0.318	0.047

Note: CQC, DWP and Census, author's own calculations. Robust standard errors at the LSOA level are in parentheses. Table provides estimates of the second stage equation 1 where the dependent variables are is number of care homes per 1000 population 65 or older, the care homes entry rates, the number of beds in the local authority and the average size of the new registered care homes. Controls are the share of old population, contemporaneous share of Labour votes, region and year fixed effects. $^{***}p < 0.01$,$^{**}p < 0.05$, $^{*}p < 0.1$

A Specifications with different instruments

This section presents results for the main outcomes (e.g. number of care homes per 1000 population 65 or older and the care homes entry rates) considering alternative specifications based on different combinations of the instruments described in Section 4. Columns 1 to 3 use solely the instruments and columns 4 and 5 combine them with the historical density population. Hence, Column (1) uses the changes in the delay rate pre and post planning reform, column (2) uses the historical and contemporaneous share of Labour votes in general elections and column (3) the share of historical density population. Results are similar to the results obtained in Table 3 for both the number of care homes per 1000 population aged 65 or more and the entry rates.

Table 8: Effects of house prices on number of care homes and entry rates

	Number of care homes per 1000 population 65+				
	(1)	(2)	(3)	(4)	(5)
Average house prices (log)	-0.978	1.461	-1.194***	-1.156***	-0.612**
	(0.964)	(1.176)	(0.343)	(0.300)	(0.272)
R-squared	0.197	-0.671	0.170	0.176	0.202
	Entry rates				
Average house prices (log)	0.0616	-0.0928**	-0.0183	-0.00443	-0.0292*
	(0.0530)	(0.0453)	(0.0214)	(0.0188)	(0.0152)
R-squared	-0.151	-0.233	0.010	0.017	-0.003
Historical share of Labour votes	No	Yes	No	Yes	No
Contemporaneous share of Labour votes	No	Yes	No	Yes	No
Change delay rate	Yes	No	No	No	Yes
Historical density population	No	No	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes
Observations	1260	1260	1260	1260	1260
Local authorities	315	315	315	315	315

Note: CQC, DWP and Census, author's own calculations. Robust standard errors at the LSOA level are in parentheses. Table provides estimates of the second stage equation 1 where the dependent variable is number of care homes per 1000 population 65 or older and the care homes entry rates. Controls are the share of old population, contemporaneous share of Labour votes, region and year fixed effects. $^{***}p < 0.01$,$^{**}p < 0.05$, $^{*}p < 0.1$