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Market concentration, supply, quality and prices paid by local authorities in the English care home market

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Abstract

We investigate the impact of exogenous local conditions which favor high market concentration on supply, price and quality in local markets for care homes for older people in England. We extend the existing literature in: (i) considering supply capacity as a market outcome alongside price and quality; (ii) taking account of the chain structure of care home supply and differences between the nursing home and residential care home sectors; (iii) using an econometric approach based on reduced form relationships that treats market concentration as a jointly determined outcome of a complex market. We find that areas susceptible to a high degree of market concentration tend to have greatly restricted supply of care home places and (to a lesser extent) a higher average public cost, than areas susceptible to low degree of market concentration. There is no significant evidence that conditions favoring high market concentration affect average care home quality.

KEYWORDS
care homes, market concentration, price, quality, supply

1 | INTRODUCTION

The performance of the care home sector is an important policy concern given the "marketization" of long-term care services (Spasova et al., 2018). In most countries where there is substantial nonpublic provision of care homes, the state intervenes in the sector through regulation of supply, negotiation of prices for publicly funded residents and monitoring

and publicizing quality (e.g., U.S. Government Accountability Office, 2018). In addition, competition authorities have examined the care home sector in relation to a range of issues, including the difficulties faced by care home consumers in "shopping around," cross-subsidization from private payers to publicly supported residents, and the existence of large for-profit multi-home providers (e.g., Competition and Markets Authority [CMA], 2017).

Institutional settings differ between countries and are reflected in the research literature. Much of the economics literature on care home markets concerns the United States and the United Kingdom (usually England) where the for-profit sector dominates and where a major focus of research has been the impact of competition on quality.[1] In this paper, we analyze the English care home market and examine the relationship between local market competition and supply and price as well as quality. This broader focus is justified by the English public funding arrangements, which differ from those in the United States.

In the United Kingdom, the market for care home places for older people is dominated by privately owned care homes. In 2016, 80% of older (65 years and over) care home residents lived in homes run by for-profit operators, only 7% lived in publicly owned homes and the remainder lived in homes run by not-for-profit organizations such as charities (Laing, 2017).[2] Over half of care home residents receive means-tested public help with their care home fees through their local authority (LA) (Laing, 2017). LAs purchase care home places mainly[3] on behalf of residents whom they fund. Although individuals' preferences over care home location and provider must be considered, certain conditions apply including that any additional cost must be met by the individual and the chosen care home must accept the LA's standard contractual terms [Care and Support and After-care (Choice of Accommodation) Regulations 2014, Sections 2 and 3]. LAs' negotiations with care homes take various forms: agreeing fees in advance for prebooked places ("block" contracts) sometimes with flexibility for additional payments for high dependency residents, "spot" contracts negotiated on a case-by-case basis often starting with a "benchmark" price set by the LA; and reverse auctions through which providers compete on price and quality for publicly funded residents (CMA, 2017). LAs reportedly pay fees between 25% and 50% lower than the fees paid by residents who fund themselves and while LA fees generally cover operating costs, capital costs are primarily recouped through self-payers (CMA, 2017). Occupancy rates are high at an average of over 90% for the United Kingdom as a whole in 2016/17, but capacity is falling (Laing, 2017).[4] Care homes in the United Kingdom consist of nursing homes, which cater for those with nursing care needs as well as those who have only personal care needs, and residential homes which offer places to people who require only personal care.

The 2014 Care Act (Section 5) introduced a duty on English[5] local authorities to "*promote the efficient and effective operation of a market in services for meeting care and support needs*" having regard to (amongst other things) "*the importance of ensuring the sustainability of the market*" and "*fostering continuous improvement in the quality of such services.*"[6] A recent CMA report concluded that the parts of the care home industry that supply primarily LA-funded demand for care home places are not sustainable at the current level of fees for LA-funded residents. CMA recommended that an effective procurement strategy should, amongst other things, encourage competition amongst care homes "*based on delivering good outcomes for residents* [...] *and value for money for LAs and the taxpayer*" (CMA, 2017, p. 43). Against this background, any concentration of the local supply of care home places in the hands of a relatively small number of providers would be a concern.

In the United States, states have required providers to obtain a Certificate of Need (CON) before entering the market or expanding existing nursing home capacity, as one means to contain Medicaid and Medicare expenditure. No equivalent exists in England, where LA spending on long-term care is managed within the LA's overall fixed budget through individual assessments of need for care followed by a means test to establish entitlement to financial help with care costs. Rules for receiving financial help are set nationally with little scope for LAs to deviate from them. Descriptors of need in the 2014 Care Act promote consistency in care needs assessments across LAs. Ensuring an adequate supply of good quality care home places at prices that individuals and LAs can afford is a major policy concern, against a background of reportedly high numbers of homes at risk of insolvency (see, e.g., Lloyd, 2017, p. 13).

In the United States, the relationship between various measures of competition and quality in care homes is the main subject of research, since price and supply are primarily determined by Medicare/Medicaid rules and CON laws (Zhao, 2016).[7] Exploiting the introduction of new requirements to make quality information more accessible to consumers, Zhao (2016) found that for lower market concentration to improve quality, good information on quality has to be available to consumers. Grabowski et al. (2011) found that a lack of competition in the nursing home market may explain the limited impact of the Nursing Home Quality Initiative Report Card on nursing home quality. One-year improvements in reported nursing home quality have been found to be greatest in the least concentrated markets especially those with relatively low occupancy rates (Castle et al., 2007). Starkey et al. (2005, cited in Forder & Allan, 2011) found that States with CON laws and hence less contestable markets had lower quality but the effects of

market concentration on quality were statistically insignificant. Zinn (1994) investigated whether market concentration resulting from the CON laws and the consequent reduced competition from new entrants was detrimental to care home quality. She found that some mechanisms for promoting competition in the nursing home market improve quality but that quality can be higher in more concentrated markets, due to the buyer power of public authorities impeding the exercise of supplier power. Motivated by theoretical considerations set out in Hirth (1999), competition from not-for-profit care homes was found empirically to be associated with higher quality in the for-profit sector (Grabowski & Hirth, 2003).

Like the United States, the UK literature has been concerned with quality but, because of the different institutional setting, has also examined the link between concentration and the price paid for LA-funded care home residents. Forder and Netten (2000) found that those prices fell as the number of providers in the local market increased but, in a wide-ranging review of studies of the effect of competition on price and quality in care home markets, Forder and Allan (2011) conclude that competition often reduces prices only to a modest degree. Evidence on the effect of competition on quality is more mixed and they suggest this may be because, once minimum standards are met, public purchasers seek the cheapest supplier. They also highlight the varying extent to which previous research has addressed simultaneity between competition and price or quality. In subsequent analysis of the English care home market taking account of this simultaneity (Forder & Allan, 2014), they find that competition reduces both price and quality, arguing that competition can push prices down to the level at which no more than minimum quality standards are achievable.

In this paper, our aim is to identify LA-level local characteristics that affect the degree of market concentration and the associations between that tendency towards high concentration and the jointly determined outcomes of the supply, average prices for LA-funded care home residents and quality of care home places. We highlight the LA characteristics which facilitate or inhibit the discharge of the new duty of "market shaping" that has been placed on LAs (Department of Health and Social Care, 2017).

We make three new contributions to the literature on competition in the English care home market. First, we bring bed supply (relative to the total population aged 65 and over) into the picture, both because supply is an important market outcome in the English setting and because of the new statutory responsibility placed on LAs to promote a flourishing market. We are unaware of any previous attempts to investigate the relationships between competition and the supply of care home beds as joint market outcomes, although there is a parallel in the seminal contribution of Joskow (1980) for the US hospital market. The neglect of supply as an explicit outcome is perhaps understandable where supply is controlled by the state but that is not the case in England where there is no analog of the U.S. CON system, and supply shortages are a major policy concern.

Second, we take account of the important role of care home chains, where multiple homes within the local area have common ownership and consequently may avoid competition with each other. Chains have been neglected in the U.K. literature, but in the United States Hirth et al. (2019) showed that treating homes within a chain as a single entity greatly changes the empirical picture of market concentration, increasing the number of counties classed as concentrated by over a fifth. They suggest that researchers should take account of common ownership of homes when constructing measures of market structure, and we follow that recommendation. We also allow for the possibility that homes that offer nursing services and those that do not may not be in direct competition. While nursing homes can compete for residents who need nursing care and those who need only personal care according to demand, residential homes cannot compete for residents who require nursing care. In addition, the market for nursing homes may be less contestable than that for residential care homes because nursing homes need to employ qualified nurses as well as staff to provide personal care.

Third, in contrast to previous work, we use an econometric approach based on a reduced form representation of our measure of market concentration. We use this reduced form to construct a measure of the impact on supply, quality and price of being in an area whose characteristics make it vulnerable to high concentration in the care home market. The approach requires only the standard exogeneity assumptions on demographic and economic area characteristics; its relative simplicity and robustness compared to instrumental variable (IV) and similar "structural" methods arises from the type of parameter it aims to estimate: the effect of characteristics predisposing an area to market concentration, rather than the effect of concentration itself. We argue that supply, price, quality, and market concentration are all outcomes jointly determined by the same complex of short- and long-term strategic interrelationships, so it is not entirely clear how to interpret a "causal" impact of concentration on the other market outcomes, nor how to exploit it for policy purposes without falling foul of the Lucas (1976) critique. The focus on factors which tend to promote or curtail concentration makes sense from a policy point of view. Because of budgetary pressures constraining direct provision and the absence of command powers in the private market, LAs have little power to directly restrain market concentration—they can only try to create an environment favorable to competition.

The paper is organized as follows. Section 2 sets out our econometric approach to estimating the influence of LA characteristics on market outcomes and to gauging the impact of a tendency towards low or high market concentration on price, supply and quality. In Section 3 we outline relevant details on the regulation and funding of care home places in England. Data, measurement of market outcomes, and area characteristics are discussed in Section 4. Section 5 presents econometric results relating market concentration to LA characteristics and examines the impact of susceptibility to market concentration on price, supply and quality. In Section 6 we assess the robustness of our results in three respects: the choice of parameters that control the construction of our impact measures; the treatment of chained care homes; and the role of publicly run care homes. Section 7 concludes.

2 | THE ECONOMETRIC APPROACH

A realistic multimarket model of local market concentration (C), supply of care home places[8] (S), price (P), and quality (Q) would be immensely complex. In each LA area there are many actors: the LA has an important role as a large strategic buyer with multiple statutory objectives; similarly but to a lesser extent, the National Health Service (NHS); a large number of private self-funding individuals; and potential suppliers, both individual entrepreneurs and larger-scale chains. The long-run equilibrium outcome for C, S, P, and Q is produced by the reaction functions of each player with respect to the potential actions of every other player in the market, with respect to each decision variable. For potential suppliers, these decisions include entry and price, quality, and capacity. For LAs they include decisions on the level of need required for local residents to qualify for care subsidy, the reservation price they pay in the market, and possibly other actions to meet their new market-shaping responsibility. For private (nonsubsidized) buyers, decisions include choice of price and quality and the potential alternative of substitutes such as care delivered in private households.

The research literature adopts one of two approaches: either ignoring the endogeneity of C, or using an IV to estimate a "causal effect" of C. In our view, both approaches are open to question. In particular, estimating regressions of S, P, and Q on C, with IVs used to address the endogeneity of C will not identify this complex underlying market structure and it seems hard to justify the claim that a causal impact of market concentration on supply, price and quality can be achieved in this way. This is a more fundamental issue than conventional doubts about instrument validity—it is far from clear what a causal effect would mean in this case, where C, S, P, and Q are jointly determined as outcomes produced by market equilibrating forces. Moreover, even if we could clearly define and empirically identify such a causal effect, it would not shed much light on policy questions, since it is unlikely to remain stable under changing policy conditions (the Lucas, 1976 critique). In any case, public authorities cannot use market concentration as a policy lever—they can only influence concentration indirectly by creating conditions favorable to competition or exploiting their market power to influence pricing.

The quest for an elusive causal impact identified by econometric IV technology has distracted attention from another, more modest reduced form approach to understanding the connection between concentration and other market outcomes. The nature of the equilibrium in a particular area (or movements towards such an equilibrium) will be determined by the basic exogenous characteristics of that area, $\boldsymbol{X}$. Instead of asking the question: "What is the causal impact of market concentration on S, P and Q?," we ask the much clearer question: "What is the impact on S, P and Q of the exogenous area characteristics that tend to produce high levels of market concentration?" We argue that answers to the former question are questionable in a setting with general equilibrating forces, while it is possible to give clear answers to the latter using straightforward econometric analysis.

Define $F(C|\boldsymbol{X})$ as the distribution function of market concentration conditional on area characteristics. We say that a tendency to high market concentration is any configuration of area characteristics $\boldsymbol{X}$ such that $\Pr(C > c_H|\boldsymbol{X}) > \rho$, where c_H is a pre-specified threshold above which the degree of concentration is regarded as high and ρ is the probability we require for high concentration to be regarded as likely. Similarly, a tendency to low concentration entails a set of characteristics $\boldsymbol{X}$ such that $\Pr(C < c_L|\boldsymbol{X}) > \rho$, where c_L is the low concentration threshold.

Define binary indicators of high and low concentration risk:

$$\xi_H(X) = \mathbb{I}(1 - F(c_H|X) > \rho)\,;\ \xi_L(X) = \mathbb{I}(F(c_L|X) > \rho) \tag{1}$$

where $\mathbb{I}(\wp)$ is the indicator function taking the value 1 if proposition $\wp$ is true and 0 otherwise, and let Y denote any of the equilibrium outcomes S, P, and Q. Our impact measure, δ, is the percentage difference in expected value of Y between areas with high and low vulnerability to market concentration:

$$\delta = 100 \times \frac{E(Y \mid \xi_H(X) = 1) - E(Y \mid \xi_L(X) = 1)}{E(Y \mid \xi_L(X) = 1)} \tag{2}$$

We then define corresponding empirical binary indicators:

$$\hat{\xi}_H(X) = \mathbb{I}([1 - \hat{F}(c_H|X)] > \rho) \tag{3}$$

$$\hat{\xi}_L(X) = \mathbb{I}\left(\hat{F}(c_L|X) > \rho\right) \tag{4}$$

where $\hat{F}(.)$ is an estimate of $F(C|\boldsymbol{X})$ derived from an econometric model of market concentration. In a dataset with areas indexed by i, our empirical estimate of δ is:

$$\hat{\delta} = 100 \times \left[\frac{\sum_i Y_i \hat{\xi}_H(X_i) \sum_i \hat{\xi}_L(X_i)}{\sum_i \hat{\xi}_H(X_i) \sum_i Y_i \hat{\xi}_L(X_i)} - 1\right] \tag{5}$$

In implementing this, we use two alternative variants of the regression model of C on $\boldsymbol{X}$ to construct $\hat{F}(C|\boldsymbol{X})$, allowing for heteroskedasticity and non-normality. The details of the construction of $\hat{F}(C|\boldsymbol{X})$ are set out in Section 5 below.

For our primary results, we specify $\rho = 0.6$ and our choice of c_L, c_H (discussed in Section 4.2) is guided by the empirical distribution of C to ensure adequate statistical reliability. Section 6 examines the sensitivity of $\hat{\delta}$ to the choice of c_H, c_L, and ρ. Estimated impacts are expressed as percentage differences and confidence intervals are constructed by bootstrapping with 500 replications.

3 | REGULATION AND FUNDING OF THE CARE HOME MARKET IN ENGLAND

In England the Care Quality Commission (CQC) registers, monitors, inspects and rates the quality of care homes. Care homes register with CQC as either nursing homes or residential homes. A nursing home must meet certain standards for on-site availability of a registered nurse, but not all its places are necessarily occupied by people with nursing care needs.

Older people can get state help with care home fees. They must first be assessed as needing nursing and/or non-nursing care in a care home. Assessments for nursing care are the responsibility of the NHS. Local Authorities assess needs for nonnursing care. For care home residents assessed as needing nursing care, a small proportion with complex and long-term health conditions are entitled to have their fees met in full by the NHS, the remainder are eligible for a flat rate nonmeans-tested contribution from the NHS (known as NHS Funded Nursing Care). Only the subset of those assessed in need of nursing or residential services with sufficiently low income and capital assets are entitled to any further LA funding (which may be additional to NHS Funded Nursing Care). For this group, LAs procure care home places, pay the care home and collect required contributions from the care home resident. Most care home residents who previously owned their homes are disqualified from state help with their care costs because the value of their home is included in the capital test. Only those others whose incomes fall below the care home fee plus a small margin (and excluding the NHS contribution where relevant) are entitled to state help, but they still have to contribute most of their income towards the care home's fee.

Procurement of care home places by the 152 English LAs with adult social services responsibilities generally involves each individual LA negotiating with care homes in its area. The cost of NHS care home funding falls on NHS

Clinical Commissioning Groups (CCGs) of which there are some 190 in England. For procurement of nursing home places for people entitled to full NHS funding, CCGs reportedly combine into larger geographical groups to negotiate fees that are not much above those that LAs pay for residents they support (Laing, 2017). The respective roles of the NHS and LAs in procurement of nursing home places for self-funding residents entitled only to the flat rate NHS subsidy is less clear but neither body has any particular financial incentive to exert downward pressure on fees in such cases.

4 | DATA

4.1 | Data sources

Most of the data we use come from CQC records on care homes registered as active in January 2016. This date was chosen to avoid the potential transitional effects on the low-wage care home sector, of the replacement in April 2016 of the United Kingdom minimum wage with the higher and increasing National Living Wage (Giupponi et al., 2016; Vadean & Allan, 2020). We focus on care homes for older people and select those that, in January 2016, were registered as offering services for people aged 65+ and/or people with dementia.[9] CQC data distinguish between nursing homes and residential homes and provide the total number of beds in each care home. They also provide some information used to establish whether each care home is one of a group with a common owner. Since it is not compulsory for care homes to provide such information to CQC, we link data from an annual industry database on the care home market (Laing, 2017) to the CQC data at care home level (only 0.85% [96] care homes could not be matched). We refer to homes whose owner has more than one home in the *same* LA as "chained." The same source is also used to identify the sector (for-profit or not-for-profit) of each care home. CQC data are also a source of information on care home quality. Since October 2014 the CQC rating system has classified care homes as (1) inadequate, (2) requiring improvement, (3) good or (4) outstanding (see, e.g., Barron & West, 2017 for details).

Table 1 summarizes the characteristics of English care homes for older people or people with dementia that were active in January 2016 and used in our analysis. Of the 11,336 care homes, 63% provided residential care only and 37% provided nursing care. Over three-quarters of residential care homes were for-profit organizations; amongst nursing homes the percentage reached 88%. Nearly 70% of nursing homes were chained compared with just under 50% of residential homes. On average nursing homes had more beds than residential homes (51 compared with 27) and chained homes had more beds than unchained homes (43 compared with 28 when nursing and residential homes are taken together). In the care home market as a whole, around two-thirds of care homes were rated "good" or "outstanding" and there is very little difference in these proportions between chained and nonchained homes. The proportion rated good or outstanding is higher (71%) for residential homes than for nursing homes (62%). In the

TABLE 1 The composition of the English care home market for older people and those with dementia, January 2016

	All care homes	Nursing homes	Residential homes
Number of active care homes	11,336	4246	7090
% for-profit	81	88	76
% Chained	56	69	48
Average number of beds			
Overall	36	51	27
Among chained care homes	43	55	32
Among nonchained care homes	28	42	23
% Rated good/outstanding[a]			
Overall	67	62	71
Among chained care homes	68	62	74
Among nonchained are homes	66	61	68

[a]Excludes 885 homes which had not been rated by CQC since before October 2014 when the rating system changed.

residential care home market, quality seems to be higher among chained homes; 74% are rated good or outstanding compared with 68% of nonchained homes.

Of the 11,336 care homes, 6351 were chained (in 856 chains). Of those, 30% were part of chains that owned both nursing and residential homes in the LA, 31% were in chains owning only nursing homes and 39% belonged to chains owning only residential care homes.

CQC data do not contain information on the prices care homes charge, whether to LA-funded residents or to those who fund themselves. However, we are able to make use of data on the average gross (before resident contributions) cost to each LA of care home residents aged 65+ whom they support on a long-term basis. Since we are interested in LA characteristics which influence market outcomes at the LA level this policy-defined geography is appropriate for the econometric analysis as used, for example, in Allan et al. (2021). Implicitly we are assuming that the boundaries of each care home market are coterminous with LA boundaries. This is appropriate given our focus on the market that LAs are required to "shape" and on the prices paid by LA-funded residents, who are mostly placed in care homes within the LA funding them.[10] Although other approaches to defining the boundary of the market have been used (e.g., Forder & Allan, 2014), using geopolitically defined areas has the advantage that "*the choice of political boundary is exogenous to other factors that could influence market size, such as quality or nursing home amenities*" (Bowblis & North, 2011). Data from 148 (out of 152) English LAs were used.[11]

4.2 | Market concentration measures

We measure local market concentration by means of the commonly used Herfindahl–Hirschman index (Hirschman, 1964):

$$C = \sum_{i=1}^{N} v_i^2 \tag{6}$$

where v_i is the market share of firm (care home) i in a market of N firms, measured as the share of total supply of care home beds in the LA which are owned by each care home or chain.[12] For our purposes market shares correspond to the share of total supply of care home beds in the LA which are owned by each care home or chain (when combining care homes belonging to the same chain). Since occupancy rates in care homes are typically high (CMA, 2017) shares of available beds are close to shares of volumes sold. For each local market, we derive a measure of C for the care home market as a whole (*overall*) and by care home type (*nursing*, *residential*). We treat each care home as a separate entity that competes with all other care homes in the LA or, alternatively, consider care homes within the same chain as part of the same entity giving a chain-adjusted index (Hirth et al., 2019). We call the measure of market concentration for the former C_{ind} and for the latter C_{chain}. Figure A1 shows the geographical distribution of concentration levels.

Previous research (Forder & Allan, 2011, 2014) has concluded that care home markets in England are generally not highly concentrated. This is confirmed by C_{ind} (Table 2). However we find this to be much less so when market concentration is assessed at the chain level and when nursing and residential care homes are treated as belonging to separate markets. There is considerable variation in concentration across LAs, and concentration is higher within nursing home markets than residential care markets. The importance of chains is particularly evident in the nursing home market (Table 2). When concentration is measured at the individual care home level, just over 25% of local nursing home markets have C above 0.1, indicating they can be considered concentrated. When market concentration is assessed at chain level (C_{chain}), median concentration in the nursing home market almost reaches the threshold of 0.1, the average concentration level is 0.125 and for 25% of markets it exceeds 0.147.

For the care home market as a whole, the effect of moving from a C_{ind} to a C_{chain} measure is to increase average market concentration by 74%. It increases measured concentration by 50% or more in 68% of LAs, by 100% or more in 41% of LAs and by 200% or more in 23% of LAs. In our view, it is implausible to regard care homes within the same local chain as competing freely, so we conduct our main analysis using C_{chain} as the primary measure of concentration. Section 6.2 gives alternative results based on C_{ind}.

TABLE 2 Summary LA-level statistics of the Herfindahl–Hirschman index of market concentration

	First quartile	Median	Mean	Third quartile
All care homes				
Care homes per LA	29.5	49.5	76.5	92.0
C_{ind}	0.014	0.028	0.038	0.047
C_{chain}	0.035	0.053	0.066	0.077
Nursing homes				
Care homes per LA	11.5	17.0	28.6	37.5
C_{ind}	0.033	0.068	0.089	0.108
C_{chain}	0.067	0.099	0.125	0.147
Residential homes				
Care homes per LA	17.5	31.0	47.9	57.0
C_{ind}	0.024	0.040	0.061	0.082
C_{chain}	0.045	0.076	0.107	0.124

Note: Based on data for 148 LAs.

The thresholds c_L and c_H defining low and high concentration need to be chosen carefully to ensure adequate statistical precision in the estimation of $\hat{\delta}$. If c_L is too low or c_H too high, there will be few observations in the high and low concentration categories and consequently a large sampling variance of $\hat{\delta}$. Interpretation and comparison of results is most straightforward if we use the same absolute values c_L, c_H for the nursing and residential care home sectors, rather than, say, quartile points of their respective distributions. Inspection of Table 2 for the chain-adjusted concentration index suggests $c_L = 0.05$ and $c_H = 0.125$ as a good choice, and we use those values for our main results. They correspond, respectively, to markets of approximately 20 and 8 equal-sized providers. For the combined market, the concentration distribution is strongly left-shifted relative to the nursing and residential markets separately. As a result, statistical precision is lower for the combined market results when using $c_L = 0.05$ and $c_H = 0.125$. In Table 5, we also present for comparison alternative estimates for the combined market using the lower and upper quartile points 0.035 and 0.077 (equivalent, respectively, to markets of 29 and 13 equal-sized providers). Table 6 shows the sensitivity of our estimated impacts across a grid of concentration thresholds c_H, c_L, and ρ.

4.3 | Other market outcomes

Supply (S) is defined as the ratio of the total number of beds offered by active care homes in the LA to the total population aged 65 and over (in thousands), the latter taken from the Office for National Statistics (ONS) LA-level population estimates for December 31, 2015.

Price (P) is measured using data on the unit costs of LA-funded care from the Adult Social Care Finance Return for the financial year 2015/16.[13] We use weekly unit costs to the LA for older care home residents it supports on a long-term basis, distinguishing nursing, and residential care homes. The cost measure excludes any NHS nursing care contribution because we are interested in the cost to LAs. On average this cost was about £572 per week and was similar for nursing and residential homes.[14] See Section 6.3 for sensitivity analysis concerning alternative price definitions.

Quality (Q) is a bed-weighted average (across nursing homes, residential homes or both) of the CQC overall quality ratings (on a scale of 1–4) for each care home in the LA, using the most recent rating available within the period October 2014–December 2016. The 885 care homes without a rating in this period are excluded from the construction of Q. Q is scaled to have a maximum possible value of 100. Despite the coarse nature of the quality ratings for individual care homes, there is considerable variation in average quality between LAs. Table A1 contains descriptive statistics for the supply, price, and quality market outcomes.

4.4 | Measures of LA-level characteristics

The market outcomes S, C, P, and Q are all ultimately driven by area characteristics. Our aim is to define a set of exogenous and observable variables, $\boldsymbol{X}$, that capture the conditions that shape the nature of the outcome in a local market, but are not themselves market outcomes. Variables such as LA-specific social care expenditure on older people, and client contributions to LA-supported services, were not used because they are clearly not exogenous to the workings of the social care system.[15]

We began with an extended set of exogenous covariates and then selected the subset which were found to be statistically significant in a linear reduced form regression for any of C, P, Q, or S.[16] The vector of covariates, $\boldsymbol{X}$, comprises the following:

Potential demand. Current and foreseeable future demand for care home places is not directly measureable but is important for current suppliers and potential new entrants to the market. We use a proxy constructed as the number of women aged 75 years and older living alone (*Source*: ONS Census, 2011). We choose age 75 because demand for care increases significantly with age; and those living alone because they lack access to coresident informal care. We select older women because they tend to have lower economic resources than men (see, e.g., Banks et al., 2005, p. 65 with respect to pension wealth) and are therefore more likely to be entitled to LA-funded care which is the focus of our analysis.

Low-income demand. Low-income care home residents are likely to be LA funded. Since LAs' large-scale purchasing of care home places gives them considerable market power, the prevalence of low-income people within the older population is clearly relevant to suppliers' decisions. We use the proportion of the over-65 population who receive the means-tested Pension Credit benefit (data at LA level are not available for the more appropriate over-75 population). The numerator is taken from the Department for Work and Pension Statistics of February 2015; the denominator is derived from ONS local population estimates.

Local income is measured as the LA average of income from employment and asset ownership from ONS Gross Disposable Household Income statistics.[17]

House prices are potentially important for both sides of the market. Property values determine the estate component of new suppliers' potential costs, and they also affect the resources available to home owners who sell their homes to finance a move into a care home. We use the ONS index, which is based on 2015 property transactions, adjusted for differences in the characteristics of properties.[18]

Political control. We capture the political composition of LA councils prior to the elections of May 7, 2015,[19] distinguishing Conservative party control and Labor party control, from a combined reference category of no overall political control or Liberal Democrat control.

Location. We distinguish LAs in the South of England (London included) and LAs belonging to a metropolitan borough. We also include a measure of urbanization of the LA, constructed as the proportion living in urban areas, derived from the ONS 2011 rural–urban classification of LA Districts[20] combined at LA levels using ONS lookup tables.

Table A2 of the Appendix shows bivariate correlations of the outcome variables. Table A3 reports descriptive statistics for the set of exogenous variables $\boldsymbol{X}$ for all LAs and for those in the upper and lower quartiles of C_{chain} to provide context for our impact estimates.

5 | ECONOMETRIC ANALYSIS

Following initial selection of the covariates $\boldsymbol{X}$, we consider two alternative models for the concentration measure C, linear and logarithmic:

$$C_i = \beta_0 + X_i\beta_1 + u_i \tag{7}$$

$$\ln(C_i) = \beta_0 + X_i\beta_1 + u_i \tag{8}$$

Initially, these models are estimated by least squares, on the assumption of homoskedasticity for the error term u_i. However, the impact measure δ is sensitive to departures from the canonical homoskedasticity and normality assumptions, so we apply the Breusch–Pagan test for heteroskedasticity and the Jarque–Bera test for nonnormality of the regression residuals.

The results are shown in Table 3. Homoskedasticity is emphatically rejected in every case for the linear model, but never for the logarithmic model. The normality assumption is also rejected clearly for the linear model, but the outcome is more mixed for the log model, since normality is rejected in the case of nursing homes but not for residential homes nor for care homes overall. Comparing the two models in terms of root mean square error for C, the linear model provides a better fit, substantially so in the case of residential care homes.[21]

Given these results, we retain both models for the purposes of estimating the impact measure δ. For the log model (8), $\hat{\delta}$ is constructed using $\hat{F}(c|\boldsymbol{X}) = \Phi((\ln(c) - \hat{\beta}_0 - \boldsymbol{X}_i\hat{\beta}_1)/\hat{\sigma}_u)$, where $\Phi(.)$ is the $N(0,1)$ distribution function. In the case of linear regression (7), we generalize the model to accommodate heteroskedasticity of the form:

$$\text{var}(u_i|X_i) = \exp(\gamma_0 + X_i\gamma_1) \tag{9}$$

and re-estimate using two-step generalized least squares. We then construct standardized residuals:

$$e_i = (C_i - \hat{\beta}_0 - X_i\hat{\beta}_1)/\exp(\hat{\gamma}_0 + X_i\hat{\gamma}_1) \tag{10}$$

and calculate the nonparametric empirical distribution function $\hat{\Psi}(e)$. $\hat{\delta}$ is then constructed using $\hat{F}(c|\boldsymbol{X}) = \hat{\Psi}((c - \hat{\beta}_0 - \boldsymbol{X}_i\hat{\beta}_1)/\exp(\hat{\gamma}_0 + \boldsymbol{X}_i\hat{\gamma}_1))$, to avoid the conventional normality assumption.

Parameter estimates for the heteroskedastic linear model are presented in Table 4; the estimated skedasticity functions are set out in Table A4.[22] The results indicate that low potential demand (proxied by the number of women aged 75+ living alone) and a high proportion of low-income members of the older population (Pension Credit recipients) are important drivers of market concentration in both market sectors. The estimated elasticities, evaluated at mean values, of market concentration with respect to potential demand are −0.20 (residential) and −0.29 (nursing); and with respect to the low-income proportion are 0.30 (residential) and 0.46 (nursing). One way to interpret these estimates is that lower demand means fewer homes overall (especially if, as seems likely, there is a minimum efficient scale of operation), making it easier to "monopolize" the market (Sutton, 1991), while more low-income people gives rise to a greater need to monopolize to withstand monopsonistic LA demands.

Average earned and investment income has a highly significant positive impact on concentration in the residential care sector and overall (elasticities 1.44 and 0.91, respectively). Our interpretation of this is that income acts as a proxy for the general level of economic development of the local area, and consequently as an indicator of local opportunities open to potential entrepreneurs. Other things equal, the stronger are those opportunities, the lower is the potential flow of new entrants into the care home market and consequently the higher is equilibrium market concentration. Against this, is the lack of any evidence of an income effect in the nursing home sector, but the nursing home sector is more specialist and less contestable and therefore more concentrated, offering less scope for entry to generalist entrepreneurs.

TABLE 3 Diagnostic information for linear and logarithmic regression models of market concentration (chain-adjusted)

	All care homes		Nursing homes		Residential homes	
	Linear	Log	Linear	Log	Linear	Log
Homoskedasticity $\chi^2(1)$[a]	73.0	1.59	69.0	0.18	168.3	0.26
p Value	0.000	0.208	0.000	0.675	0.000	0.607
Residual normality $\chi^2(2)$[b]	67.7	1.92	453.0	8.93	575.8	1.74
p Value	0.000	0.382	0.000	0.012	0.000	0.419
RMSE for C	0.0326	0.0440[c]	0.0753	0.0754[c]	0.0779	0.1268[c]

Note: Based on data for 148 LAs.

[a]Breusch-Pagan Lagrange Multiplier test for heteroskedasticity with variance proportional to squared fitted value.

[b]Jarque-Bera Lagrange Multiplier test for third and fourth moment departures from normality.

[c]For log models, calculated as $s.d.(C_i - \exp[\boldsymbol{X}_i\beta + \sigma^2/2])$, based on the formula for the standard deviation of a lognormal variate.

TABLE 4 Two-step GLS estimates of linear regression models for concentration measure C_{chain}

Covariate	All care homes	Nursing homes	Residential homes
Potential demand (no. of women aged 75+ and living alone/10,000)	−0.016***	−0.035***	−0.020***
	(0.002)	(0.004)	(0.004)
Low-income proportion in older population (proportion over 65s on Pension Credit)	0.132***	0.221***	0.123
	(0.044)	(0.085)	(0.088)
Average income (all ages, from earnings and assets, £0000)	0.035***	−0.000	0.090***
	(0.010)	(0.021)	(0.023)
Average house price (£00,000)	0.006	0.023**	0.007
	(0.005)	(0.009)	(0.007)
Conservative-controlled LA	0.003	0.022*	−0.015
	(0.006)	(0.013)	(0.011)
Labor-controlled LA	0.002	0.004	0.020
	(0.006)	(0.010)	(0.014)
London and South-East	−0.005	−0.016	−0.011
	(0.006)	(0.013)	(0.011)
Metropolitan borough	−0.002	−0.017	−0.008
	(0.006)	(0.011)	(0.013)
Urbanization (proportion of population in urban areas)	−0.023	−0.007	−0.036
	(0.017)	(0.034)	(0.033)
Intercept	−0.007	0.056	−0.046
	(0.018)	(0.039)	(0.038)

Note: Linear regression estimated by 2-step GLS with heteroskedasticity of multiplicative exponential form. Standard errors in parentheses. Statistical significance: *10%, **5%, ***1%. Estimated parameters of the skedasticity function $\exp(\gamma_0 + \boldsymbol{X}_i\gamma_1)$ are given in Table A4. Based on data for 148 LAs.

The average house price is arguably best interpreted as a measure of the estate costs component of actual and potential care suppliers. It is estimated to have a positive impact (significant at the $p = 0.015$ level) in the nursing care sector, with an elasticity of 0.42, but the evidence for any effect in the residential care sector is very weak. This might relate to the larger size of nursing homes and the associated higher costs to run in high-priced areas, ceteris paribus.

Political factors are not significantly associated with concentration for the market as a whole nor in the market for residential homes. There is some weak evidence of higher concentration in nursing home markets in LAs controlled by the Conservative party.

The urbanization coefficients are not close to statistical significance at conventional levels. Other aspects of location (London and the South-East and metropolitan boroughs) also have no significant impact on concentration.

Table 5 reports results of the $\hat{\delta}$ measures of the impact of market concentration on supply, price, and quality, for the care home market overall (Column 1) and separately for the nursing and residential sectors (Columns 2 and 3). The estimates are accompanied by nonparametric bias-adjusted bootstrap standard errors, where the whole process of model estimation and calculation of $\hat{\delta}$ is repeated in each of the 500 bootstrap replications. These impact parameters $\hat{\delta}$ are interpreted as the average effect on expected supply, price, or quality of moving from area characteristics that make probable a low ($C_{chain} < 0.05$) degree of market concentration to characteristics that make probable a high degree of concentration ($C_{chain} > 0.125$) (where "probable" in this case means a probability of at least $\rho = 0.6$). The effect of varying these definitions is considered in Section 6. For reasons explained earlier we also show in Table 5 the impact parameters for all care homes using C_{chain} thresholds of 0.035 and 0.077.

The linear and logarithmic versions of the concentration model produce similar results for the market as a whole and for the residential care market. For the nursing home sector the estimated effects from the logarithmic model are smaller and not statistically significant.

TABLE 5 Estimated impact of conditions favoring concentration on average supply, price, and quality

	$c_L = 0.05$, $c_H = 0.125$			$c_L = 0.035$, $c_H = 0.077$
	All care homes	**Nursing homes**	**Residential homes**	**All care homes**
Impact measure	%			
Heteroskedasticity-adjusted linear model				
Supply ($\hat{\delta}_S$)	−44.1***	−9.3	−64.1***	−34.0***
	(12.8)	(10.4)	(4.9)	(6.3)
Price ($\hat{\delta}_P$)	53.8***	16.5***	33.9***	28.7***
	(19.2)	(5.7)	(9.1)	(7.2)
Quality ($\hat{\delta}_Q$)	−0.8	1.2	4.1	2.3
	(10.8)	(1.9)	(3.2)	(2.1)
Logarithmic model				
Supply ($\hat{\delta}_S$)	−45.9***	−5.3	−62.5***	−39.6***
	(9.5)	(11.1)	(5.7)	(4.9)
Price ($\hat{\delta}_P$)	42.1***	10.3	33.3***	26.3***
	(15.3)	(6.1)	(8.7)	(6.5)
Quality ($\hat{\delta}_Q$)	−2.2	2.5	2.8	2.8
	(5.6)	(1.9)	(2.6)	(2.0)

Note: $\rho = 0.6$. Bootstrapped (500 replications) standard errors in parenthesis. Statistical significance: *10%, **5%, ***1%. Based on data for 148 LAs.

The effect on supply of moving from probable low market concentration to probable high concentration is to produce very large estimated supply reductions, of over 60% in both models for the residential sector but small and statistically insignificant estimated falls in the nursing home sector. Table 5 also show large positive impacts of conditions favoring concentration on the average price that LAs pay, of around 33% for the residential sector and 16% for the nursing home sector for our preferred linear heteroskedastic model. Results for the combined market based on the thresholds $c_L = 0.05$, $c_H = 0.125$, are broadly consistent with sector-specific findings. Impacts are a little smaller than for the residential sector for supply (a reduction of around 45% compared with over 60%) but a little larger for price (an increase of 54% for the linear model or 42% for the logarithmic model compared with about 33%). Using the alternative thresholds for all care homes (rightmost column), impacts on both supply and price are smaller than when using $c_L = 0.05$, $c_H = 0.125$, but remain substantial. The impact of concentration on quality is not statistically significant for either model specification in any of the markets.

The association of restricted supply and increased price with conditions favoring market concentration is large but consistent with the predictions of standard microeconomic theory.

The large supply effect in the residential care home sector is extremely important for LAs with their need to ensure adequate numbers of care home places, but it has been missed by much of the published research literature, with its primary focus on price and quality. The much larger response of supply than price in that sector is striking and is interpretable as a consequence of LAs' considerable market power to resist price rises, but limited ability to resist withdrawal of supply. Nursing homes are different from residential homes in this respect, since places are often funded partly or wholly by the NHS, whose budgeting and decision-making is not confined within LA areas. In addition, they probably have more scope than residential homes to adapt to changing levels of frailty in the population of potential care home residents by switching places between nursing and personal care.

6 | ROBUSTNESS CHECKS

In this section we assess the sensitivity of our results to the choice of values for the parameters used in constructing measures of tendency towards high/low concentration, to whether concentration takes account of locally chained care

homes and to the exclusion of NHS and LA-run care homes. The main focus is on the $\hat{\delta}$ impact measures but estimates of the variant models involved in these robustness experiments are given in the Appendix.

6.1 | Sensitivity to c_H, c_L, and ρ

The construction of impact measures rests on two elements that we set a priori—a definition of what constitutes high and low concentration (c_H, c_L), and a definition of a high conditional probability of such a level. Table 6 shows alternative results for a grid of concentration thresholds c_H, c_L, set as the 10/90, 20/80, 30/70, 40/60, and 45/55 percentiles of the sector-specific concentration distributions,[23] and $\rho = 0.6, 0.7, 0.8, 0.9$.

The estimated impacts on P, Q, and S are remarkably robust in qualitative terms with respect to choices for c_H, c_L, and ρ. Generally, the impacts increase in absolute size as we move from small to large c_H, c_L differences and to high values of ρ although the pattern is not entirely monotonic. The general picture remains one of large price and supply effects, much greater responsiveness of supply for residential care homes than nursing homes, and little evidence of any statistically significant effects on quality.

6.2 | The role of chains

As we have seen, adjustment for chained care homes substantially increases measured concentration in the care home market. Table 7 compares the concentration impact estimates obtained when concentration is measured using C_{ind} with those obtained using C_{chain} (as in Table 5).

TABLE 6 Estimated impact of conditions favoring concentration on average supply, price and quality: effect of varying parameters c_H, c_L, and ρ on $\hat{\delta}_S$, $\hat{\delta}_P$, and $\hat{\delta}_Q$ (heteroskedastic linear model for C_{chain})

	Nursing care homes				Residential care homes			
	$\rho = 0.6$	$\rho = 0.7$	$\rho = 0.8$	$\rho = 0.9$	$\rho = 0.6$	$\rho = 0.7$	$\rho = 0.8$	$\rho = 0.9$
Impact measure					%			
Supply ($\hat{\delta}_S$)								
$c_L, c_H = p_{10}, p_{90}$	−24.8	§	§	§	−75.6***	−77.3***	−78.1***	§
$c_L, c_H = p_{20}, p_{80}$	−30.9***	−50.5***	−43.4***	−49.2**	−69.3***	−75.7***	−78.9***	−77.9***
$c_L, c_H = p_{30}, p_{70}$	−20.8**	−34.6***	−44.9***	−35.5	−63.3***	−65.8***	−67.2***	−70.0***
$c_L, c_H = p_{40}, p_{60}$	−5.6	−14.4	−25.7**	−36.4**	−55.3***	−63.0***	−67.1***	−70.3***
$c_L, c_H = p_{45}, p_{55}$	−5.8	−10.3	−25.4**	−35.6**	−45.2***	−54.6***	−59.2***	−66.8***
Price ($\hat{\delta}_P$)								
$c_L, c_H = p_{10}, p_{90}$	20.2	§	§	§	36.9	43.1	63.1	§
$c_L, c_H = p_{20}, p_{80}$	30.2***	31.4	26.5	8.4	30.0***	33.3**	42.3*	72.4
$c_L, c_H = p_{30}, p_{70}$	23.5***	33.5***	33.3**	14.8	32.2***	30.7***	33.2**	49.6
$c_L, c_H = p_{40}, p_{60}$	14.4***	22.7***	29.1***	28.2	31.9***	26.1***	28.3***	38.4**
$c_L, c_H = p_{45}, p_{55}$	12.5***	19.3***	23.0***	33.8***	29.9***	25.9***	20.4***	30.4*
Quality ($\hat{\delta}_Q$)								
$c_L, c_H = p_{10}, p_{90}$	13.4	§	§	§	−7.9	−7.8	−5.9	§
$c_L, c_H = p_{20}, p_{80}$	4.9	7.9*	7.3	11.4	−2.0	−4.6	−3.5	7.6
$c_L, c_H = p_{30}, p_{70}$	3.5	7.2*	12.5	12.4	4.3	−0.4	0.3	5.6
$c_L, c_H = p_{40}, p_{60}$	4.6*	3.3	7.1*	9.8	4.7*	2.7	2.6	1.5
$c_L, c_H = p_{45}, p_{55}$	4.6*	3.9	7.0*	11.4*	5.0*	3.1	1.2	2.9

Note: § insufficient data points for estimation. Estimates based on 2-step GLS heteroskedastic regression with empirical cdf of standardized residuals used to estimate $F(.)$. p_{10} ... p_{90} are 10th ... 90th percentiles of the empirical distribution of C_{chain}. Statistical significance: *10%, **5%, ***1%. Based on data for 148 LAs.

The differences are particularly striking for the nursing home sector, where the estimated supply and price effects are greatly increased and more strongly significant, and a slightly larger estimated quality effect appears statistically significant at the 5% level. For the residential care home sector, the only major change is a doubling of the price effect to reach roughly the same magnitude as the estimated supply effect. This suggests that the existing research literature (which generally relates to the combined care home market and makes no allowance for chains) may tend to overestimate price effects through biases originating in both sectors of the market.

6.3 | The role of publicly run care homes

We, first, disregard 23 care homes known to be NHS-run, on the assumptions that NHS care homes beds are available to NHS funded clients only and NHS activity in the market does not produce spillover effects. We then further disregard the 414 care homes known to be LA-run (24 nursing and 390 residential). C, Q, and S are computed ignoring the excluded public care homes.[24]

Table 8 reports impacts, using C_{chain}, re-estimated after excluding NHS and LA-run care homes.[25] The impacts are comparable with the two leftmost columns in Table 7. For residential care homes, the effect of disregarding NHS homes is marginal, given their minimal role in the sector.[26] There is a slightly larger change for the nursing home market, where the estimated price effect rises from 16.5% to 20.3%, but the qualitative picture remains much the same.

TABLE 7 Effect of using concentration measure C_{chain} and C_{ind} on $\hat{\delta}_S$, $\hat{\delta}_P$, and $\hat{\delta}_Q$ (heteroskedastic linear model)

	No competition within chains (C_{chain})		Competition within chains (C_{ind})	
	Nursing care homes	**Residential care homes**	**Nursing care homes**	**Residential care homes**
$\hat{\delta}_S$	−9.3	−64.1***	−41.1***	−69.1***
	(10.4)	(4.9)	(11.1)	(6.5)
$\hat{\delta}_P$	16.5***	33.9***	32.3***	65.3***
	(5.7)	(9.1)	(7.8)	(19.7)
$\hat{\delta}_Q$	1.2	4.1	7.7**	1.7
	(1.9)	(3.2)	(3.1)	(10.4)

Note: $c_L = 0.05$, $c_H = 0.125$, $\rho = 0.6$. Bootstrapped (500 replications) standard errors in parenthesis. Statistical significance: *10%, **5%, ***1%. Parameter estimates using concentration measure C_{ind} are reported in Table A6. Based on data for 148 LAs.

TABLE 8 Effect of excluding publicly run care homes on $\hat{\delta}_S$, $\hat{\delta}_P$, and $\hat{\delta}_Q$ (heteroskedastic linear model for C_{chain})

	Disregarding NHS-run care homes		Disregarding NHS + LA-run care homes	
	Nursing	**Residential**	**Nursing**	**Residential**
$\hat{\delta}_S$	−11.9	−64.5***	−14.4*	−59.7***
	(11.1)	(4.8)	(8.6)	(7.7)
$\hat{\delta}_P$ (Average P)	20.3***	34.3***	15.3***	41.9***
	(5.5)	(10.0)	(5.0)	(10.4)
$\hat{\delta}_P$ (External P)				36.0***
				(10.3)
$\hat{\delta}_Q$	2.5	3.3	4.2**	2.2
	(2.2)	(3.0)	(2.1)	(3.1)

Note: Bootstrapped (500 reps) standard errors in parenthesis. Statistical significance: *10%, **5%, ***1%. Standard settings: $c_L = 0.05$, $c_H = 0.125$, $\rho = 0.6$. "Average P" is (as in previous analysis) the overall gross price LAs pay to support clients in any care home. "External P" is the average price paid by LAs to support clients in non-LA-run care homes only. Based on data for 148 LAs.

The effect of further disregarding LA care homes is again quite modest, and mainly affects the results for the market for residential care homes (where LA-run care homes mainly operate), with $\hat{\delta}_s$ reduced slightly. When examining the impact on price after excluding LA-run care homes, we consider two alternative price definitions: the overall average price as previously used; and the average price paid for clients placed in care homes other than those owned by the LA.[27] Using the former price measure, the effect of excluding LA run residential homes on the estimated price impact is to raise the estimate by almost 6 percentage points. However, using the latter price measure, the price impact is close to that when only NHS runs are excluded and when no homes are excluded.

7 | CONCLUSIONS

This paper makes three main contributions. First, we extend the literature on concentration in the care home market to bring in the important issue of supply effects, alongside price and quality. For the English market, we find that local area characteristics associated with a probable high rather than low market concentration produces a large (over 60%) reduction in the supply of residential care home places and a much smaller (and statistically insignificant) fall in nursing home places. In the context of LAs' duties to shape the care home market, it is important to recognize such large differences which primarily result from factors outside the control of a LA—its economic and demographic composition, for example.

Our second contribution is to take account of the fact that some care homes within a LA have the same owner and so may not compete with one another in the same way or to the same extent as they do with other care homes. When such chains are taken into account, the measured degree of concentration in the care home market rises considerably. Moreover, the impact on supply and price of susceptibility to market concentration are substantially larger when the chain structure is ignored and all care homes are assumed to compete with one another. Our chained-adjusted and unadjusted estimates might be viewed as upper and lower bounds for the impact of differences in the degree of concentration. We also separate the market into care homes offering nursing care and those which do not. Again this raises measured concentration and it results in quantitatively different supply impacts of susceptibility to market concentration in the two sectors. A likely explanation for this difference is that, unlike the residential care sector, public purchasing of nursing home places is split between LAs and the NHS, which differ in their objectives and decision-making. On prices, our results for chains suggest that the existing research literature (which generally makes no allowance for chains) may overestimate price effects.

Our third contribution, on which these results rest, is to recognize in our econometric approach that the supply of care home places, the prices paid by LAs, the quality of care homes and the degree of market concentration are all joint outcomes of the same complex of equilibrating forces. Attempting to establish the causal effect of one of these market outcomes on another (e.g., concentration on price) risks missing the wider general equilibrium context. Instead, we seek to identify the associations between all four market outcomes and exogenous local area characteristics. This allows us to classify LAs by their inherent susceptibility to high or low concentration in the care home market and establish how the other three market outcomes differ according to the variation in these probabilities. In this framework, we find large negative impacts of exogenous conditions favorable to concentration on supply, and substantially higher average prices also in LAs where exogenous conditions tend to promote market concentration. But the estimated impact on average quality is generally small and not statistically significant—unsurprisingly, given the mixed findings of previous research on quality (as measured by the regulator's rating system) effects in the care home market (Forder & Allan, 2014). Given LAs' new "market shaping" duties this analytical approach based on the reduced-form has a great deal to offer.

Although novel in many ways, our study has limitations. We are forced to rely on a limited set of available area-level exogenous variables to capture the conditions that influence the outcomes in a local market. We cannot rule out the possibility other unobserved factors may have influenced our impact estimates. Second, the regulator's measure of quality is unlikely to capture fully all dimensions of quality (Netten et al., 2012). Third, by assuming LA boundaries define each local market, we do not allow for the possibility that within LAs, especially large ones, not all care homes will compete with one another while some, especially those close to the LA border, may compete with care homes in a neighboring LA. Fourth, LAs are responsible for forms of social care for older people other than care homes. The balance between care home provision and other forms of social care is arguably another jointly determined market outcome but our data do not allow us to include this in the picture. Finally, our analysis is based on a single cross-section of care homes (albeit containing all but 4 of the 152 LAs with responsibility for social care in England).

A key motivation was the new duties following the 2014 Care Act placed on LAs to shape the market for care. In future as more time passes since these duties were introduced it may be possible to construct a panel of data to investigate whether the relationships we have found are stable over time and hold longitudinally as well as cross-sectionally. However, continual policy and practice developments in social care and local piloting of initiatives (e.g., Pioneer, Vanguard, see Morciano et al., 2020), the introduction of the National Living Wage (Vadean & Allan, 2020) and the turmoil of the care home market induced by the COVID-19 pandemic (Morciano et al., 2021) are likely to confound temporal trends.

Our findings suggest that there are potentially large benefits to be gained in terms of supply and price from fostering competition. However, many of the factors that cause an LA to face a highly concentrated local care home market are beyond its direct control and the required increases in competition may be more than can be expected of LAs in the short, or even medium, term through "market shaping."

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are openly available through NHS digital, the Office for National Statistics, and the Care Quality Commission.

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ENDNOTES

[1] In the rest of Europe, despite increasing reliance on markets, not-for-profit care homes tend to outnumber for-profit homes (Spasova et al., 2018) and most studies are not concerned with competition but instead examine aspects of the not-for-profit sector, for example, Dewaelheyns et al. (2009) (Flanders); Farsi and Filippini (2004) (Switzerland). An exception is Martin and Jérôme (2016) who analyze the for-profit sector in France concluding that nursing homes which are part of a chain may be less cost-efficient than those which are not part of a chain.

[2] At 3%, the proportion of English care home places in publicly owned care homes is less than half that for the United Kingdom as a whole (CMA, 2017, table. 2.2).

[3] They may also procure places for self-funders who lack the capacity to negotiate with a care home and have no-one who can do so on their behalf. Some nursing home places are supported by payments from the National Health Service, as discussed in Section 3.

[4] Unlike the United States where short stay (under 100 days) residents comprise over 40% of nursing home residents (National Center for Health Statistics, 2019, table. IX), a large majority of UK care home residents are long-term residents. Comprehensive figures are not available but a 2012 survey of a large chain of homes found that 94% of its UK care home residents were admitted for "long-term care" with only 1.2% admitted for intermediate, subacute, convalescent or rehabilitative care, the remainder for respite or end-of-life care (Centre for Policy on Ageing, 2012).

[5] Social care is a devolved function so arrangements in Wales, Scotland, and Northern Ireland deviate from those in England.

[6] http://www.legislation.gov.uk/ukpga/2014/23/section/5

[7] There is a limited U.S. literature on competition and price. For example, Nyman (1994) found that market concentration, attributed to the CON laws, raised the prices that self-payers pay relative to Medicaid reimbursement rates.

[8] Strictly speaking, our supply concept is a relative indicator of potential supply, measured as care home capacity divided by total population aged 65 and over. Actual delivered supply is very slightly less, due to transient shortfalls in occupancy. The capacity definition of supply seems appropriate to the medium and long-term policy perspective.

[9] Since dementia predominantly affects older people, care homes which offer services for people with dementia are included even if they did not report specifically that they offer services for people aged 65+.

[10] Out-of-LA placements (14% over all LAs in 2008/10; Allan et al., 2021) do occur especially in LAs with a limited supply of care homes, but negotiation of fee levels for LA-funded residents tends to be with care homes within the LA concerned.

[11] Due to their peculiar nature, Isles of Scilly and City of London were excluded from the analysis. We also excluded Hammersmith and Fulham because of the presence of only one (LA-run) care home in the residential market and Islington because of missing quality rating for the only two residential care homes.

[12] As the number of firms increases, and if market shares all approach very small fractions, C tends to zero. Where shares are expressed as proportions, $C = 1$ means that all supply is provided by a single monopolist. The inverse of the HHI is interpretable as the effective numbers of suppliers in a hypothetical market where each has the same market share. A market with $C > 0.1$ is sometimes considered concentrated, and $C > 0.2$ highly concentrated (Competition Commission and Office of Fair Trading, 2010).

[13] *Source*: Health and Social Care Information Centre (HSCIC), through NHS Digital.

[14] Residential care costs are higher when services are provided "in house," that is, by LA-run homes. There are 76 LAs that offer in-house residential services (average cost = £1350 p.w. The cost associated with "external" residential services (i.e., non-LA-run homes) was much less at about £555).

[15] We also tested for the inclusion of LA-level care workforce data (source Skills for Care) on workforce turnover rate, contracts types, and mean age and ethnicity of the workforce. These variables are highly correlated with other covariates (see below), which are less prone to endogeneity problems. Similarly, the labor cost-adjustment used to guide allocations for adult social care across LAs in England (Department for Communities and Local Government, 2013) have been excluded because of endogeneity concerns.

[16] The following area-level indicators were all statistically insignificant in regressions for each of the four market outcomes: average (self-reported) health status; the population proportion of informal carers; the Index of Multiple Deprivation; mortality rates, overall life-expectancy (LE) and healthy LE at old-age; average state pension weekly payment; log of LA size (in hectares), population structure with respect to age, social class, education, occupation, housing tenure, and ethnicity.

[17] *Source*: https://www.ons.gov.uk/economy/regionalaccounts/grossdisposablehouseholdincome

[18] *Source*: https://www.gov.uk/government/statistical-data-sets/uk-house-price-index-data-downloads-january-2017#download-the-data

[19] *Source*: http://www.gwydir.demon.co.uk/uklocalgov/makeup2015.htm

[20] *Source*: https://ons.maps.arcgis.com/home/item.html?id=0560301db0de440aa03a53487879c3f5

[21] It is unsurprising that the linear model gives a slightly lower RMSE since that is the fitting criterion that it minimizes, whereas the log regression minimizes the RMSE for ln$C$. Nevertheless, the much better fit for the linear model in the residential sector is striking.

[22] The (qualitatively similar) results for the logarithmic model are in Table A5.

[23] Relevant percentile thresholds (10th, 20th, 30th, 70th, 80th, 90th, respectively) are: nursing homes 0.038, 0.060, 0.073, 0.132, 0.153, 0.249; residential homes: 0.031, 0.040, 0.052, 0.116, 0.145, 0.223.

[24] As expected, concentration increases overall and by setting-type when disregarding publicly run care homes. Overall Q tends to be marginally higher when publicly run care homes are excluded. In the nursing market, Q is slightly higher when NHS-run care homes are excluded but slightly lower when LA-run care homes are further disregarded from the analyses. In the residential market, Q tends to be lower when excluding LA-run care homes. Noticeable also is the increased variability around the mean of Q in this type of home. S reduces when disregarding publicly run care homes.

[25] The model estimates underlying these impacts are set out in Tables A7 and A8.

[26] Twenty-three NHS-run care homes (14 nursing; 9 residential).

[27] Prices LAs pay for places in publicly owned care homes are higher on average than for those in privately owned homes so when excluding LA-run homes it is arguably better to exclude their prices too. Information is not available to construct a price for nursing home places which excludes those in homes run by LAs but this is not a major limitation given the small number of LA-run nursing homes, this is not a major limitation.

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APPENDIX

Additional Figures and Tables

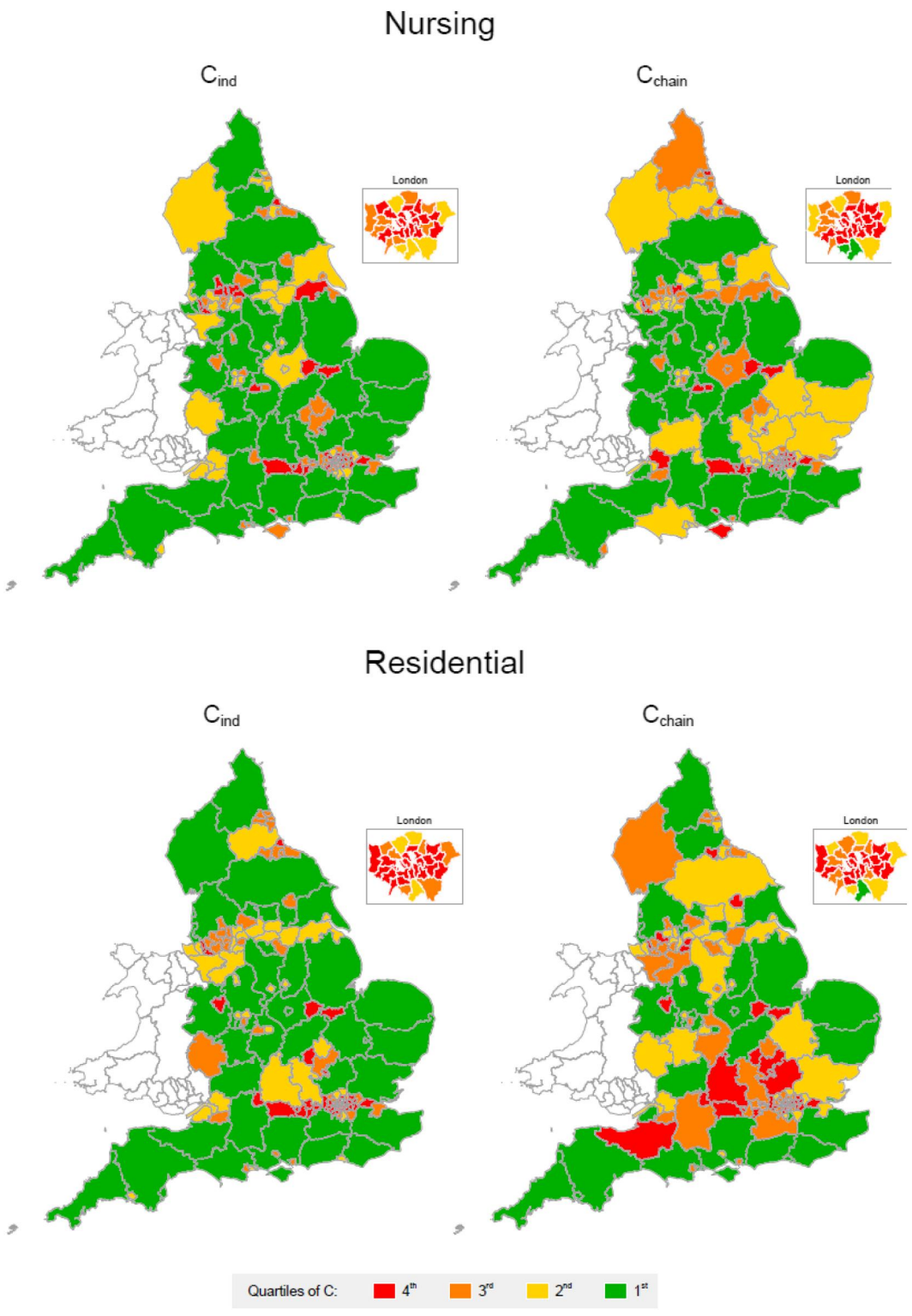

FIGURE A1 Level of concentration of the English care home market, by whether nursing or residential care [Colour figure can be viewed at wileyonlinelibrary.com]

TABLE A1 Summary statistics for supply, price, and quality

	All care homes				Nursing homes				Residential homes			
	Mean	***SD***	**Min**	**Max**	**Mean**	***SD***	**Min**	**Max**	**Mean**	***SD***	**Min**	**Max**
S	41.2	10.05	13.1	74.5	22.0	6.39	5.7	43.2	19.1	8.17	3.5	44.4
P	571.7	110.49	388.6	989.9	567.8	106.44	314.0	900.9	578.3	131.95	377.2	1130.8
Q	65.6	4.53	50.5	75.0	64.4	5.43	45.9	76.9	67.5	4.92	56.4	81.3

Note: Based on data for 148 LAs.

TABLE A2 Bivariate Spearman correlations of market concentration, and supply, price, and quality outcomes

	C_{ind}	C_{chain}	*S*	*P*	*Q*
Overall					
C_{ind}	1				
C_{chain}	0.8336*	1			
S	−0.5197*	−0.5278*	1		
P	0.2772*	0.3713*	−0.4286*	1	
Q	0.1557*	0.1438*	−0.1719*	0.2186*	1
Nursing					
C_{ind}	1				
C_{chain}	0.9806*	1			
S	−0.4473*	−0.4313*	1		
P	0.1662*	0.1921*	−0.1372*	1	
Q	0.1846*	0.1859*	−0.1869*	0.1283	1
Residential					
C_{ind}	1				
C_{chain}	0.9867*	1			
S	−0.5998*	−0.5945*	1		
P	0.3207*	0.3259*	−0.4411*	1	0
Q	0.2011*	0.1988*	−0.2014*	0.2371*	1

Note: Based on data for 148 LAs.

*Statistical significance at 10% or lower.

TABLE A3 Descriptive statistics of area characteristics

(a) Based on data for 148 LAs				
	Mean	***SD***	**Min**	**Max**
No. of women aged 75+ and living alone/10,000	1.0	0.85	0.1	4.5
% over 65s on Pension Credit	26.1	9.91	9.3	64.0
Average income (all ages, from earnings and assets, £000 per year)	17.1	6.05	9.9	61.4
LA-average house price (£00,000 2015 prices)	23.1	15.83	9.2	131.3
Council controlled by the conservative party	0.3	0.46	0.0	1.0
Council controlled by the labor party	0.5	0.50	0.0	1.0
London and South of England	0.4	0.50	0.0	1.0
Metropolitan borough	0.2	0.43	0.0	1.0
% Population living in urban area	86.8	17.42	30.8	100.0
(b) Based on data for LAs in the upper and lower C_{chain} quartiles[a]				
	Lower quartile		**Upper quartile**	
	Mean	***SD***	**Mean**	***SD***
No. of women aged 75+ and living alone/10,000	1.8	1.2	0.4	0.1
% over 65s on Pension Credit	22.7	7.5	31.0	12.8
Average income (all ages, from earnings and assets, £,000 per year)	15.5	2.8	20.9	9.7
LA-average house price (£00,000 2015 prices)	19.5	6.2	34.8	24.8
Council controlled by the conservative party	0.4	0.5	0.2	0.4
Council controlled by the labor party	0.3	0.5	0.6	0.5
London and South of England	0.4	0.5	0.7	0.5
Metropolitan borough	0.2	0.4	0.1	0.3
% Population living in urban area	79.4	19.0	94.3	13.2

[a]C_{chain} cut-off for the lower (upper) quartile is 0.035 (0.077), see Table 2.

TABLE A4 Estimated skedasticity functions for heteroskedastic linear models of C_{chain} (underlying Table 3)

Area characteristic	**All care homes**	**Nursing homes**	**Residential homes**
Potential demand (no. of women aged 75+ and living alone/10,000)	−0.625**	−0.493**	−0.354
	(0.246)	(0.246)	(0.246)
Low-income proportion in older population (proportion over 65s on Pension Credit)	5.238**	6.412**	2.095
	(2.645)	(2.645)	(2.645)
Average income (all ages, from earnings and assets, £0000)	0.021	0.188	2.262***
	(0.622)	(0.622)	(0.622)
Average house price (£00,000)	0.317	0.066	−0.458*
	(0.258)	(0.258)	(0.258)
Conservative-controlled LA	0.789	1.567***	−0.940*
	(0.552)	(0.552)	(0.552)

TABLE A4 (Continued)

Area characteristic	All care homes	Nursing homes	Residential homes
Labor-controlled LA	0.194	0.332	0.894
	(0.557)	(0.557)	(0.557)
London and South-East	−0.053	0.652	1.035**
	(0.525)	(0.525)	(0.525)
Metropolitan borough	−0.404	−0.380	0.334
	(0.558)	(0.558)	(0.558)
Urbanization (proportion of population in urban areas)	−0.726	−1.269	−2.445
	(1.520)	(1.520)	(1.520)
Intercept	−8.312***	−7.081***	−7.581***
	(1.391)	(1.391)	(1.391)

Note: $N = 148$ LAs. Standard errors in parentheses. Statistical significance: *10%, **5%, ***1%.

TABLE A5 Estimated loglinear models of C_{chain} (underlying Table 3)

Area characteristic	All care homes	Nursing homes	Residential homes
Potential demand (no. of women aged 75+ and living alone/10,000)	−0.431***	−0.463***	−0.441***
	(0.048)	(0.047)	(0.064)
Low-income proportion in older population (proportion over 65s on Pension Credit)	1.311**	1.589***	1.019
	(0.514)	(0.510)	(0.684)
Average income (all ages, from earnings and assets, £0000)	0.342***	−0.010	0.671***
	(0.121)	(0.120)	(0.161)
Average house price (£00,000)	0.043	0.113**	−0.035
	(0.050)	(0.050)	(0.067)
Conservative-controlled LA	0.011	0.079	0.022
	(0.107)	(0.106)	(0.143)
Labor-controlled LA	0.138	0.054	0.254*
	(0.108)	(0.107)	(0.144)
London and South-East	0.038	−0.042	0.002
	(0.102)	(0.101)	(0.136)
Metropolitan borough	−0.026	−0.079	−0.130
	(0.108)	(0.107)	(0.144)
Urbanization (proportion of population in urban areas)	−0.602**	−0.196	−0.387
	(0.295)	(0.293)	(0.393)
Intercept	−3.072***	−2.328***	−3.196***
	(0.270)	(0.268)	(0.360)

Note: $N = 148$ LAs. Standard errors in parentheses. Statistical significance: *10%, **5%, ***1%.

TABLE A6 Parameter estimates for heteroskedastic linear models of C_{ind} (underlying Table 7)

	Nursing care homes		Residential care homes	
Area characteristic	**Regression**	**Skedasticity**	**Regression**	**Skedasticity**
Potential demand (no. of women aged 75+ and living alone/10,000)	−0.035***	−0.246	−0.025***	−0.197
	(0.005)	(0.246)	(0.002)	(0.246)
Low-income proportion in older population (proportion over 65s on Pension Credit)	0.206***	7.614***	0.118***	5.817**
	(0.074)	(2.645)	(0.038)	(2.645)
Average income (all ages, from earnings and assets, £0000)	−0.011	0.334	0.021**	−0.069
	(0.017)	(0.622)	(0.010)	(0.622)
Average house price (£00,000)	0.022***	0.108	0.013***	0.066
	(0.007)	(0.258)	(0.004)	(0.258)
Conservative-controlled LA	0.018	1.314**	0.008	0.113
	(0.011)	(0.552)	(0.006)	(0.552)
Labor-controlled LA	0.002	0.468	0.008	−0.160
	(0.009)	(0.557)	(0.005)	(0.557)
London and South-East	−0.020*	0.226	−0.002	0.636
	(0.011)	(0.525)	(0.007)	(0.525)
Metropolitan borough	−0.020**	−0.457	−0.008	−1.597***
	(0.010)	(0.558)	(0.006)	(0.558)
Urbanization (proportion of population in urban areas)	0.001	−2.827*	−0.010	0.969
	(0.034)	(1.520)	(0.016)	(1.520)
Intercept	0.042	−7.006***	−0.007	−9.488***
	(0.036)	(1.391)	(0.016)	(1.391)

Note: $N = 148$ LAs. Standard errors in parentheses. Statistical significance: *10%, **5%, ***1%.

TABLE A7 Parameter estimates for heteroskedastic linear models of C_{chain} excluding NHS run homes (underlying Table 8)

	Nursing care homes		Residential care homes	
Area characteristic	**Regression**	**Skedasticity**	**Regression**	**Skedasticity**
Potential demand (no. of women aged 75+ and living alone/10,000)	−0.036***	−0.454*	−0.021***	−0.271
	(0.004)	(0.246)	(0.004)	(0.246)
Low-income proportion in older population (proportion over 65s on Pension Credit)	0.223**	8.071***	0.114	1.576
	(0.089)	(2.645)	(0.086)	(2.645)
Average income (all ages, from earnings and assets, £0000)	−0.002	0.068	0.090***	2.264***
	(0.021)	(0.622)	(0.023)	(0.622)
Average house price (£00,000)	0.021**	0.059	0.007	−0.440*
	(0.009)	(0.258)	(0.007)	(0.258)
Conservative-controlled LA	0.025*	1.943***	−0.016	−0.887
	(0.013)	(0.552)	(0.011)	(0.552)
Labor-controlled LA	0.003	0.476	0.019	1.011*
	(0.010)	(0.557)	(0.013)	(0.557)

TABLE A7 (Continued)

Area characteristic	Nursing care homes		Residential care homes	
	Regression	Skedasticity	Regression	Skedasticity
London and South-East	−0.014	0.798	−0.010	1.109**
	(0.013)	(0.525)	(0.012)	(0.525)
Metropolitan borough	−0.017	−0.383	−0.007	0.381
	(0.011)	(0.558)	(0.012)	(0.558)
Urbanization (proportion of population in urban areas)	−0.008	−1.094	−0.037	−2.361
	(0.032)	(1.520)	(0.033)	(1.520)
Intercept	0.063*	−7.645***	−0.040	−7.750***
	(0.039)	(1.391)	(0.038)	(1.391)

Note: N = 148 LAs. Standard errors in parentheses. Statistical significance: *10%, **5%, ***1%.

TABLE A8 Parameter estimates for heteroskedastic linear models of C_{chain} excluding NHS and LA run homes (underlying Table 8)

Area characteristic	Nursing care homes		Residential care homes	
	Regression	Skedasticity	Regression	Skedasticity
Potential demand (no. of women aged 75+ and living alone/10,000)	−0.041***	−0.253	−0.028***	0.072
	(0.006)	(0.246)	(0.006)	(0.246)
Low-income proportion in older population (proportion over 65s on Pension Credit)	0.240**	8.646***	0.094	4.620*
	(0.103)	(2.645)	(0.112)	(2.645)
Average income (all ages, from earnings and assets, £0000)	−0.020	0.398	0.089***	1.181*
	(0.023)	(0.622)	(0.027)	(0.622)
Average house price (£00,000)	0.030***	−0.155	0.002	0.002
	(0.009)	(0.258)	(0.010)	(0.258)
Conservative-controlled LA	0.031*	1.999***	−0.006	−0.005
	(0.016)	(0.552)	(0.012)	(0.552)
Labor-controlled LA	0.006	0.575	0.012	1.576***
	(0.012)	(0.557)	(0.014)	(0.557)
London and South-East	−0.017	0.590	−0.015	0.649
	(0.015)	(0.525)	(0.015)	(0.525)
Metropolitan borough	−0.016	−0.716	−0.003	−0.160
	(0.013)	(0.558)	(0.014)	(0.558)
Urbanization (proportion of population in urban areas)	−0.031	−0.887	−0.011	−2.899*
	(0.039)	(1.520)	(0.043)	(1.520)
Intercept	0.097**	−8.038***	−0.040	−7.791***
	(0.044)	(1.391)	(0.049)	(1.391)

Note: N = 148 LAs. Standard errors in parentheses. Statistical significance: *10%, **5%, ***1%.