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Abstract

We quantify competition in Australia's residential aged care sector and study how competition is associated with quality of care and prices in the sector. Competition is defined three ways: the number of competitors within a 10 km radius of a facility; the distance (in km) to the third closest competing facility; and Herfindahl-Hirschman index based on market share of facilities within 10 km. We further examine whether quality and price differ by ownership types (government owned, for profit, and not for profit), after controlling for competition. We find that more competition is not associated with better quality or lower prices. Government-owned facilities, in comparison to for-profit and not-for-profit facilities, are found to provide higher quality in some domains but not in others, yet tend to charge lower prices than other ownership types. The results indicate the possibility of market failures in aged care. Two key sources of market failures, the lack of public reporting of quality of care and price transparency, should be addressed as policy priorities before competition can work in residential aged care markets.

JEL classification: I11, I18, L80.

Keywords: Nursing home competition; Aged care quality; Aged care prices; Australia.

1 Introduction

Nursing homes, or residential aged care facilities, provide short- and long-term housing, support and care to frail older persons unable to live independently. Many countries, developing or developed alike, are entering the era of an ageing population. Increased longevity implies rising demand for aged care services. Concomitant with the increase in demand is the rise in aged care expenditures, much of which is funded through general taxation.

In Australia, competition and consumer choice have been key components in aged care reforms (Productivity Commission, 2011). The Australian government has in recent years implemented a series of market-oriented reforms under the umbrella of the Aged Care (Living Longer Living Better) Act of 2013. The aims were to promote greater consumer choice and increase the reliance on markets and competition to promote efficiency and contain costs in the aged care sector. However, how the reforms affect aged care quality and prices remain an open question.

The nature of aged care services suggests that market failures cannot be easily dismissed. Consumers often choose an aged care home in their local area, due to the desire to maintain family, social and community connections. Competition is thus localised—only providers within a reasonable geographic distance will be considered by consumers. Moreover, consumers' demand for aged care places often arise due to sudden and significant changes in health conditions (e.g., due to a fall, dementia, loss of mobility, etc.). Yet it is unlikely that all providers in the local area have the capacity and facility to accommodate an individual when his or her care need arises. The timing and geographic constraints can limit the effective competition between providers operating in a local market.

Moreover, information on prices and quality of services is difficult to obtain, assess and compare. Pricing information is difficult to understand because prices are made up of multiple components that comprise various care fees and accommodation fees. They can vary for each individual and also over time because of means testing. Moreover, not

all prices are disclosed in advance (e.g., fees for 'extra' and 'additional' services). For accommodation fees, there are also options of paying by lump-sum or daily payments. Information about quality of care in Australia, unlike countries such as the US and UK, is not readily available as Australia does not have a functioning public rating and reporting system that caters to consumers.[1] Aged care services also tend to have a 'lock-in' effect, in that once an individual 'bought in' to an aged care home, it can be exceedingly difficult and costly to switch to another provider. Anecdotal evidence suggests that switching between aged care homes is uncommon, most residents stay until their death.

Despite the move towards consumer choice and market-based allocation of resources, quality and safety in aged care continue to be a community concern. Media reports of a series of questionable practices and mistreatment of the elderly in nursing homes across several states in recent years have resulted in strong public disapproval. In response, the Australian government set up the Royal Commission into Aged Care Quality and Safety in 2018 to examine a broad range of issues surrounding aged care quality and safety.

The objective of this research is to examine the role of competition in aged care, and the extent to which competition is related to quality of care and prices. We construct three different measures of competition, the number of competitors, distance to other competitors and the Herfindahl-Hirschman index (HHI), as the basis for measuring the degree of competition facing nursing home facilities. Each measure of competition is related to several quality measures covering different quality domains by regression analyses. We also examine whether competition is related to the average price consumers pay to providers at each residential aged care facility.

The rest of the paper is structured as follows. Section 2 provides some background information on the aged care sector in Australia and also briefly describes related studies relevant to this research. Section 3 outlines the data, study variables, and methods used. Key findings are presented in Section 4, and a discussion of the implications of our findings is given in Section 5. Section 6 concludes the paper.

[1]The government website 'myagedcare.gov.au' provides some basic quality information but the information is often incomplete and difficult to compare across different homes.

2 Institutional Background and Related Literature

Residential aged care in Australia is predominantly funded and regulated by the Commonwealth government, with government funding accounting for around three-quarters of national spending on residential aged care. During 2017-18, Australia spent about A$16.5 billion on residential aged care services (excluding capital expenditures), with A$12 billion funded by the government and A$4.5 billion by consumers (Australian Aged Care Financing Authority 2019).

To receive government funding, aged care providers must be approved by the government through an accreditation process. An approved provider must have an allocation of residential aged care places, which are distributed through an annual bidding process known as the Aged Care Approvals Round (ACAR). Through ACAR, the government restricts the supply of residential aged care places using the aged care planning ratio target, which takes into account regional population size and composition. In 2017-18, there were around 207,000 residential aged care places nation wide. The occupancy rate was about 90% (Australian Aged Care Financing Authority, 2019). By restricting the supply of aged care places, the government is able to control the growth of its financial outlays. However, the supply restriction may create excess demand, resulting in long waiting times for care places in some local markets.

Providers receive government funding and subsidies as approved places are taken up by eligible consumers. An individual who needs an aged care place will be assessed for eligibility for government subsidies. The subsidy amount is determined by two key factors: the care needs and income/assets of the individual.

Providers can offer aged care services outside of the accreditation system as non-accredited private providers. Statistics on non-accredited private aged care places are not available, but by all accounts the number is small.[2]

Providers of residential aged care services in Australia fall into one of three owner-

[2]Given the significant costs involved in providing residential aged care services, non-accredited services could only be commercially viable by catering to a small group of the very rich.

ship types: government owned, private for-profit or not-for-profit organisations. Not-for-profit organizations include charitable and community organisations, accounting for about 56% of all providers, or 55% of all residential aged care places, as of 2018. For-profit organisations account for about a third (294 providers) of all providers, or 41% of residential aged care places. The other providers are run by state and local governments (Australian Aged Care Financing Authority, 2019).

The performance of residential care providers, in terms of compliance and meeting accreditation standards, are monitored by the Australian Aged Care Quality and Safety Commission through a system of inspections. However, information on the quality of specific facilities, beyond their accreditation status and results of a consumer experience survey, is not publicly available. To-date, Australia lacks a functioning system of public reporting of nursing home quality that caters to the need of consumers.

Prices of residential aged care places are set by providers subject to a number of restrictions imposed by the government. There are two broad types of fees: cost of care fees and accommodation fees. There are various components under each type of fees. The following is a list of prices a nursing home may charge:

(1). Accommodation fees, which vary depending on the outcome of means testing and also the type and features of rooms chosen. Individuals with income or assets below a certain threshold (set at $49,500 as of April 2020) will not be required to pay any accommodation fee. For those above the threshold, an accommodation payment will be required. Aged care homes are required to offer the following payment options:

- Refundable Accommodation Payment (RAD) is a single lump-sum payment, which will be refundable (after deductions are made) upon leaving the home.
- Daily Accommodation Payment (DAP) is a periodic payment, usually monthly, to the nursing home and is non refundable.
- A combination of RAD and DAP in preferred proportions chosen by individuals.

For residents not eligible for accommodation subsidies, the price is determined by mutual agreements between providers and consumers. Providers are required to publish the maximum accommodation price (expressed as both lump sum and daily payments) they charge for each facility. Any agreed prices between consumers and providers cannot exceed the posted maximum.[3]

(2). A basic daily fee for the care services. There is a limit on the maximum amount of basic daily fee an aged care home can charge, and it is based on the Aged Pension rate. As of April 2020, the maximum was set at 85% of the annual single basic Age Pension and stood at $52.25 per day. The basic daily fee applies to every resident in the aged care home, regardless of whether they are eligible for government subsidies.

(3). Means-tested care fees for the care services. The means-tested fee is on top of the basic daily care fee. It is on-going and varies depending on the outcome of means testing, subject to a maximum limit (in October 2020, the maximum cap for means-tested care fees was $256.44 per day, $28,087 per year and subject to a lifetime cap of $67,410). Individuals whose income and assets fall below the mean-testing thresholds are not required to pay the means-tested care fees.

(4). Extra service fees and additional service fees, for services or levels of amenities beyond what are normally provided. These fees are not subsidised and can vary from facility to facility.

The complex pricing structure means prices are difficult to understand and there is little pricing transparency in residential aged care markets. It is exceedingly difficult for consumers to compare prices across providers, particularly if the package of products and services (and quality) also differ. From the provider's perspective, admitting more affluent residents is generally favourable, since it can generate higher revenue by offering additional services and also collect higher accommodation fees by offering additional amenities (Hamilton and Menezes, 2011).

[3]We are not aware of any data on the actual agreed prices between consumers and providers being collected or available.

2.1 Related Literature

To the best of our knowledge, to-date there has been no research directly examining the relationship between competition, prices and/or quality of residential age care in Australia. The lack of evidence could in part be due to the lack of suitable data and in part reflects the belief that there is little or no price competition in the Australian aged care market (King and Martin, 2009; Productivity Commission, 2011, Chap. 5). As argued by Hamilton and Menezes (2011), competition is likely dampened by government regulations over the number of approved care places and complicated pricing structure.

However, there is a related, albeit small, Australian literature that compares the performance of for-profit and not-for-profit providers. Several studies have found that lower quality of care in for-profit than not-for-profit and government operated facilities (Jenkins and Braithwaite, 1993; King and Martin, 2009; Ellis and Howe, 2010; Baldwin et al., 2015a; Baldwin et al., 2015b). King and Martin (2009) investigate differences in employment patterns and find that for-profit facilities tend to have fewer staff per bed, younger patient care assistants, greater use of agency staff and higher staff turnover than not-for-profit facilities, but they caution that the differences are small. Ellis and Howe (2010) and Baldwin et al. (2015b) examine sanctions imposed on providers that fail to meet compliance standards and find that for-profit providers are more at risk of having sanctions imposed than not-for-profit and government operated facilities. Baldwin et al. (2015a) examine long-term changes in the Australian nursing home sector using data for the period 2003–2012. Measures used include size, service location, and ownership structure. They find large regional differences, in particular there is a limited presence of for-profit providers in regional and remote locations. They warn that the long-term trend of having fewer but larger providers, with more of them for-profit may not be compatible with achieving the desired quality of care and outcomes for consumers.

Elsewhere, the literature is dominated by US and UK studies on nursing home competition. Overall, the international literature appears to produce mixed evidence, some studies find a positive relationship between competition and nursing home quality, while others find negative or no relationship; see the review by Yang et al. (2020) and the ref-

erences therein. On the relationship between competition and prices, most studies find a negative relationship, i.e., markets with more competition tend to have lower prices. However, as pointed out by Yang et al. (2020), the discrepancies across countries and over time are likely accounted for by the difference in institutional settings and changes over time.

3 Data and Methods

We use de-identified data accessed under contract from the Royal Commission. The data cover aspects of quality of care, prices, and facility characteristics such as ownership status and size of nursing homes. The analysis will focus on data on nursing home facilities that provide residential care on a permanent basis. The data are organised by de-identified facility ID (designated by a non-identifying facility code) and over time, covering financial years 2008/09, 2013/14 to 2019/20. No data are available during the period 2009/10–2012/13, thus resulting in the gap in the time period covered. The dataset contains around 2,900 facilities each year, which nearly include all facilities in Australia. However, not all data series are available in all financial years indicated; some data, e.g., workforce data, are only available during a shorter time period.

We outline below how measures of competition, quality, and other covariates are constructed. Our aim is to estimate linear regression equations relating quality to competition using data with a panel structure with observations designated by facility i in year t. For the purpose of this analysis, we construct three measures of competition and relate each to six measures of quality. Several additional variables are used as covariates in the regression equations. The equations take the following form:

$$Qual_{it} = \beta Comp_{it} + X_{it}\gamma + \epsilon_{it}, \tag{1}$$

where *Qual* denotes a quality measure, *Comp* denotes a measure of competition, and X denotes a vector of covariates (e.g., provider ownership type, average price received by facility provider (henceforth referred to as provider price), facility size, etc). The error term ϵ captures random errors and unobservables. The key parameter of interest is β,

which captures the association between competition and quality. Equation (1) will be implemented for each quality measure and each measure of competition we construct.

We also conduct an analysis of whether prices are related to competition, where prices are measured as the average price in a facility paid by consumers at the facility (henceforth referred to as consumer price). The regression equation takes the form:

$$ln(Price)_{it} = \lambda Comp_{it} + Z_{it}\delta + \varepsilon_{it}, \tag{2}$$

where the consumer price is logarithmically transformed to allow for the skewness in the distribution of prices, and Z denotes a vector of covariates that are relevant in affecting prices, including quality and provider ownership type. The parameter of interest is λ, which measures the association between consumer prices and competition. The regression is implemented for each competition measure used in (1).

3.1 Competition measures

We measure competition between facilities using three different measures: (i) the number of competing facilities within a 10 km radius of a facility; (ii) the distance (in km) to the third closest competing facility; and (iii) HHI index, where the market share of a facility is defined as its share of total occupied bed-days of all facilities within 10 km. A simple measure of competition is the number of competitors in a local market—more competitors imply a more competitive market. This is a common measure for competition in the literature (e.g., Lu et al. 2017). However, firms may differ in size or market share, which makes counting the number of competitors in the market or measuring their distance too simplistic. The HHI index takes into account market shares of firms in the market and is the most common measure of competition (Miller, 1982; Yang et al., 2020).

In searching for nursing homes, consumers often do not search beyond their local areas. For this reason, a small geographic area is often used, e.g., the county is often used in US studies as a geographic market (see, e.g., Bowblis 2012). Here, we define the market of a facility as the geographic area within a 10km radius, which we think is

a reasonable approximation for most markets.[4] Note that the number of competitors and HHI both require defining a geographic market, whereas the distance to the third closest competitor can be constructed without reference to any market boundaries. The measure was proposed by Gravelle et al. (2016) to measure the competition between general practitioners (GPs). It is worth noting that, by measuring the distance to the third closest competitor, it implies that there are two other competitors within this distance. Thus, if the distance is small, the market is competitive, otherwise it is noncompetitive; the degree of competition is inversely proportional to the distance.

In constructing all three competition measures, a complication arises in the way one should interpret what 'competing' means. We note that a provider may own multiple residential aged care facilities in different locations. It is reasonable to assume that a facility does not compete with other facilities under the same ownership, even though they are in the same geographic market. We therefore define two facilities to be 'associated' if they are under the same ownership. The association between providers, compiled and provided by the Royal Commission, is identified by religious denominations and additional information collected from the aged care financing authority. In counting the number of competitors in the market, we do not count associated facilities as competitors. Likewise, we do the same for measuring market share in computing the HHI index and locating the third closest competitor.

We next outline how the HHI index is constructed. To compute the HHI, we first determine the market share of each facility in a given geographic market. For the purpose of computing market share, we first define the geographic market of a facility as the area within a 10 km radius, and make use of information on occupied bed days (OBDs). A facility's market share is its share of total OBDs in a market, excluding any OBDs of associated facilities in the market. Let s_{it} denote the market share of facility i in the market in year t. By construction,

$$s_{it} = \mathsf{OBD}_{it} / \sum_{j} \mathsf{OBD}_{jt},$$

[4] We also perform similar calculation using a 20km radius to set the market boundaries. Results are similar and are reported in Appendix E.

where the summation is over all aged care facilities that are not associated with i and in the same market.

The HHI is defined as:

$$\mathsf{HHI}_{it} = \sum_{i} s_{it}^2,$$

The HHI ranges from 0 (perfectly competitive) to 1 (monopoly). A market with an HHI of 0.15 is generally considered to be competitive, whereas one with an HHI greater than 0.25 is regarded as highly concentrated, i.e., noncompetitive.

3.2 Measuring quality of care

Nursing homes provide residents with a package of products and services that include medical care, room and board, and social activities. Quality of care thus encompasses a large number of domains, ranging from clinical care, health maintenance and rehabilitation and lifestyle enhancements. The literature has produced numerous measures of quality, covering clinical and social aspects of care, in addition to using measures of inputs such as nursing hours, and administrative based measures such as sanctions by the authority (Yang et al. 2020).

The data collection available from the Royal Commission contains a large number of quality indicators, including routine data reported by the Aged Care Quality and Safety Commission (ACQSC) in relation to the accreditation process, data collected from compulsory reporting (e.g., assaults and missing residents), workforce data, and measures constructed by the Royal Commission using the Registry of Senior Australian's (ROSA) Outcome Monitoring System specifications (Inacio et al., 2020).

We determine whether to include a quality measure in the analysis based on three criteria:

(1). There must be sufficient number of observations covering a reasonable number of years and facilities.

(2). The measure must not be heavily influenced by policy changes or shifts in policy

or enforcement during the data period. This is to ensure that the variation in the measure (e.g., number of compliance failures) we observed reflects changes in the underlying quality of care and is not due to policy or enforcement changes (e.g., changes in compliance enforcement).

(3). The measure is not strongly correlated with other measures (correlation coefficient should be smaller than 0.5).

By these criteria, the following six quality measures are included in our analysis. We also conduct additional analyses using other quality measures, results are summarised in Appendix A.

- Antipsychotic medication use (adjusted), defined as the proportion of residents dispensed an antipsychotic medication, adjusted by excluding residents that have schizophrenia or Huntington's disease. This is a ROSA indicator; the data cover about 2,700 facilities for the period 2012/13–2016/17.

- Premature mortality, defined as the proportion of residents who died and their main cause of death is 'external' and considered potentially avoidable. This is a ROSA indicator; the data cover about 2,700 facilities for the period 2012/13–2016/17.

- Number of reported assaults per resident, defined as number of reported incidents during each financial year that involve unreasonable use of force on residents, including hitting, punching or kicking a resident regardless of whether this causes visible harm, such as bruising. The reporting of such assaults is compulsory by law and is the responsibility of providers. The number is expressed as per resident using an approximate number of permanent residents, computed as the total number of occupied bed-days divided by 365. We assume that if a facility has no records of assaults (i.e., missing from the dataset) in a given financial year, there is zero reported assault for the facility in that year. The data cover about 1,300 facilities for the period 2014/15–2019/20.

- RN hours per resident-day, defined as the number of hours worked by registered nurse staff per resident per day. The data cover about 1,200 facilities for the period 2014/15–2018/19.

- Total care hours per resident-day, defined as total hours worked by direct care staff per resident per day. The data cover about 1,200 facilities for the period 2014/15–2019/20. It is worth noting that labour hours, of which care hours and RN hours are two components, are inputs into the production process, and as such they are likely to influence quality of care. Although they are often used as proxies for quality, they could also enter as explanatory variables for other measures of quality.

- Number of complaints per resident, based on the number of complaints received about a facility by the Aged Care Quality and Safety Commission (ACSQC) during each financial year. The number is expressed as per resident using the approximated number of residents as in the case of reported assaults. We assume that if a facility has no records of complaints (i.e., missing from the dataset) in a given financial year, there is no complaint against the facility in that year. The data cover about 2,900 facilities for the period 2014/15–2018/19.

3.3 Nursing home prices

Prices of nursing home services are an important factor that we expect to be closely associated with quality. It is reasonable to assume higher quality services will attract higher prices, which in turn give higher profit margins that allow providers to provide better quality of care. Prices for aged care services, however, are complex since not only there are myriad rules and regulations on how much and what items providers can charge, but also prices in many instances are heavily influenced by government subsidies, which are subjected to means testing that involves income and asset tests. Moreover, prices are also likely to be affected by the degree of competition. For markets that are competitive, prices should on average be lower than in markets that see no competition, other things equal.

We distinguish two different prices: average consumer price (out-of-pocket payments faced by consumers) and average provider price (consumer payment plus government subsidies). The two prices differ because of government subsidies, as providers received not only payments from consumers but also from the government under various subsidy and payment schemes. The two prices are used in different analyses. We hypothesize that quality at the facility level is affected by the average price (i.e., averaged over all residents in a facility) received by the provider, whereas competition affects the average price faced by consumers because government subsidies are unrelated to the degree of competition.

Nursing home prices generally include two main components: fees for providing care (daily care fees) and charges in relation to the accommodation provided. Government subsidies for both components are means tested. In addition, nursing homes can also provide additional services for additional fees, known as additional and extra service fees. These additional and extra service fees are not means tested. The accommodation charges may also include additional government subsidies known as supplements (e.g., enteral feeding supplement) that are designed to cover the additional cost of providing care to residents with special care needs. We derive the average consumer and provider prices using revenue data at the facility level. The revenue data are disaggregated into various revenue sources which include various types of fees and subsidy payments received. Data on additional service fees are not available and these are not included in the price calculation.

The average consumer price is derived as the sum of three components: (i) Daily care fees, including means-tested daily care fees and extra service fees; (ii) amount of daily accommodation payment received during the financial year; (iii) amount of refundable accommodation deposits (RAD), refundable accommodation contribution (RAC), bond and entry contribution balances at the end of the financial year, converted into an annual value using the average minimum permissible interest rates (MPIR) during the financial year.[5] Note that data on basic daily care fees and additional service fees are

[5]The MPIR is a government-set interest rate used to determine the equivalence between a daily payment and a refundable lump sum deposit. It is revised periodically (usually quarterly) by the

not available, hence are not included in the calculation.[6] The average provider price is constructed by adding the total subsidy amount claimed for permanent residents to the average consumer price, and expressed in per resident-day basis. In deriving both prices, lump sum amounts are converted into per resident-day using occupied bed-days as weights.

3.4 Other covariates

In addition to competition measures and prices, we also include several covariates in the regression equations.

- Ownership type, including (i) for-profit, (ii) not-for-profit, and (iii) government-owned facilities.
- Number of resident places, included as an indicator of facility size.
- Casemix weights, in the form of the national weighted activity units (NWAUs). The weights are designed to reflect the costs of providing care due to the different individual care needs of residents and different characteristics of facilities (e.g., facilities in remote areas providing care to indigenous residents); see Kobel and Eager (2020).
- Socio-Economic Indexes for Areas (SEIFA), developed by the Australian Bureau of Statistics to measure the relative socio-economic advantage and disadvantage of small areas based on census data. SEIFA comprises four different indexes. The index used in this study is the Index of Relative Socio-Economic Advantage and Disadvantage (IRSAD). Since it is based on census data, the index is only available for the census years. For our analysis, we use the deciles of IRSAD 2011 for the

government. We take the simple average of the MPIRs during each financial year as the relevant interest rate for the purpose of this calculation.

[6] We note that basic daily care fees are mandatory for all residents and typically do not vary across facilities. We also perform similar analyses on the relationship between consumer price, competition and ownership type using an alternative, more complete data source that contains additional service fees and find similar results; see Appendix D for details.

year 2013/14, and the deciles of IRSAD 2016 for the years 2014/15 to 2018/19; see ABS (2013, 2018).

- Financial year and Statistical Area 3 (SA3) dummy variables. These variables are included to control for unobserved time effects and local area effects.

4 Results

The data contain 20,228 observations of facility-financial-year units. We first apply several exclusion restrictions to exclude 498 (2.5%) outlier observations in the data.

- Average provider price above $500 per bed-day (65 observations).
- Negative average consumer price or an average consumer price above $250 per bed-day (59 observations).
- Observations with an occupancy rate below 10% or above 100% are excluded (374 observations). Occupancy rate is defined as the ratio of total occupied bed-days to total available bed-days. Total occupied bed-days are in turn defined as the sum of occupied permanent care bed-days and transition care bed-days. Total available bed-days are similarly defined.

Table 1 provides an overview of the data which contain nearly all nursing homes in Australia.[7] Total number of residential places nationwide have steadily increased over time, from about 178,000 places in 2008/09 to close to 217,000 in 2018/19. The number and share of for-profit facilities are rising, from about 798 (27%) in 2008/09 to 922 (32%) in 2018/19. This increase is offset by the fall in not-for-profit facilities, which experienced a decline in number from 1,697 (58%) to 1,585 (54%). The number of government owned facilities declined slightly during the period, from 435 (15%) in 2008/09 to 416 (14%) facilities in 2018/19.

[7] Additional summary statistics can be found in Appendix C.

Table 1: No. of facilities, residential places and ownership type

Fin Year	Total no. places	No. facilities	For profit	%	Govern-ment	%	Not for profit	%
2008/09	178,281	2,930	798	27.2	435	14.9	1,697	57.9
2013/14	192,757	2,858	842	29.5	413	14.5	1,603	56.1
2014/15	195,882	2,870	850	29.6	422	14.7	1,598	55.7
2015/16	199,408	2,871	864	30.1	427	14.9	1,580	55.0
2016/17	204,299	2,875	880	30.6	423	14.7	1,572	54.7
2017/18	210,783	2,900	906	31.2	419	14.5	1,575	54.3
2018/19	217,047	2,923	922	31.5	416	14.2	1,585	54.2

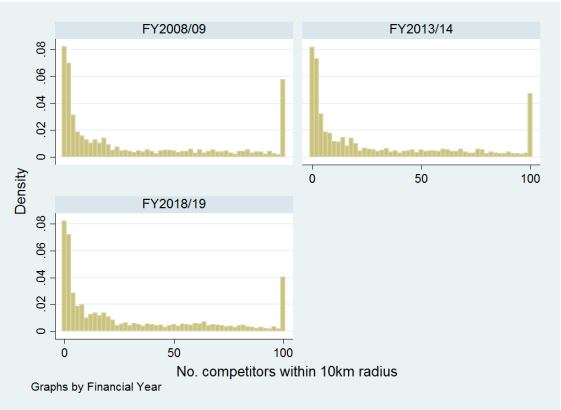
Table 2 presents summary statistics for quality measures used in the analysis. The distributions of antipsychotic medication use, RN hours, and care hours appear roughly symmetric, with the mean and median values about the same in magnitude. The other measures, premature mortality, assaults and complaints appear to skew to the right, with noticeably larger mean than median values. With the exception of premature mortality, all measures appear to have reasonably low variation, with standard deviation values in the same order of magnitude as the mean.

Table 2: Summary statistics of quality measures

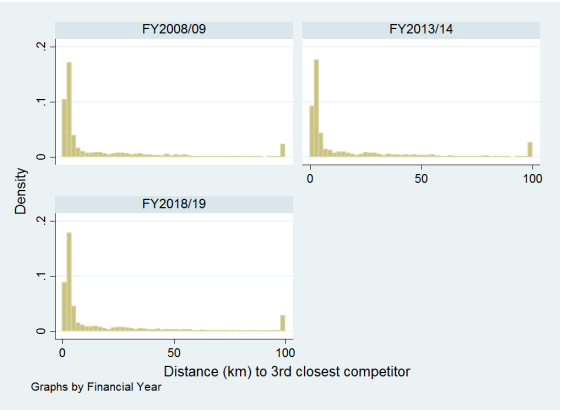
	Mean	Median	Std dev	N	Data period
Antipsychotic use	0.234	0.233	0.082	10,427	2013/14–2016/17
Premature mortality	0.006	0.000	0.011	10,433	2013/14–2016/17
No. assaults per res	0.018	0.000	0.032	14,152	2014/15–2018/19
RN hours per res-day	0.436	0.413	0.265	6,215	2014/15–2018/19
Care hours per res-day	3.019	2.979	0.604	6,215	2014/15–2018/19
No. complaints per res	0.023	0.012	0.039	13,142	2014/15–2018/19

The distributions of the three competition measures are shown in Figure 1, where selected years are shown. The years are chosen such that they are five years apart. Note that for the purpose of plotting the figures, the number of competitors in 10km are 'top-coded' at 100 competitors and the distance to the third closest competitor is 'top-coded' at 100km; no adjustment is needed for the HHI as its values are by construction bounded between 0 and 1. Note that for the HHI and distance to the third closest competitor, larger values indicate lesser degrees of competition, whereas the opposite is true for the number of competitors within 10km—larger number of competitors indicate more competition.

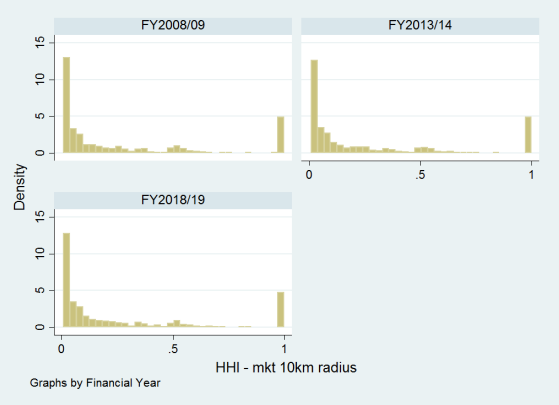
As shown in Figure 1, all three distributions appear to be bi-modal, with more observations at the two extremes than in the center. This suggests that most facilities are operating in one of two extremes, in either very competitive or noncompetitive markets. For all three measures, the distributions remain broadly similar over time, suggesting that the variation across facilities is far larger than the variation over time. Indeed, the standard deviations across facilities for the number of competitors within 10km, distance to the third closest competitor, and HHI are respectively 37.8, 149.0, and 0.334, whereas the corresponding standard deviations across time are 1.9, 54.1, and 0.027.



(a) No. competitors 10km



(b) Distance to 3rd closest



(c) HHI

Figure 1: Distributions of competition measures

Table 3 presents summary statistics for several additional variables used in our analyses: Average provider price, average consumer price, number of resident places, aged care casemix weights (NWAU), SEIFA quintile, and proportion of ownership types. Facilities in the sample operate with an average capacity of 74.4 resident places, although the

range varies widely between one and 356 places across the sample. Average provider and consumer prices are respectively around $233 and $39 per resident-day, with the difference reflecting the extent of government subsidies on average. The large gap between the two average prices also indicate that the bulk of the spending on residential care is paid for by government subsidies. A majority of facilities in the sample (55%) are operated by not-for-profit providers, the remaining facilities are either for-profit (about 30%) or government-owned (about 15%).

Table 3: Summary statistics of additional variables

	Mean	Median	Std. dev.	Min	Max
No. resident places	74.46	62.00	42.27	1.00	356.00
Ave provider price	233.44	234.57	40.53	79.90	467.80
Ave consumer price	39.33	31.23	31.77	0.06	248.30
Casemix weights NWAU	1.01	1.00	0.13	0.76	4.86
SEIFA quintile	5.05	5.00	2.86	1.00	10.00
For profit (prop.)	0.30	–	0.46	0.00	1.00
Government owned (prop.)	0.15	–	0.36	0.00	1.00
Not for profit (prop.)	0.55	–	0.50	0.00	1.00

Note: Summary statistics are computed over the sample period 2013/14–2018/19, sample size ranges from 12,338 to 16,954 observations.

Table 4 shows the summary statistics of the variables by ownership type. The statistics serve to highlight the differences in characteristics between facility types. When measured using the number of resident places, for-profit facilities are on average larger than not-for-profit facilities, which in turn are larger than government-owned facilities. The average size of government-owned facilities is about a third of the average for-profit facility and less than half of the average not-for-profit facility. Importantly, the standard deviation values suggest that government-owned facilities not only are small on average but also have less variation in size than either for-profit or not-for-profit facilities.

For-profit facilities charge the highest average provider price, whereas government-owned facilities charge the lowest. The same pattern follows in the case of average consumer price. Residents do not differ much in terms of casemix complexity across the three types of facilities. Lastly, average SEIFA index quintile shows that government-owned facilities tend to locate in less advantaged areas than for-profit and not-for-profit facilities.

Table 4: Summary statistics of selected variables by ownership type

	For profit		Government		Not for profit	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
No. resident places	89.48	36.99	27.85	24.37	71.21	40.90
Ave provider price	252.61	34.40	207.55	40.14	227.10	39.42
Ave consumer price	47.52	40.31	29.75	19.46	36.39	26.76
Casemix weights NWAU	1.05	0.08	0.98	0.18	0.99	0.14
SEIFA quintile	5.83	2.89	3.60	1.79	5.01	2.92

4.1 Effects of competition on quality

This section reports the regression results of examining quality as a function of competition, after adjusting for all covariates mentioned above. We also perform similar analyses on several additional quality measures, results are reported in Appendix A and are broadly consistent.

Selected coefficient estimates are reported in Tables 5 and 6. A full listing of all coefficient estimates can be found in Appendix B. Robust standard errors are reported throughout, these are obtained via clustering by facility. Table 5 reports the effects of competition on each of six quality measures. The table is divided into three sections, each corresponds to a measure of competition. Overall, competition is not associated with quality. One exception is higher HHI values (i.e., less competition) appear to be associated with fewer RN hours, with coefficient estimates ranging from -0.05 to -0.09. This result suggests a relatively large effect in comparison to the mean RN hours of 0.4 hour per resident-day, implying that as HHI rises from 0 (most competitive) to 1 (least competitive), RN hours per resident-day fall by 12% to 22%. We note that the corresponding estimates using the number of competitors within 10km and distance to the third closest competitor do not produce any statistically significant results.

Another significant result is on total care hours—having more competitors within 10 km are associated with *fewer* care hours. The significant coefficients are -0.14 and -0.24, suggesting that a change from no competitor within 10 km to having 4–10 competitors, or to 26 or more competitors, lowers total care hours by respectively 0.14 and 0.24 hour per resident-day. Compared to the mean care hours of 3 hours per resident-day across

all facilities, these estimates represent about 5%–8% of the mean care hours.

Table 5: Regression of quality on competition, coefficients of competition measures

	Antipsy-chotic use	Premature mortality	Assaults	RN hrs	Total care hrs	complaints
No. competitors 10 km (Ref: No comp.)						
1–3 comp.	0.0037	-0.0002	-0.0020	-0.0225	-0.1035	-0.0014
	(0.006)	(0.001)	(0.002)	(0.039)	(0.074)	(0.002)
4–10 comp.	0.0024	0.0002	0.0006	-0.0170	-0.1411*	-0.0043
	(0.007)	(0.001)	(0.002)	(0.032)	(0.069)	(0.002)
11–25 comp.	0.0003	0.0005	0.0010	0.0039	-0.1634	-0.0042
	(0.010)	(0.001)	(0.002)	(0.038)	(0.089)	(0.003)
26 or more comp.	0.0055	0.0003	0.0024	0.0232	-0.2371*	-0.0024
	(0.012)	(0.001)	(0.003)	(0.042)	(0.101)	(0.004)
N	6,917	6,921	11,788	5,692	5,692	11,788
Adjusted R^2	0.148	0.011	0.082	0.334	0.303	0.0703
Distance to 3rd closest (Ref: 0 km $\leq$ dist $\leq$ 2 km)						
2 km $<$ dist $\leq$ 5 km	-0.0030	0.0001	0.0010	-0.0252	-0.0398	-0.0006
	(0.004)	(0.000)	(0.001)	(0.014)	(0.031)	(0.001)
5 km $<$ dist $\leq$ 20 km	-0.0026	-0.0003	0.0022	-0.0098	0.0427	0.0024
	(0.005)	(0.001)	(0.002)	(0.017)	(0.039)	(0.002)
20 km $<$ dist $\leq$ 50 km	-0.0090	0.0001	0.0015	-0.0515	0.0775	-0.0011
	(0.007)	(0.001)	(0.002)	(0.029)	(0.062)	(0.002)
dist. $>$ 50 km	-0.0072	-0.0007	-0.0017	0.0903	0.2237	-0.0002
	(0.012)	(0.001)	(0.003)	(0.096)	(0.181)	(0.004)
N	7,234	7,238	12,338	5,942	5,942	12,338
Adjusted R^2	0.150	0.012	0.080	0.334	0.300	0.070
HHI (Ref: $0 \leq$ HHI ≤ 0.02)						
$0.02 <$ HHI ≤ 0.05	-0.0117	0.0005	-0.0007	-0.0505*	-0.0716	-0.0030
	(0.006)	(0.001)	(0.002)	(0.023)	(0.066)	(0.002)
$0.05 <$ HHI ≤ 0.15	-0.0135	0.0007	-0.0004	-0.0731*	-0.0094	-0.0025
	(0.009)	(0.001)	(0.003)	(0.029)	(0.083)	(0.003)
$0.15 <$ HHI ≤ 0.60	-0.0163	0.0003	-0.0006	-0.0838*	-0.0267	-0.0022
	(0.011)	(0.001)	(0.003)	(0.035)	(0.098)	(0.004)
HHI > 0.60	-0.0213	0.0002	-0.0022	-0.0921*	0.0461	-0.0009
	(0.012)	(0.001)	(0.003)	(0.043)	(0.106)	(0.004)
N	7,234	7,238	12,338	5,942	5,942	12,338
Adjusted R^2	0.150	0.012	0.079	0.331	0.297	0.070

Figures in parentheses are robust standard errors.
Significance levels: *: 5% **: 1% ‡: 0.1%

Table 6 reports the effect of ownership type and average provider price after controlling for competition and other covariates. The results are obtained from the same regression analyses that produce Table 5. The estimates presented in Table 6 suggest significant differences in quality by ownership and the results are remarkably consistent across different competition measures.

Compared to for-profit facilities, government-owned facilities appear to use more an-

tipsychotic medication, provide more RN and total care hours per resident-day, and have fewer complaints per resident. Government-owned facilities also appear to have more reported assaults than for-profit and not-for-profit facilities. Not-for-profit facilities, in comparison to for-profit facilities, have more premature mortality, provide fewer RN hours but more total care hours, and have fewer complaints. These results hold under all three different measures of competition. It is also clear from the results that no one ownership type consistently provides the best quality of care in all quality domains we analysed. However, for the additional quality measures we analysed and reported in Appendix A, government-owned facilities appear to be performing better than for-profit and not-for-profit facilities in all cases. Thus on balance it appears that government-owned facilities have the best quality among all ownership type.

The estimates in Table 6 also show that higher price does not consistently lead to better quality, after controlling for competition. On the one hand, higher average provider price appears to be associated with more antipsychotic medication use, more reported assaults, and more complaints. On the other hand, higher average provider price is also associated with more RN hours and total care hours, indicating a positive association with quality. It is worth noting that the price used in the regression is provider price, the bulk of which is made up of government subsidies. On average, about 80% of provider price consists of subsidies (see Table 3 above), which we regard as exogenous to the choice of quality levels.

4.2 Regression analysis of price and competition

We next report on the second set of regression results from implementing equation (2), which investigates the association between average consumer price and competition. In the regression, the dependent variable, average consumer price, is logarithmically transformed to allow for left-skewness. Three regression equations are implemented, and each corresponds to a different measure of competition.

In addition to the competition measures, the following additional covariates are also included in the estimation.

Table 6: Regression of quality on competition, coefficients on ownership and price

	Antipsy-chotic use	Premature mortality	Assaults	RN hrs	Total care hrs	complaints
No. competitors 10 km						
Ownership type (Ref: For profit)						
Government owned	0.0245**	-0.0003	0.0053*	0.2660‡	1.0208‡	-0.0136‡
	(0.008)	(0.001)	(0.002)	(0.052)	(0.114)	(0.002)
Not for profit	-0.0000	0.0006*	-0.0008	-0.0809‡	0.0742**	-0.0091‡
	(0.003)	(0.000)	(0.001)	(0.011)	(0.027)	(0.001)
Ave. provider price (log)	0.0843‡	0.0000	0.0171‡	0.3723‡	1.2651‡	0.0106‡
	(0.008)	(0.001)	(0.003)	(0.052)	(0.127)	(0.003)
Distance to 3rd closest						
Ownership type (Ref: For profit)						
Government owned	0.0236**	0.0003	0.0062**	0.2485‡	0.9961‡	-0.0127‡
	(0.008)	(0.001)	(0.002)	(0.049)	(0.111)	(0.002)
Not for profit	-0.0007	0.0008**	-0.0010	-0.0773‡	0.0772**	-0.0090‡
	(0.003)	(0.000)	(0.001)	(0.011)	(0.026)	(0.001)
Ave. provider price (log)	0.0808‡	0.0004	0.0182‡	0.3653‡	1.2318‡	0.0104‡
	(0.008)	(0.001)	(0.003)	(0.048)	(0.122)	(0.003)
HHI						
Ownership type (Ref: For profit)						
Government owned	0.0233**	0.0002	0.0059**	0.2637‡	1.0260‡	-0.0129‡
	(0.007)	(0.001)	(0.002)	(0.048)	(0.107)	(0.002)
Not for profit	-0.0006	0.0008**	-0.0009	-0.0772‡	0.0755**	-0.0091‡
	(0.003)	(0.000)	(0.001)	(0.011)	(0.026)	(0.001)
Ave. provider price (log)	0.0807‡	0.0004	0.0180‡	0.3702‡	1.2314‡	0.0105‡
	(0.008)	(0.001)	(0.003)	(0.050)	(0.124)	(0.003)

Figures in parentheses are robust standard errors.
Significance levels: *: 5% **: 1% ‡: 0.1%

- Ownership type: For profit, government owned, and not for profit.
- Reported assaults per resident, as a measure of quality of care.
- Casemix weights, measured using adjusted NWAU.
- SEIFA index deciles, as dummies.
- Financial years, as dummies.
- SA3 locations, as dummies.

The regression coefficient estimates on competition and ownership type are shown in Table 7. There is little association between price and competition. Facilities in monopoly markets (i.e., no competitor) tend to charge higher consumer prices than facilities in

markets with some competitors, but only up to 10 competitors, beyond which (in markets with 11 or more competitors) consumer prices do not appear to be statistically different from prices found in monopoly markets. Similarly, facilities whose third closest competitors are beyond 50 km are more likely to charge higher consumer prices than facilities whose third closest competitors are within 50 km.

The price charged to consumers varies substantially by ownership type, after controlling for competition and other covariates. Government-owned facilities charge the lowest prices, followed by not-for-profit facilities, and for-profit facilities charge the highest prices. The estimates indicate that, compared to for-profit prices, prices of government-owned and not-for-profit facilities are respectively about 23% and 8% lower on average.

Table 7: Regression of price on competition, selected coefficient estimates

Dep variable: log(consumer price)					
	Estimate		Estimate		Estimate
No. competitors 10 km		Distance to 3rd closest		HHI	
Ref: No comp.		Ref: $0 \leq$ dist ≤ 2 km		Ref: $0 \leq$ HHI ≤ 0.02	
1–3 comp.	-0.0600*	$2 <$ dist ≤ 5 km	0.0019	$0.02 <$ HHI ≤ 0.05	0.0670
	(0.030)		(0.030)		(0.057)
4–10 comp.	-0.1121**	$5 <$ dist ≤ 20 km	0.0499	$0.05 <$ HHI ≤ 0.15	0.1076
	(0.039)		(0.034)		(0.077)
11–25 comp.	-0.0338	$20 <$ dist ≤ 50 km	0.0536	$0.15 <$ HHI ≤ 0.60	0.0639
	(0.056)		(0.040)		(0.086)
26 or more comp.	-0.0776	dist. > 50 km	0.1413**	HHI > 0.60	0.1306
	(0.077)		(0.055)		(0.088)
Ownership type		Ownership type		Ownership type	
(Ref: For profit)		(Ref: For profit)		(Ref: For profit)	
Government	-0.2271‡	Government	-0.2379‡	Government	-0.2277‡
	(0.044)		(0.042)		(0.042)
Not for profit	-0.0767**	Not for profit	-0.0777**	Not for profit	-0.0789‡
	(0.025)		(0.025)		(0.024)
N	11,717	N	12,265	N	12,265
Adjusted R^2	0.347	Adjusted R^2	0.346	Adjusted R^2	0.347

Figures in parentheses are robust standard errors.
Significance levels: *: 5% **: 1% ‡: 0.1%

5 Discussion

Our results show that competition is not associated with quality of care and weakly associated with price. We do not observe consistently more competition is associated with lower prices, only note this in the markets lacking competition (identified as less than 10

competitors within 10 km or third closest competitors are beyond 50 km). We also find that ownership type has significant effects on quality and prices. Government-owned facilities charge lowest price and provide higher quality in some domains, compared to for-profit and not-for-profit facilities.

Several reasons may explain why competition in aged care is not associated with better quality and lower prices. First, it is well known that aged care markets can suffer from market failures. For the residential aged care sector in Australia, market failures can arise due to a lack of publicly available information on quality and the complex structure of pricing. Unlike the US and UK, Australia does not have a functioning system of public reporting and rating of aged care facilities.[8] Although quality is regulated by the government, it is loosely defined and poorly enforced. It is extremely difficult for an average consumer to gather information on quality of care and prices that is useful and relevant for her local market for the purpose of choosing a service provider. The complex pricing structure arises not only from having numerous components of fees, but also due to complicated rules of means testing and numerous options to pay for accommodation charges. In this environment, providers have little incentives to provide high quality care given that quality information is difficult to obtain and verified by consumers. The disincentive is further compounded by the fact that quality in aged care is often associated with high costs, and providers have no incentive to incur such costs.

Second, aged care consumers also have certain characteristics that render informed consumer choice a challenge. Demand in this market often arises from consumers who experience changes in cognitive and physical conditions that make it difficult to search for information, weigh their options and exercise choice, as would be required for a competitive market to properly function. Consumers also typically search for care within their local area and often for specialised services that meet their needs, meaning that competition is localised and limited.

Third, supply of residential care places is restricted by the government through the

[8]Both the US and UK have dedicated government agencies running a five-star rating system of quality with regular public reporting targeting at consumers; for a recent review, see Yang et al. (2020).

ACAR process, which places limits on both the number of places and the locations where they can be offered. In addition, there is also an increase in concentration in the residential care industry, with the share of very large providers (with more than 5000 places) of total approved care places rising steadily from 16% in 2009/10 to 39% in 2018/19.[9] Concomitant with this rising trend of concentration is the trend of common ownership, i.e., large providers owning more facilities over time.

Our results on ownership type on quality is generally consistent with findings reported by international studies (e.g., Hjelmar et al., 2018; see the review by Bos et al., 2017). In addition, we find strong evidence that government-owned facilities on average charge lower prices than other facilities and for-profit facilities charge the highest prices on average. Although for-profit prices are higher on average, there is no evidence that they offer the best quality of care. While government-owned facilities charge the lowest price on average, they provide the most RN hours and total care hours per resident-day, and have the least number of complaints per resident among all ownership types.

There are several limitations to note. Although comprehensive data on quality and various components of prices have been made available for this research by the Royal Commission, these are by no means complete or exhaustive. Several quality domains, e.g., reported assaults and complaints, could be influenced by policy changes and shifts in enforcement focus. There could also be systematic reporting differences across different types of facilities that we would not be able to detect. For example, it is plausible that for-profit facilities may respond better to complaints from residents than other types of facilities, and thus residents in for-profit facilities may have incentives to make more complaints than residents in other facilities. Last, the research focuses on association rather than causal relation between competition and quality.

A number of potential endogeneity or confounding issues in relation to competition and prices have not been considered in this paper. Market shares, which are critical in the

[9]See Royal Commission Final Hearing Day 2, Exhibit 22-25 (RCD.9999.0538.0250), "Picture of the residential aged care and home sector," https://agedcare.royalcommission.gov.au/hearings-and-workshops/final-hearing-day-2 (accessed 20 Nov 2020).

computation of HHI, not only affects quality but can also be affected by quality, e.g., facilities that provide higher quality are able to attract more customers and thereby enjoying higher market shares. Similarly, the number of competitors in a market and quality can both be affected by unobserved factors such as costs of providing care in specific areas or type of care, thereby resulting in an endogeneity or confounding problem. Besides competition, prices are also potentially subject to endogeneity or confounding, as both quality and prices, especially consumer prices, can to some extent be influenced by the decision of providers. To what extent these issues will affect the results are questions to be addressed in future research.

6 Conclusions

To study the relationship between competition, quality and price in the residential aged care sector in Australia, this paper constructs three measures of competition and relates these measures to several measures of quality and prices. We find that more competition is not consistently associated with higher quality or lower prices. We also examine the quality and price differences by ownership type and find that government-owned facilities charge lower prices and provide better quality of care at least for some domains of quality measures. This is the case after controlling for competition. Our results suggest there is no effective competition in the current aged care sector. Therefore, policies should focus on addressing sources of market failure before market forces could be relied on for resource allocation in aged care. First, a system of public rating and reporting of quality of care aiming at facilitating consumer choice is key infrastructure that is still currently missing in the residential aged care sector. Second, price transparency, or the lack of it, is another source of market failures that requires policy actions. The current pricing structure should be simplified so that consumers can compare products and services from different providers with reasonable ease.

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Appendix A: Results from additional Quality Indicators

This appendix presents results obtained from five additional quality measures constructed by the Royal Commission in accordance to indicators developed by the Registry of Senior Australian's (ROSA) Outcome Monitoring System specifications (Inacio et al., 2020). Data for all five measures are available for the period 2014/15 to 2018/19. The indicators measure, for each facility, the proportion of residents experiencing five types of adverse events listed below. Note that all measures have been adjusted for casemix.

- Adverse medication events, adjusted rate.
- Dementia hospitalisation, adjusted rate.
- Emergence department (ED) presentation after reentry, adjusted rate.
- Falls, adjusted rate.
- Fractures, adjusted rate.
- Pressure injuries, adjusted rate.

Summary statistics of the five quality measures are presented in Tables A1 and A2, wherein statistics in the latter are shown by provider type. The total number of observations across five years for each quality measure range from 12,569 to 13,090. The distributions are approximately symmetric, since for each measure the mean and median values are about the same. The adverse events with the highest and lowest rate are ED presentation and adverse medication events. On average and adjusted for casemix, about 20% of residents per facility experienced an ED presentation while about 1.6% experienced an adverse medication event per facility.

Table A1: Summary statistics of additional quality measures

	Mean	Median	Std dev	N
Adverse medication	0.005	0.000	0.011	13,091
Dementia hospitalisation	0.035	0.028	0.038	12,915
ED presentation	0.202	0.196	0.117	12,570
Falls	0.092	0.084	0.058	13,090
Pressure Injuries	0.033	0.028	0.029	13,091

Table A2: Summary statistics of additional quality measures by ownership type

	For profit		Government		Not for profit	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
Adverse medication	0.005	0.007	0.004	0.013	0.006	0.012
Dementia hospitalisation	0.038	0.033	0.020	0.045	0.035	0.039
ED presentation	0.201	0.097	0.133	0.133	0.211	0.122
Falls	0.090	0.048	0.059	0.064	0.099	0.061
Pressure Injuries	0.037	0.028	0.018	0.026	0.033	0.029

Government-owned facilities have lower rates of adverse events on average across all five measures, when compared to private for-profit and not-for-profit facilities, whereas the latter two ownership types have roughly similar average rates.

We estimate regression equations of the same form as in (1), which we reproduce below.

$$Qual_{it} = \beta Comp_{it} + X_{it}\gamma + \epsilon_{it}.$$

This regression is implemented for each of the quality measure above. As before, the coefficient of interest is β, estimates of which are summarised for each quality measure in Table A3. Overall there are few statistically significant estimates, suggesting that competition is not related to quality of care in most cases. This result is consistent with the results reported earlier in the main text using other quality measures. There is some indication that adverse medication events are more likely for facilities in highly uncompetitive markets, as measured by the distance to the 3rd closest competitor beyond 50km and HHI above 0.6 (but no significant relationship is found when competition is measured using the number of competitors within 10km). Similarly, facilities in less competitive markets also tend to have more ED presentations if competition is measured using the distance to the 3rd closest competitor and HHI, but the association is reverse if competition is measured using the number of competitors within 10km. In the latter case facilities with more competitors appear to be associated with having more ED presentations.

Table A4 reports the estimates on provider ownership status, also reported are estimates on provider price. Government-owned facilities are found to provide significantly better quality of care than for-profit and not-for-profit facilities in all five measures, and this is the case regardless of which measure of competition is used in the regression. Not-for-profit facilities are found to perform better than for-profit facilities in some measures, e.g., pressure injuries but worse in others, e.g., falls. Lastly, the estimates on provider price are consistently negative, suggesting that higher prices are associated with better quality of care in all measures except pressure injuries, where the estimates are no

Table A3: Regression results, effects of competition on quality

	Adverse Medication	Dementia hospitalisation	ED presentation	Falls	Pressure Injuries
No. competitors 10km (Ref: No comp.)					
1–3 comp.	0.0004	0.0025	0.0112	0.0023	-0.0018
	(0.001)	(0.002)	(0.007)	(0.003)	(0.001)
4–10 comp.	-0.0001	0.0021	0.0220*	-0.0023	-0.0014
	(0.001)	(0.002)	(0.009)	(0.004)	(0.002)
11–25 comp.	-0.0003	0.0043	0.0273**	0.0049	-0.0000
	(0.001)	(0.003)	(0.010)	(0.005)	(0.002)
26 or more comp.	-0.0008	0.0014	0.0192	0.0031	-0.0008
	(0.001)	(0.004)	(0.012)	(0.006)	(0.003)
N	11,756	11,617	11,308	11,755	11,756
Adjusted R^2	0.116	0.124	0.223	0.288	0.247
Distance to 3rd closest (Ref: 0 km $\leq$ dist $\leq$ 2 km)					
2 km$<$ dist $\leq$5 km	0.0005*	0.0019	0.0092*	0.0001	-0.0007
	(0.000)	(0.001)	(0.004)	(0.002)	(0.001)
5 km$<$ dist $\leq$20 km	0.0007*	0.0007	0.0006	0.0025	0.0008
	(0.000)	(0.002)	(0.005)	(0.003)	(0.001)
20 km$<$ dist $\leq$50 km	0.0013	0.0040	-0.0030	0.0051	0.0005
	(0.001)	(0.002)	(0.008)	(0.003)	(0.002)
dist. $>$ 50 km	0.0028*	0.0020	-0.0017	0.0198**	-0.0013
	(0.001)	(0.003)	(0.014)	(0.006)	(0.002)
N	12,303	12,162	11,844	12,302	12,303
Adjusted R^2	0.114	0.125	0.221	0.288	0.247
HHI (Ref: $0 \leq$ HHI ≤ 0.02)					
$0.02 <$ HHI ≤ 0.05	0.0005	0.0006	0.0095	0.0033	-0.0018
	(0.000)	(0.002)	(0.007)	0.003)	(0.002)
$0.05 <$ HHI ≤ 0.15	0.0012	0.0060	0.0218*	0.0071	0.0001
	(0.001)	(0.003)	(0.009)	(0.005)	(0.002)
$0.15 <$ HHI ≤ 0.60	0.0014	0.0050	0.0260*	0.0038	-0.0004
	(0.001)	(0.004)	(0.011)	(0.006)	(0.003)
HHI > 0.60	0.0022*	0.0045	0.0196	0.0095	0.0005
	(0.001)	(0.004)	(0.012)	(0.006)	(0.003)
N	12,303	12,162	11,844	12,302	12,303
Adjusted R^2	0.114	0.125	0.221	0.287	0.247

Figures in parentheses are robust standard errors.
Significance levels: *: 5% **: 1% ‡: 0.1%

different from zero.

In summary, the use of the additional five quality measures in this appendix corroborates the main findings presented in the text. First, the evidence does not suggest that more competition is associated with higher quality. Second, quality of care differs between facilities with different ownership status; in particular, government-owned facilities appear

Table A4: Regression results, effects of ownership and price on quality

	Adverse Medic-ation	Dementia hospital-isation	ED present-ation	Falls	Pressure Injuries
No. competitors 10 km					
Ownership type (Ref: For profit)					
Government owned	-0.0004‡	-0.0106‡	-0.0264‡	-0.0190‡	-0.0087‡
	(0.001)	(0.002)	(0.008)	(0.004)	(0.002)
Not for profit	0.0005*	-0.0009	0.0054	0.0091‡	-0.0026‡
	(0.000)	(0.001)	(0.003)	(0.002)	(0.001)
Ave. provider price (log)	-0.0052‡	-0.0190‡	-0.0670‡	-0.0708‡	0.0025
	(0.001)	(0.003)	(0.010)	(0.005)	(0.002)
Distance to 3rd closest					
Ownership type (Ref: For profit)					
Government owned	-0.0009	-0.0104‡	-0.0342‡	-0.0230‡	-0.0089‡
	(0.001)	(0.002)	(0.008)	(0.004)	(0.001)
Not for profit	0.0005*	-0.0011	0.0054	0.0088‡	-0.0026‡
	(0.000)	(0.001)	(0.003)	(0.002)	(0.001)
Ave. provider price (log)	-0.0050‡	-0.0204‡	-0.0633‡	-0.0703‡	0.0029
	(0.001)	(0.004)	(0.010)	(0.005)	(0.002)
HHI					
Ownership type (Ref: For profit)					
Government owned	-0.0007	-0.0102	-0.0342‡	-0.0210‡	-0.0091‡
	(0.001)	(0.002)	(0.008)	(0.004)	(0.001)
Not for profit	0.0005*	-0.0011	0.0054	0.0086‡	-0.0025‡
	(0.000)	(0.001)	(0.003)	(0.002)	(0.001)
Ave. provider price (log)	-0.0050‡	-0.0207	-0.0628‡	-0.0702‡	0.0027
	(0.001)	(0.004)	(0.010)	(0.005)	(0.002)

Figures in parentheses are robust standard errors.
Significance levels: *: 5% **: 1% ‡: 0.1%

to offer higher quality of care than for-profit and not-for-profit facilities.

Appendix B: List of Regression Coefficients

This Appendix contains a complete listing of all coefficient estimates obtained from the regression estimation of quality and price equations. Tables B1–B3 list the coefficient estimates for regressing quality on the three competition measures, as specified in eq. (1). Table B4 lists the estimates of regressing consumer prices on competition measures as specified in eq. (2).

Table B1: Regression of quality on number of competitors, all coefficient estimates

	Antipsy-chotic use	Premature mortality	Assaults	RN hrs	Total care hrs	complaints
No. competitors 10 km (Ref: No comp.)						
1–3 comp.	0.0037	-0.0002	-0.0020	-0.0225	-0.1035	-0.0014
	(0.006)	(0.001)	(0.002)	(0.039)	(0.074)	(0.002)
4–10 comp.	0.0024	0.0002	0.0006	-0.0170	-0.1411*	-0.0043
	(0.007)	(0.001)	(0.002)	(0.032)	(0.069)	(0.002)
11–25 comp.	0.0003	0.0005	0.0010	0.0039	-0.1634	-0.0042
	(0.010)	(0.001)	(0.002)	(0.038)	(0.089)	(0.003)
26 or more comp.	0.0055	0.0003	0.0024	0.0232	-0.2371*	-0.0024
	(0.012)	(0.001)	(0.003)	(0.042)	(0.101)	(0.004)
Ave. provider price (log)	0.0843‡	0.0000	0.0171‡	0.3723‡	1.2651‡	0.0106‡
	(0.008)	(0.001)	(0.003)	(0.052)	(0.127)	(0.003)
No. of approv. places (log)	-0.0013	0.0005	0.0021*	0.0063	0.1459‡	-0.0026*
	(0.003)	(0.000)	(0.001)	(0.014)	(0.029)	(0.001)
Ownership type (Ref: For profit)						
Government owned	0.0245**	-0.0003	0.0053**	0.2660‡	1.0208‡	-0.0136‡
	(0.008)	(0.001)	(0.002)	(0.052)	(0.114)	(0.002)
Not for profit	-0.0000	0.0006*	-0.0008	-0.0809‡	0.0742**	-0.0091‡
	(0.003)	(0.000)	(0.001)	(0.011)	(0.0270)	(0.001)
SEIFA decile (Ref: 1st decile)						
2nd decile	-0.0021	0.0005	-0.0027	-0.0166	-0.0586	-0.0038
	(0.007)	(0.001)	(0.002)	(0.027)	(0.052)	(0.003)
3rd decile	0.0089	0.0015	-0.0035	0.0606	0.0049	-0.0050
	(0.007)	(0.001)	(0.002)	(0.031)	(0.065)	(0.003)
4th decile	0.0012	-0.0001	-0.0004	0.0620**	0.0693	-0.0052
	(0.007)	(0.001)**	(0.002)	(0.026)	(0.062)	(0.003)
5th decile	0.0006	0.0019	-0.0058*	0.0176	-0.0458	-0.0037
	(0.008)	(0.001)	(0.002)	(0.026)	(0.057)	(0.003)
6th decile	0.0141	0.0004	-0.0070**	0.0046	0.0058	-0.0081**
	(0.008)	(0.001)	(0.002)	(0.037)	(0.072)	(0.003)
7th decile	-0.0069	-0.0008	0.0010	0.0859**	0.0870	-0.0082**
	(0.008)	(0.001)	(0.003)	(0.033)	(0.069)	(0.003)
8th decile	0.0039	0.0011	-0.0047	0.0996‡	0.0763	-0.0091*
	(0.009)	(0.001)	(0.003)	(0.031)	(0.077)	(0.004)
9th decile	0.0128	0.0016	-0.0000	0.0818**	0.0447	-0.0076*
	(0.009)	(0.001)	(0.003)	(0.033)	(0.085)	(0.004)
10th decile	0.0082	0.0019	-0.0029	0.0774*	0.0711	-0.0066
	(0.011)	(0.001)	(0.004)	(0.038)	(0.102)	(0.004)
Financial year (Ref: 2014/15)						
2015/16	-0.0152‡	0.0005	-0.0009	-0.0458‡	-0.1735‡	-0.0012
	(0.002)	(0.000)	(0.001)	(0.009)	(0.023)	(0.001)
2016/17	-0.0206‡	0.0006	-0.0010	-0.0486‡	-0.1998‡	0.0000
	(0.002)	(0.000)	(0.001)	(0.011)	(0.027)	(0.001)
2017/18	–	–	0.0037‡	-0.0504‡	-0.1570‡	0.0031**
			(0.001)	(0.012)	(0.030)	(0.001)
2018/19	–	–	0.0095‡	-0.0658‡	-0.1427‡	0.0093‡
			(0.001)	(0.015)	(0.036)	(0.001)
Constant	-0.2460‡	-0.0036	-0.0709‡	-1.5670‡	-4.6561‡	-0.0193
	(0.050)	(0.005)	(0.015)	(0.276)	(0.748)	(0.016)
N	6,917	6,921	11,788	5,692	5,692	11,788
Adjusted R^2	0.148	0.011	0.082	0.334	0.303	0.070

Note: figures in parentheses are robust standard errors.
Significance levels: *: 5% **: 1% ‡: 0.1%

Table B2: Regression of quality on distance to third closest competitor, all coefficient estimates

	Antipsy-chotic use	Premature mortality	Assaults	RN hrs	Total care hrs	complaints
Distance to 3rd closest (Ref: 0 km $\leq$ dist $\leq$ 2 km)						
2 km $<$ dist $\leq$ 5 km	-0.0030	0.0001	0.0010	-0.0252	-0.0398	-0.0006
	(0.004)	(0.000)	(0.001)	(0.014)	(0.031)	(0.001)
5 km $<$ dist $\leq$ 20 km	-0.0026	-0.0003	0.0022	-0.0098	0.0427	0.0024
	(0.005)	(0.001)	(0.002)	(0.017)	(0.039)	(0.002)
20 km $<$ dist $\leq$ 50 km	-0.0090	0.0001	0.0015	-0.0515	0.0775	-0.0011
	(0.007)	(0.001)	(0.002)	(0.029)	(0.062)	(0.002)
dist. $>$ 50 km	-0.0072	-0.0007	-0.0017	0.0903	0.2237	-0.0002
	(0.012)	(0.001)	(0.003)	(0.096)	(0.181)	(0.004)
Ave. provider price (log)	0.0808‡	0.0004	0.0182‡	0.3653‡	1.2318‡	0.0104‡
	(0.008)	(0.001)	(0.003)	(0.048)	(0.122)	(0.003)
No. of approv. places (log)	-0.0009	0.0006	0.0020*	0.0065	0.1443‡	-0.0031**
	(0.003)	(0.000)	(0.001)	(0.013)	(0.028)	(0.001)
Ownership type (Ref: For profit)						
Government owned	0.0236**	0.0003	0.0062**	0.2485‡	0.9961‡	-0.0127‡
	(0.008)	(0.001)	(0.002)	(0.049)	(0.111)	(0.002)
Not for profit	-0.0007	0.0008**	-0.0010	-0.0773‡	0.0772**	-0.0090‡
	(0.003)	(0.000)	(0.001)	(0.011)	(0.026)	(0.001)
SEIFA decile (Ref: 1st decile)						
2nd decile	-0.0002	0.0006	-0.0035	-0.0163	-0.0846	-0.0053
	(0.007)	(0.001)	(0.002)	(0.026)	(0.053)	(0.003)
3rd decile	0.0102	0.0014	-0.0043	0.0481	-0.0120	-0.0061*
	(0.007)	(0.001)	(0.002)	(0.028)	(0.061)	(0.003)
4th decile	0.0027	-0.0001	-0.0018	0.0507*	0.0519	-0.0069*
	(0.007)	(0.001)	(0.002)	(0.025)	(0.060)	(0.003)
5th decile	0.0013	0.0018*	-0.0066**	0.0131	-0.0579	-0.0046
	(0.007)	(0.001)	(0.002)	(0.026)	(0.058)	(0.003)
6th decile	0.0143	0.0003	-0.0080‡	0.0079	0.0047	-0.0092**
	(0.008)	(0.001)	(0.002)	(0.035)	(0.070)	(0.003)
7th decile	-0.0071	0.0008	-0.0022	0.0781*	0.0672	-0.0095**
	(0.008)	(0.001)	(0.003)	(0.032)	(0.070)	(0.003)
8th decile	0.0037	0.0010	-0.0053	0.0983‡	0.0629	-0.0107**
	(0.009)	(0.001)	(0.003)	(0.031)	(0.078)	(0.004)
9th decile	0.0133	0.0015	-0.0008	0.0798*	0.0344	-0.0087*
	(0.009)	(0.001)	(0.003)	(0.032)	(0.085)	(0.004)
10th decile	0.0087	0.0018	-0.0038	0.0788*	0.0639	-0.0078
	(0.011)	(0.001)	(0.004)	(0.037)	(0.101)	(0.004)
Financial year (Ref: 2014/15)						
2015/16	-0.0149‡	0.0003	-0.0010	-0.0452‡	-0.1716‡	-0.0014
	(0.002)	(0.000)	(0.001)	(0.009)	(0.023)	(0.001)
2016/17	-0.0206‡	0.0004	-0.0010	-0.0476‡	-0.1946‡	-0.0000
	(0.002)	(0.000)	(0.001)	(0.010)	(0.026)	(0.001)
2017/18	–	–	0.0037‡	-0.0499‡	-0.1512‡	0.0032‡
			(0.001)	(0.012)	(0.029)	(0.001)
2018/19	–	–	0.0091‡	-0.0639‡	-0.1325‡	0.0095‡
			(0.001)	(0.014)	(0.035)	(0.001)
Constant	-0.2237‡	-0.0058	-0.0767‡	-1.5159‡	-4.6695‡	-0.0213
	(0.049)	(0.005)	(0.015)	(0.261)	(0.730)	(0.016)
N	7,234	7,238	12,338	5,942	5,942	12,338
Adjusted R^2	0.150	0.012	0.080	0.334	0.299	0.070

Note: figures in parentheses are robust standard errors.
Significance levels: *: 5% **: 1% ‡: 0.1%

Table B3: Regression of quality on HHI, all coefficient estimates

	Antipsy-chotic use	Premature mortality	Assaults	RN hrs	Total care hrs	complaints
HHI (Ref: $0 \leq$ HHI ≤ 0.02)						
$0.02 <$ HHI ≤ 0.05	-0.0117	0.0005	-0.0007	-0.0505*	-0.0716	-0.0030
	(0.006)	(0.001)	(0.002)	(0.023)	(0.066)	(0.002)
$0.05 <$ HHI ≤ 0.15	-0.0135	0.0007	-0.0004	-0.0731*	-0.0094	-0.0025
	(0.009)	(0.001)	(0.003)	(0.029)	(0.083)	(0.003)
$0.15 <$ HHI ≤ 0.60	-0.0163	0.0003	-0.0006	-0.0838*	-0.0267	-0.0022
	(0.011)	(0.001)	(0.003)	(0.035)	(0.098)	(0.004)
HHI > 0.60	-0.0213	0.0002	-0.0022	-0.0921*	0.0461	-0.0009
	(0.012)	(0.001)	(0.003)	(0.043)	(0.106)	(0.004)
Ave. provider price (log)	0.0807‡	0.0004	0.0180‡	0.3702‡	1.2314‡	0.0105‡
	(0.008)	(0.001)	(0.003)	(0.050)	(0.124)	(0.003)
No. of approv. places (log)	-0.0013	0.0006	0.0018*	0.0052	0.1400‡	-0.0029*
	(0.003)	(0.000)	(0.001)	(0.013)	(0.029)	(0.001)
Ownership type (Ref: For profit)						
Government owned	0.0233**	0.0002	0.0059**	0.2637‡	1.0260‡	-0.0129‡
	(0.007)	(0.001)	(0.002)	(0.048)	(0.107)	(0.002)
Not for profit	-0.0006	0.0008**	-0.0009	-0.0772‡	0.0755**	-0.0091‡
	(0.003)	(0.000)	(0.001)	(0.011)	(0.026)	(0.001)
SEIFA decile (Ref: 1st decile)						
2nd decile	-0.0006	0.0006	-0.0035	-0.0095	-0.0657	-0.0054
	(0.007)	(0.001)	(0.002)	(0.025)	(0.051)	(0.003)
3rd decile	0.0106	0.0013	-0.0042	0.0591*	0.0012	-0.0062*
	(0.007)	(0.001)	(0.002)	(0.030)	(0.065)	(0.003)
4th decile	0.0031	-0.0001	-0.0017	0.0544*	0.0642	-0.0070*
	(0.007)	(0.001)	(0.002)	(0.025)	(0.060)	(0.003)
5th decile	0.0011	0.0017*	-0.0065**	0.0195	-0.0452	-0.0048
	(0.007)	(0.001)	(0.002)	(0.026)	(0.057)	(0.003)
6th decile	0.0145	0.0003	-0.0077‡	0.0097	0.0059	-0.0092**
	(0.008)	(0.001)	(0.002)	(0.036)	(0.071)	(0.003)
7th decile	-0.0071	0.0008	-0.0020	0.0828**	0.0737	-0.0094**
	(0.008)	(0.001)	(0.003)	(0.032)	(0.070)	(0.003)
8th decile	0.0033	0.0010	-0.0051	0.0991‡	0.0695	-0.0107**
	(0.009)	(0.001)	(0.003)	(0.031)	(0.077)	(0.004)
9th decile	0.0138	0.0014	-0.0004	0.0860**	0.0432	-0.0086*
	(0.009)	(0.001)	(0.003)	(0.033)	(0.085)	(0.003)
10th decile	0.0083	0.0018	-0.0034	0.0788*	0.0653	-0.0078
	(0.011)	(0.001)	(0.004)	(0.037)	(0.102)	(0.004)
Financial year (Ref: 2014/15)						
2015/16	-0.0148‡	0.0003	-0.0010	-0.0450‡	-0.1694‡	-0.0014
	(0.002)	(0.000)	(0.001)	(0.009)	(0.023)	(0.001)
2016/17	-0.0204‡	0.0004	-0.0010	-0.0478‡	-0.1927‡	-0.0000
	(0.002)	(0.000)	(0.001)	(0.010)	(0.027)	(0.001)
2017/18	–	–	0.0037‡	-0.0505‡	-0.1496‡	0.0032**
			(0.001)	(0.012)	(0.029)	(0.001)
2018/19	–	–	0.0091‡	-0.0652‡	-0.1312‡	0.0095‡
			(0.001)	(0.014)	(0.036)	(0.001)
Constant	-0.2095‡	-0.0062	-0.0726‡	-1.4887‡	-4.5745‡	-0.0183
	(0.049)	(0.005)	(0.015)	(0.271)	(0.740)	(0.016)
N	7,234	7,238	12,338	5,942	5,942	12,338
Adjusted R^2	0.150	0.012	0.079	0.331	0.297	0.070

Note: figures in parentheses are robust standard errors.
Significance levels: *: 5% **: 1% ‡: 0.1%

Table B4: Regression of consumer price on competition, all coefficient estimates

Dep variable: log(consumer price)			
	No. competitors within 10km	Distance to 3rd closest	HHI, 10km market
Competition cat. (Ref: Cat. 1)			
Cat. 2	-0.0600*	0.0019	0.0670
	(0.030)	(0.030)	(0.057)
Cat. 3	-0.1121**	0.0499	0.1076
	(0.039)	(0.034)	(0.077)
Cat. 4	-0.0338	0.0538	0.0639
	(0.056)	(0.040)	(0.086)
Cat. 5	-0.0776	0.1413**	0.1306
	(0.077)	(0.055)	(0.088)
Assaults per resident	-0.9613‡	-1.0351‡	-1.0313‡
	(0.299)	(0.285)	(0.286)
Number of approved places	0.0034‡	0.0033‡	0.0034‡
	(0.000)	(0.000)	(0.000)
Adjusted NWAU	0.0266	-0.0274	-0.0180
	(0.113)	(0.115)	(0.113)
Ownership type (Ref: For profit)			
Government owned	-0.2271‡	-0.2379‡	-0.2277‡
	(0.044)	(0.042)	(0.042)
Not for profit	-0.0767**	-0.0777**	-0.0789‡
	(0.025)	(0.025)	(0.024)
SEIFA decile (Ref: 1st decile)			
2nd decile	0.1477‡	0.1579‡	0.1651‡
	(0.040)	(0.039)	(0.038)
3rd decile	0.2442‡	0.2622‡	0.2573‡
	(0.043)	(0.041)	(0.041)
4th decile	0.3097‡	0.3087‡	0.3096‡
	(0.046)	(0.044)	(0.044)
5th decile	0.3081‡	0.3069‡	0.3103‡
	(0.048)	(0.047)	(0.047)
6th decile	0.4059‡	0.4230‡	0.4189‡
	(0.049)	(0.047)	(0.047)
7th decile	0.4226‡	0.4398‡	0.4406‡
	(0.059)	(0.058)	(0.057)
8th decile	0.5118‡	0.5169‡	0.5189‡
	(0.063)	(0.061)	(0.061)
9th decile	0.5416‡	0.5530‡	0.5479‡
	(0.071)	(0.069)	(0.070)
10th decile	0.6502‡	0.6624‡	0.6623‡
	(0.091)	(0.089)	(0.089)
Financial year (Ref: 2014/15)			
2015/16	0.3739‡	0.3716‡	0.3720‡
	(0.016)	(0.015)	(0.015)
2016/17	0.4517‡	0.4462‡	0.4456‡
	(0.016)	(0.016)	(0.016)
2017/18	0.5145‡	0.5117‡	0.5113‡
	(0.016)	(0.016)	(0.016)
2018/19	0.6224‡	0.6215‡	0.6214‡
	(0.017)	(0.017)	(0.017)
Constant	2.3095‡	2.2038‡	2.1712‡
	(0.295)	(0.294)	(0.309)
N	11,717	12,265	12,265
Adjusted R^2	0.347	0.346	0.347

Note: figures in parentheses are robust standard errors.
Competition categories:
No. of competitors: Cat. 1= No comp., Cat. 2= 1–3, Cat. 3= 4–10, Cat. 4= 11–25, Cat. 5= 26 or more competitors.
Distance to 3rd closest: Cat. 1= 0–2km, Cat. 2= 2–5km, Cat. 3= 5–10km, Cat. 4= 20–50km, Cat. 5= more than 50km.
HHI: Cat. 1= [0, 0.02], Cat. 2= (0.02, 0.05], Cat. 3= (0.05, 0.15], Cat. 4= (0.15, 0.60], Cat. 5= (0.60, 1]
Significance levels: *: 5% **: 1% ‡: 0.1%

Appendix C: Summary Statistics

C.1 Summary statistics on competition measures

This section lists additional summary statistics on the three measures of competition constructed in this paper: HHI, the number of competitors within 10 km, and the distance to the third closest competitor.

Table C1: Average HHI, by provider type, selected years

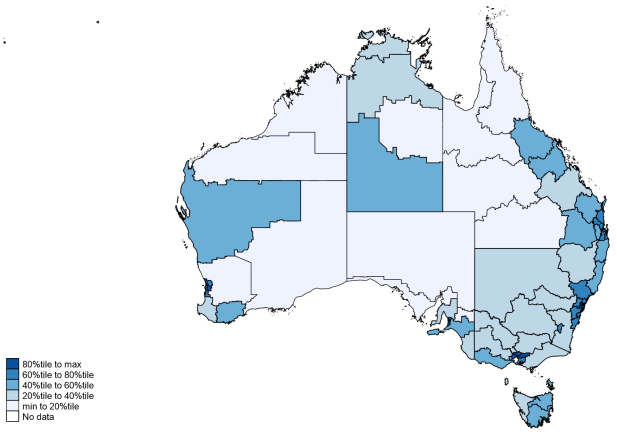
	2008/09		2013/14		2018/19	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
For profit	0.10	0.18	0.12	0.19	0.11	0.18
Government	0.58	0.39	0.61	0.38	0.62	0.37
Not for profit	0.27	0.34	0.28	0.35	0.28	0.35

Table C2: Average no. competitors within 10 km, by provider type, selected years

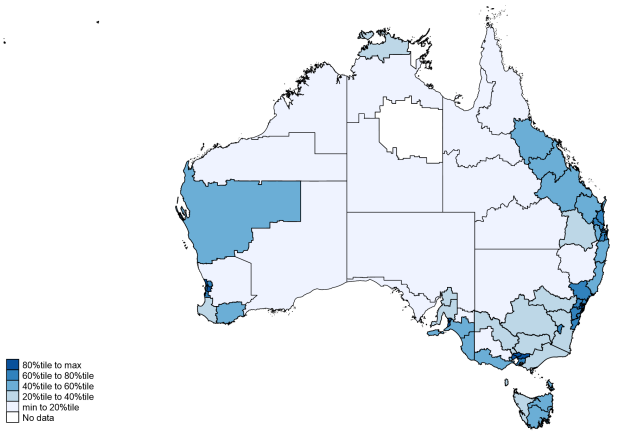
	2008/09		2013/14		2018/19	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
For profit	52.16	43.23	46.71	40.18	43.99	37.62
Government	11.06	29.09	7.89	23.37	5.26	17.86
Not for profit	32.46	40.35	30.53	37.56	29.69	36.01

Table C3: Average distance to 3rd closest competitor, by provider type, selected years

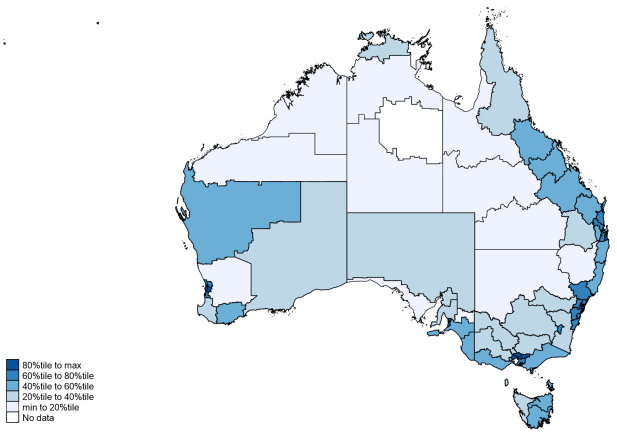
	2008/09		2013/14		2018/19	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
For profit	4.19	12.80	5.82	24.08	4.52	7.30
Government	76.14	153.43	111.52	258.33	144.85	402.18
Not for profit	20.28	62.87	24.74	112.16	22.60	83.21



(a) Competition map, FY 2008/09



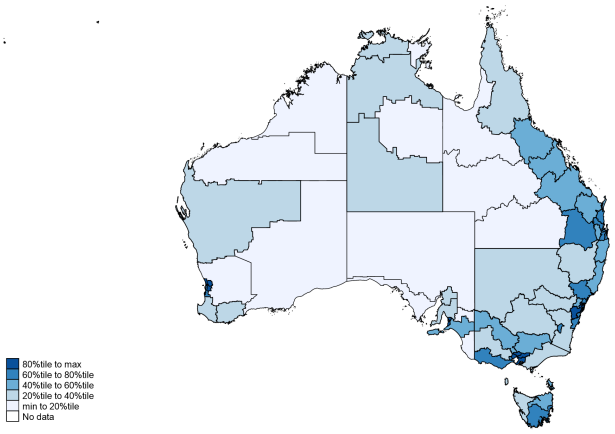
(b) Competition map, FY 2013/14



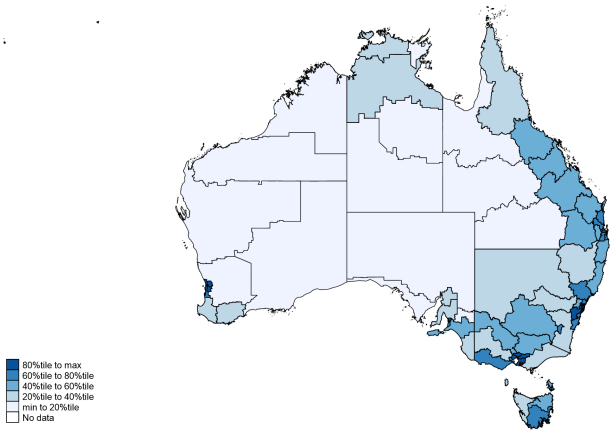
(c) Competition map, FY 2018/19

Figure C1: Aged care competition measured by HHI [10]

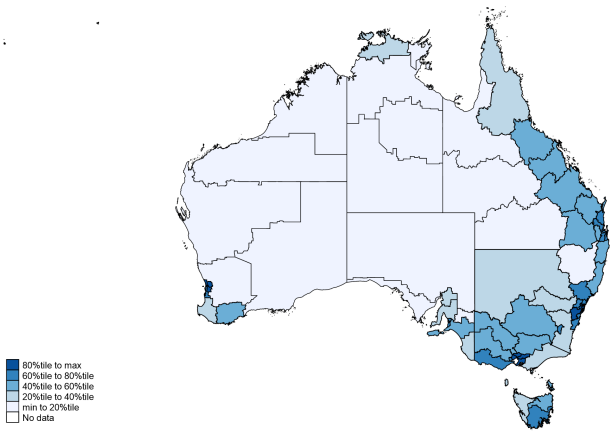
[10]Maps of competition adjusted for population is available upon request



(a) Competition map, FY 2008/09



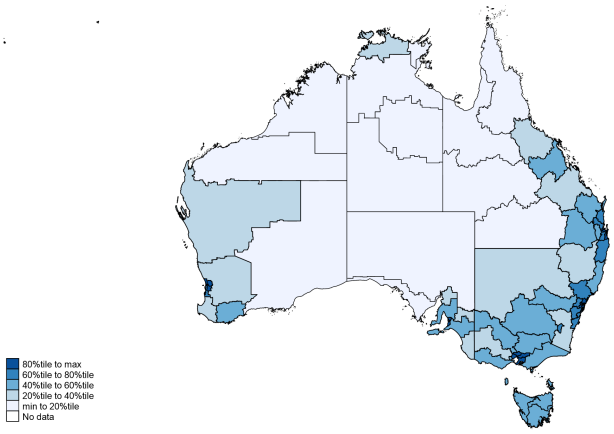
(b) Competition map, FY 2013/14



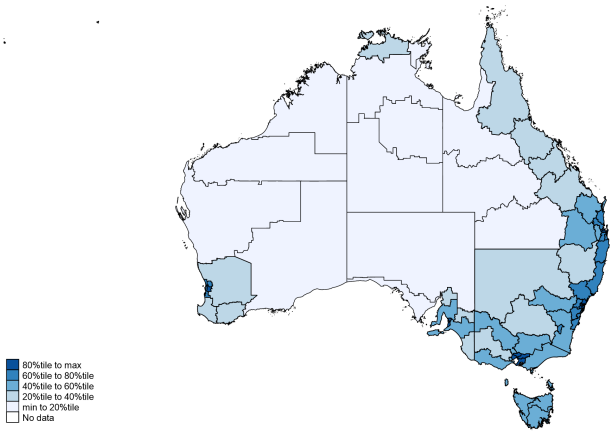
(c) Competition map, FY 2018/19

Figure C2: Aged care competition measured by no. competitors within 10 km [11]

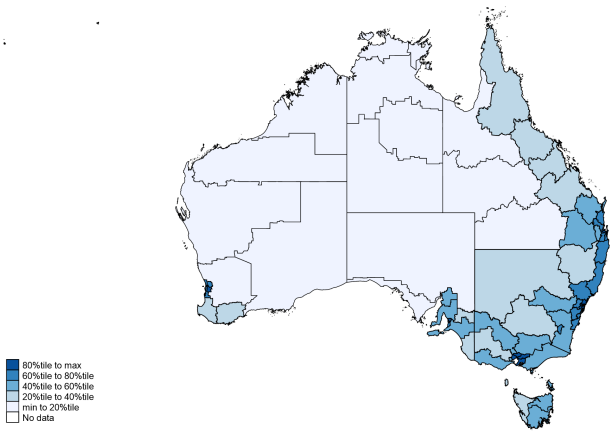
[11] Maps of competition adjusted for population is available upon request



(a) Competition map, FY 2008/09



(b) Competition map, FY 2013/14



(c) Competition map, FY 2018/19

Figure C3: Aged care competition measured by distance to 3rd closest competitor [12]

[12]Maps of competition adjusted for population is available upon request

C.2 Summary statistics on measures of quality

This section presents several tables of summary statistics on the measures of quality used as dependent variables in the regression analyses in the paper. The measures of quality are: Rate of antipsychotic use, rate of premature mortality, number of reported assaults per resident, number of complaints per resident, RN hours per resident-day and total care hours per resident-day. The first two measures were constructed by the Royal Commission in accordance to indicators developed by the Registry of Senior Australian's (ROSA) Outcome Monitoring System specifications (Inacio et al., 2020).

Table C4: Average rates of antipsychotic use and premature mortality, by provider type and financial year

	Antipsychotic use				Premature mortality			
	2013/14	2014/15	2015/16	2016/17	2013/14	2014/15	2015/16	2016/17
For profit	0.253	0.246	0.240	0.235	0.006	0.005	0.006	0.006
	(0.072)	(0.070)	(0.069)	(0.066)	(0.009)	(0.009)	(0.009)	(0.009)
Government	0.249	0.253	0.247	0.242	0.006	0.007	0.007	0.007
	(0.114)	(0.117)	(0.116)	(0.115)	(0.015)	(0.019)	(0.018)	(0.017)
Not for profit	0.231	0.230	0.224	0.222	0.005	0.006	0.006	0.006
	(0.084)	(0.082)	(0.080)	(0.080)	(0.010)	(0.010)	(0.012)	(0.011)

Note: standard deviations are in parentheses

Table C5: Average no. reported assaults and complaints per resident, by provider type and financial year

	No. reported assaults					No. complaints				
	2014/15	2015/16	2016/17	2017/18	2018/19	2014/15	2015/16	2016/17	2017/18	2018/19
For profit	0.018	0.019	0.019	0.024	0.032	0.025	0.026	0.027	0.031	0.040
	(0.024)	(0.023)	(0.027)	(0.030)	(0.038)	(0.033)	(0.036)	(0.034)	(0.038)	(0.044)
Government	0.008	0.006	0.006	0.012	0.017	0.014	0.015	0.013	0.013	0.023
	(0.023)	(0.019)	(0.019)	(0.031)	(0.049)	(0.041)	(0.046)	(0.029)	(0.040)	(0.039)
Not for profit	0.014	0.015	0.016	0.021	0.027	0.018	0.016	0.018	0.022	0.028
	(0.023)	(0.031)	(0.031)	(0.036)	(0.042)	(0.035)	(0.030)	(0.033)	(0.052)	(0.042)

Note: standard deviations are in parentheses

Table C6: Average RN hours and total care hours per resident-day, by provider type and financial year

	RN hours					Total care hours				
	2014/15	2015/16	2016/17	2017/18	2018/19	2014/15	2015/16	2016/17	2017/18	2018/19
For profit	0.444	0.449	0.475	0.465	0.469	2.911	2.913	2.941	2.943	3.065
	(0.169)	(0.154)	(0.168)	(0.156)	(0.152)	(0.507)	(0.383)	(0.370)	(0.357)	(0.350)
Government	0.876	0.712	0.732	0.775	0.795	3.871	3.654	3.675	3.860	3.857
	(0.639)	(0.561)	(0.545)	(0.563)	(0.578)	(1.121)	(1.032)	(1.003)	(1.053)	(0.987)
Not for profit	0.332	0.354	0.353	0.365	0.390	2.906	2.883	2.872	2.992	3.089
	(0.251)	(0.221)	(0.199)	(0.295)	(0.194)	(0.734)	(0.575)	(0.604)	(0.611)	(0.598)

Note: standard deviations are in parentheses

C.3 Summary statistics on measures of prices and other covariates

This section present some summary statistics on two measures of prices and several other covariates included in the regression equations on quality and prices. The two price measures are average prices at facility level, the first is average payment made by consumers at a facility (consumer price) and the second is average payment received by providers at a facility (provider price). Summary statistics on three other covariates are also presented, these are number of resident places, casemix weights (NWAUs), and SEIFA quintiles at SA3 level,

Table C7: Average consumer and provider prices, by provider type and financial year

	Average consumer price					Average provider price				
	2014/15	2015/16	2016/17	2017/18	2018/19	2014/15	2015/16	2016/17	2017/18	2018/19
For profit	30.746	47.174	48.625	52.474	56.796	223.409	248.622	254.199	260.235	273.787
	(33.858)	(40.519)	(39.513)	(41.159)	(40.962)	(35.857)	(30.934)	(28.786)	(28.638)	(28.418)
Government	28.058	27.042	30.080	30.265	33.159	189.630	201.058	208.716	212.778	224.819
	(26.209)	(18.326)	(20.997)	(14.320)	(14.685)	(42.090)	(37.383)	(41.450)	(35.912)	(34.929)
Not for profit	26.721	34.722	38.325	38.657	42.698	197.922	218.905	229.358	234.863	251.628
	(27.252)	(26.578)	(28.619)	(23.519)	(25.009)	(39.347)	(37.407)	(36.505)	(30.630)	(31.763)

Note: standard deviations are in parentheses

Table C8: Average number of resident places, by provider type and financial year

	2014/15	2015/16	2016/17	2017/18	2018/19
For profit	85.87	88.87	90.45	92.35	94.61
	(35.48)	(36.77)	(37.25)	(37.62)	(38.32)
Government	29.52	28.44	28.25	28.16	27.94
	(24.89)	(24.53)	(24.36)	(23.94)	(23.16)
Not for profit	69.36	70.22	71.53	73.19	74.37
	(39.85)	(40.21)	(41.41)	(41.86)	(42.04)

Note: standard deviations are in parentheses

Table C9: Average casemix weights (NWAUs), by provider type and financial year

	2014/15	2015/16	2016/17	2017/18	2018/19
For profit	1.05	1.05	1.05	1.04	1.04
	(0.09)	(0.08)	(0.07)	(0.07)	(0.07)
Government	1.00	0.98	0.98	0.97	0.97
	(0.22)	(0.15)	(0.16)	(0.17)	(0.17)
Not for profit	0.98	0.98	0.99	0.99	1.00
	(0.16)	(0.13)	(0.12)	(0.14)	(0.14)

Note: standard deviations are in parentheses

Table C10: SEIFA quintile by provider type

	2014/15	2015/16	2016/17	2017/18	2018/19
For profit	5.79	5.83	5.85	5.90	5.91
	(2.91)	(2.89)	(2.88)	(2.88)	(2.87)
Government	3.60	3.55	3.58	3.58	3.59
	(1.83)	(1.75)	(1.75)	(1.74)	(1.75)
Not for profit	5.04	5.04	5.01	5.03	5.02
	(2.93)	(2.94)	(2.92)	(2.93)	(2.92)

Note: standard deviations are in parentheses

C.4 Statistics by ACPR

We have collected statistics on measures of competition, quality, prices and other variables by ACPR in a spreadsheet, which can be accessed from this link: Descriptive Statistics by ACPR. The measures of quality are: Rate of antipsychotic use, rate of premature mortality, number of reported assaults per resident, number of complaints per resident, RN hours per resident-day and total care hours per resident-day. The first two measures were constructed by the Royal Commission in accordance to indicators developed by the Registry of Senior Australian's (ROSA) Outcome Monitoring System specifications (Inacio et al., 2020).

Appendix D: Analysis using alternative data sources on components of nursing home prices

The Appendix summarises the analysis from using an alternative source of data on various components of nursing home prices. As stated in the text, nursing home prices comprise various components, including (i) Daily care fees, including means-tested daily care fees, extra and additional service fees; (ii) amount of daily accommodation payment received during the financial year; (iii) amount of refundable accommodation deposits (RAD), refundable accommodation contribution (RAC), bond and entry contribution. The main data sources do not have any information on basic daily care fees and additional services fees.

Using the alternative data sources from the surveys conducted by Stewart Brown covering 2,208 nursing homes for the period 2014/15–2018/19, we are able to derive the following price components: (i) Basic daily care fees and subsidies and supplements from Commonwealth and state governments; (ii) additional service fees; (iii) capital grants provided from Commonwealth and state governments. The first two components are added to the consumer price calculation (which are also included in the provider price calculation by construction), and the third component is added to provider price only. It should be noted that the Steward Brown survey data were collected at the provider level. Thus for providers with multiple facilities, it is necessary to distribute these components to their constituent facilities. For this, we make use of a facility's share of total occupied bed days of permanent residents among all facilities owned by the provider.

Table D1 presents some basic summary statistics about the alternative provider and price variables we constructed. For comparison purposes, prices used in our main analysis are also presented in the same table. As expected, the average alternative prices are higher, by about 7% on provider price and 15% on consumer price, due to the additional components, but the sample size is substantially smaller.

Table D2 shows the summary statistics by ownership type. It remains the case that for-profit prices are the highest on average while government-owned facilities charge the lowest price. Thus although prices were underestimated in our main text, the pricing differences between facility types remain the same.

We perform the same pricing analysis as in the main text using the logarithm of consumer price as the dependent variable in the regression equation as specified in eq.(2). The

Table D1: Summary statistics of alternative price variables

	Mean	Std. dev.	Min	Max	N
Alternative price data					
Alt. provider price	252.53	35.30	105.48	466.95	4,383
Alt. consumer price	46.02	31.89	0.06	246.02	4,383
Main price data					
Main provider price	233.44	40.53	79.90	467.80	12,339
Main consumer price	39.33	31.77	0.06	248.30	12,339

Table D2: Summary statistics of alternative price variables by ownership type

	For profit		Government		Not for profit	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
Alternative price data						
Alt. provider price	272.70	28.48	227.52	47.08	246.52	31.61
Alt. consumer price	59.44	41.43	31.09	14.42	41.78	25.81
N	1,284		383		2,716	
Main price data						
Main provider price	252.61	34.40	207.55	40.14	227.09	39.42
Main consumer price	47.52	40.31	29.75	19.46	36.38	26.76
N	3,930		1,127		7,282	

results, reported in Table D3, are broadly consistent with those reported in the main text. Specifically, there does not appear to be strong association between competition and prices, facilities in competitive markets do not seem to charge lower consumer prices. However, the pattern of pricing by ownership type remains as before, with government-owned facilities charging the lowest prices and for-profit facilities the highest. The estimated estimates suggest that, compared to prices of for-profit facilities, prices of government-owned facilities are on average 44%–46% lower, and prices of not-for-profit facilities are 20%–21% lower.

In summary, the data provided by the Stewart Brown survey, in comparison to our main data source, cover more price components and hence are more comprehensive, but at the expense of a much smaller sample size. However, we find similar results in so far as the association between consumer prices and competition is concerned. Our result on the pattern of pricing by ownership type also remains unchanged, although the estimates suggest even greater pricing differences between facility types.

Table D3: Regression of price on competition, selected coefficient estimates

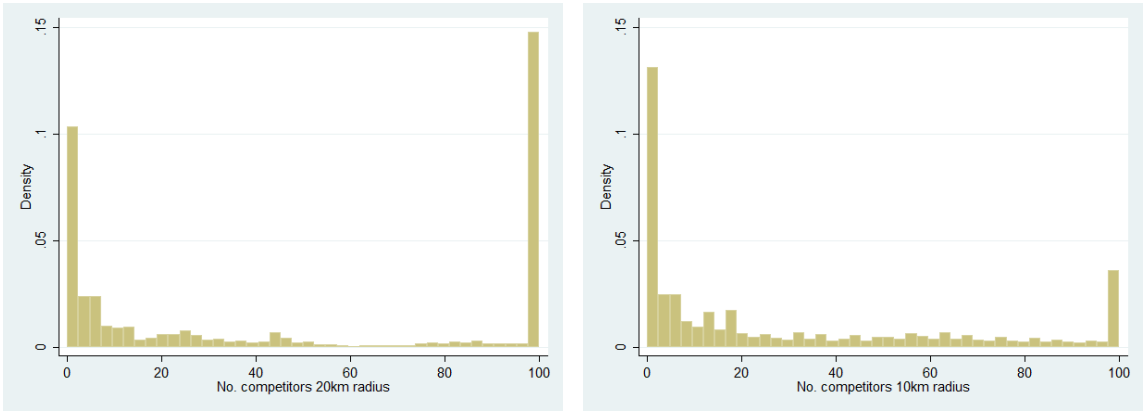
Dep variable: log(consumer price)					
	Estimate		Estimate		Estimate
No. competitors 10 km		Distance to 3rd closest		HHI	
Ref: No comp.		Ref: $0 \leq$ dist $\leq$ 2 km		Ref: $0 \leq$ HHI ≤ 0.02	
1–3 comp.	0.0005	$2 <$ dist $\leq$ 5 km	-0.0344	$0.02 <$ HHI ≤ 0.05	0.1298
	(0.036)		(0.034)		(0.068)
4–10 comp.	-0.0636	$5 <$ dist $\leq$ 20 km	0.0179	$0.05 <$ HHI ≤ 0.15	0.2004*
	(0.050)		(0.039)		(0.088)
11–25 comp.	0.0079	$20 <$ dist $\leq$ 50 km	0.0441	$0.15 <$ HHI ≤ 0.60	0.1495
	(0.068)		(0.049)		(0.100)
26 or more comp.	-0.0713	dist. $>$ 50 km	0.1385*	HHI > 0.60	0.1892
	(0.091)		(0.070)		(0.103)
Ownership type		Ownership type		Ownership type	
(Ref: For profit)		(Ref: For profit)		(Ref: For profit)	
Government	-0.4633‡	Government	-0.4578‡	Government	-0.4383‡
	(0.063)		(0.059)		(0.058)
Not for profit	-0.2046‡	Not for profit	-0.2124‡	Not for profit	-0.2140‡
	(0.030)		(0.030)		(0.030)

Figures in parentheses are robust standard errors.
Significance levels: *: 5% **: 1% ‡: 0.1%

Appendix E: Analysis using competition measures with market boundaries set at 20km radius

The Appendix contains results using a broader geographic market to construct market-based competition measures. Here, we define the local market of a facility as all facilities within a 20km radius, instead of the 10km radius used in the main text. This 'broadening' of the market affects the enumeration of the number of competitors in the local market and the computation of HHI, which requires the computation of market shares of all facilities in the geographic market. Note that this broadening of the market does not affect the way we compute the distance to the third closest competitor, which needs no geographic market to be defined.

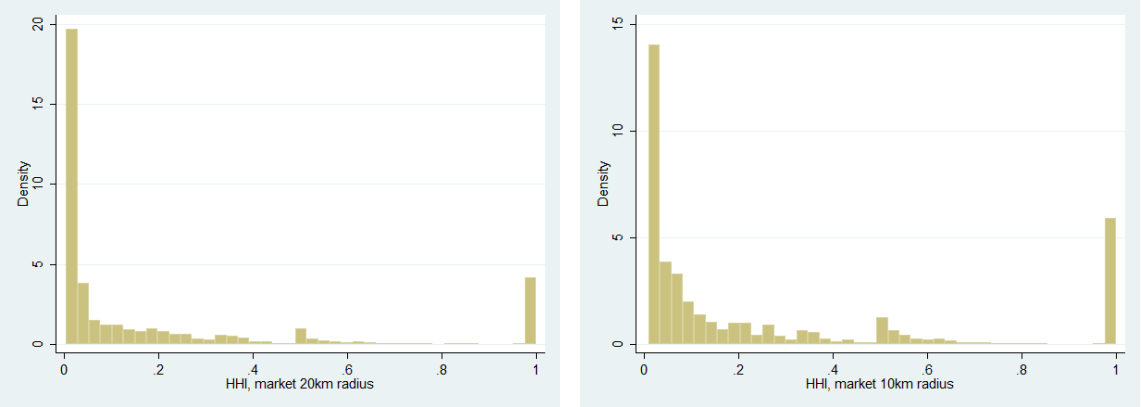
Figures E1 and E2 present the distributions of the number of competitors and HHI, and for comparison, the distributions of using 20km radius are presented alongside the corresponding measure based on a 10km radius. Not surprisingly, the distributions have shifted to indicate greater degrees of competition—there are more competitors within 20km than within 10km, and HHI values tend to become smaller (i.e., the distribution shifts to the left) when market is measured using 20km rather than 10km radius. However, in both cases it is worth noting that the measures are closely correlated—the correlation coefficient is 0.89 for the number of competitors computed using the two radii, and 0.96 for HHI.



(a) No. competitors 20km (b) No. competitors 10km

Figure E1: Distributions of number of competitors, within 20km vs within 10km

We conduct the same regression analysis as in the main text by estimating the regression equation using the quality measures in the main text and additional quality measures in Appendix A as dependent variables. The same specification in eq. (1) is used. The



(a) HHI, 20km radius

(b) HHI, 10km radius

Figure E2: Distributions of HHI, market 20km radius vs 10km radius

main results are summarised in Tables E1 and E2, which present respectively estimates on the competition measures, and on ownership and average provider price. We find consistent results as those presented in the main text.

The estimates in Table E1 show that only two quality measures, antipsychotic medication use and ED presentations, have statistically significant coefficients when competition is measured using the number of competitors within 20km. No statistically significant estimates are found when competition is measured using HHI with market boundaries set at 20km. Moreover, the significant estimates are not consistent with expectations, in that markets with more competitors are found to perform worse in the two quality measures.

Table E2 reports the coefficient estimates on ownership and provider price obtained from the same regression estimation as Table E1. The results are similar to those we report in the main text. Government-owned facilities, compared to for-profit and not-for-profit facilities, perform better in most quality domains, except in antipsychotic medication use and number of assaults. On balance, government-owned facilities appear to provide better quality of care than for-profit and not-for-profit facilities. It is also worth noting that higher provider price is not necessarily associated with better quality, although in majority of the cases it is so.

Table E3 shows the estimates from the regression analysis of consumer prices. The results are in line with those presented in Table 7 in the main text. There is some indication that prices are lower for markets that are more competitive, although this is only found when competition is measured using the number of competitors within

20km. No statistically significant estimates are found when HHI is used. In contrast, consistent results are obtained on ownership type—government owned facilities are found to charge lower prices than for-profit facilities by about 24%, while the prices of not-for-profit facilities are about 8% lower than those of for-profit facilities. We note that these results are almost identical to the earlier results reported in Table 7 in the main text.

In summary, using 20km radius to set the boundary of the market (which affect two measures of competition: the number of competitors and HHI) produces consistent results as those obtained when 10km is used. The very high correlation between the two sets of measures (with correlation coefficients of 0.89 for the number of competitors, and 0.96 for HHI) likely explain the consistent results we obtained. The conclusions we draw about competition, ownership type and pricing remain unchanged.

Table E1: Regression of quality on competition, coefficients of competition measures

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]
No. competitors 20 km (Ref: No comp.)											
1–3 comp.	-0.0016	-0.0004	-0.0002	-0.0124	-0.0321	0.0020	0.0004	0.0035	0.0232**	-0.0033	-0.0014
	(0.008)	(0.001)	(0.002)	(0.069)	(0.126)	(0.003)	(0.001)	(0.002)	(0.009)	(0.004)	(0.002)
4–10 comp	0.0191*	-0.0008	-0.0016	0.0071	-0.1018	0.0021	-0.0011	-0.0007	0.0237*	-0.0067	-0.0022
	(0.009)	(0.001)	(0.002)	(0.054)	(0.106)	(0.003)	(0.001)	(0.003)	(0.012)	(0.005)	(0.002)
11–25 comp	0.0238*	-0.0001	0.0002	0.0634	-0.0842	0.0013	-0.0001	-0.0011	0.0341*	-0.0008	0.0017
	(0.012)	(0.001)	(0.003)	(0.068)	(0.119)	(0.004)	(0.001)	(0.003)	(0.015)	(0.006)	(0.003)
26 or more comp.	0.0341*	0.0009	0.0006	0.1223	-0.0093	0.0023	0.0005	-0.0004	0.0378*	0.0005	-0.0021
	(0.014)	(0.001)	(0.004)	(0.067)	(0.126)	(0.004)	(0.001)	(0.004)	(0.016)	(0.007)	(0.003)
N	6,942	6,946	11,845	5,712	5,712	11,845	11,816	11,679	11,375	11,815	11,816
Adjusted R^2	0.155	0.011	0.083	0.335	0.301	0.071	0.115	0.123	0.224	0.286	0.249
HHI, 20km radius (Ref: $0 \leq$ HHI ≤ 0.02)											
$0.02 <$ HHI ≤ 0.05	0.0023	-0.0013	-0.0028	0.0016	0.0234	-0.0014	-0.0004	-0.0022	-0.0052	-0.0060	-0.0039
	(0.012)	(0.001)	(0.003)	(0.034)	(0.069)	(0.003)	(0.001)	(0.004)	(0.011)	(0.005)	(0.002)
$0.05 <$ HHI ≤ 0.15	-0.0048	-0.0016	-0.0027	-0.0544	-0.0922	-0.0005	-0.0007	-0.0015	-0.0101	-0.0073	-0.0015
	(0.013)	(0.001)	(0.003)	(0.037)	(0.078)	(0.003)	(0.001)	(0.005)	(0.011)	(0.006)	(0.003)
$0.15 <$ HHI ≤ 0.60	-0.0163	-0.0016	-0.0033	-0.0560	-0.0643	0.0007	-0.0015	-0.0020	-0.0234	-0.0108	-0.0045
	(0.014)	(0.001)	(0.004)	(0.042)	(0.087)	(0.004)	(0.001)	(0.006)	(0.014)	(0.007)	(0.003)
HHI > 0.60	-0.0288	-0.0020	-0.0041	-0.0466	0.0367	-0.0022	0.0004	-0.0021	-0.0308	-0.0032	-0.0030
	(0.016)	(0.001)	(0.004)	(0.058)	(0.109)	(0.004)	(0.001)	(0.006)	(0.016)	(0.007)	(0.003)
N	7,234	7,238	12,338	5,942	5,942	12,338	12,303	12,162	11,844	12,302	12,303
Adjusted R^2	0.151	0.012	0.079	0.330	0.298	0.070	0.109	0.125	0.220	0.285	0.247

Note: [1]=Antipsychotic use [2]=Premature mortality [3]=Assaults [4]=RN hrs [5]=Total care hrs [6]=Complaints [7]=Adverse medication [8]= Dementia hospitalisation [9]=ED presentation [10]=Falls [11]=Pressure injuries.
Significance levels: *: 5% **: 1% ‡: 0.1% .

Table E2: Regression of quality on competition, coefficients on ownership and price

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]
No. competitors in 20 km (Ref: No comp.)											
Ownership type (Ref: For profit)											
Government owned	0.0281‡	0.0004	0.0046*	0.2795‡	1.0515‡	-0.0137‡	-0.0006	-0.0098‡	-0.0248**	-0.0203‡	-0.0087‡
	(0.008)	(0.001)	(0.002)	(0.053)	(0.117)	(0.002)	(0.001)	(0.003)	(0.008)	(0.004)	(0.002)
Not for profit	-0.0008	0.0008**	-0.0012	-0.0755‡	0.0812**	-0.0092‡	0.0005*	-0.0012	0.0048	0.0086‡	-0.0029‡
	(0.003)	(0.000)	(0.001)	(0.011)	(0.027)	(0.001)	(0.000)	(0.001)	(0.003)	(0.002)	(0.001)
Ave. provider price	0.0829‡	0.0008	0.0173‡	0.3819‡	1.2925‡	0.0100‡	-0.0049‡	-0.0203‡	-0.0658‡	-0.0714‡	0.0022
	(0.008)	(0.001)	(0.003)	(0.051)	(0.126)	(0.003)	(0.001)	(0.004)	(0.010)	(0.005)	(0.002)
N	6,942	6,946	11,845	5,712	5,712	11,845	11,816	11,679	11,375	11,815	11,816
Adjusted R^2	0.155	0.011	0.083	0.335	0.301	0.071	0.115	0.123	0.224	0.286	0.249
HHI, 20km radius (Ref: $0 \leq$ HHI ≤ 0.02)											
Ownership type (Ref: For profit)											
Government owned	0.0247**	0.0003	0.0059**	0.2665‡	1.0279‡	-0.0127‡	-0.0007	-0.0102‡	-0.0333‡	-0.0212‡	-0.0090‡
	(0.008)	(0.001)	(0.002)	(0.048)	(0.107)	(0.002)	(0.001)	(0.002)	(0.008)	(0.004)	(0.001)
Not for profit	-0.0006	0.0008**	-0.0010	-0.0764‡	0.0778‡	-0.0091‡	0.0005*	-0.0011	0.0054	0.0087‡	-0.0026‡
	(0.003)	(0.000)	(0.001)	(0.011)	(0.026)	(0.001)	(0.000)	(0.001)	(0.003)	(0.002)	(0.001)
Ave. provider price	0.0807‡	0.0004	0.0181‡	0.3686‡	1.2328‡	0.0105‡	-0.0051‡	-0.0205‡	-0.0628‡	-0.0704‡	0.0028
	(0.008)	(0.001)	(0.003)	(0.050)	(0.124)	(0.003)	(0.001)	(0.004)	(0.010)	(0.005)	(0.002)
N	7,234	7,238	12,338	5,942	5,942	12,338	12,303	12,162	11,844	12,302	12,303
Adjusted R^2	0.151	0.012	0.079	0.330	0.298	0.070	0.109	0.125	0.220	0.285	0.247

Note: [1]=Antipsychotic use [2]=Premature mortality [3]=Assaults [4]=RN hrs [5]=Total care hrs [6]=Complaints [7]=Adverse medication [8]= Dementia hospitalisation [9]=ED presentation [10]=Falls [11]=Pressure injuries.
Significance levels: *: 5% **: 1% ‡: 0.1% .

Table E3: Regression of price on competition, selected coefficient estimates

Dep variable: log(consumer price)			
	Estimate		Estimate
No. competitors 20 km		HHI, 20km radius	
Ref: No comp.		Ref: $0 \leq$ HHI ≤ 0.02	
1–3 comp.	-0.0957*	$0.02 <$ HHI ≤ 0.05	-0.0427
	(0.038)		(0.077)
4–10 comp.	-0.1937‡	$0.05 <$ HHI ≤ 0.15	-0.0481
	(0.047)		(0.076)
11–25 comp.	-0.1522*	$0.15 <$ HHI ≤ 0.60	-0.0581
	(0.063)		(0.080)
26 or more comp.	-0.1129	HHI > 0.60	0.0368
	(0.074)		(0.086)
Ownership type		Ownership type	
(Ref: For profit)		(Ref: For profit)	
Government owned	-0.2370‡	Government owned	-0.2327‡
	(0.044)		(0.042)
Not for profit	-0.0837‡	Not for profit	-0.0783**
	(0.025)		(0.025)

Figures in parentheses are robust standard errors.
Significance levels: *: 5% **: 1% ‡: 0.1%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