Assessing the Impact of an Increase in Pay on Adult Social Care Labour Supply in Scotland

May 2024

Scottish Government
Riaghaltas na h-Alba

Assessing the Impact of an Increase in Pay on Adult Social Care Labour Supply in Scotland

Florin Vadean

Hansel Teo

Stephen Allan

Disclaimer:

The views expressed in this report are those of the researcher and do not necessarily represent those of the Scottish Government or Scottish Ministers. We would like to thank Scottish Government and Department of Health and Social Care analysts for very helpful comments on earlier versions of the study, and the Skills for Care analytical team for support with the Adult Social Care Workforce Data Set (ASC-WDS).

Executive summary

Background and motivation

To support the effectiveness and sustainability of the Adult Social Care (ASC) sector in Scotland, the Cabinet Secretary for NHS Recovery, Health and Social Care uplifted ASC minimum pay from £10.90 to £12.00 per hour in April 2024. This uplift in pay is expected to improve staff recruitment and retention in a sector in which a large share of care staff is paid a minimum wage and employers experience challenges with high turnover and vacancies.

A key question is: “How will the increase in the ASC wage floor impact employment in the sector?” There is currently no available evidence on the responsiveness of ASC employment to changes in wages.

Aims

This study is a first attempt to provide estimates of wages elasticities of labour supply to the ASC sector in Scotland and use them to predict the impact of a sector wage floor increase on employment.

Methods

Seven-years of longitudinal data (2016-2022) from the Adult Social Care Workforce Data Set (ASC-WDS), the main source of ASC workforce intelligence for England, managed by Skills for Care, together with Scottish ASC wage distribution data from the Office for National Statistics (ONS) Annual Survey of Hours and Earnings (ASHE) was used for the analysis. ASC-WDS data was used to estimate the responsiveness of care staff to a wage change due to the lack of individual-level data on pay, employment and demographic characteristics for Scotland.

The predicted impact of an increase in the ASC wage floor on employment in the sector was estimated in two steps. First, the wage elasticity of labour supply in the ASC sector (i.e., the percentage change in employment resulting from a 1% change in wages) was estimated using an adjusted version of the ASC-WDS panel. The adjusted dataset consisted only of care staff in the North East, North West, Yorkshire and The Humber, East Midlands, and West Midlands regions of England in order to maximise comparability with Scotland’s labour market and excluded staff employed in a home care setting, due to imprecision in their wage measurement. Moreover, estimations were weighted to correct for the difference in market shares of public, private and voluntary ownership between Scotland and England.

Next, the estimates of the wage elasticity of labour supply were then used, together with Scottish ASC wage distribution data from ASHE, to predict the effect of an increase in the ASC wage floor on employment. The total predicted employment effect of raising the wage floor was computed as the sum of employment changes associated with successive increases in wages, starting at the bottom of the distribution, up to the new wage floor.

Findings

Estimates from the first part of the analysis imply that a 1% increase in wages would lead to an increase in employment of between 1.75% to 1.80%, depending on the

initial wage level. These estimates suggest that an increase in wages in the ASC sector is likely to have a positive effect on employment.

Based on the above estimates, the second part of the analysis predicts that, all else constant, an increase in the ASC wage floor to £12.00 in 2024 would lead to an increase in employment of between 2.7% and 4.0% in the sector. A larger increase of the wage floor to £12.50 would lead to an ASC employment increase of between 5.4% and 7.5%, while an increase of the wage floor to £13.00 would lead to an ASC employment increase of between 8.4% and 11.2%.

Limitations

The analysis and findings are subject to the following limitations. First, the analysis implicitly assumes that wages in all other sectors remain unchanged. In reality, the minimum wage for all workers aged 21 and over (i.e., National Living Wage) also increased in April 2024 to £11.44 per hour. This reduces the relative increase in pay due to a rise in the ASC wage floor and will likely reduce the impact of the ASC pay increase on ASC employment. Additionally, non-ASC employers that compete for the same workforce (e.g., hospitality and retail establishments), could respond to the new ASC minimum wage floor by increasing their wages above the new NLW. This will similarly reduce the relative increase in pay due to the rise in the ASC wage floor. We expect, therefore, the ASC employment effects to be lower than predicted by our model, with actual effects depending on wider local labour market adjustments.

Second, the analysis relied on hourly pay by deciles for Scotland. To address this data limitation, predicted employment effects are reported by taking either the lower or upper end of the decile bracket as initial pay. This goes some way to addressing the uncertainty regarding the true wage distribution and provides lower and upper bound predictions, with actual effects on employment expected to be somewhere between the two.

Third, the home care staff excluded from the analysis due to wage measurement issues, may in fact have a different response to wages compared to staff in other care settings. We had however, to implicitly assume that this was similar. More accurate data on hourly pay of home care staff on their full time spent at work (including travel time) would be needed to confirm the similarity (or difference) in wage elasticities between care settings.

Fourth, the analysis is based on data from England due to the lack of Scottish data on pay and employment at employer/employee level. Despite the adjustments made to the analysis sample to address potential differences between the Scottish and English contexts, there remain potential differences that have not been accounted for. One concern is that differences in the sectoral split of ASC providers in Scotland versus England may reflect structural differences between the markets. For example, in England private care providers are facing less labour market competition from the public sector due to the relatively small share of localised public ASC provision. In Scotland the public ASC sector is much larger and may have a stronger influence on pay and employment conditions in the private sector. It is possible, therefore, that employers and employees from respective contexts may respond differently to the

same minimum wage policy. To shed light on this would require more granular individual-level wage data for Scotland, which was not available to the research team at this stage.

Table of Contents

1. Introduction

In the year ending 31 March 2022, an estimated 88,965 people accessed Care at Home and 44,840 accessed Care Home services in Scotland. These represent approximately 45 percent and 25 percent increases compared to corresponding figures in 2017/18 (Public Health Scotland). A key challenge for the social care sector therefore is in building and maintaining a workforce to meet this growing demand. Social care services in Scotland are provided by a mix of private, public (i.e., local authority in-house) and third-sector providers. These providers individually make pay and employment decisions that are, in turn, subject to wider labour market forces. Given the decentralised nature of the social care sector, central government policies aimed at supporting the care workforce are thus subject to factors outside of policymakers' direct control.

One policy currently in place is the minimum wage for the social care staff. Since April 2023, the wage floor for social care staff in Scotland has been £10.90, compared to the £10.42 national minimum wage. This wage floor was raised to a minimum of £12.00 in 2024.[1] A key question is "How will the increase in the social care wage floor affect employment in the sector?" A separate, and higher, minimum wage in the social care sector relative to other sectors could potentially support employment through two channels. First, it directly increases relative pay for the lowest-paid care staff compared to other sectors. Second, it could also support employment indirectly, if social care employers respond by shifting their pay schedules upwards, thereby increasing relative wages for people above the minimum wage level. Both primary and secondary channels work by inducing a premium between social care and non-social care wages, which, in turn, improves recruitment of new staff and/or retention of existing employees.

2. The Scottish ASC labour market

2.1 Aggregate trends in employment and pay

To understand the context for the new policy, Figures 1 and 2 plot the trends in employment and wage levels for the residential (Figure 1) and non-residential (Figure 2) adult social care (ASC) subsectors in Scotland. The left-hand panel in each figure plots annual employee headcounts while the right-hand panel plots the first five deciles of real hourly pay in the subsector, i.e., taking inflation into account.[2,3] Both figures indicate that real hourly pay (excluding overtime) increased between 2016 and 2022. The 10th percentile of hourly pay increased by approximately 16.4% in residential care and 15.5% in non-residential care, while median pay increased by 14.0% and 11.6%, respectively. These increases reflect longer term trends, as opposed to the temporary spike in hourly pay above the 30th

[1] https://www.gov.scot/news/pay-uplift-commitment-for-social-care-and-childcare-staff/
[2] Employee headcounts are obtained from the Scottish Social Services Council (SSSC) Workforce Data and are as at December of each year. Residential care refers to care in a care home for adults. Non-residential care comprises the Care at Home, Adult Day Care, and Fieldwork Service (Adults).
[3] Hourly pay data are obtained from the ONS Annual Survey of Hours and Earnings (ASHE). Residential care refers to Residential Care Activities (SIC: 87) and Non-residential care refers to Social Work Activities Without Accommodation (SIC:88). Real hourly pay is derived by deflating hourly pay (excluding overtime) for all workers by CPIH for 2022.

percentile in 2021, which is likely an artefact of a larger share of lower-wage workers leaving the sector that year, thereby mechanically shifting upwards the wage distribution.

Figure 1: Trends in employment and wage levels (Residential care)

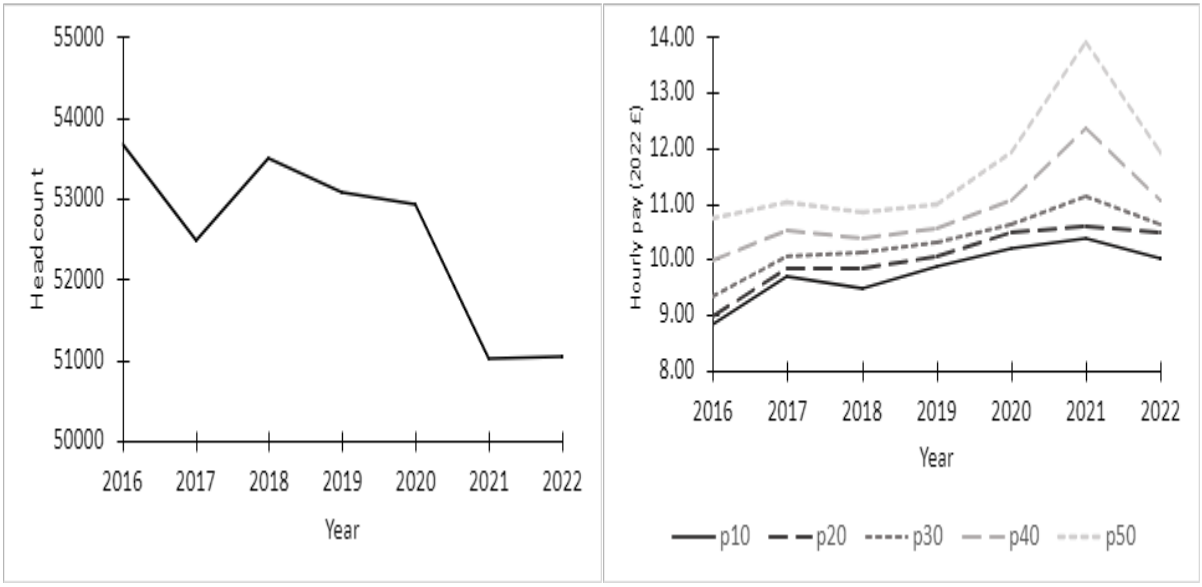
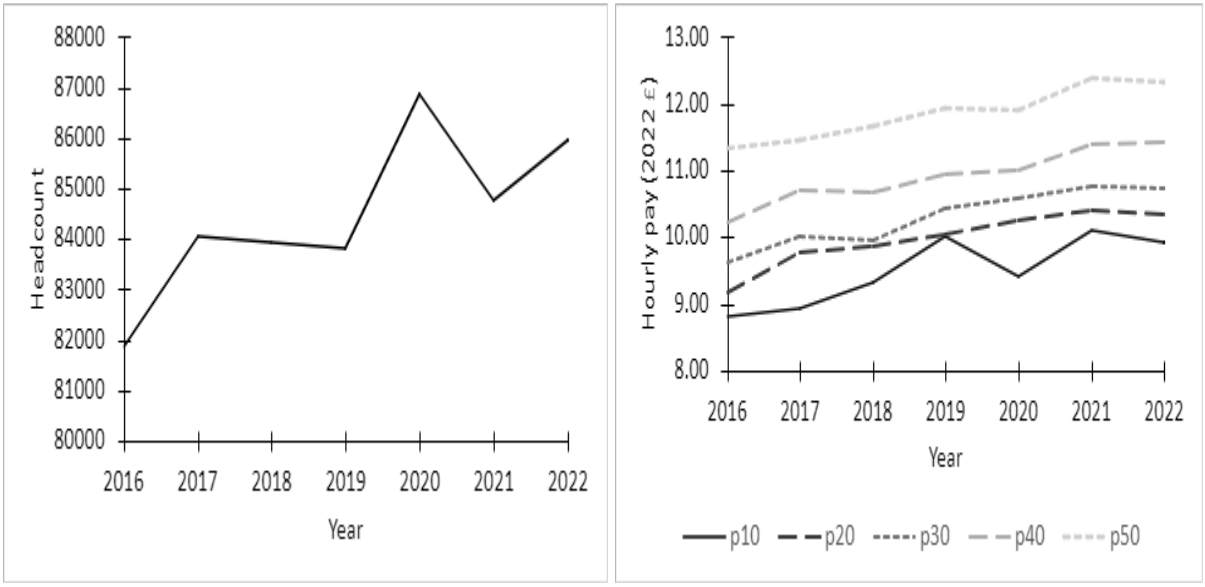


Figure 2: Trends in employment and wage levels (Non-residential care)



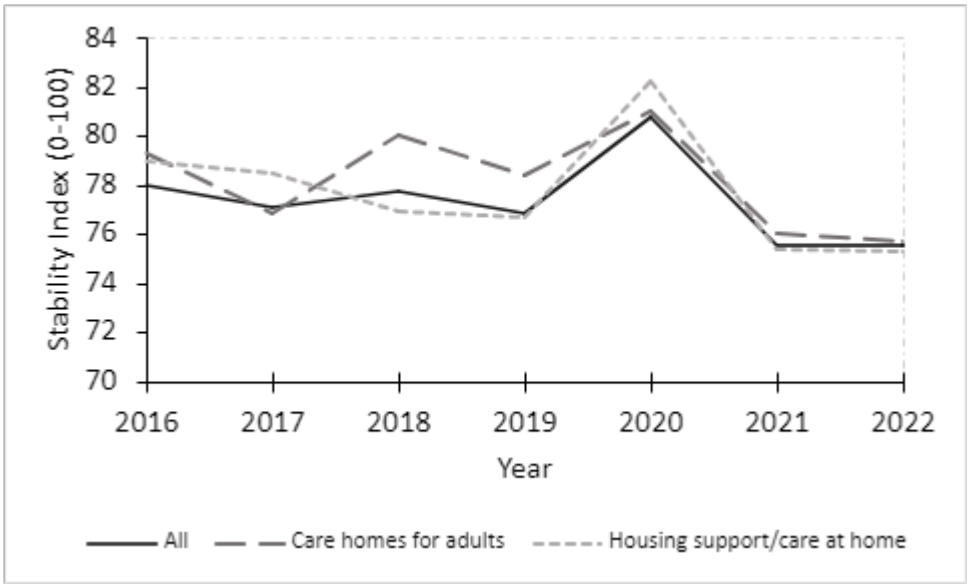
On the other hand, employment growth has been unsteady, with trends across subsectors diverging. Between 2016 and 2022, employment in residential care decreased by approximately 4.9% while employment in non-residential care services increased by about 5.0%. While the sharp fall in employment in both groups between 2020 and 2021 may be pandemic-related, the pattern of decreasing residential care and increasing non-residential care employment appear to be part of a longer-term

trend. In the years leading up to 2020, employment in residential care had decreased by approximately 1.1 percent between 2016 and 2019, while employment in non-residential care services increased by about 2.4 percent. The net effect of these changes is a roughly 1% increase in total (i.e., residential and non-residential care) employment between 2016 and 2022.

2.2 Aggregate trends in retention

Changes in employment levels are driven by underlying changes in recruitment and retention. Year-on-year employment growth figures can thus mask significant levels of churn. That is, employment levels can appear stable even with high rates of employee turnover. While turnover data is not available for the Scottish social care workforce, the annual SSSC Workforce Data Report publishes Stability Indices (SI), which measure the percentage of staff retained in the same post from the previous year. For example, a SI of 75 in 2022 implies that 75% of staff employed in 2021 are still in the same post in 2022. Figure 3 plots the stability indices for the entire Scottish social services sector and for the Care homes and Care at home subsectors. It shows a general decline in SI between 2016 and 2022. Within this period, all three indices increased sharply in 2020 (likely due to initial job protection policies during the early waves of the pandemic) but subsequently dropped to below pre-pandemic levels in 2021.

Figure 3: Trends in retention



While not directly comparable, for a fixed level of employment, a high SI implies fewer leavers and hence lower staff turnover. The Scottish social care workforce, therefore, appears to show a similar longer-term trend as the English ASC workforce, where the turnover rate in England increased from 27.1% in 2016/17 to 29.1% in 2022/23 (Skills for Care, 2023).

To sum-up, between 2016 and 2022, median pay in the Scottish social care sector increased between 11 and 31% (for non-residential and residential care, respectively), while employment growth in adult social care services has been weak and retention appears to be worsening. However, aggregate trends in pay and employment are, in general, affected by various factors such as wider labour market (i.e., non-social care) shifts, changes in demand for different types of care services (e.g., residential vs. non-residential care), and possible systematic differences across subsectors and localities. The preceding discussion therefore *cannot* be used to infer the relationship between employment and pay, which is the key quantity of interest. Instead, such an analysis would require more granular data (i.e., at employer and employee levels) and an approach to account for simultaneous non-wage factors that affect employment.

In the next section, we outline how we use employee-level data on pay and job/employer characteristics to address the confounding factors described above, thereby isolating the relationship between wages and employment.

3. Estimating the employment effect of increasing the minimum wage for ASC staff

3.1 Data

In the absence of individual level data on social care staff for Scotland, we analysed the relationship between wages and employment using a large dataset for England; see Technical Appendix A1. The Adult Social Care Workforce Data Set (ASC-WDS) is the main source of social care workforce intelligence in England, covering over 50% of the English ASC market, and containing rich information at both establishment level (e.g., type of service provided, sector, establishment size, count of employees and job roles, starters, leavers and vacancies, etc.) and staff level (e.g., age, gender, nationality, qualifications, training, hourly pay, job role, contract type, etc.); see Skills for Care (2023).

For our baseline model, we used the full sample of care staff aged 16 to 59 (i.e., employees close to state retirement age excluded) in ASC-WDS for the years 2016 to 2021, being employed by either a public (i.e., statutory local authority), private (i.e., for-profit) or voluntary (i.e., not-for-profit) sector care provider. The sample consisted of 335,330 care staff employed in 9,483 care establishments; see Technical Appendix, Table A1.

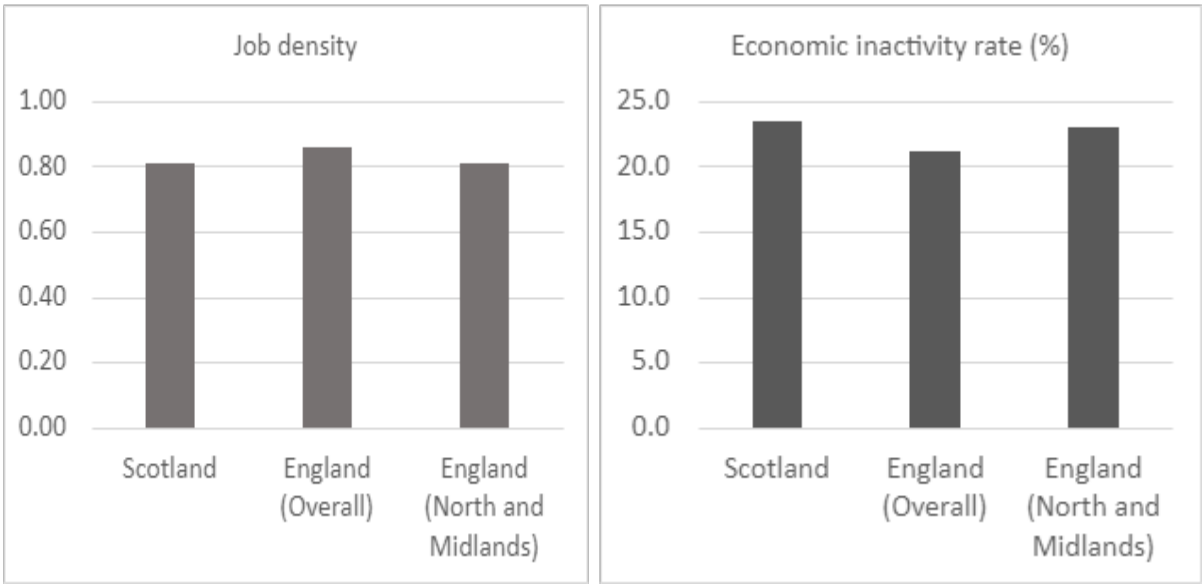
As shown in Vadean et al. (2024), the ASC-WDS data may include some measurement issues with respect to individual hourly wages in domiciliary care. Specifically, some domiciliary care employers reporting higher hourly wages may pay these only for client contact time, while others pay lower wages but compensate for travel time. These differences in reporting may lead to poor identification of pay differences between domiciliary care providers and potentially lead to biased results on relationship between wages and employment. We, therefore, proposed an alternative analysis on a sample restricted to residential care staff, including 206,138 workers in 6,509 care homes with or without nursing; see Technical Appendix, Table A2. This analysis implicitly assumes that, everything else equal, the relationship

between wages and employment is similar for residential and non-residential employees.

3.1.1 Differences between the ASC labour markets in Scotland and England

Analysis using the full baseline ASC-WDS sample described above assumes that the ASC labour market in Scotland is similar to England. In reality, though, there are substantial differences between the two. Looking first at the wider labour market and economic environment, Figure 4 reports job density (i.e., the number of jobs divided by the resident population aged 16-64) and economic inactivity rates (i.e., the percentage of working age people not in employment who have not been seeking work within the last 4 weeks and/or are unable to start work within the next 2 weeks) for Scotland, England, and England's North and Midlands regions. A cross-country comparison indicates higher aggregate jobs density (0.86) and lower economic inactivity rates (21.2%) in England compared to Scotland (0.81 and 23.5% respectively). This would mean that not only do care staff in Scotland have fewer job opportunities outside ASC, but also that people of working age are more likely to stay outside the labour market if they do not find suitable jobs. Therefore, the responsiveness to wages of ASC care staff in Scotland is likely to be different than in England.

Figure 4: Labour market indicators: Scotland vs. England; 2021

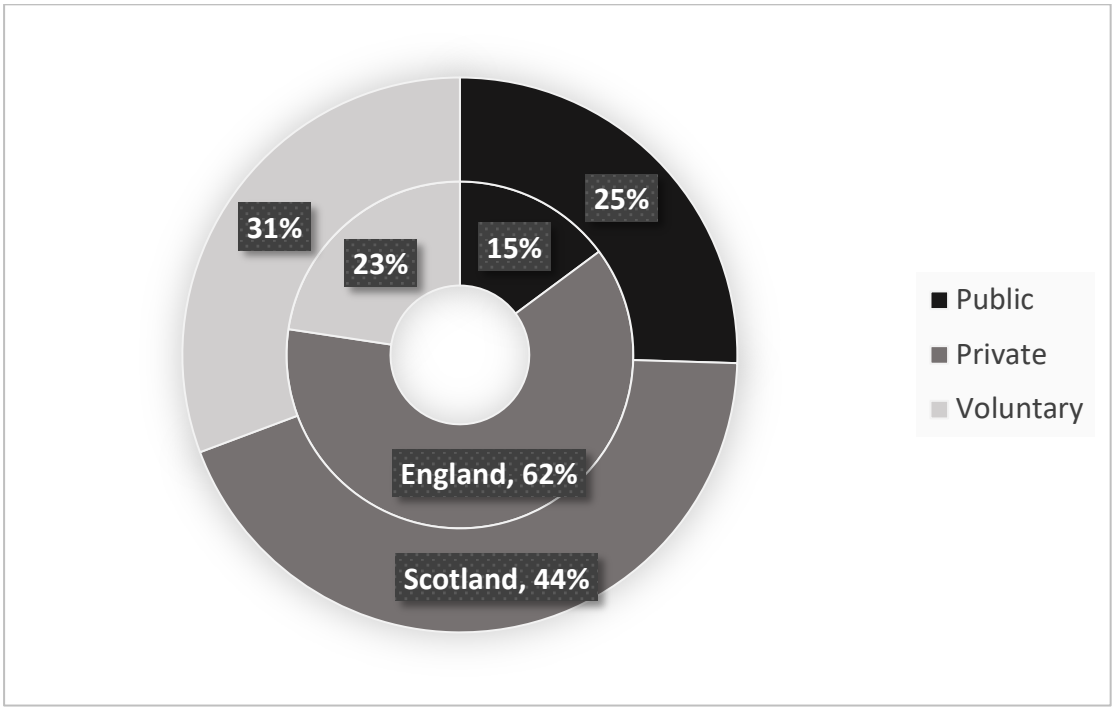


Data source: Office for National Statistics (ONS), Annual Population Survey 2021.

To improve the similarity in wage responsiveness between Scotland and the analysis sample (i.e. to make the source data more representative of Scotland), we therefore looked to refine the analysis using data for selected regions of England. Disaggregated statistics for English regions (see Technical Appendix, Table A3) suggest that part of the difference in economic conditions between Scotland and England stems from the North-South divide within England. Specifically, regions in

the South have noticeably higher jobs density and economic activity rates. By experimenting with combinations of English regions that would have labour market indicators more closely resembling Scotland, we identified that the closest were England's North and Midlands (i.e., North East, North West, Yorkshire and The Humber, East Midlands, and West Midlands), with an aggregate job density of 0.81 and economic inactivity rate of 23.0%.

Figure 5: Sector of employment in ASC: Scotland vs. England; 2022



Data source: Skills for Care (2023) and Scottish Social Services Council (2023).

A further important difference between the ASC sectors in Scotland and England is the sectoral split, with relatively more care staff being employed in Scotland by public and voluntary (i.e., not-for-profit) care providers. In particular public providers are known to offer better pay and contractual conditions (e.g., sick leave and pensions) and consequently experience higher staff retention rates (Scottish Social Services Council, 2023; Skills for Care, 2023). Figure 5 plots the breakdown of employment by sector in 2022, showing that public sector care providers accounted for roughly 25% of care staff in Scotland (compared to only 15% in England), while voluntary care providers employed about 31% of care staff (compared to only 23% in England). In contrast, the majority of care staff in England (62%) were employed in the private sector. The differences in the ASC markets between the two countries comes mainly from a relatively smaller share of private non-residential market in Scotland: only about 28% of non-residential care staff was employed by private care

providers in 2022, while 32% were employed by public and 40% by voluntary care providers; see Technical Appendix, Table A4.[4]

3.1.2 Distribution of social care wages in Scotland

To obtain predicted effects for ASC employment in Scotland, we used Scottish social care wage decile data from the 2023 ONS Annual Survey of Hours and Earnings (ASHE).[5] Comparing the wage distribution in Scotland to that in our analysed sample (i.e., inflated to 2023 levels), we note that Scottish social care wages are persistently higher along the entire distribution (see Technical Appendix, Table A2). This difference comes from an about 5% higher minimum wage in the Scottish ASC sector (£10.90) compared to the NLW level that applies for ASC workforce in England. Furthermore, the higher share of Scottish care workforce employed by public and voluntary sector providers (see Figure 5), known to pay higher wages, could also contribute to this gap.

Under the assumption that employees assess relative wage differences (i.e., compare pay at other ASC employers or outside the sector against their current pay) when deciding whether or not to leave or take up a position, it is important that we address the gap between the analysis sample and Scottish wage distributions. This is because the policy we are analysing is an increase of the wage floor to a specific nominal value (i.e., £12.00). In this situation, not adjusting for the systematic gap in wages between the Scottish wage distribution and the analysis sample would lead us to infer the behavioural responses (to a wage increase) of the lowest-paid Scottish ASC workers based on the behaviour of English ASC workers who are higher up in the English ASC wage distribution, and potentially more skilled and experienced.

To reduce the gap between the Scottish social care wage distribution and that of our analysis sample, we applied a scaling factor equal to the percentage difference between the Scottish ASC minimum wage (i.e., £10.90) and the NLW (i.e., £10.42), uniformly across our analysis sample. This preserves the underlying shape of the distribution (i.e., relative distances and prevalence between wages) but brings wages at the lower part of the two wage distributions closer together. This gives us some confidence with respect to estimation results for a minimum wage floor increase, which are likely to affect only care staff with wages below the median wage. The higher part of the wage distribution in our sample (i.e., higher than median) diverges more substantially from the wage distribution in Scotland. This is likely due to higher

[4] We did not provide a sectoral split by care setting between the two countries due to the lack of information on the split between private and voluntary providers by care setting in Skills for Care data for England. We also need to note that the figures only provide a rough comparison between ASC markets of the two countries due to differences in reporting. For example, the Scottish data reports headcounts while the English data reports filled job posts, which may differ from headcounts when individuals occupy multiple posts. We also excluded from the data for England 130,000 filled post by Personal Assistants (i.e., care workers employed directly by cared for people), as these have no equivalent in social care workforce data in Scotland.

[5] We take the social care wage to be the employment-weighted average wage levels in SIC Q87 (Residential care activities) and Q88 (Social work activities without accommodation). As these industrial classifications include childrens' social services, they are rather an approximation of the ASC sector we analyse.

wages paid by public and voluntary employers and the higher share of care staff employed by public and voluntary care providers in Scotland.

3.2 Responsiveness of labour supply to a change in wages

The key metric that is conventionally used to assess the effect of a change in wages on employment is the wage elasticity of labour supply. It is defined as the percentage change in labour supply resulting from a 1% change in wages, and captures how employment at an establishment, or in a sector, responds to changes in wages.

We estimated the wage elasticity of labour supply in the Scottish ASC sector following the two-step procedure developed in Vadean et al. (2024). First, we modelled the relationship between hourly pay and the probability of job separation (i.e., how likely are currently employed ASC staff to leave their employer during the next 12 months). Using this model, we estimated the wage elasticity of job separations (i.e., the change in separation probability associated with a percentage change in wages). The resulting elasticity estimate accounts for non-wage drivers of job separation and removes them from the effect of wage changes; see Technical Appendix Table A5 and Table A6.

Employment changes in each establishment result from the net effects of job separations and new hires. As it is not possible to directly estimate the responsiveness of hiring to wage changes (i.e., the wage elasticity of hiring) from available data (i.e., the pool of potential hires is not known, particularly because there are no specific qualification requirements for care workers), in the second step of the procedure we determine the wage elasticity of labour supply by inferring the wage responsiveness of hiring from the wage responsiveness of separation; see Technical Appendix, Section A2. This widely-used approach in the labour economics literature is based on the view that in a steady-state equilibrium (i.e., when aggregate employment growth is negligible) hiring and separation reflect churn and are, in aggregate, balanced (Lazear and McCue, 2017; Manning, 2003). The assumption about negligible aggregate employment growth is broadly in line with real-world observations. For example, headcount in ASC in Scotland increased only by 3% (from 138,120 to 142,160) between 2016 and 2022, which averages to less than 0.5% per year (Scottish Social Services Council, 2023). This simplifying assumption allows us to estimate the wage elasticity of labour supply from elasticities of job separation.

To allow for the responsiveness of employment to wage changes to differ at different wage levels, we estimated wage elasticities at deciles of the aggregate ASC wage distribution.

3.3 The employment effect of an increase in ASC minimum wage

The estimates of the wage elasticity of labour supply are used to predict the effect of an increase in the ASC wage floor on employment. Implicitly, the predictions abstract from indirect effects of the policy on wages above the new wage floor and assume that wages and employment at these higher wage levels remain unchanged.

To predict the total employment effect of raising the wage floor, we first computed the predicted change in employment at points in the Scottish social care wage

distribution (i.e., wage deciles). Because only wage decile information is available, we assumed that the hourly wages paid are at the increments given by the deciles of the wage distribution. Because the 10th percentile wage is slightly under the ASC minimum wage of £10.90, we assume all workers in the lowest wage decile are paid the 10th percentile wage. For the remainder of workers, some assumptions on the distribution of wages between the reported wage deciles are necessary. For simplicity and transparency, we consider two contrasting assumptions: A) that the workers with wages between two increments are paid at the lower increment, and B) that the workers with wages between two increments are paid at the higher increment. Because Assumption (A) results in the wage floor increase affecting a larger portion of workers, while Assumption (B) results in the wage floor increase affecting a smaller portion of workers, they give an upper (A) and lower bound (B) for our predicted labour supply change.

The predicted changes in employment for wage increases between deciles of the wage distribution were then summed together to obtain the total predicted effect. For example, if we assume that the new minimum wage floor is between the 30th and 40th percentile of the wage distribution, the predicted employment effect is the sum of:

i. the employment effect from increasing the wage floor from the 10th percentile (our assumed minimum) to the 20th percentile of the wage distribution – this equals the average wage elasticity of labour supply for the 10th and 20th percentiles **multiplied by** the percentage difference between 10th and 20th percentile wages **multiplied by** the share of care staff that were paid below the 20th percentile (this is 20% under Assumption A or 10% under Assumption B above);
ii. the employment effect from further increasing the wage floor wage from the 20th to the 30th percentile of the wage distribution – this equals the average wage elasticity of labour supply for the 20th and 30th percentiles **multiplied by** the percentage difference between 20th and 30th percentile wages **multiplied by** the share of care staff that were paid below the 30th percentile (this is 30% under Assumption A or 20% under Assumption B above); and
iii. the employment effect from further increasing the wage floor wage from the 30th percentile of the wage distribution to the new wage floor – this equals the average wage elasticity of labour supply for the 30th percentile and that at the new wage floor **multiplied by** the percentage difference between 30th percentile wage and the new wage floor **multiplied by** the share of care staff that were paid below the new wage floor (this is 40% under Assumption A or 30% under Assumption B above).

For more details on and a mathematical expression of the calculation of the employment effect predictions see Technical Appendix, Section A3.

4. Results

Our headline results are based on the sample of ASC-WDS observations located in England's North and Midlands regions (i.e., North East, North West, Yorkshire and

The Humber, East Midlands, and West Midlands), excluding home care staff. The exclusion of observations from home care staff aims to avoid the measurement issues related to wage reporting for home care (see Section 3.1), while the restriction to observations from Northern and Midlands regions aims to account for the differences in ASC labour markets between Scotland and England (see Section 3.1.1). Our preferred specification also uses post-sampling weights to address the difference in relative employment share of the public sector in Scotland versus our sample, as discussed in Section 3.1.1.

The job separation estimations, on which our predicted employment effects are based, are presented in the Technical Annex, Table A6; Columns 1 and 2 report unweighted estimates, while Columns 3 and 4 report the preferred weighted estimates. The wage elasticities of separation and labour supply at each wage decile, as well as corresponding predicted incremental and total effects on employment of our preferred model (with weights) are presented in the Technical Annex, Table A10. As expected, wage elasticities of labour supply from the weighted estimations are slightly smaller than those from the unweighted estimations (Technical Annex, Table A9), as job separation outcomes of staff employed in the public and voluntary sectors, and likely having better pay and employment conditions, are given higher weights.

A summary of our preferred model predictions is given in Table 1. The predicted total employment effects were obtained (as described in Section 3.3) by adding up incremental employment effects from increases of the wage floor between deciles of the wage distribution. These were calculated using wage elasticities of labour supply to the sector, obtained from wage elasticities of separation (overall and to jobs inside ASC). Because only wage decile information is available for Scottish ASC wages, the analysis has had to make assumptions about the distribution of wages between deciles. This means we are only able to report upper- and lower-bound estimates of the employment effect of raising the ASC wage floor. These bounds result from contrasting assumptions and should be read together and interpreted as implying that true employment effects lie somewhere between the two estimates.

Table 1: Predicted employment effects - wage responsiveness of ASC labour supply in Scotland assumed similar to that of ASC labour supply in England's North and Midlands, excluding home care

New ASC Minimum Wage (nominal; 2024 £)			**12.00**		**12.50**	**13.00**
New ASC Minimum Wage (deflated to 2023 £)			11.57		12.05	12.53
	p20	p30		p40		
Wage distribution ASC Scotland (ONS ASHE 2023)	10.94	11.27	11.57	11.71	12.05	12.53
Wage elasticity labour supply to the sector	1.74	1.74	1.77	1.76	1.78	1.82
A (workers assumed fully clustered at lower wage)						
Assumed cumulated share of workers below wage	0.20	0.30		0.40		
Cumulated total labour supply increase (%)			**4.0%**		**7.5%**	**11.2%**
B (workers assumed fully clustered at higher wage)						
Assumed cumulated share of workers below wage	0.10	0.20		0.30		
Cumulated total labour supply increase (%)			**2.7%**		**5.4%**	**8.4%**

As the Scottish wage distribution data are for 2023, we deflated the new 2024 wage floor to its equivalent 2023 value, assuming a 3.75% inflation rate, based on Bank of England Q2 2024 estimates. For example, raising the wage floor from £10.90 to £12.00 in 2024 (a 10.1% nominal increase) represents a 6.1% increase in real terms to £11.57. The predicted policy effects are then estimated based on the 2023 equivalent.

Our preferred model predicts that the increase in the ASC wage floor to £12.00 in 2024/25 could lead to a predicted increase in ASC employment of between 2.7% and 4.0%. Table 1 also reports predicted employment increases under alternative policy scenarios where the ASC wage floor is increased to £12.50 or £13.00. All else constant, raising the wage floor to £12.50 (i.e., 14.7% nominal or 10.5% real wage increase) could lead to an ASC labour supply increase of between 5.4% and 7.5%, while an increase of the wage floor to £13.00 (i.e., 19.3% nominal or a 15.0% real wage increase) could lead to an ASC labour supply increase of between 8.4% and 11.2%.

As mentioned above, the expected employment effects should be interpreted as being somewhere between the upper and lower estimated values, as the two assumptions represent extremes. Moreover, the estimates assume that any other factors influencing labour supply are being kept constant, including wages in other sectors. Therefore, as discussed in more detail in the next section, to the extent that non-social care employers respond to the higher ASC wage floor by raising pay, the predicted effects are likely to overstate the net impact of the policy on social care employment.

5. Discussion

In this study, we estimated predicted effects of labour supply related to the increase in the minimum wage floor in the ASC sector in Scotland in April 2024. This is an important policy intervention aimed at improving recruitment and retentions for a sector facing increasing demand for services.

Due to the lack of individual level data on ASC staff employment and wages for Scotland, the responsiveness of care staff labour supply (i.e., recruitment and retention) to changes in wages was estimated using a large dataset on ASC staff and employers for England: the Adult Social Care Workforce Data Set (ASC-WDS) collected and managed by Skills for Care (Skills for Care, 2023). The predicted labour supply impact to the increase in the minimum wage floor in ASC was based on a model developed in Vadean et al. (2024) which estimated wage elasticities of labour supply to the ASC sector in England. However, due to the differences between the Scottish and English labour markets, a preferred model in this study was estimated using data for a subsample of care staff employed in certain English regions. These regions, England's North East, North West, Yorkshire and the Humber, East Midlands and West Midlands, were identified as providing (on aggregate) a closer match to labour market realities in Scotland, both in terms of job density (i.e., the number of jobs divided by the resident population aged 16-64, and thus job opportunities outside the ASC sector) and economic inactivity rates (i.e., the percentage of working age people that are out of work and not actively looking for

work, not waiting to start a job, not in full-time education, caring for their family or retired). Estimations were also weighted to correct for differences between Scotland and England in the market shares of the public, private and voluntary sectors.

The analysis focused on the impact of the wage floor policy on employee *numbers* (i.e., the extensive margin). This focus aligns with the broader policy objective of improving retention and recruitment of care staff. Nonetheless, employment can also be more broadly defined to consider the number of hours worked, for a given staff headcount. Some previous studies on wages elasticities of labour supply have studied the effects of changes in wage on hours worked (i.e., the intensive margin); for a review see Bargain and Peichl (2016). However, hours worked are less well captured in the dataset used in this study, particularly for employees on contracts with no guaranteed working hours (i.e., zero-hours contracts). Therefore, an analysis on the relationship between wages and working hours was not included and our predictions are limited to the changes in employee headcount.

Our model predicts that increases in the ASC minimum wage floor would have a positive effect of improving recruitment and retention in the ASC sector. Holding everything else constant, an ASC minimum wage increase to £12.00 (i.e., 10.1% nominal or a 6.1% real wage floor increase) is predicted to lead to an ASC labour supply increase of between 2.7% and 4.0%. A larger increase of the wage floor to £12.50 (i.e., 14.7% nominal or a 10.5% real wage floor increase) would lead to an ASC labour supply increase of between 5.4% and 7.5%, while an increase of the wage floor to £13.00 (i.e., 19.3% nominal or a 15.0% real wage floor increase) would lead to an ASC labour supply increase of between 8.4% and 11.2%.

The predictions have, nonetheless, several limitations.

5.1 Limitations of the analysis framework

Our point estimates of wage elasticities of labour supply are subject to statistical uncertainty. Nonetheless, all estimates reported in the Technical Annex, Tables A7 to A10 have high statistical significance. Moreover, due to wage measurement issues for home care staff, the response of ASC staff to wages has been approximated excluding home care employees. While this approximation was required to reduce potential measurement bias, the wage elasticities of homecare staff (38% of our initial sample), may in fact be different to that of staff in other care setting. To address this issue, we would need more accurate data on hourly pay of home care staff on their full time spent at work, including travel time.

The analysis also assumed that the increase in the ASC wage floor affects only the social care sector and that all other related factors remain unchanged. In particular, this means that employers in other sectors do not respond by adjusting their wages. This assumption would be more likely to hold if the ASC labour market is small compared to the wider market for workers with similar characteristics. In this instance, the social care sector could be seen as a ‘price taker’ relative to the wider labour market.

The ASC sector in Scotland, however, accounts for about 7.6% of employment overall (ONS Annual Population Survey 2021) and the share is even higher when

considering only employment in low-paying occupations (e.g., care, retail, hospitality, cleaning, etc.). As such, competition for the same pool of workers may lead employers outside the sector to respond to an increase in the ASC minimum wage floor by raising their wage offers as well (i.e., we expect some degree of pass-through of the policy to wages in other sectors). In this case, the minimum wage policy is likely to have a smaller effect on ASC employment compared to our estimates. Nonetheless, since it is highly unlikely that non-social care employers respond more strongly to the policy than social care employers, we expect some difference between social care and non-social care wages to remain after accounting for wage adjustments in all sectors. Accordingly, we expect the increase in ASC wage floor to have a positive impact on employment, but lower than our predicted figures, with actual effects depending on wider local labour market conditions.

In deriving predicted effects of the rise in ASC wage floor, the analysis assumed that the policy only affects people whose pay are below the new minimum. This implicitly assumes that employment at higher wage levels remains unchanged. In reality, such indirect effects on pay and employment are possible if employee compensation is based on a wage schedule and employers respond to the policy by shifting wages at other points of the schedule upwards. To the extent that retention and recruitment for these better-paid job roles are improved, the policy would also have a positive effect on employment that our analysis does not account for. We expect though that the underestimated employment effects from increases in pay above the new minimum wage floor to be smaller than the overestimated effects from assuming wages in other sectors constant.

The increase in NLW to £11.44 per hour for all workers in the UK aged 21 and over in April 2024 is a major policy intervention affecting wages in all sectors, including those that are competing with ASC for labour force. We expect the predicted ASC employment effect, resulting from the increase in the minimum wage floor for ASC staff in Scotland, is likely to be significantly offset by the UK minimum wage policy. In addition, Scottish employers in competing sectors (e.g., hospitality and retail), can further increase wages as a reaction to the new ASC minimum wage floor, as argued above. Overall, our predicted effects on labour supply rather represent an upper limit.

5.2 Limitations in Scottish wage distribution data

Our analysis relies on hourly pay in ASC in Scotland by deciles published by the ONS. This means we do not know how wages are actually distributed between adjacent deciles. To address this data limitation, we computed for each bracket (i.e., 10^{th} to 20^{th} percentile, 20^{th} to 30^{th} percentile, etc.) predicted employment effects taking either the lower or upper end of the bracket as their initial pay. The predicted employment effects based on the higher and lower initial wage levels correspond to the lower and upper bounds of predicted employment effects, respectively. We expect that actual effects on employment to be somewhere between the two predicted values. This goes some way to addressing the uncertainty regarding the true wage distribution.

5.3 Differences between the Scottish and English labour markets and economic conditions

As noted above, the present analysis is based on data from England due to the lack of Scottish data on pay and employment at the establishment (or more granular) level. Although we have sought to address some of the differences between both contexts, there remain potential differences that cannot be straightforwardly accounted for. One concern is that differences in the public-private-voluntary sector composition of social care providers in Scotland vs. England may reflect structural differences in both markets. If so, it is possible that employers and employees from respective contexts may respond differently to the same minimum wage policy. To shed light on this would require individual-level wage data for Scotland. A potential data source for future analysis could be the Annual Population Survey (APS), depending on its sample size of social care employees located in Scotland.

References

Bargain, O., Peichl, A., 2016. Own-wage labor supply elasticities: variation across time and estimation methods. IZA J Labor Econ 5, 1–31. https://doi.org/10.1186/S40172-016-0050-Z/TABLES/5

Castle, N.G., 2008. State Differences and Facility Differences in Nursing Home Staff Turnover. Journal of Applied Gerontology 27, 609–630. https://doi.org/10.1177/0733464808319711

Castle, N.G., Engberg, J., 2006. Organizational characteristics associated with staff turnover in nursing homes. The Gerontologist 46, 62–73. https://doi.org/10.1093/geront/46.1.62

Castle, N.G., Engberg, J., Anderson, R., Men, A., 2007. Job satisfaction of nurse aides in nursing homes: Intent to leave and turnover. The Gerontologist 47, 193–204. https://doi.org/10.1093/geront/47.2.193

Donoghue, C., 2010. Nursing Home Staff Turnover and Retention. Journal of Applied Gerontology 29, 89–106. https://doi.org/10.1177/0733464809334899

Gaudenz, C., De Geest, S., Schwendimann, R., Zuniga, F., 2019. Factors Associated With Care Workers' Intention to Leave Employment in Nursing Homes: A Secondary Data Analysis of the Swiss Nursing Homes Human Resources Project. Journal of Applied Gerontology 38, 1537–1563. https://doi.org/10.1177/0733464817721111

Jenkins, S.P., 2005. Survival analysis. Institute for Social and Economic Research, University of Essex, Colchester.

Karantzas, G.C., Mellor, D., McCabe, M.P., Davison, T.E., Beaton, P., Mrkic, D., 2012. Intentions to quit work among care staff working in the aged care sector. The Gerontologist 52, 506–516. https://doi.org/10.1093/geront/gnr161

Kennedy, K.A., Applebaum, R., Bowblis, J.R., 2020. Facility-Level Factors Associated With CNA Turnover and Retention: Lessons for the Long-Term Services Industry. The Gerontologist 60, 1436–1444. https://doi.org/10.1093/GERONT/GNAA098

Kennedy, K.A., Applebaum, R., Bowblis, J.R., Straker, J.K., 2021. Organizational Factors Associated with Retention of Direct Care Workers: A Comparison of Nursing Homes and Assisted Living Facilities. The Gerontologist 61, 530–539. https://doi.org/10.1093/GERONT/GNAA130

Lazear, E.P., McCue, K., 2017. Hires and Separations in Equilibrium. NBER Working Paper 23059, National Bureau of Economic Research.

Manning, A., 2003. Monopsony in motion: imperfect competition in labor markets. Princeton University Press, Princeton and Oxford.

Morris, L., 2009. Quits and job changes among home care workers in Maine: The role of wages, hours, and benefits. The Gerontologist 49, 635–650. https://doi.org/10.1093/geront/gnp071

Park, Jeongkyu, Yoon, S., Moon, S.S., Lee, K.H., Park, Jueun, 2017. The Effects of Occupational Stress, Work-Centrality, Self-Efficacy, and Job Satisfaction on Intent to Quit Among Long-Term Care Workers in Korea. Home Health Care Services Quarterly 36, 96–111. https://doi.org/10.1080/01621424.2017.1333479

Public Health Scotland, 2023. Insights in social care: statistics for Scotland. https://publichealthscotland.scot/publications/insights-in-social-care-statistics-for-scotland/insights-in-social-care-statistics-for-scotland-care-home-services-funded-by-local-authorities-in-scotland-financial-year-202223/

Rosen, J., Stiehl, E.M., Mittal, V., Leana, C.R., 2011. Stayers, leavers, and switchers among certified nursing assistants in nursing homes: A longitudinal investigation of turnover intent, staff retention, and turnover. The Gerontologist 51, 597–609. https://doi.org/10.1093/geront/gnr025

Scottish Social Services Council, 2023. Scottish Social Service Sector: Report on 2022 Workforce Data. Dundee: Scottish Social Services Council.

Skills for Care, 2023. The state of the adult social care sector and workforce in England. Leeds: Skills for Care.

Vadean, F., Allan, S., Teo, H. 2024. Wages and labour force supply in the Adult Social Care sector. NIHR Policy Research Unit in Adult Social Care.

Vadean, F., Allan, S., 2023. Labour market competition and wages in Adult Social Care. NIHR Policy Research Unit in Adult Social Care.

Vadean, F., Saloniki, E.-C., 2023. Job Quality and Job Separation of Direct Care Workers in England. Innovation in Aging. https://doi.org/10.1093/GERONI/IGAD009

Wooldridge, J.M., 2010. Econometric Analysis of Cross Section and Panel Data, Second Edi. ed. MIT Press, Cambridge, MA; London, UK.

Technical Appendix

A1. Data

Adult Social Care Workforce Data Set

The Adult Social Care Workforce Data Set (ASC-WDS) is the main source of ASC staff data in England. Information is provided by ASC employers on both establishment characteristics (e.g., type of service provided, sector, establishment size, count of employees and job roles, starters, leavers and vacancies, etc.) and care staff (e.g., age, gender, nationality, qualifications, training, hourly pay, job role, contract type, etc.). Public employers provide data on a mandatory basis, while independent employers provide data voluntarily, being incentivised through access to workforce development grants. All data in the ASC-WDS is updated or confirmed to be up to date within the last two years, with about 80% of employers having updated their data in the past six months. ASC-WDS data is validated at source and undergoing rigorous data quality checks (Skills for Care, 2023).

We included seven annual cuts from the dataset (Oct 2016 to Oct 2022), matched at individual level. We excluded all establishments with records not updated withing the last six months and establishments with missing IDs for more than 25% of their care staff. We included establishments offering ASC services to adults (i.e., people aged 18 and over), and being owned by either public (i.e., statutory local authority), private (i.e., for-profit) or voluntary (i.e., not-for-profit) sector care providers. Employees were included in the sample if aged between 16 and 59 (i.e., employees close to state retirement age excluded). We excluded observations for care staff without a unique ID (as these could not be traced over time; 7%), for those who erroneously had multiple entries per year with the same establishment (1%), and for staff with two or more jobs in any year (6%).

Care establishments and staff have each unique and permanent IDs, allowing staff to be traced over time and identifying job transitions/separations. Following Vadean et al. (2024), job transitions inside ASC were identified as a dummy variable equal to '0' if the employee was still with the same employer one year later (t + 1) and equal to '1' if the employee could be identified as working for another ASC employer in the sample at t + 1. Overall job separations were defined as a dummy variable equal to '0' if the employee was still with the same employer one year later (t + 1) and 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 at t + 1, 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 (about 14%).

The final sample consisted of 903,690 observations (job-spell-years) of 395,281 care staff employed in 13,291 care establishments; see Table A1. A large number of job spells in our sample ended with a job separation: 31%. Out of these job separations, we could identify about 30% to be transitions to other ASC employers in the ASC-

WDS sample. As the ASC-WDS only covers about half of the ASC market in England, the remaining job separations were to destinations outside the ASC-WDS sample, and not identifiable whether inside or outside the ASC sector.

More accurate information on the job transitions between ASC jobs was obtained from a question related to the source of new recruits, this showing that about 62% of recruits were previously employed in other ASC jobs.

From the job spells in our sample, about 52% were in adult residential care (with or without nursing), 38% in adult home care, and 10% in other adult community care. Moreover, a large majority of job spells were in privately owned care establishments (72%) and smaller shares (14% each) in the public and voluntary sector.

The UK minimum wage policy and in particular the introduction of the National Living Wage (NLW) in April 2016 led to a significant increase of wages for many ASC employees. As illustrated in Figure A1 (b), when inflated by CPI to 2023 prices, the wage distribution in 2021 (the last year in our panel) is significantly above those from previous years. This shows that wages in ASC have increased more that consumer prices. Figure A1 (c) shows that a more suitable inflation factor for wages in this study is the percentage change in NLW, leading to a better overlap of the wage distributions between the years included in the sample.

Annual Survey of Hours and Earnings: wage distribution

Information on the distribution of wages in the Scottish social care sector is taken from the Annual Survey of Hours and Earnings (ASHE), the most comprehensive source of information on the structure and distribution of earnings in the UK. Table A2 presents the deciles and quartiles of the distribution of hourly wages (excluding overtime) in Scotland in 2023 for: a) residential care employees (SIC Q87) and b) employees involved in social work activities without accommodation (SIC Q88). We combined these in an overall distribution for the ASC sector using as weights employee headcount in the two care settings from the Scottish Social Workforce Data (Scottish Social Services Council, 2023). The ASHE wage data includes wages from employees in children social care services and is, therefore, an approximation of the wage distribution in ASC.

When comparing the wage distribution in ASC in Scotland in 2023 to that of the analysed ASC-WDS sample, we note that ASC wages are higher in Scotland. There are likely two reasons for this difference: a) the introduction in April 2023 of a sector minimum wage of £10.90 (which increased wages of the lowest paid ASC workers above the level of their counterparts in England), and b) the substantially higher share of ASC staff employed by public and voluntary care providers (see Figure 5), which are known to pay higher wages.

To bring the wage distribution of our analysed sample closer to that of the ASC workforce in Scotland, we applied a scaling factor equal to the percentage difference between the Scottish ASC minimum wage (i.e., £10.90) and the NLW (i.e., £10.42). As shown in the last row of Table A2, this brought the lower part of the two wage distributions (below the 40th percentile) quite close to each other (within a 5% range), and with the 20th percentiles almost coinciding. Wages above the 50th percentile are

more different (above 10%) and most likely due to the differences in ASC sectoral split between Scotland and England.

Office for National Statistics and Annual Population Survey labour market statistics

To compare the labour market in Scotland to the labour market in England (and parts of England) we used Office for National Statistics (ONS) data on job density (i.e., the number of jobs divided by the resident population aged 16-64) and Annual Population Survey (APS) data on economic inactivity (i.e., people not in employment who have not been seeking work within the last 4 weeks and/or are unable to start work within the next 2 weeks). The data for Scotland and English regions for 2021 is presented in Table A3.

Scottish Social Service Sector (SSSC) report on workforce data

All employee headcount and registered services (establishment count) data are obtained from the Scottish Social Services Council's 2022 Annual Report on Workforce Data.

A2. Wage elasticity of labour supply to the sector

Based on a Dynamic Monopsony Model (Manning, 2003), and following Vadean et al.(2024), the wage elasticity of labour supply to the ASC sector (ε_{ASCw}) is determined from the overall wage elasticity of separation (ε_{sw}), the wage elasticity of separation to other employment inside the sector (ε_{sw}^{I}), and share of separations to employment inside the sector (θ_s^I):

$$\varepsilon_{ASCw} = \frac{-2\varepsilon_{sw} + 2\theta_s^I \varepsilon_{sw}^I}{(1-\theta_s^I)} \quad (1)$$

given the steady-state assumptions that the overall flows of staff separation and recruitment are equal ($\theta_R = \theta_s$), the overall recruitment elasticity equals the negative of the separation elasticity ($\varepsilon_{Rw} = -\varepsilon_{sw}$), and the recruitment elasticity from employment inside the sector equals the negative of the separation elasticity to employment inside the sector ($\varepsilon_{Rw}^I = -\varepsilon_{sw}^I$). The equality between the overall flows of staff separation and recruitment also implies that the shares of separations to and recruitment from employment inside the sector have to be equal as well ($\theta_R^I = \theta_s^I$).

Econometric approach

Also following Vadean et al. (2024), the two wage elasticities of separation are estimated using discrete time proportional hazard model proposed by Jenkins (2005). The discrete hazard of the job spell i to end during the tenure-year t is:

$$\Pr(h_{it} = 1 | x_{it}, u_i) = \Phi\left(\mathrm{D}_{di}\alpha + x_{it}\beta_{CREprobit} + \bar{z}_i\xi + a_i\right) \quad (2)$$

where (D) is the baseline hazard, allowed to be piece-wise constant over the tenure periods (d). To account for time-invariant unobserved effects, the discrete time proportional hazard model is estimated by correlated random effects (CRE) probit. This is a quite flexible estimator for binary settings, including 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 fixed-effects estimator but allowing the estimation of average partial effects (i.e., marginal effects) and elasticities (Wooldridge, 2010).[6] Most 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 the included year dummies. We estimated CRE probit by pooled probit in Stata 17.0, with the Huber-White sandwich estimator used to obtain cluster-robust standard errors.

An important challenge in estimating wage elasticities of separation is related to the adequate control for other relevant factors in x_{it} besides wages. Following related studies on determinants of job separation and wage elasticities of labour supply (Vadean et al., 2024; Vadean and Allan, 2023; Vadean and Saloniki, 2023;), the covariates included are: a) individual factors that can be associated with the likelihood of job separations (i.e., age, gender, ethnicity, and qualifications); b) a job

[6] 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).

and employer related characteristics, like job role, training incidence, employment without guaranteed working hours, sector (i.e., public, private, and voluntary), user type (i.e., younger adults, older people, and mixed), employer size, the vacancy rate in the previous year, and the turnover rate for the past 12 months to capture any potential 'herd' effect with respect to separations; and c) local market characteristics, like the local unemployment rate, the log of the 1st quartile of the local wage distribution (as proxy for peer wages in alternative employment), the geometric mean of local house prices (as proxy for demand of self-funded care), the ASC tariffs paid by local councils (as proxy for demand of publicly funded care), and competition in the local ASC market. Additionally, we used regional and year fixed effects.

The above variables have been found to be significant factors in previous studies, with job separations and/or staff turnover in long-term care shown to be related to job characteristics (e.g., tenure, training provision, and job benefits and rewards) (Castle et al., 2007; Gaudenz et al., 2019; Karantzas et al., 2012; Morris, 2009; Park et al., 2017; Rosen et al., 2011), employer characteristics (e.g., employer's size, lower staffing levels, guaranteed working hours, for-profit ownership, and home care provision) (Castle, 2008; Castle and Engberg, 2006; Kennedy et al., 2021, 2020), as well as local market factors (e.g., unemployment, wages in alternative jobs in the local area, and competition) (Castle, 2008; Donoghue, 2010; Morris, 2009).

Certain controls used in earlier studies (e.g., the ratio of staff per service users [as proxy for workload] and metrics for management quality) were not including in the analysis, as they were not available for certain care settings (e.g., community care). Moreover, we avoided including a control for full-time/part-time employment as this can be itself an outcome of wages and mediate some of the relationship between wages and extensive margin employment choice.

The reason behind using a panel fixed effects estimator (i.e., CRE probit) is that many factors related to job performance and separations (e.g., workers' job commitment and motivation, workload, organisational culture, management style/quality, etc.) are often not observed in survey data. Not suitably controlling for unobserved factors has been shown to bias the separation elasticities towards zero, even if uncorrelated with wage (Manning, 2003).

We used the 3-degree polynomial of hourly wages in x_{it}, to allow more flexibility with respect to the functional form.[7] Wage elasticities of separation (i.e., proportional change in the probability of separation for a proportional change in wage) are obtained by expressing derivatives after CRE probit as:

$$d(\ln h)/d(\ln w) = (\beta_w + 2 \times \beta_{w^2} + 3 \times (\beta_{w^3})^2) \times (w/h) \quad (3)$$

where h is the job separation rate, and w is the hourly wage.

[7] We also run estimations with log transformed wages, but these did not fit data as good as the model with 3-degree polynomial of hourly wages.

A3. The impact of a minimum wage increase in ASC on ASC employment in Scotland

We predicted labour supply effects from a change in wages based on estimated wage elasticities of labour supply to the sector. The wage elasticities of labour supply to the sector are based on wage elasticities of job separation obtained from the estimation of models of job separation overall and of separation/transition the other ASC jobs; see Equation (1). The full estimation results of the models of job separation/transition (under the form of marginal effects) are presented in Table A5 (for all care settings) and Table A6 (for residential care). The wage elasticities and predicted labour supply effects are summarised in Table A7 to A9. The labour supply effects are predicted under four different assumptions:

1. The wage responsiveness of ASC labour supply in Scotland is similar to that of ASC labour supply in England;
2. The wage responsiveness of ASC labour supply in Scotland is similar to that of ASC labour supply in residential care in England;
3. The wage responsiveness of ASC labour supply in Scotland is similar to that of ASC labour supply in residential care in England's North and Midlands.
4. The wage responsiveness of ASC labour supply in Scotland is similar to that of ASC labour supply in the weighted sample of residential care staff in England's North and Midlands resembling the sectoral split in Scotland.

The rationale behind these assumptions and the predicted employment effects are presented below.

Model 1: Wage responsiveness of ASC labour supply in Scotland assumed similar to that of ASC labour supply in England

In our baseline model we consider the wage responsiveness of ASC labour supply in Scotland is similar to that of ASC labour supply in England. Table A7 presents the wage elasticities of separation (overall and to jobs inside ASC based on the estimations in Table A5, column 1 and 2 respectively), the share of recruitment from inside ASC, and the wage elasticities of labour supply to the ASC sector for England, for deciles of the wage distribution in the ASC sector in Scotland.

For simplicity, we assumed that the hourly wages paid are at the increments given by the deciles of the wage distribution. For a wage floor increase of k wage increments, the predicted increases in in labour supply ($\frac{\Delta h}{h}$) equals the weighted sum of the percentual increase in wage from increment n to the next ($\frac{w_{n+1}-w_n}{w_n}$) times the average wage elasticity of labour supply between wage increments n and $n+1$ ($\frac{\varepsilon_n+\varepsilon_{n+1}}{2}$). The weights being the cumulated share of workers paid at wage increment n or below, which are either:

A) $\frac{\sum h_{n+1}}{h}$, if we consider that the workers with wages between to increments are paid at the lower increment, and giving a predicted increases in in labour supply of:

$$\frac{\Delta h^A}{h} = \sum_n \left(\frac{\varepsilon_n + \varepsilon_{n+1}}{2} \times \frac{w_{n+1} - w_n}{w_n} \right) \frac{\sum h_{n+1}}{h} \quad (4)$$

B) $\frac{\sum h_n}{h}$, if we consider that the workers with wages between to increments are paid at the lower increment, and giving a predicted increases in in labour supply of:

$$\frac{\Delta h^B}{h} = \sum_n \left(\frac{\varepsilon_n + \varepsilon_{n+1}}{2} \times \frac{w_{n+1} - w_n}{w_n} \right) \frac{\sum h_n}{h} \quad (5)$$

The two predicted values giving an upper ($\Delta h^A/h$) and lower ($\Delta h^B/h$) bound.

Our model shows that an increase in the minimum wage floor in ASC in Scotland from £10.90 to £12.00 in 2024/25 (i.e., a 10.1% nominal increase or a 6.1% real wage increase if we take into account the Bank of England predicted 3.75% year-on-year inflation rate in Q2 2024), would lead to an ASC employment increase of between 4.3% and 6.2%; an increase of the wage floor to £12.50 (i.e., 14.7% nominal or a 10.5% real wage increase) would lead to an ASC employment increase of between 8.6% and 11.7%, while an increase of the wage floor to £13.00 (i.e., 19.3% nominal or a 15.0% real wage increase) would lead to an ASC employment increase of between 13.3% and 17.6%.

Model 2: Wage responsiveness of ASC labour supply in Scotland assumed similar to that of ASC labour supply in England, excluding home care

As showed in Vadean et al. (2024), the ASC-WDS data may include some measurement issues with respect to individual hourly wages in home care, with some home care employers paying higher wages (but only for client contact time), while others paying lower wages (but for travel time as well). This may lead to biased results of wage elasticities for home care workers. We, therefore, suggested to consider the wage elasticities of labour supply estimated for staff employed in settings excluding home care as applying for the whole sector.

Wage elasticities of labour supply from Table A8 (based on estimates with the sample excluding home care; see Table A5, column 3 and 4) are rather similar to those for all care settings, but leading to slightly smaller predictions of labour supply increases. An increases in the minimum wage floor to £12.00 in 2024/25 (i.e., 10.1% nominal or a 6.1% real wage increase), would lead to an ASC employment increase of between 4.0% and 5.9%; an increase of the wage floor to £12.50 (i.e., 14.7% nominal or a 10.5% real wage increase) would lead to an ASC employment increase of between 8.2% and 11.2%, while an increase of the wage floor to £13.00 (i.e., 19.3% nominal or a 15.0% real wage increase) would lead to an ASC employment increase of between 12.8% and 17.0%.

Model 3: Wage responsiveness of ASC labour supply in Scotland assumed similar to that of ASC labour supply in England's North and Midlands, excluding home care

The labour market in Scotland differs from that in England. For example, the average job density (i.e., the number of jobs divided by the resident population aged 16-64) is higher (0.86) and the economic inactivity rate lower (21.2%) in England as compared

to Scotland (0.81 and 23.5% respectively); see Figure 4. This would mean that the job opportunities outside ASC faced by care staff in Scotland would be different to those faced by care staff in England, and their responsiveness to wages would be also different. We, therefore, experimented with combinations of English regions that would have similar labour market conditions in terms of job density and economic inactivity with Scotland. The closest identified was North and Midlands (i.e., North East, North West, Yorkshire and The Humber, East Midlands, and West Midlands), which has a job density of 0.81 and economic inactivity rate of 23.0%.

Wage elasticity estimates for predicting the wage responsiveness of a change in the minimum wage floor for the ASC sector in Scotland are, therefore, based on an ASC-WDS sample including only care staff in England's North and Midlands regions and excluding home care; see Table A9 and Table A6 (column 1 and 2). These are lower than for England overall (excluding home care) and leading to a lower predicted labour supply increase: an increases in the minimum wage floor to £12.00 in 2024/25 (i.e., 10.1% nominal or a 6.1% real wage increase) is predicted to lead to an ASC employment increase of between 3.1% and 4.5%; an increase of the wage floor to £12.50 (i.e., 14.7% nominal or a 10.5% real wage increase) would lead to an ASC employment increase of between 6.2% and 8.5%, while an increase of the wage floor to £13.00 (i.e., 19.3% nominal or a 15.0% real wage increase) would lead to an ASC employment increase of between 9.7% and 12.8%.

Model 4: Wage responsiveness of ASC labour supply in Scotland assumed similar to that of ASC labour supply in England's North and Midlands, excluding home care; sample reweighted to resemble the ASC sectoral split in Scotland

This model builds on Model 3 by performing wage elasticity estimations on a weighted version of the sample of residential care staff located in England's North and Midlands regions. A weight for each observation was computed by entropy balancing such that the respective aggregate shares of care staff employed by public, private, and voluntary care providers in the weighted sample are close to the corresponding values for Scotland; see Figure 5. In practice that meant giving higher weights to care staff employed by public and voluntary care providers and lower weights to care staff employed by private care providers.

Public and voluntary care providers are known to pay higher hourly wages, employ a lower share of staff on contracts with no guaranteed working hours, and offer better benefits (e.g., sick pay and pension), and consequently have also better staff retention rates (Skills for Care, 2023; Vadean and Allan, 2023; Vadean and Saloniki, 2023). We would, therefore, expected labour supply to be relatively less responsive to wages in the public and voluntary sectors compared to the private sector, and the wage elasticities of labour supply obtained from the weighted estimations to be comparatively lower.

Our results of the weighted regressions led indeed to lower wage elasticities of labour supply and a lower predicted labour supply effect of the minimum wage increase: the minimum wage floor increase to £12.00 in 2024/25 (i.e., 10.1% nominal or a 6.1% real wage increase) is predicted to lead to an ASC employment increase of between 2.7% and 4.0%; an increase of the wage floor to £12.50 (i.e., 14.7%

nominal or a 10.5% real wage increase) would lead to an ASC employment increase of between 5.4% and 7.5%, while an increase of the wage floor to £13.00 (i.e., 19.3% nominal or a 15.0% real wage increase) would lead to an ASC employment increase of between 8.4% and 11.2%.

Figure A1: Wage distribution in ASC-WDS sample

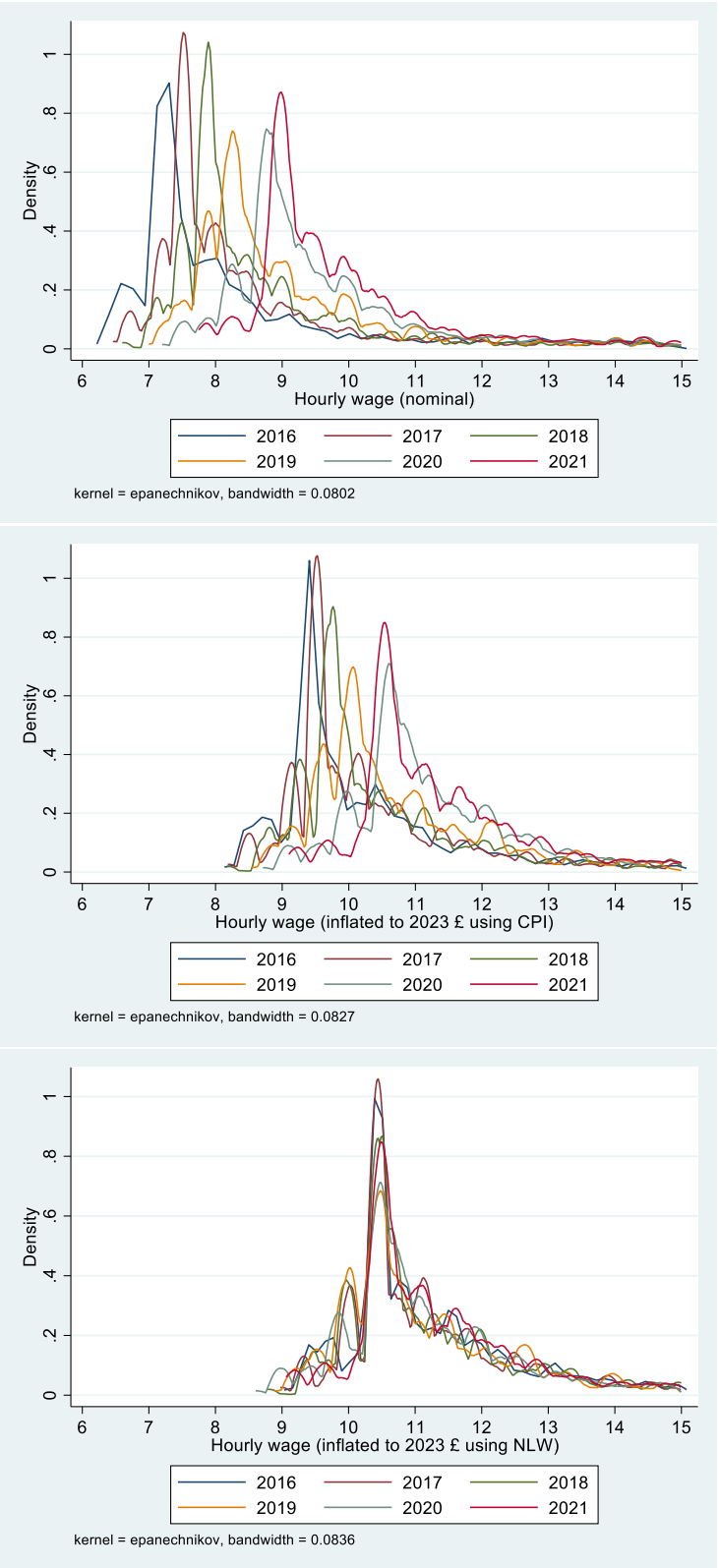


Table A1: Job spells and separations

	All care settings	
Observations (spell-years)	903,690	
Job spells	431,336	
Care staff	395,281	
Establishments	13,291	
Job spells ending in separation	133,148	30.9%
Job spells ending in identified transitions to other ASC job	39,896	9.2%
Share of recruits from other ASC employers		61.9%
	Excluding home care	
Observations (spell-years)	570,407	
Job spells	268,294	
Care staff	249,850	
Establishments	9,260	
Job spells ending in separation	79,517	29.6%
Job spells ending in identified transitions to other ASC job	24,374	9.1%
Share of recruits from other ASC employers		63.2%
Job spells by care setting		
Adult residential care	224,190	52.0%
Adult home care	163,042	37.8%
Other adult community care (excl. home care)	44,104	10.2%
Job spells by sector		
Statutory LA	61,490	14.3%
Private	308,920	71.6%
Voluntary	60,926	14,1%

Data source: Adult Social Care Workforce Data Set (ASC-WDS); pooled Oct 2016 to Oct 2021.

Table A2: Hourly pay distribution in ASC in Scotland compared to analysed ASC-WDS sample for England

Percentile	10	20	30	40	50	60	70	80	90
Hourly pay distribution – ASC Scotland (excluding overtime) 2023									
Residential care activities	10.84	10.90	11.23	11.71	12.38	13.21	15.03	17.60	x
Social work activities without accommodation	10.71	10.96	11.30	11.71	12.83	14.04	15.43	17.58	x
ASC overall	10.76	10.94	11.27	11.71	12.64	13.70	15.27	17.59	x
Hourly pay distribution – ASC-WDS sample England									
ASC overall (inflated to 2023 using NLW)	9.98	10.42	10.45	10.72	11.11	11.58	12.27	13.64	
% difference to ASC Scotland	7.8%	4.9%	7.9%	9.2%	13.8 %	18.3 %	24.4 %	28.9 %	
ASC overall (inflated to 2023 using NLW + scaled to Scottish ASC min wage)	10.44	10.90	10.93	11.22	11.62	12.11	12.83	14.27	
% difference to ASC Scotland	3.1%	0.3%	3.1%	4.4%	8.8%	13.1 %	19.0 %	23.3 %	

Data source: Pay data for ASC Scotland are from the ONS: ASHE Table 5 Earnings and hours worked, UK region by industry by two-digit SIC (ons.gov.uk). The ASC-WDS sample for England includes yearly data for October 2016 to October 2021, as described in the Appendix Section A1.
Notes: Unshaded values are considered to be precise, with a coefficient of variation (CV) (i.e., ratio of the standard error to the estimate itself) <=5%. The light grey shaded values are considered reasonably precise (CV <5% and <=10%). Dark shaded values are considered unreliable for practical purposes and are supressed (CV >20%).

Table A3: Labour market indicators – Scotland and English regions; 2021

	Job density	**Economic inactivity rate**	**Working age population (mil.)**
Scotland	**0.81**	**23.5**	3.430
England (overall)	*0.86*	*21.2*	*34.903*
North East	0.75	25.6	1.624
North West	0.84	23.4	4.480
Yorkshire and The Humber	0.81	22.2	3.371
East Midlands	0.80	22.3	2.948
West Midlands	0.81	22.5	3.622
East	0.84	19.2	3.790
London	1.02	20.5	6.137
South East	0.85	19.0	5.591
South West	0.87	19.8	3.340
England (North and Midlands)	***0.81***	***23.0***	*16.044*

Data source: Office of National Statistics (ONS) and Annual Population Survey (APS).
Notes: North and Midlands includes: North East, North West, Yorkshire and The Humber, East Midlands, and West Midlands. The average job density and economic inactivity rate in North and Midlands was computed using the working age populations as weights.

Table A4: Scottish Adult Social Care employment; 2022

	Headcount			Proportion of total headcount		
	Public	Private	Voluntary	Public	Private	Voluntary
Total overall	36,210	62,300	43,640	0.255	0.438	0.307
Care homes for adults	6,570	37,020	7,450	0.129	0.725	0.146
Total non-residential	29,640	25,280	36,190	0.325	0.277	0.397
Housing support/care at home	20,780	20,160	33,670			
Adult day care	2,910	320	2,290			
Adult placement services	150	0	90			
Fieldwork service (adults)	5,800	0	0			
Nurse agencies	0	4800	140			

Data source: Scottish Social Services Council (2023).

Table A5: Job separation estimations – marginal effects, England overall

VARIABLES	(1)	(2)	(3)	(4)
	All care settings		Excl. home care	
	Job separations overall	Job separations to ASC	Job separations overall	Job separations to ASC
Job tenure: >1 & <=2 years	-0.099***	-0.063***	-0.089***	-0.063***
	(0.002)	(0.002)	(0.002)	(0.002)
Job tenure: >2 & <=4 years	-0.239***	-0.138***	-0.228***	-0.139***
	(0.001)	(0.002)	(0.002)	(0.002)
Job tenure: >4 & <=8 years	-0.352***	-0.184***	-0.339***	-0.186***
	(0.001)	(0.002)	(0.002)	(0.002)
Job tenure: >8 years	-0.395***	-0.198***	-0.381***	-0.201***
	(0.001)	(0.002)	(0.002)	(0.002)
Age	0.000	0.003***	0.001***	0.004***
	(0.000)	(0.000)	(0.000)	(0.000)
Age squared (x 1,000)	-0.035***	-0.054***	-0.042***	-0.055***
	(0.003)	(0.003)	(0.004)	(0.003)
Female	-0.009***	0.001	-0.012***	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Nationality: British	-0.042***	-0.015***	-0.058***	-0.027***
	(0.009)	(0.006)	(0.012)	(0.007)
Qualification: yes	0.015***	-0.001	0.007	-0.005
	(0.004)	(0.003)	(0.005)	(0.003)
Training (any): yes	0.041***	0.023***	0.038***	0.030***
	(0.003)	(0.002)	(0.004)	(0.003)
Job group: manager/supervisor	-0.033***	-0.010***	-0.052***	-0.019***
	(0.005)	(0.003)	(0.006)	(0.004)
Job group: professional	0.004	0.018***	-0.002	0.011
	(0.010)	(0.007)	(0.010)	(0.007)
Job group: other	-0.004	-0.008**	-0.011**	-0.012***
	(0.005)	(0.003)	(0.006)	(0.004)
Hourly wage (2023 £)	-0.023***	-0.009***	-0.019***	-0.006***
	(0.001)	(0.001)	(0.001)	(0.001)
Zero-hours contract	0.035***	0.004	0.074***	0.015**
	(0.006)	(0.004)	(0.009)	(0.006)
Sector: Private	0.035***	-0.033***	0.038***	-0.026***
	(0.002)	(0.002)	(0.003)	(0.002)
Sector: Voluntary	-0.005**	-0.045***	-0.002	-0.040***
	(0.002)	(0.002)	(0.003)	(0.002)
Care setting: adult home care	0.011***	0.016***		
	(0.001)	(0.001)		
Care setting: adult community (excl. home care)	0.033***	0.032***	0.039***	0.035***
	(0.002)	(0.002)	(0.003)	(0.002)
User type: young adults	-0.039***	-0.003	-0.057***	-0.033***

	(0.009)	(0.006)	(0.011)	(0.006)
User type: mixed	-0.071***	-0.040***	-0.081***	-0.048***
	(0.006)	(0.003)	(0.006)	(0.003)
Staff size: medium/large (50+ workers)	0.008***	-0.003	0.019***	0.005**
	(0.003)	(0.002)	(0.004)	(0.002)
Turnover rate (previous 12 months)	0.018***	0.009***	0.028***	0.014***
	(0.002)	(0.002)	(0.003)	(0.002)
Vacancy rate	0.010	-0.040***	-0.009	-0.041***
	(0.011)	(0.007)	(0.014)	(0.010)
Unemployment rate (LAD level)	-0.001	0.001*	-0.001	-0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
Mean wage 1st quartile (LAD level; log; 2023 £)	0.002	0.031***	-0.061***	-0.013
	(0.016)	(0.010)	(0.019)	(0.013)
House price (LAD level; log; 2022 £)	0.053***	0.010	-0.013	-0.010
	(0.017)	(0.011)	(0.022)	(0.015)
Urban	-0.001	0.001	0.004**	0.006***
	(0.002)	(0.001)	(0.002)	(0.002)
ASC Unit Costs Residential Care (LA level; log; £/week)	-0.033***	-0.031***	-0.039***	-0.063***
	(0.008)	(0.005)	(0.010)	(0.006)
ASC Unit Costs Domiciliary Care (LA level; log; £/hour)	-0.010	0.022***	0.029***	0.051***
	(0.009)	(0.005)	(0.011)	(0.007)
Care home competition (distance-weighted HHI)	0.572	0.075	3.370***	3.196***
	(0.463)	(0.279)	(0.720)	(0.459)
Home care competition (count of agencies at LAD level; log)	-0.007	-0.006*	-0.002	0.009*
	(0.005)	(0.003)	(0.007)	(0.004)
Year fixed effects	yes	yes	yes	yes
Region fixed effects	yes	yes	yes	yes
Observations	903,690	734,051	570,407	467,641
Log likelihood/pseudo-likelihood	-405,405	-176,741	-250,934	-111,209
F-test of $\bar{x}_{ij} = 0$; Hausman test	140,000***	58,742***	87,267***	35,893***

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 group: direct care; Sector: statutory LA; Care setting: adult residential care; User type: old age; Staff size: micro/small (1-49 workers). CRE probit: correlated random effects probit estimation. LAD: local authority district.

Table A6: Job separation estimations – marginal effects; North and Midlands; excl. home care

VARIABLES	(1)	(2)	(3)	(4)
	North & Midlands		North & Midlands (weighted)	
	Job separations overall	Job separations to ASC	Job separations overall	Job separations to ASC
Job tenure: >1 & <=2 years	-0.096***	-0.072***	-0.093***	-0.073***
	(0.003)	(0.003)	(0.003)	(0.004)
Job tenure: >2 & <=4 years	-0.233***	-0.146***	-0.224***	-0.147***
	(0.003)	(0.003)	(0.003)	(0.004)
Job tenure: >4 & <=8 years	-0.345***	-0.193***	-0.332***	-0.192***
	(0.003)	(0.003)	(0.003)	(0.004)
Job tenure: >8 years	-0.386***	-0.206***	-0.365***	-0.203***
	(0.003)	(0.003)	(0.003)	(0.004)
Age	0.001*	0.003***	0.000	0.004***
	(0.000)	(0.000)	(0.001)	(0.000)
Age squared (x 1,000)	-0.041***	-0.054***	-0.035***	-0.057***
	(0.006)	(0.004)	(0.006)	(0.005)
Female	-0.015***	-0.002	-0.012***	-0.002
	(0.002)	(0.001)	(0.002)	(0.002)
Nationality: British	-0.115***	-0.053***	-0.116***	-0.047***
	(0.015)	(0.009)	(0.015)	(0.010)
Qualification: yes	0.005	-0.005	0.002	-0.005
	(0.007)	(0.004)	(0.007)	(0.005)
Training (any): yes	0.041***	0.035***	0.036***	0.035***
	(0.006)	(0.004)	(0.006)	(0.004)
Job group: manager/supervisor	-0.050***	-0.016***	-0.056***	-0.022***
	(0.008)	(0.005)	(0.008)	(0.005)
Job group: professional	-0.015	0.012	-0.015	0.004
	(0.014)	(0.010)	(0.014)	(0.010)
Job group: other	-0.019**	-0.019***	-0.023***	-0.024***
	(0.008)	(0.005)	(0.009)	(0.005)
Hourly wage (2023 £)	-0.028***	-0.013***	-0.020***	-0.009***
	(0.002)	(0.001)	(0.002)	(0.001)
Zero-hours contract	0.025**	-0.010	0.037***	-0.007
	(0.011)	(0.008)	(0.013)	(0.009)
Sector: Private	0.048***	-0.023***	0.046***	-0.023***
	(0.003)	(0.003)	(0.004)	(0.003)
Sector: Voluntary	-0.015***	-0.053***	-0.017***	-0.055***
	(0.004)	(0.003)	(0.004)	(0.003)
Care setting: adult community (excl. home care)	0.047***	0.038***	0.051***	0.037***
	(0.003)	(0.003)	(0.004)	(0.003)
User type: young adults	-0.042***	-0.026***	-0.074***	-0.046***

	(0.015)	(0.009)	(0.017)	(0.012)
User type: mixed	-0.081***	-0.047***	-0.113***	-0.057***
	(0.007)	(0.004)	(0.007)	(0.005)
Staff size: medium/large (50+ workers)	0.036***	0.017***	0.023***	0.015***
	(0.005)	(0.003)	(0.005)	(0.004)
Turnover rate (previous 12 months)	0.019***	0.008**	0.021***	0.006
	(0.005)	(0.003)	(0.005)	(0.004)
Vacancy rate	0.049**	-0.069***	0.042*	-0.030*
	(0.021)	(0.015)	(0.022)	(0.017)
Unemployment rate (LAD level)	-0.004**	-0.005***	-0.009***	-0.006***
	(0.002)	(0.001)	(0.002)	(0.001)
Mean wage 1st quartile (LAD level; log; 2023 £)	0.112***	0.148***	0.175***	0.172***
	(0.031)	(0.020)	(0.034)	(0.023)
House price (LAD level; log; 2022 £)	0.004	-0.039*	0.037	-0.019
	(0.031)	(0.021)	(0.034)	(0.023)
Urban	0.012***	0.017***	0.015***	0.017***
	(0.003)	(0.002)	(0.003)	(0.003)
ASC Unit Costs Residential Care (LA level; log; £/week)	-0.074***	-0.096***	-0.054***	-0.093***
	(0.013)	(0.009)	(0.015)	(0.010)
ASC Unit Costs Domiciliary Care (LA level; log; £/hour)	0.007	0.014*	0.020	0.013
	(0.012)	(0.008)	(0.014)	(0.009)
Care home competition (distance-weighted HHI)	4.307***	2.984***	2.884***	1.656***
	(0.840)	(0.526)	(0.934)	(0.599)
Home care competition (count of agencies at LAD level; log)	-0.022**	-0.022***	-0.063***	-0.036***
	(0.009)	(0.006)	(0.010)	(0.007)
Year fixed effects	yes	yes	yes	yes
Region fixed effects	yes	yes	yes	yes
Observations	308,273	256,712	308,273	256,712
Log likelihood/pseudo-likelihood	-131,597	-59,512	-127,821	-59,533
F-test of $\bar{x}_{ij} = 0$; Hausman test	46,757***	19,935***	33,883***	15,789***

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 group: direct care; Sector: statutory LA; Care setting: adult residential care; User type: old age; Staff size: micro/small (1-49 workers). CRE probit: correlated random effects probit estimation. LAD: local authority district.

This publication is available at **www.gov.scot**

Any enquiries regarding this publication should be sent to us at

The Scottish Government
St Andrew's House
Edinburgh
EH1 3DG

ISBN: 978-1-83601-256-6 (web only)

Published by The Scottish Government, May 2024

Produced for The Scottish Government by APS Group Scotland, 21 Tennant Street, Edinburgh EH6 5NA
PPDAS1410734 (05/24)