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Labour market competition and wages in Adult Social Care

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DISCLAIMER

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Introduction

Adult Social Care (ASC) in England is a quasi-market. On the supply side, policy reform in the early 1990s encouraged the marketisation of ASC services and competition, with the intention to increase the cost-effectiveness of services and improve choice for people with ASC needs (Fernandez et al., 2011). Currently, there are about 18,000 care providers (39,000 care establishments), with about 85 per cent of the workforce employed by independent (i.e., for-profit and not-for-profit) providers (Skills for Care, 2022a). On the demand side, a substantial part of ASC services (about 65 per cent) continues to be commissioned by local councils (Office of National Statistics, 2022), which due to budget constraints, are using their market power to push down care fees (Forder and Allan, 2014). Combined with the gradual increase in the minimum wage floor this has resulted in a compressed wage distribution and a large share of direct care workers (DCW) being paid at minimum wage levels, with secondary effects on high staff turnover and job vacancies (Skills for Care, 2022a, 2022b; Vadean and Allan, 2021).

There is a substantial literature assessing the effects of competition on prices and care quality, showing that greater competition has a small negative effect on prices, but with conflicting evidence on the relationship between competition and quality; for a scoping review see (Yang et al., 2022). For the English care home market, (Forder and Allan, 2014) found that a 10 per cent increase in competition (as measured by the Herfindahl-Hirschman index) was associated with a 2.2 per cent decrease in prices. Moreover, they found that greater competition was associated with lower Care Quality Commission (CQC) quality ratings. However, when controlling for the endogeneity of prices, the effect disappeared, leading to the conclusion that the negative quality effect works through prices (i.e., greater competition reduces revenue, with a knock-on effect on quality). (Allan et al., 2021) investigated the impact of competition on the difference in care fees between self-funded and publicly funded care home residents. They found that greater competition reduced the higher fees paid by self-funders and the fee gap.

Research on the wage structure and labour market competition in ASC has been rather scarce. An exception is (Machin and Manning, 2004). Looking at care homes on England's South Coast in 1992/1993, they found that about 1/3rd of care homes (employing about 25 per cent of care workers) paid all care workers the same wage, another 1/3rd (employing about 35 per cent of care workers) had two hourly wages, and only the remaining 1/3rd had more differentiated pay structures. Moreover, they found that about 65 per cent of the log care worker wage variation was between care homes and only 35 per cent within care homes. From analysing wage and price equations, they also found that worker characteristics associated with higher wages were not associated with higher care fees, e.g., tenure was found to be associated with higher wages but lower care fees. Therefore, the wage differences within care homes did not seem to be associated with higher productivity. These findings were inconsistent with a competitive market, in which one would expect a single wage for all care workers of a given quality. The authors concluded that for the care home market it was helpful to view employers as having considerable discretion in setting wages, due to labour market frictions.

Since the period captured in the above study (i.e., 1992/1993), the ASC system in England and other OECD countries went through a substantial marketisation process that substantially increased the number of independent ASC providers and the competition in the sector (Corlet Walker et al., 2022). Another important labour market intervention over the last decades, affecting ASC staff pay in many OECD countries is minimum wage policy (OECD, 2020). In England, the minimum wages floor has been increased significantly over the past few years, compressing the wage distribution in the ASC sector (Vadean and Allan, 2021). The aim of this paper was to assess the wage structure and labour market competition in ASC in view of these developments.

We used data for 2016 to 2019 from the Adult Social Care Workforce Data Set (ASC-WDS), the main source of ASC workforce intelligence in England. After accounting for worker, job, employer, and local market characteristics, we find substantial wage differentials between sectors, with wages being about 20 percent lower in the private and 15 per cent in the voluntary sector compared to the public sector. Wage differentials between sectors are higher for senior care workers, compared to care workers, mainly due to the low rewards to experience in the private and voluntary sectors.

Using longitudinal data and controlling for time-invariant unobserved heterogeneity, we found wage elasticities of labour supply to the firm of about 3 to 4. These are consistent to estimates by other studies employing methods to address unobserved heterogeneity or quasi-experimental design – for an overview see (Bassier et al., 2022) – and about two to three time larger than estimates not accounting for omitted variable bias. We also found that wage elasticities (i.e., labour market competition) was higher in the private (for-profit) sector, but without translating into higher wages. Our results are consistent with the existence of frictions in labour markets, claimed by the monopsonistic competition literature.

The paper is structured as follows: the next section outlines a model of dynamic monopsony used in previous studies to derive wage elasticities of labour supply to the firm, we then present the econometric framework, describe the dataset and analysed sample, discuss the results, and conclude.

A model of dynamic monopsony

In contrast to perfectly competitive labour markets, in which labour supply to a firm is infinitely elastic with respect to wages, in monopsonistic or oligopsonistic markets labour supply to the firm is imperfectly elastic. The monopsonistic theory assumes that there are important frictions in the labour market that reduce workers' ability to move swiftly between jobs. The most plausible sources of frictions are heterogenous preferences and mobility costs. The stronger these frictions, the greater the market power of employers and the lower wages they can offer without immediately losing their workforce (Manning, 2003).

In ASC labour markets, a potential source of frictions would be that care workers' derive motivation not only from pay and employment conditions but also (and sometimes more) from altruism (i.e., relationship with clients) (Adams and Sharp, 2013; Bjerregaard et al.,

2015; Maben et al., 2012). Moreover, the distribution of care worker hourly wages in England is rather narrow (i.e., difference of £1.48, or about 17 per cent, between 10th and 90th percentiles) giving mobility cost a higher weight in offsetting any utility from moving to employers paying (slightly) higher wages (Skills for Care, 2022b).

We derive wage elasticities of labour supply to the firm using a dynamic monopsony model presented in (Manning, 2003) and based on (Burdett and Mortensen, 1998).[1] We have:

$$s(w) = \delta + \lambda[1 - F(w)] \tag{1}$$

$$R(w) = R^u + \lambda \int^{w} f(x)N(x)\,dx \tag{2}$$

where $s(w)$ is the job separation rate of a firm paying the wage w, δ is the (exogenous) rate of separations to non-employment, λ is the rate of job offers from the distribution of wage offer $F(w)$, $R(w)$ is the inflow of recruits, R^u are recruits from unemployment, and $N(x)$ is the firms' employment level. Differentiating (1) and (2) gives with respect to w:

$$\varepsilon_{sw} = \frac{ws'(w)}{s(w)} = -\frac{\lambda w f(w)}{s(w)} = -\frac{\lambda w f(w) N(w)}{R(w)} = \frac{wR'^{(w)}}{R(w)} = -\varepsilon_{Rw} \tag{3}$$

where ε_{sw} is the elasticity of separations and ε_{Rw} the elasticity of recruits with respect to wage, and the third equality follows from the steady state condition that the total job separation must equal the inflow of recruits (i.e., $s(w)N(w) = R(w)$). From the steady state condition, and replacing ε_{Rw} using Equation (3), the elasticity of labour supply facing the firm can be written as:

$$\varepsilon_{Nw} = \varepsilon_{Rw} - \varepsilon_{sw} = -2\varepsilon_{sw} \tag{4}$$

Meaning that one can simply double the job separation wage elasticity to get an estimate of the labour supply wage elasticity. This is a rather useful simplification, especially when separations to other employment vs. non-employment cannot be identified in the observed job separations, as in the case of the dataset used for this study.

An augmented approach models the wage elasticity of labour supply facing the firm as weighted sum of wage elasticities of separation to both other employment and non-employment, and the wage elasticity of recruitment from other employment and non-employment (Manning, 2003). Nonetheless, in practice, the two approaches often yield rather similar estimates (Bassier et al., 2022; Booth and Katic, 2011).

Econometric framework

A common approach to estimating job separation wage elasticities used in previous studies is exponential proportional hazard models (Frijters et al., 2007; Hirsch and Jahn, 2015;

[1] The wage elasticity of labour supply to the firm estimated in this study differs from the wage elasticity of labour supply to the sector. The latter includes wage effects on recruitment from, and separation to, employment outside the sector and non-employment but excludes the wage responsiveness of job-to-job transitions to and from employers in the same sectors.

Manning, 2003; Vick, 2017). For this analysis, given survival times (i.e., job tenure) are grouped into years, we estimated a discrete time proportional hazard model as proposed in (Jenkins, 2005). The discrete hazard of the job spell i to end during the tenure-year t (that starts at T_k and ends at T_{k+1}) is:

$$h_{it} = \Pr\left(T_k < t \leq T_{k+1} | x_{ijt}, t > T_k\right) = 1 - \exp\left\{-\int_{T_k}^{T_{k+1}} \lambda_d(t)\,\mathrm{d}t \times \exp(x_{it}\beta_{PH})\right\} \quad (5)$$

where (λ) is the baseline hazard, allowed to be piece-wise constant over the tenure periods (d). The cumulated baseline is multiplied by an exponentiated scalar including a vector of covariates affecting employment (x_{it}) and their respective parameters (β_{PH}) (Farnworth, 2012). Equation (6) is estimated by complementary log-log regression in Stata 17.0, and the Huber-White sandwich estimator was used to obtain cluster-robust standard errors.

An important challenge in estimating wage elasticities of separation, comes from the failure to adequately control for other relevant factors. Following (Manning, 2003), the covariates (x_{it}) included, beside the log of wages, a set of individual factors that can be associated with both wages and the likelihood of job separations (i.e., age, gender, ethnicity, qualifications and distance to work). Moreover, we included a set of job, employer and local market characteristics found in previous studies to affect the turnover of care staff.

Job separation has previously been found to be related with part-time employment, tenure, work overload, work stress, low levels of support from supervisors and co-workers as well as satisfaction with training and rewards (Castle et al., 2007; Gao et al., 2014; Gaudenz et al., 2019; Ha et al., 2014; Karantzas et al., 2012; Morris, 2009; Park et al., 2017; Rosen et al., 2011; Yeatts et al., 2010). Studies at employer level found high turnover to be related to organisational characteristics (e.g., employer's size, lower staffing levels, higher share of staff on contracts without guaranteed hours, for-profit ownership, and home care provision) (Castle, 2008; Castle and Engberg, 2006; Hussein et al., 2016), management style (e.g., not giving staff autonomy over tasks and/or not asking staff for input in decision making) (Donoghue and Castle, 2009).

The job and employer related characteristics included in the model were therefore indicators for job role, training incidence, full-time employment, employment on contract without guaranteed working hours (i.e., zero-hours contract), sector (i.e., public, for-profit and not-for profit), user type (i.e., younger adults, older people, and mixed), employer size, the staff per service user ratio (as proxy for workload), the vacancy rate (as proxy for difficulties in hiring sufficient staff), as well as the national health and care regulator's rating of the management (i.e., Care Quality Commission (CQC) rating on 'Well-led') (Care Quality Commission, 2018). Moreover, we included the turnover rate for the past 12 months to capture any potential 'herd' effect with respect to separations.

In the case of tenure, there are arguments both for including and excluding it (Manning, 2003). On the one hand, paying higher wages is expected to reduce separations (and increase tenure). This indirect effect would suggest that tenure should not be included. On

the other hand, if there are seniority wage scales, the exclusion of tenure can lead to biased estimates. Following (Frijters et al., 2007; Hirsch and Jahn, 2015; Vick, 2017), we decided including tenure is appropriate, as it allows to better deal with unobserved heterogeneity, which is an important issue in this context.

A potential source of bias could also come from the failure to adequately control for local labour market factors. For example, previous studies showed that higher turnover of ASC staff is related to lower unemployment and higher competition (Castle, 2008; Donoghue, 2010). Separations are also likely to depend on wages differences to alternative jobs in the local area, and a failure to control for these is likely to downward bias the wage elasticities (Manning, 2003). We therefore further included the local unemployment rate, the mean local area wage for women, and competition in the local ASC market as covariates. Finally, we included local area controls for wealth in the local population (i.e., average house prices; as a proxy for self-funded ASC) as well as the ASC tariffs paid by local councils, which could have a positive effect on revenue and wages.

The influence of pay on turnover in ASC has been mixed and is based mainly on studies form the US. For example, (Rosen et al., 2011) found that hourly pay did not predict the intention to leave or job separation, and argued that this may be explained by the fact that any pecuniary benefits (i.e., pay and rewards) may be offset by non-pecuniary and indirect costs associated with the status quo. On the other hand, (Morris, 2009) found that job separation was negatively related to hourly wages and that a switch to another care job was significantly associated with a wage increase. Nonetheless, this study was based on a small sample of 507 home care workers and had a small geographic focus (i.e., Maine). Using nationally representative data for the US and accounting for endogeneity of wages, (Baughman and Smith, 2012) found only a small effect of wages in preventing transitions out of a direct care occupation. Finally, (Rapp and Sicsic, 2020) using pooled individual data from one of the largest US household surveys, identified a positive relationship between hourly wages and retention rates in ASC.

Unobserved heterogeneity is known to bias the separation elasticity towards zero, even if uncorrelated with wage (Manning, 2003). For example, (Vick, 2017) showed that wage elasticities of labour supply in Brazil were higher when accounting for correlations between job spells of the same worker (i.e., shared frailty or random effects). Moreover, estimated elasticities from quasi-experimental studies have been about three to four time larger than those from studies using the 'traditional model' (Dube et al., 2019, 2018). Using a different approach, (Bassier et al., 2022) isolated the individual wage component determined by firm wage policy (i.e., the component not related to worker heterogeneity), and obtained labour supply elasticities of similar magnitude as those from quasi-experimental studies.

We estimated panel-data models accounting for unobserved heterogeneity. A proportional hazard model in which the frailty term (i.e., the unobserved heterogeneity, u_i) is shared by all the times-to-events within a group is called a shared frailty model (Farnworth, 2012; Frijters et al., 2007; Jenkins, 2005; Vick, 2017). As with random effects (RE) models, shared frailty models assume that the unobserved heterogeneity (u_i), is independent of the observed characteristics (x_{it}). The discrete hazard in this case is defined as:

$$h_{it} = 1 - \exp\left\{-\int_{T_k}^{T_{k+1}} \lambda_d(t)\,\mathrm{d}t \times \exp\left(x_{it}\beta_{PH(sh)} + u_i\right)\right\} \quad (6)$$

The shared frailties (u_i) are assumed to follow either a normal, gamma or inverse-Gaussian distribution. We estimated a RE cloglog model, which assumes a normal distribution of the shared frailties. RE probit estimations are run for comparison.

Fixed effects (FE) (i.e., 'within') estimators relax the independence assumption and allow u_i to be correlated with x_{it}. A quite flexible estimator for binary settings is correlated random effects (CRE) probit. It includes among covariates the average over time of the time-varying covariates ($\bar{z}_i$) to remove the time-invariant unobserved heterogeneity associated with the explanatory variables (x_{it}). The parameters $\beta_{CREprobit}$ are Mundlak-type 'within' estimates similar to those from a FE estimator, and allow the estimation of average partial effects (i.e., marginal effects) and elasticities (Wooldridge, 2010).[2] The probability of job spell i to end during the tenure-year t is:

$$\Pr(h_{it} = 1|x_{it}, u_i) = \Phi(x_{it}\beta + u_i) = \Phi\left(x_{it}\beta_{CREprobit} + \bar{z}_i\xi + a_i\right) \quad (7)$$

where a_i is assumed to be independent from x_{it}. Most of unobservables (u_i) are time invariant (or change very little over time) and, thus are captured by $\bar{z}_i$. Nonetheless, if they would change over time in a deterministic way, they would be captured by year dummies. We estimated CRE probit using RE probit (assuming serial independence) and pooled probit (in which the serial independence assumption is dropped).

Data and sample characteristics

We used data from the Adult Social Care Workforce Data Set (ASC-WDS), which is the leading source of workforce information for the ASC sector in England. It includes information on over 20,000 ASC providing establishments and over 700,000 workers across England, covering about 50 per cent of the ASC market. The information is rich at both establishment (e.g., type of service provided, sector, establishment size, count of employees and job roles, starters, leavers and vacancies, etc.) and worker level (e.g., age, gender, nationality, qualifications, pay, working hours, job role and job type). Public employers update data on a mandatory basis in September each year, while independent employers submit data on a voluntary basis, but are incentivised to do so by access to workforce development grants. All data in the ASC-WDS have been updated or confirmed to be up to date within the last two years, and about 80 per cent of employers in the ASC-WDS sample have updated their data in the past six months. Although the dataset does not cover all independent sector establishments, it does have a large enough sample to provide a solid basis for reliable workforce estimates at both national and local level. All ASC-WDS data was validated at source and has undergone rigorous data quality checks (Skills for Care, 2022a).

We used data from four cuts of the ASC-WDS for October 2016-2019, matched at individual level, and with some variables from the provider data set. Skills for Care assigns to each

[2] The vector of variables x_{ijt} includes time-variant, time-invariant (e.g., gender) as well as time-dependent variables (e.g., age and tenure).

establishment a unique and permanent ID and generates a unique and permanent ID for each worker with reported national insurance number and date of birth. We excluded employees from all establishments with records not updated for more than six months and establishments that had unique IDs for less than 75 per cent of their workers. We kept establishments providing either care home services (with or without nursing) or domiciliary care to adults (i.e., service users aged 18 and over). Statutory local authority, private (i.e., for-profit), and voluntary (i.e., not-for-profit) sector providers were all included.

We included in the sample employees aged between 16 and 64 in a direct care role, i.e., care workers (86 per cent), senior care workers (10 per cent), and other care providing roles (e.g., community support and outreach and activity workers) (4 per cent). We excluded observations for workers without a unique ID (as these could not be traced over time; 7 per cent), for those who erroneously had multiple entries per year with the same establishment (1 per cent), and for workers with two or more jobs in any year (6 per cent).[3]

The job separation variable was defined as a dummy variable equal to '0' if the employee was still with the same employer one year later ($t + 1$). The job separation variable was defined as being equal to '1' if either: a) the employee could be identified as working for another ASC employer in the sample at $t + 1$; or b) the employee left the sample, but their employer at time t was still in the sample. For a small number of employees information was missing at t+1, but we could use the information from a subsequent year to identify the job separation status. Employees for whom the job separation status could not be identified because both they and their initial employer dropped from the sample in all subsequent years, were excluded from the analysis (14 per cent).

The final sample consists of 355,170 observations (job-spell-years) of 211,294 job-spells of 204,149 direct care staff, employed by 5,856 care homes and 2,457 domiciliary care establishments; see Table 1. In line with national reports, a large number of job spells in our sample ended with a job separation: 39.8 per cent in residential care and 46.0 per cent in domiciliary care. However, given that the panel is rather short (i.e., 4 years), we observed more than one job spell only for a minority of workers (under 4 per cent).

The national representativeness of the establishments in the analysed sample has been assessed in (Vadean and Saloniki, 2023), showing that it overrepresented statutory LA establishments, care homes with slightly larger capacity (i.e., care home beds) as well as establishments with better Care Quality Commission (CQC) quality rating. Post sampling raking weights were generated for each establishment (and year) using control totals obtained from the CQC care directory data. Nonetheless, statistical test showed that unweighted regression analysis gave consistent estimates. As in (Vadean and Saloniki,

[3] Workers with more than one job were mainly domiciliary care workers registered on zero-hours contracts with multiple agencies. As contracted hours reported for zero-hours contracts where '0' and anecdotal evidence suggests that care worker effectively works for only one agency (despite multiple registrations), we could not reliably differentiate for workers with more than one job between real job separations and de-registrations of 'work intention'.

2023), we used the post-sampling weights for computing the mean values presented in the descriptive statistics only.

Wages and wage differentials

The distribution of wages in 2019 among direct care staff is illustrated in Figure 1 through box plots by care setting and sector. For each year and sectors, we winsorised wages at the 5th and 99th percentiles in order to remove outliers. We first notice the quite substantial pay gap between direct care staff employed by public vs. independent care providers. The median hourly wage in the public sector was about £10, compared to only £8.21 in private residential care (and equal to the statutory minimum wage level for workers aged 25 and over). The median hourly wage was relatively higher in domiciliary care (£8.50). However, some domiciliary care providers do not consider travel between clients as working hours. Instead, they pay slightly higher hourly wages (for client contact time only) to compensate for travel time. Median hourly wages were also relatively higher in the voluntary sector (£8.51 in residential care and £8.61 in domiciliary care) compared to the private sector.

We also note the narrow distribution of wages, in particular in the private sector. Hourly wages in the 90th percentile were only 12 per cent above the NLW in residential care and about 20 per cent above the NLW in domiciliary care, compared to around 50 per cent in the public sector. This narrow distribution can be partly explained by the rather large share of direct care staff aged 25 and over in the private sector paid at the NLW: about 53 per cent in residential care and 35 per cent in domiciliary care.

To assess to what extent the wage differentials are explained by worker, job, employer, and local market characteristics, we estimated Mincerian wage equations; see Table 2. We started with a simple model (1) in which we included qualifications, work experience, job role, and the sector of employment. In model (2), we then added the full set of worker, job, employer, and labour market characteristics. Both also included year and region fixed effects and were estimated using a generalised linear estimator (GLM) with Gaussian distribution of wages and a log link. The third column in Table 2, presents estimation results of model (2) using population-averaged GLM, to control for time-invariant unobservables at job-spell level.

We found that, everything else being equal, employment on zero-hour contracts was associated with marginally lower wages, showing that care workers unable to secure a contract with guaranteed working hours are probably overall in a weaker bargaining position, having to accept lower wages as well. As expected, having a qualification is positively associated with higher wages. However, surprisingly, training incidence is associated with a slightly lower wage. With staff training likely to increase the likelihood of transition to better paid jobs elsewhere (Vadean and Saloniki, 2023), care staff may agree to share the cost of training with employers (Wiener, 2003), thus accepting (marginally) lower pay as a trade-off for improved career prospects. Wages are slightly higher in medium/large establishments, establishments with better leadership and in care homes without nursing and domiciliary care compared to care homes with nursing. In terms of local market characteristics, we find, as expected, that the unemployment level is negatively related to

wages and the local wage level positively related. We also find a positive relationship between our wealth metric (i.e., log of mean house price) and wages, which may be evidence that a higher share people in the local population self-paying for their care would increase care providers' revenues, and consequently the wages they can pay. Quite importantly, we also find that the ASC fee level paid by local councils – who commission a large proportion (over 50 per cent) of ASC services – are positively related to wages. This reveals that increasing tariffs paid by local councils may be an important part of any policy aimed at improving wages in the ASC sector in England.

By far the highest difference in wages was between sectors of employment: the wage differential between the private and public sector was -21 per cent in our model with the minimum set of controls, reducing to -19 per cent when controlling for the full set of worker, job, employer and local market characteristics as well as unobservable heterogenity. Similarly, the wage difference between voluntary and public sector was -16 per cent and -15 per cent respectively. These results show large unexplained wage differentials between sectors, and potentially that the privatisation of ASC in England that started in the 1990s may have provided financial savings to public expenditure, but most likely at the cost of the workforce employed by independent providers.

In Table 3, we look at the wage differentials in a bit more detail, through predicted wages by care setting, job role, and sector. These are obtained from estimation results in column (3), Table 2 with interactions between care setting, job role, and sector. We note that the wage differentials between sectors are lower for care workers and highest for senior care workers. These may be due to differences in rewards for skills and experience between sectors. We, therefore, ran model (3) with interactions between sector and experience, after excluding controls for job role (to allow for potential promotion with job experience). The predicted wages by experience (with 5 per cent and 95 per cent confidence intervals) are plotted in Figure 2 and illustrate that, everything else being equal, the predicted wage difference over 30 year of experience is indeed very low in the private sector (2.9 per cent), somewhat higher in the voluntary sector (6.7 per cent), and highest in the public sector (12.0 per cent).

The geographic distribution of wage differentials for care workers is presented in Table 4. The predicted wages are obtained from estimations of model (3), Table 2 with interactions between region, sector, and care setting, but excluding local market controls (i.e., allowing the variation in local market characteristics to be reflected in the differences between regions). Unsurprisingly, for both care settings the lowest predicted wages of independent sector care workers are in the North East and North West and the highest in London and the South East. The maximum regional differential for independent sector care worker wages being -7.1 per cent in residential care and -7.6 per cent domiciliary care. The wage differential between independent and public sector residential care workers were highest in the North West (-25.9 per cent) and West Midlands (-24.8 per cent), while for domiciliary care workers in the North East (-21.0 per cent) and West Midlands (-18.9 per cent).

A measure of the labour market competition between employers used in previous studies was the wage variation between care establishments (i.e. inter-firm variation, due to

differences in firm-level wage policies) and the wage variation between workers employed in the same establishment (i.e., intra-firm variation) (Machin and Manning, 2004). Similar to their findings, our results in Table 5 (Column 1) show that about two-thirds of the variation in wages between direct care workers is between care homes and the remainder (one-third) is within care homes. Part of the variation may be however due to geographical differences in labour markets. After including local authority fixed effects, the variation between care homes drops slightly to 62 per cent. The inter-firm variation in domiciliary care (Column 2) is slightly higher (70 and 66 per cent respectively), likely due to an additional source of differences between care providers including travel time in hourly wages and those paying slightly higher wages but only for client contact time.

As these results may be driven by large wage differentials between publicly owned and independent care establishments as well as establishments with a small number of employees, we ran separate estimations including only independent care establishments with more than five direct care workers. The inter-firm variation dropped in these estimations to around 50 per cent for care homes and 60 per cent for domiciliary care, but was still high. In contrast, direct care workers' qualification and work experience in ASC varied substantially less between establishments (0.20 to 0.25) and more within establishments (0.75 to 0.80). These findings show that the substantial variation in wages between establishments cannot be explained by a similar variation in care workers' skills and experience.

Wage elasticities of labour supply to the firm

Estimated wage elasticities of job separation and of labour supply to the firm are reported in Table 6. Descriptive statistics on key variables by care setting and job separation status are presented in the Appendix, Table A1, and the full estimation results these elasticities are based on are presented in the Appendix, Table A2 (residential care) and Table A3 (domiciliary care). Without controlling for unobserved hererogeneity, wage elasticities of job separation were comparable to those found by a previous study on ASC workforce in the US (Rapp and Sicsic, 2020). However, the estimates were larger than the wage elasticities of job separation of NHS nurses in the UK (-0.066) (Frijters et al., 2007), compared to -0.79 for residential and -0.37 for domiciliary ASC workers, and (partly) higher than the wage elasticities of labour supply to the firm for the whole UK economy (0.75) (Manning, 2003), compared to 1.58 for residential and 0.73 for domiciliary care).

Our results also show that the above estimates were downward biased (i.e., closer to zero). The bias correction by RE (i.e., 'shared frailty') models was rather small: from a wage elasticity of labour supply to the firm of 1.58 to 1.60 for residential care and from 0.73 to 0.78 for domiciliary care based on discrete time proportional hazard models (cloglog), and from a wage elasticity of labour supply of 1.44 to 1.45 for residential care and from 0.75 to 0.79 for domiciliary care based on probit models. Nonetheless, 'within' estimates from CRE probit models gave a substantially larger unobserved heterogeneity bias correction with estimated wage elasticities of supply to the firm over twice as large (3.17 to 4.08) for residential care and about three times larger (3.02 to 4.01) for domiciliary care. F-test of joint statistical significance of $\bar{z}_{ij}$ from the CRE panel probit estimations (χ^2value of 34,365

[p-value<0.001] for residential care and 182.54 [p-value<0.001] for domiciliary care) and the CRE pooled probit estimations (χ^2 value of 28,858 [p-value<0.001] for residential care and 25,459 [p-value<0.001] for domiciliary care) showed that the 'within' CRE probit estimates were to be preferred.

Table 7 presents wage elasticities of labour supply to the firm by sector and region. Estimated elasticities are based on pooled CRE probit. We found wage elasticities to be relatively higher (i.e., more labour competition) in the private sector (Panel A; based on models with interactions between sector and the log of wages). The evidence of higher labour market competition in the private vs. public and voluntary sector being more evident when looking at the more homogenous senior care worker and care worker roles (Panel B).

In terms of geographical differences, we note that the highest wage elasticities of labour supply to the firm were in the Midlands (in particular West Midlands), while for domiciliary care these were highest in the Midlands and the South (in particular in the Eastern, South-East and London), regions related to higher supply of ASC services (Allan, 2021; Allan and Nizalova, 2020).

The estimated wage elasticities of labour supply to the firm reported above depend on the implied steady state assumption that the flow of recruits equals that of separations. Evidence of that is provided in Figure 3, which shows that firm-level separation and recruitment rates fall broadly along the 45-degree line.

Discussion

The ASC market in England is a quasi-market where ASC services are provided about 39,000 care establishment (e.g., domiciliary care agencies and care homes with and without nursing), the vast majority (85 per cent) owned by independent (i.e., for-profit or not-for-profit) care providers (Skills for Care, 2022a). On the other hand, the main buyer of ASC services is the public sector, or more precisely 152 (upper-tier) local authorities. They commission about 65 per cent of ASC services, while the remainder are bought by persons funding their own care (i.e., self-funders) or are supported through fundraising by voluntary organisations (National Audit Office, 2018). Therefore, local authorities have market power to set prices, and the fees they pay are dependent on their limited budgets, substantially affected in the austerity measures during the 2010s.

The focus of this study was to assess wages differentials in the ASC sector in England and the responsiveness of labour supply to changes in a care establishment's wages (i.e., wage elasticities of labour supply to a firm). As one of the few quantitative studies on the topic, it adds to the limited international evidence on wage structure and the degree of competition in ASC labour markets.

Estimations from wage equations show substantial wage differentials of direct care staff between sectors that cannot be explained by observed factors (i.e., worker, job, employer, and local market characteristics): about -20 per cent wage differential for the private (i.e., for-profit) vs. public sector, and an about -15 per cent wage differential between for the voluntary (i.e., not-for-profit) vs. public sector. Everything else being equal, we also found

that local council fee rates were also significantly positively related to care staff wages. This provides initial evidence that the downwards pressure on care fees for services commissioned by local authorities from independent providers has led to a downward pressure on wages. Moreover, it shows that an increase in tariffs paid by local councils for services commissioned from independent providers is likely to lead to an increase in care staff wages. Further research would be required to assess the above points in more detail.

Consistent with results of (Machin and Manning, 2004), we also found evidence for rather high variation of wages between care establishments, while in contrast skills and experience were reasonably were well distributed among ASC employers. These findings are not compatible with the competitive labour market theory prediction of uniform market wages for workers of equal quality, and suggest that care providers had market power in setting wages.

With respect to wage elasticities of labour supply to the firm, our results highlight the importance of controlling for unobserved heterogeneity to reduce omitted variable bias. We found wage elasticities of between 3 to 4 for both residential and domiciliary care settings. These were of similar magnitude to those found in quasi-experimental studies and estimations taking into account worker unobserved heterogeneity (Bassier et al., 2022; Dube et al., 2019, 2018), and about two to three times larger than estimates not taking into account unobserved variable bias. These estimates suggest a moderate responsiveness of direct care staff to wage changes, and a moderate level of market power for firms in the ASC labour market.

In contrast to (Bassier et al., 2022), we found that the degree of monopsony was lower (i.e., higher wage elasticities of labour supply to the firm) in the lower-wage, higher-turnover ASC private sector. However, the higher labour market competition did not translate into higher care staff wages. The monopsony power of local authorities in the market for care services and their downward pressure on care fees seem to be related to both lower care quality (Forder and Allan, 2014) as well as lower wages and rather narrow wage distribution in the private sector. We also found evidence of higher labour market competition in the Midlands and the South of England, consistent with previous studies showing that, compared to the North, these regions have more ASC providers and/or stronger growth in provision over time (Allan, 2021; Allan and Nizalova, 2020).

Limitations

We have focused in this paper on the pre-pandemic labour market, which was closer to a steady state. Since early 2020 there have been important shocks to the ASC labour market in England: i) in 2020/21 the lockdown measures related to the Covid-19 pandemic have significantly reduced employment opportunities in competing sectors (e.g., retail, hospitality), ii) the new immigration system implemented in January 2021 has reduced labour supply of immigrants from the EU to England, and iii) 2021/22 brought renewed competition for workforce from retail and hospitality. For the analysed period (2016 to 2019) employment in the ASC sector in England was relatively stable, with only a slight gradual increase (from 1.57m to 1.63m; about 1.3 per cent increase per year).

Due to lack of information on the destination of job leavers and the source of recruits in the ASC-WDS, we used a simplified model to estimate the wage elasticity of labour supply. (Manning, 2003) shows that the model can be extended by including employment and non-employment as distinct labour market states. There are potential datasets for England that could be used to fit this model (e.g., the Annual Population Survey). However, drawbacks compared to the ASC-WDS would be a substantially smaller sample size of ASC workers, and less information on employer characteristics (i.e., more unobserved heterogeneity).

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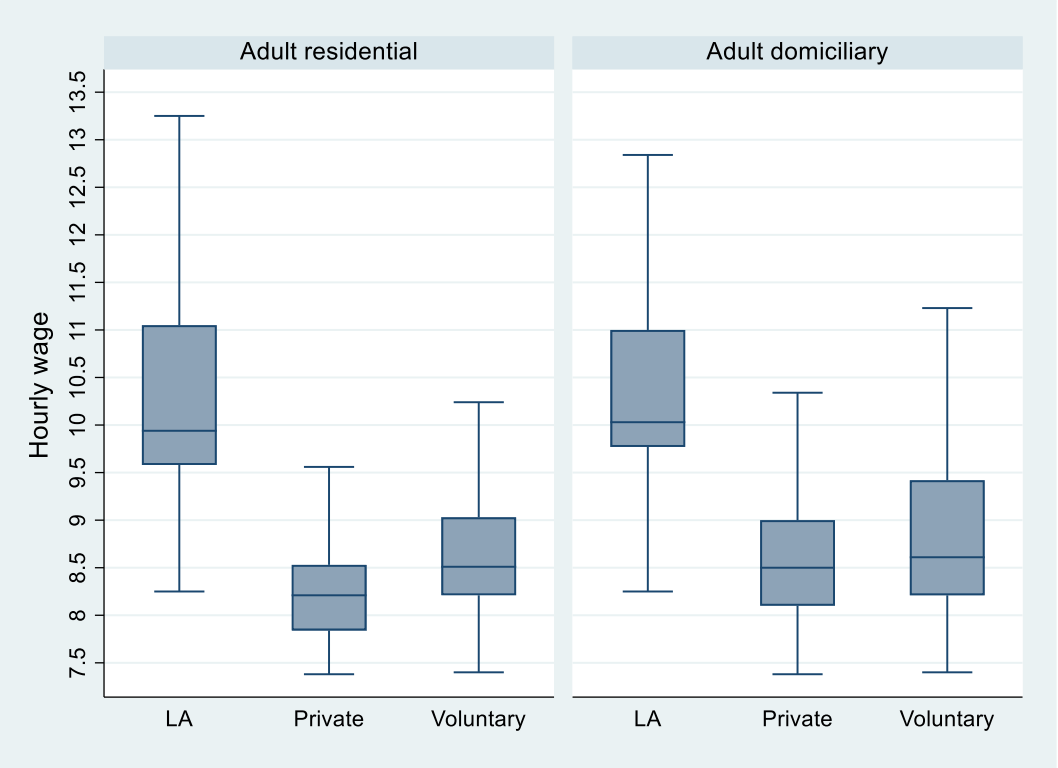
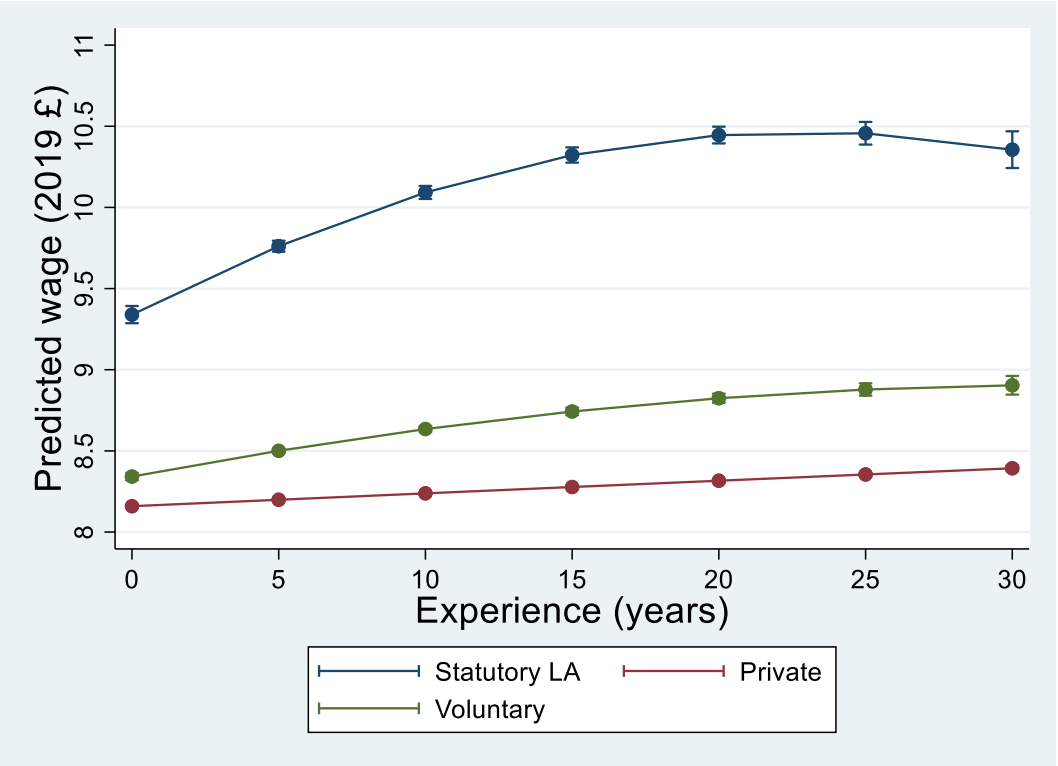
Figure 1: Distribution of hourly wages for direct care staff by care setting and sector



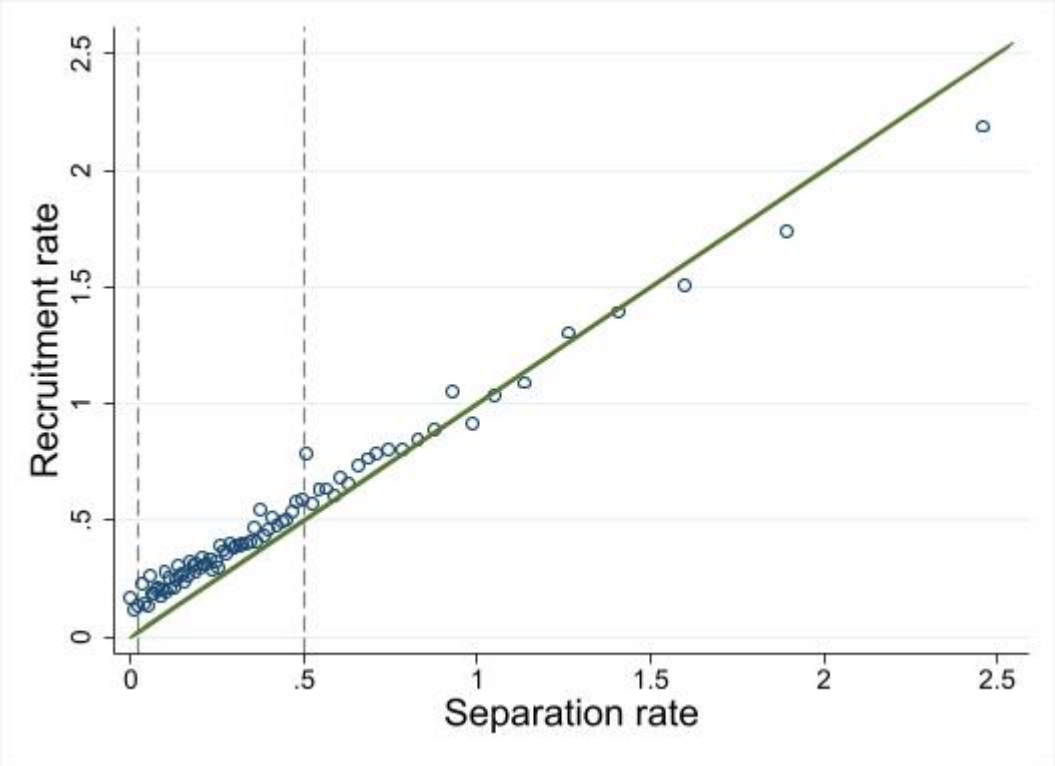
Data source: Adult Social Care Workforce Data Set (ASC-WDS); October 2019.

Figure 2: Predicted wage by sector and experience



Predictions based on Model (3), Table 3 with interactions between sector and experience.

Figure 3: Job separation vs. recruitment rates



Note: Data is at establishment-level. Percentile bins are generated by weighing by establishment size. The 45-degree line from the origin indicates equal recruitment and separation rates. The dashed vertical lines indicate the interquartile range (p25 and p75) of the separations rate.

Table 1: Job spells and separations

	Residential care		Domiciliary care	
Observations (spell-years)	199,390		155,780	
Job spells	118,503		92,791	
Workers	114,657		89,492	
Establishments	5,856		2,457	
Workers with more than one job spell	3,549	3.1%	3,462	3.9%
Job spells ending in separation	47,143	39.8%	42,647	46.0%
Right-censored spells	71,360	60.2%	50,144	54.0%

Data source: Adult Social Care Workforce Data Set (ASC-WDS); pooled Oct 2016, Oct 2017, and Oct 2018.

Table 2: Wage regressions

VARIABLES	(1)	(2)	(3)
Qualification: yes	0.007***	0.010***	0.010***
	(0.001)	(0.001)	(0.001)
Experience (years)	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)
Experience (years) squared x 1,000	-0.008**	0.001	-0.003
	(0.004)	(0.003)	(0.003)
Age		0.003***	0.003***
		(0.000)	(0.000)
Age squared x 1,000		-0.029***	-0.033***
		(0.001)	(0.001)
Female		-0.000	0.000
		(0.001)	(0.001)
Nationality: British		0.003***	0.002***
		(0.001)	(0.001)
Distance from work (km; log)		0.007***	0.006***
		(0.000)	(0.000)
Job role: senior care worker	0.087***	0.093***	0.085***
	(0.001)	(0.001)	(0.001)
Job role: other care-providing	0.050***	0.043***	0.045***
	(0.002)	(0.002)	(0.002)
Training (any): yes		-0.006***	-0.005***
		(0.001)	(0.001)
Full-time		-0.001	-0.001
		(0.001)	(0.001)
Zero-hours contract		-0.004***	-0.006***
		(0.001)	(0.001)
Sector: Private	-0.213***	-0.198***	-0.191***
	(0.002)	(0.002)	(0.002)
Sector: Voluntary	-0.161***	-0.158***	-0.151***
	(0.002)	(0.002)	(0.002)
Care setting: care home w/o nursing		0.021***	0.021***
		(0.001)	(0.001)
Care setting: domiciliary care		0.046***	0.051***
		(0.001)	(0.001)
Staff size: medium/large (50+ workers)		0.007***	0.003***
		(0.001)	(0.000)
CQC rating (Well-led): Good/Outstanding		0.012***	0.003***
		(0.001)	(0.000)
CQC rating (Well-led): Not rated		0.013***	0.003***
		(0.001)	(0.000)

VARIABLES	(1)	(2)	(3)
Unemployment rate (LA level)		-0.005***	-0.002***
		(0.000)	(0.000)
Mean wage women (LA level; log; 2019 £)		0.082***	0.049***
		(0.003)	(0.002)
Mean house price (LAD level; log; 2019 £)		0.042***	0.049***
		(0.001)	(0.001)
Urban		0.007***	0.004***
		(0.001)	(0.001)
ASC Unit Costs Residential Care (LA level; log; £/week)		0.031***	0.025***
		(0.002)	(0.002)
ASC Unit Costs Domiciliary Care (LA level; log; £/hour)		0.028***	0.012***
		(0.002)	(0.001)
Care home competition (distance-weighted HHI)		0.042***	0.002
		(0.014)	(0.013)
Constant	2.285***	1.160***	1.233***
	(0.002)	(0.020)	(0.016)
Region FE	yes	yes	yes
Year FE	yes	yes	yes
Observations	342,288	342,288	342,288
No. of groups (job spells)			202,200
Log pseudo-likelihood	-430,949	-416,176	
Wald chi-square			68,383

Robust standard errors in parentheses
Significance level: *** p<0.01, ** p<0.05, * p<0.1

Notes: Models (1) and (2) are estimated using a generalised linear estimator (GLM) with Gaussian distribution of wages and a log link. Model (3) is estimated using population-averaged GLM. Base categories: Nationality: other; Qualification: no qualification; Training: no training received; Job role: care worker; Sector: Statutory LA; Care setting: care home with nursing; Staff size: micro/small (1-49 workers); CQC rating: Inadequate/Requires improvement.

Table 3: Predicted wages by care setting, (direct care) job role, and sector

		Statutory LA	Private	Voluntary
Residential care	Senior care worker	11.23	8.63 (-23%)	9.50 (-15%)
	Care worker	9.78	7.94 (-19%)	8.35 (-15%)
	Other direct care	10.55	8.46 (-20%)	8.63 (-18%)
Domiciliary care	Senior care worker	11.61	8.76 (-25%)	9.48 (-18%)
	Care worker	9.77	8.39 (-14%)	8.52 (-13%)
	Other direct care	10.74	8.44 (-21%)	9.00 (-16%)

Notes: Predictions based on Model (3), Table 2 with interactions between care setting, job role, and sector.

Table 4: Predicted care worker wages by region, sector, and care setting

		Residential care	Difference (%)	Domiciliary care	Difference (%)
North East	Statutory LA	9.77	-19.8	10.37	-21.0
	Independent	7.84		8.19	
North West	Statutory LA	10.73	-25.9	10.02	-18.0
	Independent	7.94		8.21	
Yorkshire and the Humber	Statutory LA	9.59	-16.5	9.39	-9.9
	Independent	8.00		8.46	
East Midlands	Statutory LA	9.63	-17.6	9.28	-9.7
	Independent	7.93		8.38	
West Midlands	Statutory LA	10.82	-24.8	10.20	-18.9
	Independent	8.13		8.27	
Eastern	Statutory LA	9.37	-13.0	9.83	-12.6
	Independent	8.16		8.60	
South West	Statutory LA	10.26	-20.4	10.30	-15.4
	Independent	8.17		8.71	
South East	Statutory LA	10.05	-16.6	10.66	-16.8
	Independent	8.39		8.87	
London	Statutory LA	10.42	-19.0	10.42	-16.9
	Independent	8.44		8.66	

Notes: Predictions based on Model (3), Table 2 without local area controls, but with interactions between region, sector, and care setting.

Table 5: Proportion of wage, qualification, and experience variation between care establishments

	Wages (log)		**Qualification**		**Experience (log)**	
	Res. care	**Dom. care**	**Res. care**	**Dom. care**	**Res. care**	**Dom. care**
All establishments						
Job role and year fixed effects	0.66	0.70	0.29	0.28	0.22	0.23
Job role, year, and LA fixed effects	0.62	0.66	0.28	0.27	0.22	0.23
Independent establishments						
Job role and year fixed effects	0.57	0.64	0.28	0.25	0.22	0.21
Job role, year, and LA fixed effects	0.52	0.58	0.27	0.24	0.21	0.21
Independent establishments with >5 DCWs						
Job role and year fixed effects	0.53	0.63	0.27	0.25	0.21	0.21
Job role, year, and LA fixed effects	0.47	0.56	0.26	0.24	0.20	0.20

Notes: *rho*-values from (establishment) fixed effects estimations.

Table 6: Wage elasticities of job separation and of labour supply to the firm

	cloglog	RE cloglog	probit	RE probit	CRE probit (panel RE)	CRE probit (pooled)
Residential care						
Elasticity job separation	-0.79	-0.80	-0.72	-0.73	-1.59	-2.04
Elasticity labour supply	1.58	1.60	1.44	1.45	3.17	4.08
Domiciliary care						
Elasticity job separation	-0.37	-0.39	-0.38	-0.40	-1.51	-2.01
Elasticity labour supply	0.73	0.78	0.75	0.79	3.02	4.01

Notes: Predictions based on Models (1) to (6), Table A2 for residential care, and Models (1) to (6), Table A3 for domiciliary care.

Table 7: Wage elasticities of labour supply to the firm

	Residential care		**Domiciliary care**	
A. Sector				
Statutory local authority	-0.25	***	3.00	
Private sector	4.99	***	7.10	***
Voluntary or third sector	6.31	**	0.35	**
B. Job role & Sector				
Senior Care Worker; Statutory LA	-0.95	**	1.91	
Senior Care Worker; Private	5.83	***	9.02	***
Senior Care Worker; Voluntary	2.17		-0.25	
Care Worker; Statutory LA	-0.19	*	2.91	
Care Worker; Private	7.52	***	7.98	***
Care Worker; Voluntary	5.31	*	0.25	
Other care-providing; Statutory LA	-0.31		-1.03	
Other care-providing; Private	1.57		5.11	
Other care-providing; Voluntary	5.59		0.51	
C. Region				
North East	4.34		3.99	
North West	2.26		3.74	**
Yorkshire and the Humber	4.30	**	1.30	
East Midlands	1.56		6.97	***
West Midlands	14.06	***	12.31	*
Eastern	1.76		10.14	***
South West	2.67		0.24	
South East	4.89	**	5.94	***
London	19.99	*	5.62	**
D. Region group				
North (North East, North West, and Yorkshire and the Humber)	3.32	***	1.67	***
Midlands (East Midlands and West Midlands)	7.59	***	6.27	***
South (East, South West, South East, and London)	3.37	***	6.63	***

Significance level: *** p<0.01, ** p<0.05, * p<0.1

Notes: Panel A: pooled CRE probit (Table A2 and A3, Model 6) with interaction between sector and log of wage. Panel B: pooled CRE probit (Table A2 and A3, Model 6) with interaction between job role, sector, and log of wage. Panels C and D: pooled CRE probit (Table A2 and A3, Model 6) with interaction between region and log of wage.

Appendix

Table A1: Descriptive statistics – direct care staff aged 16-64 by care setting

	Residential care				Domiciliary care			
	Stayer	Leaver			Stayer	Leaver		
	Mean	Mean	diff		Mean	Mean	diff	
Age	41.252	37.355	3.897	***	42.809	39.186	3.623	***
Gender: female	0.864	0.845	0.019	***	0.868	0.877	-0.009	***
Nationality: British	0.828	0.809	0.018	***	0.855	0.847	0.008	***
Distance to work (km)	2.990	3.594	-0.604	***	6.181	7.057	-0.876	***
Qualification: yes	0.658	0.537	0.121	***	0.537	0.462	0.076	***
Training (any): yes	0.590	0.553	0.037	***	0.669	0.682	-0.013	***
Job tenure: <=1 year	0.121	0.202	-0.081	***	0.142	0.248	-0.106	***
Job tenure: >1 & <=2 years	0.159	0.237	-0.078	***	0.182	0.232	-0.050	***
Job tenure: >2 & <=4 years	0.228	0.251	-0.023	***	0.263	0.250	0.013	***
Job tenure: >4 & <=8 years	0.232	0.185	0.048	***	0.246	0.175	0.071	***
Job tenure: >8 years	0.260	0.125	0.134	***	0.168	0.095	0.073	***
Job role: senior care worker	0.173	0.136	0.037	***	0.058	0.041	0.016	***
Job role: care worker	0.807	0.846	-0.040	***	0.878	0.907	-0.028	***
Job role: other care-providing	0.021	0.018	0.003	***	0.064	0.052	0.012	***
Hourly wage (2019 £)	8.281	8.117	0.164	***	8.489	8.451	0.038	***
Zero hours contract	0.025	0.063	-0.037	***	0.603	0.637	-0.034	***
Full-time	0.591	0.570	0.021	***	0.489	0.472	0.017	***
Sector: statutory LA	0.032	0.020	0.012	***	0.036	0.029	0.007	***
Sector: private (i.e., for-profit)	0.826	0.872	-0.046	***	0.819	0.864	-0.045	***
Sector: voluntary (i.e., not-for-profit)	0.142	0.108	0.034	***	0.145	0.107	0.038	***
Care type: care home w/ nursing	0.392	0.416	-0.024	***				
Care type: care home w/o nursing	0.608	0.584	0.024	***				
User type: old age	0.511	0.530	-0.019	***	0.080	0.071	0.009	***
User type: young adults	0.259	0.250	0.009	***	0.143	0.119	0.024	***
User type: mixed	0.230	0.220	0.010	***	0.777	0.810	-0.033	***
Staff size: micro/small (1-49 workers)	0.551	0.543	0.008	***	0.258	0.297	-0.039	***
Staff size: medium/large (50+ workers)	0.449	0.457	-0.008	***	0.742	0.703	0.039	***
Turnover rate (previous year)	0.311	0.341	-0.030	***	0.414	0.464	-0.050	***
Vacancy rate (previous year)	0.035	0.039	-0.004	***	0.060	0.069	-0.009	***
Care worker per SU ratio	2.426	2.203	0.223	***	1.706	1.574	0.132	***
CQC rating Well-led: Inadequate/Req improvement	0.233	0.264	-0.031	***	0.155	0.151	0.004	*
CQC rating Well-led: Good/Outstanding	0.670	0.635	0.035	***	0.546	0.522	0.024	***
CQC rating Well-led: No rating received	0.096	0.101	-0.004	**	0.299	0.327	-0.028	***
Unemployment rate (LA level; ONS)	4.548	4.481	0.067	***	4.836	4.710	0.127	***
Mean wage women (LA-level; 2019 £; ASHE)	13.898	13.881	0.016	*	14.238	14.203	0.035	***
Average house price (LAD level; 2019 £)	201,245	204,904	-3,659	***	209,548	208,781	767	
Urban location	0.862	0.861	0.001		0.894	0.885	0.009	***
ASC Unit Costs Res. Care (LA level; £/week; 2019 £)	755.847	760.783	-4.937	***	763.436	758.890	4.546	***
ASC Unit Costs Dom. Care (LA level; £/hour; 2019 £)	16.275	16.357	-0.081	***	16.042	16.018	0.024	*
Care home competition (distance-weighted HHI)	0.017	0.018	-0.001	***	0.015	0.016	-0.001	***
Year: 2016	0.336	0.374	-0.038	***	0.313	0.349	-0.036	***
Year: 2017	0.343	0.348	-0.006	**	0.329	0.336	-0.008	**
Year: 2018	0.321	0.278	0.043	***	0.358	0.315	0.043	***
Region: East	0.105	0.110	-0.004	***	0.098	0.103	-0.005	***
Region: East Midlands	0.103	0.104	-0.001		0.114	0.114	0.000	
Region: London	0.077	0.072	0.005	***	0.171	0.134	0.037	***
Region: North East	0.061	0.048	0.013	***	0.072	0.064	0.008	***
Region: North West	0.131	0.122	0.009	***	0.141	0.148	-0.007	***
Region: South East	0.177	0.185	-0.009	***	0.129	0.141	-0.012	***
Region: South West	0.118	0.137	-0.019	***	0.087	0.101	-0.014	***
Region: West Midlands	0.119	0.120	-0.001		0.102	0.102	0.000	
Region: Yorkshire and the Humber	0.109	0.101	0.008	***	0.086	0.092	-0.006	***
Observations	152,247	47,143			113,133	42,647		

Significance level: *** p<0.01, ** p<0.05, * p<0.1

Data source: Adult Social Care Workforce Data Set (ASC-WDS); pooled Oct 2016, Oct 2017, and Oct 2018.

Table A2: Estimation results of job separation – marginal effects; residential care

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	cloglog	RE cloglog	probit	RE probit	CRE probit (panel RE)	CRE probit (pooled)	FE LPM
VARIABLES	ME	ME	ME	ME	ME	ME	ME
Age	-0.004***	-0.004***	-0.006***	-0.006***	-0.004***	-0.004***	
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	
Age squared (x 1,000)	0.029***	0.031***	0.046***	0.046***	0.026***	0.029***	
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.006)	
Female	-0.019***	-0.020***	-0.020***	-0.021***	-0.016***	-0.015***	
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	
Nationality: British	-0.008***	-0.009***	-0.011***	-0.011***	-0.055*	-0.061*	-0.057**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.031)	(0.033)	(0.029)
Distance from work (km; log)	0.030***	0.031***	0.030***	0.030***	0.037***	0.046***	0.054***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.010)	(0.011)	(0.012)
Qualification: yes	-0.029***	-0.031***	-0.030***	-0.031***	0.003	0.008	0.017**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.008)	(0.008)	(0.008)
Training (any): yes	-0.013***	-0.012***	-0.012***	-0.011***	0.013**	0.017**	0.019***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.006)	(0.007)	(0.007)
Job role: care worker	-0.024***	-0.024***	-0.021***	-0.021***	-0.014*	-0.015*	-0.016**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.008)	(0.008)	(0.008)
Job role: other care-providing	-0.026***	-0.027***	-0.021***	-0.021***	0.002	0.002	-0.007
	(0.007)	(0.007)	(0.007)	(0.007)	(0.020)	(0.024)	(0.020)
Hourly wage (log; 2019 £)	-0.181***	-0.185***	-0.157***	-0.161***	-0.278***	-0.325***	-0.233***
	(0.013)	(0.013)	(0.012)	(0.012)	(0.027)	(0.031)	(0.027)
Zero-hours contract	0.113***	0.118***	0.127***	0.130***	0.088***	0.130***	0.180***
	(0.004)	(0.004)	(0.005)	(0.005)	(0.012)	(0.014)	(0.017)
Full-time	-0.014***	-0.015***	-0.015***	-0.015***	-0.022***	-0.023***	-0.025***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.007)	(0.007)	(0.007)
Sector: Private	0.014**	0.015**	0.011**	0.012**	-0.006	-0.006	
	(0.006)	(0.006)	(0.005)	(0.006)	(0.006)	(0.005)	
Sector: Voluntary	-0.017***	-0.018***	-0.018***	-0.019***	-0.038***	-0.034***	
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)	
Care setting: CH w/o nursing	0.002	0.003	0.002	0.003	-0.001	-0.002	
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	

VARIABLES	(1) cloglog ME	(2) RE cloglog ME	(3) probit ME	(4) RE probit ME	(5) CRE probit (panel RE) ME	(6) CRE probit (pooled) ME	(7) FE LPM ME
User type: young adults	-0.006**	-0.006**	-0.004	-0.004	0.038	-0.006	-0.017
	(0.003)	(0.003)	(0.003)	(0.003)	(0.045)	(0.041)	(0.036)
User type: mixed	-0.008***	-0.008***	-0.006***	-0.006**	0.016	0.003	0.007
	(0.002)	(0.002)	(0.002)	(0.002)	(0.017)	(0.019)	(0.018)
Staff size: medium/large (50+ workers)	-0.008***	-0.008***	-0.011***	-0.010***	-0.007	-0.009	-0.011*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.006)	(0.007)	(0.006)
Turnover rate (previous year)	0.021***	0.023***	0.022***	0.023***	0.004	-0.004	-0.004
	(0.003)	(0.003)	(0.003)	(0.003)	(0.005)	(0.006)	(0.006)
Vacancy rate (previous year)	0.042***	0.042***	0.038***	0.039***	-0.027	0.018	0.050**
	(0.013)	(0.013)	(0.014)	(0.014)	(0.023)	(0.026)	(0.024)
Care worker per SU ratio	-0.001***	-0.001***	-0.001***	-0.001***	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
CQC rating (Well-led): Good/Outstanding	-0.023***	-0.024***	-0.024***	-0.025***	-0.012***	-0.019***	-0.019***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.004)	(0.004)
CQC rating (Well-led): Not rated	-0.028***	-0.028***	-0.026***	-0.027***	-0.015***	-0.018***	-0.016***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.006)	(0.006)	(0.005)
Unemployment rate (LA level)	0.001	0.001	0.001	0.001	0.001	0.001	0.005**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
Mean wage women (LA level; log; 2019 £)	0.009	0.008	0.005	0.005	-0.030	-0.027	-0.054*
	(0.012)	(0.012)	(0.012)	(0.012)	(0.029)	(0.032)	(0.029)
House price (LAD level; log; 2019 £)	-0.001	-0.001	-0.003	-0.003	0.104**	0.090*	0.106**
	(0.006)	(0.006)	(0.006)	(0.006)	(0.045)	(0.048)	(0.044)
Urban	0.009***	0.009***	0.010***	0.010***	0.008***	0.008***	
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	
ASC Unit Costs Residential Care (LA level; log; £/week)	0.036***	0.037***	0.037***	0.037***	-0.061***	-0.064***	-0.034**
	(0.008)	(0.008)	(0.008)	(0.008)	(0.016)	(0.018)	(0.017)
ASC Unit Costs Domiciliary Care (LA level; log; £/hour)	0.017	0.019*	0.017	0.018*	0.029**	0.033**	0.042***
	(0.011)	(0.011)	(0.011)	(0.011)	(0.013)	(0.016)	(0.015)
Care home competition (distance-weighted HHI)	0.065	0.068	0.084	0.085	3.271***	3.290***	1.804*
	(0.065)	(0.067)	(0.065)	(0.066)	(1.215)	(1.251)	(1.085)
Year	yes	yes	yes	yes	yes	yes	yes

VARIABLES	(1) cloglog ME	(2) RE cloglog ME	(3) probit ME	(4) RE probit ME	(5) CRE probit (panel RE) ME	(6) CRE probit (pooled) ME	(7) FE LPM ME
Region	yes	yes	yes	yes	yes	yes	yes
Observations	199,390	199,390	199,390	199,390	199,390	199,390	199,390
Zero outcomes	152,247						
Nonzero outcomes	47,143						
No. of job spells		118,503		118,503	118,503		118,503
Log likelihood/pseudo-likelihood	-103,497	-103,485	-103,519	-103,511	-83,687	-85,670	
Pseudo R-sq; R-sq within			0.051			0.214	0.181
Sigma ui		0.374		0.253	4.244		0.471
Sigma eij							0.292
rho		0.078		0.060	0.947		0.722
F-test of $\bar{x}_{ij} = 0$; Hausman test					34,365***	28,858***	24,696***

Robust standard errors in parentheses

Significance level: *** p<0.01, ** p<0.05, * p<0.1

Base categories: Nationality: Other; Qualification: no qualification; Training: no training received; Job role: senior care worker; Sector: statutory LA; User type: old age; Care setting: care home with nursing; Staff size: micro/small (1-49 workers); CQC rating: Inadequate/Requires improvement.

Notes: Models (1) to (6) also include dummies for job tenure, as described in Table A1. CRE: conditional random effects; RE: random effects; FE: fixed effects; LPM: linear probability model.

Table A3: Estimation results of job separation – marginal effects; domiciliary care

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	cloglog	RE cloglog	probit	RE probit	CRE probit (panel RE)	CRE probit (pooled)	FE LPM
VARIABLES	ME	ME	ME	ME	β	ME	ME
Age	-0.008***	-0.008***	-0.009***	-0.009***	-0.005***	-0.005***	
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	
Age squared (x 1,000)	0.064***	0.066***	0.078***	0.079***	0.035***	0.040***	
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.007)	
Female	-0.004	-0.004	-0.004	-0.005	-0.003	-0.003	
	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.003)	
Nationality: British	-0.020***	-0.020***	-0.020***	-0.020***	-0.038**	-0.026	-0.022
	(0.003)	(0.004)	(0.004)	(0.004)	(0.018)	(0.021)	(0.017)
Distance from work (km; log)	0.028***	0.028***	0.027***	0.028***	-0.001	0.001	0.003
	(0.001)	(0.001)	(0.001)	(0.001)	(0.008)	(0.010)	(0.010)
Qualification: yes	-0.009***	-0.010***	-0.010***	-0.010***	0.008	0.008	0.005
	(0.002)	(0.003)	(0.002)	(0.003)	(0.008)	(0.009)	(0.008)
Training (any): yes	0.010***	0.010***	0.010***	0.010***	0.028***	0.039***	0.032***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.008)	(0.008)	(0.008)
Job role: care worker	0.019***	0.019***	0.017***	0.018***	0.020	0.012	0.018
	(0.006)	(0.006)	(0.005)	(0.005)	(0.013)	(0.014)	(0.013)
Job role: other care-providing	0.014*	0.014*	0.013*	0.013*	0.036	0.028	0.024
	(0.007)	(0.007)	(0.007)	(0.007)	(0.022)	(0.022)	(0.019)
Hourly wage (log; 2019 £)	-0.098***	-0.105***	-0.096***	-0.104***	-0.302***	-0.367***	-0.280***
	(0.013)	(0.014)	(0.013)	(0.013)	(0.031)	(0.034)	(0.029)
Zero-hours contract	0.014***	0.015***	0.014***	0.014***	0.021**	0.025**	0.027**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.011)	(0.012)	(0.012)
Full-time	-0.014***	-0.015***	-0.015***	-0.016***	-0.031***	-0.044***	-0.047***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.010)	(0.011)	(0.010)
Sector: Private	-0.033***	-0.034***	-0.032***	-0.033***	-0.037***	-0.028***	
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	
Sector: Voluntary	-0.063***	-0.065***	-0.061***	-0.062***	-0.061***	-0.053***	
	(0.007)	(0.007)	(0.006)	(0.007)	(0.007)	(0.006)	
User type: young adults	-0.027***	-0.027***	-0.025***	-0.025***	0.141**	0.267***	0.328***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.056)	(0.061)	(0.071)

VARIABLES	(1) cloglog ME	(2) RE cloglog ME	(3) probit ME	(4) RE probit ME	(5) CRE probit (panel RE) β	(6) CRE probit (pooled) ME	(7) FE LPM ME
User type: mixed	0.007	0.008*	0.007	0.008*	0.082**	0.136***	0.177***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.038)	(0.033)	(0.048)
Staff size: medium/large (50+ workers)	-0.018***	-0.018***	-0.020***	-0.020***	-0.033***	-0.038***	-0.030***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.007)	(0.008)	(0.007)
Turnover rate	0.029***	0.031***	0.029***	0.031***	-0.000	0.001	0.005
	(0.002)	(0.002)	(0.002)	(0.002)	(0.005)	(0.004)	(0.004)
Vacancy rate	0.039***	0.040***	0.039***	0.040***	-0.018	0.002	0.004
	(0.010)	(0.011)	(0.011)	(0.011)	(0.023)	(0.024)	(0.024)
Care worker per SU ratio	0.001***	0.001***	0.001***	0.001***	-0.001	-0.001	-0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
CQC rating (Well-led): Good/Outstanding	-0.008**	-0.008**	-0.009***	-0.009***	-0.003	-0.005	-0.005
	(0.003)	(0.003)	(0.003)	(0.003)	(0.005)	(0.005)	(0.005)
CQC rating (Well-led): Not rated	0.015***	0.016***	0.017***	0.018***	-0.002	-0.001	-0.005
	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.006)	(0.005)
Unemployment rate (LA level)	-0.011***	-0.011***	-0.011***	-0.011***	0.006**	0.006**	0.009***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)	(0.002)
Mean wage women (LA level; log; 2019 £)	0.139***	0.142***	0.141***	0.143***	-0.143***	-0.144***	-0.088**
	(0.013)	(0.013)	(0.013)	(0.013)	(0.033)	(0.037)	(0.035)
House price (LAD level; log; 2019 £)	-0.008	-0.007	-0.007	-0.006	0.258***	0.294***	0.273***
	(0.006)	(0.007)	(0.006)	(0.007)	(0.039)	(0.040)	(0.039)
Urban	0.005	0.005	0.005	0.005	-0.002	0.001	
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	
ASC Unit Costs Residential Care (LA level; log; £/week)	0.046***	0.047***	0.044***	0.046***	-0.027	-0.028	-0.003
	(0.010)	(0.010)	(0.010)	(0.010)	(0.017)	(0.020)	(0.020)
ASC Unit Costs Domiciliary Care (LA level; log; £/hour)	-0.063***	-0.066***	-0.062***	-0.064***	-0.079***	-0.101***	-0.103***
	(0.012)	(0.013)	(0.013)	(0.013)	(0.016)	(0.020)	(0.019)
Care home competition (distance-weighted HHI)	0.220***	0.219***	0.224***	0.221***	-1.327*	-0.385	0.922
	(0.067)	(0.069)	(0.069)	(0.070)	(0.747)	(0.665)	(0.718)
Year	yes	yes	yes	yes	yes	yes	yes
Region	yes	yes	yes	yes	yes	yes	yes

VARIABLES	(1) cloglog ME	(2) RE cloglog ME	(3) probit ME	(4) RE probit ME	(5) CRE probit (panel RE) β	(6) CRE probit (pooled) ME	(7) FE LPM ME
Observations	155,780	155,780	155,780	155,780	155,780	155,780	155,780
Zero outcomes	113,133						
Nonzero outcomes	42,647						
No. of job spells		92,791		92,791	92,791		92,791
Log likelihood/pseudo-likelihood	-87,509	-87,499	-87,507	-87,491	-69,257	-71,073	
Pseudo R-sq; R-sq within			0.043			0.223	0.209
Sigma ui		0.363		0.306	4.054		0.510
Sigma eij							0.309
rho		0.074		0.086	0.943		0.731
F-test of $\bar{x}_{ij} = 0$; Hausman test					182.54***	25,459***	22,640***

Robust standard errors in parentheses

Significance level: *** p<0.01, ** p<0.05, * p<0.1

Base categories: Nationality: Other; Qualification: no qualification; Training: no training received; Job role: senior care worker; Sector: statutory LA; User type: old age; Care setting: care home with nursing; Staff size: micro/small (1-49 workers); CQC rating: Inadequate/Requires improvement.

Notes: Models (1) to (6) also include dummies for job tenure, as described in Table A1. CRE: conditional random effects; RE: random effects; FE: fixed effects; LPM: linear probability model.

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