ECONOMIC POLICY

OESTERREICHISCHE NATIONALBANK
EUROSYSTEM

68th Economic Policy Panel Meeting

4-5 October 2018
Vienna

Hosted by the Oesterreichische Nationalbank

Zero Hours Contracts and Labour Market Policy

Nikhil Datta (University College London
and Centre for Economic Performance, LSE)
Giulia Giupponi (Centre for Economic Performance, LSE)
Stephen Machin (Centre for Economic Performance, LSE)

The organisers would like to thank the Oesterreichische Nationalbank for their support.

CEPR Centre for Economic Policy Research
Research Excellence, Policy Relevance
CESifo
SciencesPo. PARIS

Paper for Economic Policy 68th Panel Meeting,
4-5 October 2018, Vienna.

Zero Hours Contracts and Labour Market Policy

Nikhil Datta*, Giulia Giupponi and Stephen Machin****

September 2018

* *Department of Economics, University College London and Centre for Economic Performance, London School of Economics*

** *Department of Economics and Centre for Economic Performance, London School of Economics*

Abstract

The evolving nature of atypical work arrangements is studied. A particular focus is placed on one such form of work relation: zero hour contracts (ZHCs). The paper uses existing secondary data and new survey data collected for the specific purpose of studying alternative work arrangements to describe the nature of ZHC work in the UK labour market. The interaction with labour market policy is also explored, in the context of the 2016 introduction of the UK's National Living Wage. ZHC work is shown to be an important feature of today's work arrangements, and a higher minimum wage has resulted in an increased use of ZHCs in the UK social care sector, and in low wage sectors more generally.

Keywords: Atypical work arrangements; Zero hours contracts; Minimum wage.

JEL Codes: J31, J32, J81

Acknowledgments

We are grateful to Roy Price of Skills for Care for helpful assistance with the NMDS-SC data and to the Editor, Andrea Ichino, plus three anonymous referees for helpful comments. We acknowledge financial support from ESRC.

1. Introduction

Contemporary labour markets feature the use of "atypical" work arrangements. Some of these – like self-employment and agency work – have emerged in their current format as an evolution of previous work structures. Others – like short hours and zero hours contracts[1] – reflect more the work demands of the modern age, with their introduction driven by technical and social change. The increased incidence of this kind of work has led to discussions of there being a trade-off between additional flexibility and the emergence of low wage, dead end jobs, which function outside the job legislation offered in conventional forms of employment.

From a research perspective, it is important to try to determine which side of this trade-off dominates, and if it differs by work arrangement. In this paper, we consider the case of the UK labour market where the rise of atypical work has been a key feature of the post-financial crisis labour market. The focus is placed specifically on one kind of alternative work arrangement that has entered the UK setting, namely zero hours contracts (ZHCs). Almost a million people are on ZHCs at the time of writing, out of a total workforce of 32 million. Many of these ZHC work positions are prominent in the low-wage sectors of employment. Their relevance to labour market policy that affects low wage levels is therefore high.

The principal focus of the paper is placed upon developing a better understanding of ZHCs and labour market policy. More specifically, in doing this, the paper has two main aims. The first is to empirically document the evolution and characterisation of ZHCs in the UK setting. There are two parts to this, the first drawing on data from the Quarterly Labour Force Survey and the second on newly collected survey data on alternative work arrangements. Part of the latter survey is devoted to ZHCs, which are only limitedly surveyed and understood in

[1] Workers on zero hours contracts agree to be available for work as and when required, with no guaranteed hours or times of work.

existing survey data sources (Abraham and Amaya, 2018) and – consequently – in the literature, and the intention is to fill this gap with new evidence.

The second aim is to more closely study how labour market policies can affect ZHC workers. A particular policy focus is placed on minimum wages, where we are interested in understanding whether higher minimum wages have potential to induce a larger utilisation of alternative work arrangements by firms and, consequently, a shift in the composition of their workforce towards more insecure jobs. To our knowledge, this is the first study connecting minimum wage changes to differential employer use of different job contracts. The empirical work exploits a substantial increase in the minimum wage rate for workers aged 25 and over that took place in the UK in April 2016, when a new minimum wage rate – the National Living Wage – was introduced (Bell and Machin, 2017; Giupponi and Machin, 2018).

Empirical evidence is presented to show that ZHCs are a key contract type in some, predominantly low wage, sectors of the UK labour market. They are characterised by the flexibility/dead end jobs trade-off already introduced above. They also feature, in different guises or by different names, in other countries' employment structures. In the UK setting, their usage by employers does seem to have been affected by changes in labour market policy, as the sizable hike of the minimum wage that occurred when the NLW was introduced did shift more workers onto ZHC positions in the adult social care sector (and in low wage sectors more generally).

The rest of the paper is structured as follows. In Section 2, a description of the atypical work arrangement under study, ZHCs, is given, together with a discussion of the extent to which other countries have job contracts that are similar. In Section 3, the relevant literature to the subject matter of the paper is discussed. Section 4 reports the analysis that documents the patterns of ZHC coverage in the UK labour market. Section 5 describes the evidence on minimum wages and ZHC jobs. Section 6 concludes.

2. Atypical Work Arrangements: Zero Hour Contracts

2.1 Zero Hour Contracts in the UK

ZHCs are an employment contract under which a worker is not guaranteed any hours and is only paid for work carried out. It can be viewed as a form of on-call working, as workers can be offered hours at short notice, as and when an employer needs them. Workers are not obliged to accept work that has been offered to them[2] and, similarly, employers are not obliged to offer any work. Thus, ZHCs offer flexibility to both the employer and the employee, and, as a result, some workers may prefer them to typical fixed hour employment contracts. Conversely, due to the lack of security and guaranteed income, they are unlikely to be suitable for many workers. Such contracts have become prevalent in particular industries such as retail, health, and hospitality.

ZHCs have, in theory, always been possible to be used by employers in the UK and have no specific legal status, rather being an informal term to refer to a type of contract. Their use has seen an increase over the past decade. Estimates from the Office of National Statistics (ONS) suggest that in 2008 143,000 employees were on ZHCs whereas by 2017 this figure was 883,000. Until 1998, ZHCs were often used to "clock off" workers during quiet periods nonetheless expecting them to stay on site, though this exploitative practice was ended in 1998 with the passing of the Working Time Regulations.

Legal complications have arisen due to the nature of the contract. One key area of contention has been whether a worker is also considered an "employee", which would in turn grant them additional rights, such as unfair dismissal protection (Adams et al., 2018).[3] While the contract itself would not classify workers as employees, case law in the UK till date has

[2] It is questionable however, whether all ZHC roles afford workers this ability in practice (Wakeling, 2014).
[3] Workers are still afforded a number of core employment rights, unlike for example, those gig economy workers who are officially self-employed and thus are not covered.

concentrated more on whether there is a pattern of regular work being accepted, and if so the employee classification would be granted (Pyper and Powell, 2018).

ZHCs have received a fair amount of attention both in the UK media and from the UK Parliament. The Conservative-Liberal Democrat coalition government that was in power from 2010 to 2015 launched a review of the use of ZHCs in 2013. This raised four main areas of concern – exclusivity clauses, transparency of contracts offered to workers, uncertainty of earnings and an imbalance in the employment relationship. Up to now, the only area which has been legislatively addressed is that concerning exclusivity clauses, i.e. clauses that prevented workers on ZHCs from working for more than one employer. As of March 2015, the *Small Business, Enterprise and Employment Act 2015* came into force and effectively banned exclusivity clauses on ZHCs.

2.2 Zero Hour-Like Contracts: the International Setting

As stated above there is no legal definition in the UK for ZHCs, and thus international comparisons rely on assessing qualitative similarities. This can often be problematic due to the differences in terminology, legal status and governance. Similar atypical working arrangements however do exist and there is varied diffusion across Europe and other developed economies, though they often operate under different names, and levels of regulation. Caution should nonetheless be taken when drawing parallels as the welfare implications of such arrangements will also rely on factors such as union coverage and domestic economic performance.

Probably the largest proportion of such atypical contracts exists in Australia. “casual employment” contracts are a legal classification there and approximately 25% of employees are on such contracts. Around half of workers on these contracts receive variable earnings from one period to the next, and around a third would like more hours (Gilfillan, 2018). Australia is however an outlier in this case, since most developed economies where zero hour like contracts are used generally have usage rates in the same region as the UK. In Canada 3.2% of

employment is “casual employment” and in the US approximately 2.6% is “on-call”. In Europe, Finland reported 4% of employees on ZHCs, Norway 0.8%, in Netherlands 6.4% are “on-call”, and the Irish Quarterly National Household Survey reports that approximately 5.3% of Irish employees have constant variation in their working hours.[4] Given the varied definition and sometimes lack of a legal classification, equivalent statistics do not necessarily exist for all countries where there is diffusion.

The attention these types of contracts have received in the media and parliament are not unique to the UK. Following union pressure, New Zealand passed regulation in 2016 which stipulated that firms needed to outline a minimum number of guaranteed hours each week and employee refusal of hours beyond that should not result in any detriment to the worker. Furthermore, it introduced the requirement of compensation to the worker if shifts were cancelled at short notice. In Finland a Citizen’s Initiative gathered 50,000 supporters to ban ZHCs, and though it was rejected by parliament, a number of proposals have been made in order to regulate such employment relationships. The most recent looks to ensure that employers present a valid reason (relating to demand fluctuations) as to why they require to use a ZHC. Extensive regulation was introduced in 2012 and 2013 to “on-call” work in Italy and has severely restricted the use of zero hour like contracts to only older and younger age groups, and in 2014 further regulation was introduced in both the Netherlands and France.

Table 1 presents a comparative table of descriptions and associated regulations for zero hour like contracts in Western Europe (where they are present) and for the US. Western Europe generally experiences significant regulation of zero hour like contracts. For example, while proliferation in the EU is largest in the Netherlands, workers there enjoy regulations which ensure a minimum number of hours of work whenever they are called to work, as well as agreed hour adjustments based on the previous 3 months of work. Conversely, unlike the UK,

[4] Figures for Netherlands are from 2016, Finland, Ireland and US from 2015 and Norway 2010.

employees must work when called upon. Such idiosyncrasies exemplify how outwardly similar contractual agreements may have very different implications when in action. What is evident, however, is that the UK, Sweden and US (aside from some specific cities) appear to have the least regulation of zero hour like contracts. Union density in Sweden is high (around 70%), but in both the UK and US rates are much lower (23.2% and 10.7% respectively). Thus, proliferation of zero-hour (like) contracts in the UK and US, where real wage growth is weak, are likely to have the most significant welfare implications.

3. Related Literature

3.1 Atypical Work Arrangements

Employment relationships such as ZHCs, diverging from the standard full-time, permanent, regular and single employer set-up have been characterised as "atypical" (Eurofound, 2017) and such working arrangements have seen a large amount of growth in the past two decades in a number of developed economies (Eichhorst and Tobsch, 2013; Gielen and Schils, 2014; Katz and Krueger, 2016; LSE Growth Commission, 2017). The concept of "atypical" work arrangements spans a variety of working practices including part-time, agency, contract, short fixed term, contingent and independent contracting. Studies have demonstrated the large heterogeneity across these types of employment relationships, though part time and temporary work fare relatively badly in terms of wages when compared to their standard counterpart (Kalleberg, 2000).

ZHCs most closely match the definition for contingent work,[5] and early literature suggested that atypical working arrangements, especially in the form of temporary or contingent work, offered workers lower wages, fewer benefits, less security and little scope for

[5] "Any job in which an individual does not have an explicit or implicit contract for long-term employment or one in which the minimum hours worked can vary in a non-systematic manner," (Polivka and Nardone, 1989).

human capital development (Rodgers and Rodgers, 1989; Beard and Edwards, 1995; Nollen, 1996; Kalleberg, 2000). Conversely, however, more recent (albeit weak) evidence has suggested that atypical work may serve as a stepping stone to more stable employment in the long run, when faced between an option of continued job search and atypical employment (Addison and Surfield, 2009).

The past few years have seen a growth in the interest in atypical or "alternative" work arrangements with a small portion of the literature presenting descriptive evidence as well as trying to understand the mechanisms driving the shift to such types of work. Katz and Krueger (2016) found that, over the ten year period between 2005 and 2015, the proportion of workers engaged in some form of alternative work arrangement grew by 50% in the United States, while analysis of the UK labour market has shown a growth in both the prevalence of ZHCs as well as individuals described as "self-employed with no employees" (LSE Growth Commission, 2017).

Katz and Krueger (2017) report US findings that individuals who suffer periods of unemployment are 7-17% more likely to be employed in alternative work arrangements 1 to 2.5 years later than their observational counterparts who did not experience such unemployment. These results suggest that at least one factor that could be driving the supply side of the atypical labour market is a weakening of market power for workers. Additionally, Mas and Pallais (2017) use a discrete choice experiment to elicit willingness to pay for alternative work arrangements for call centre workers and find that the average worker is willing to give up a fifth of their wages to avoid an employer dictated work schedule. This gives further evidence that low paid workers finding themselves in contingent work arrangements are likely to be engaged in such work out of necessity rather than choice.

To our knowledge there is little recent research concerning the factors driving labour demand for contingent work arrangements. There are obvious benefits to employers, in

particular the ability to reduce wage liabilities and cope with seasonal and weekly fluctuating demand conditions. Dube et al. (2018) present evidence demonstrating significant monopsony power on an online labour market platform, though it should be noted such self-employed "HIT" work does have some key differences to more traditional sectors, which generally offer more on-going work.

3.2 Minimum Wages

Over its long existence as a key research area in labour economics, the minimum wage literature has evolved along three main lines of research. The primary and most traditional focus has been on the employment and unemployment effects of minimum wages, which have proven elusive to detect in many cases. Early studies based mostly on US time-series work found negative employment effects among teenagers (Brown, Gilroy and Kohen, 1982). However, apart from those, the vast majority of quasi-experimental micro-based work that started in the early 1990s in the US and UK (Card and Krueger, 1994; Machin, Manning and Rahman, 2003; Stewart, 2004; Giupponi and Machin, 2018), and of more recent analyses based on spatial identification in the US find hardly any evidence of disemployment effects of minimum wages (Dube, Lester and Reich, 2010 and 2016; Baskaya and Rubinstein, 2015; Clemens and Wither, 2014). [6]

Partly in response to this fairly widespread inability to find evidence of disemployment effects, a second strand of research has investigated other margins through which firms can adjust to the wage cost shock induced by the minimum wage increase. Examples of such margins of adjustment are prices (Aaronson, 2001; MaCurdy, 2015; Harasztosi and Lindner, 2017), profits (Draca, Machin and Van Reenen, 2011), firm value (Bell and Machin, 2018) and the quality of services provided (Giupponi and Machin, 2018). A third body of the literature

[6] In a rather different context of union bargained minima, Kreiner et al. (2017) study the effect of a change in the youth minimum wage in Denmark and find an employment elasticity to the wage rate of -0.8.

has looked at the impact on wage inequality at the bottom of the distribution, and at wage spillover effects up the wage distribution and onto legally unaffected workers (DiNardo, Fortin and Lemieux, 1996; Lee, 1999; Autor, Manning and Smith, 2016; Giupponi and Machin, 2018).

To the best of our knowledge, this is the first paper examining the impact of a minimum wage change on contractual arrangements. We thus contribute to the existing literature by assessing the impact of minimum wages on workers' employment conditions (other than pay) and on the utilisation of flexible contractual forms by firms that can act as buffers against the wage cost shock. We do this by exploiting the introduction of the National Living Wage (NLW) in the UK in April 2016. The NLW is the mandated minimum wage rate for workers aged 25 and over; it was set at £7.20 an hour from April 2016 to March 2017, then uprated to £7.50 in April 2017.[7] As demonstrated by Figure A1 in Appendix A, while the UK has had various national minimum wages (NMW) in place since 1999, the NLW introduction represented a substantial (7.5%) increase in the wage floor for those aged 25 and over.

4. Zero Hour Contracts

4.1 ZHCs in the Labour Force Survey

The Labour Force Survey (LFS) is a quarterly cross-sectional survey of the UK labour market. Each quarter contains data on approximately 35,000 employees, some of whom could be on a ZHC. Questions relating to flexible work arrangements are asked only in quarters April-June and October-December therefore in each year it is only these two quarters analysed.

Table 2 presents summary statistics for both all employees and ZHC employees for 2017. Of all workers in 2017, around 2.7% are recorded as being on ZHCs. ZHC workers are on average more likely to be younger, female, and still in full time education, though still a

[7] Further details on UK minimum wage policies and the National Living Wage will be provided in Section 5.

large proportion (over 80%) have completed their full-time education. It is unsurprising that female workers experience a higher incidence of ZHCs given they are more prevalent amongst part time employees. Typically, ZHC workers have lower tenure, though it is unclear whether this is due to higher ZHC worker turnover rates or if longer tenured ZHC workers are more likely to be placed on more secure contracts. The mean hourly wage for ZHC workers is around £5 lower than the equivalent for all workers, and they work on average 10 hours less per week than the average employee. Interestingly, the median hourly wage for ZHC workers is very close to the 2017 NLW of £7.50 per hour, within approximately 5%.

Figure 1 and Table 3 exemplify the importance of the NLW for ZHC workers. Figure 1 shows there to be a very sizable spike in the wage distribution for ZHC workers at the 2017 NLW of £7.50 an hour. Table 3 shows that, while the NLW is important for a significant proportion of all employees, with around 6% paid exactly the NLW and 20% likely to be affected by the subsequent uprating, the 2016 and 2017 upratings affected a lot more – around half – of all ZHC workers. This latter figure could increase when one considers the possibility of wage spillover effects up the distribution.[8] While the NLW is age specific and mandatory only for those aged 25 and over, there is strong evidence that there are spillovers for workers aged under 25 (Giupponi and Machin, 2018). Indeed, one can see that the proportion paid exactly the NLW is identical for all employees and for those aged 25 and over. This identity is lost, but only marginally, when considering ZHC workers.

The LFS also has a panel version of the survey, albeit with a much smaller sample size. We use this to produce transition Tables 4 and 5, which detail flows into/out of ZHC positions from/to different types of economic activity. As can be seen by the diagonals in both tables, ZHCs have the lowest persistence of all working arrangements presented. Over the period

[8] For evidence on the existence (or lack thereof) of spillover effects in the UK see Stewart (2012), Low Pay Commission (2009) and Butcher et al. (2012).

analysed (2015-2018) just over a third of ZHC workers remained in ZHC positions after 5 quarters and, of ZHC workers, only a quarter were ZHC workers 5 quarters before. ZHC workers are most likely to transition from and to other forms of part time employment, full time employment and inactivity.

These patterns of work dynamics act to confirm the somewhat precarious nature of ZHCs as a form of employment. A dynamic issue that emerges with this is whether workers who move from ZHCs into more secure working arrangements (part time and full time employment) do so by changing employer, or if after a period of time their employer offers a more secure contract. Equally, there is the question of whether those in "regular" work get reclassified by employers onto ZHCs. Sample size issues preclude any systematic and robust probing of this question with the data we have available, but when we investigated the interaction between job changes and changes in ZHC status for non-job changers, we found there to be a roughly half and half mixture of job moves and reclassifications. Clearly both are happening, but reaching a firmer conclusion on this requires more detailed and larger sample size longitudinal data than we are currently able to study.

4.2 ZHCs in the LSE-CEP Survey of Alternative Work Arrangements

In order to better understand the role of alternative work arrangements in the UK, between February 5th and March 2nd 2018, we ran the "LSE-CEP Survey of Alternative Work Arrangements" using an online platform. While the survey was designed to be representative of the UK population aged 18-65, its main goal was to collect information on both the types of jobs and characteristics of workers involved in alternative work arrangements. The survey questionnaire is reported in Appendix B. The survey questioned approximately 20,000 individuals, of which just fewer than 19,000 remained in the cleaned sample.[9]

[9] Respondents were excluded from the cleaned sample if they responded with gibberish to any open questions and/or did not answer the attention questions correctly.

Table A1 in Appendix A presents descriptive statistics for the sample of respondents of the CEP's survey. The survey is equally represented across sex and the age distribution, with a slightly lower participation rate for the ends (18-24 and 55-65) of the surveyed age distribution. Additionally, there is a healthy mixture of qualification attainment as well as regional representativeness across the UK. Around half of our sample are employed by a private company, a further quarter are employed by either a non-profit or government and the remainder are split between some form of self-employment or not working. Sample attrition during cleaning does not appear to fundamentally change any of these statistics.

Table 6 presents descriptive statistics for ZHC workers, for the cleaned sample. ZHCs are spread roughly equally across the sexes of respondents, which is marginally different to the LFS proportion shown earlier in Table 2. ZHC workers in our survey are on average younger than the average worker, though surprisingly share a similar distribution of qualifications as all workers in the survey. One may have assumed that workers experiencing more insecure employment contracts would be those with lower skill sets and thus market power, however these summary statistics suggest otherwise. On the whole, a region's share of ZHC workers is roughly the same as their share of workers overall. However, London appears to be anomalous in that its share of ZHC workers is about four fifths higher than its share of workers. Interestingly, a large proportion of ZHC workers (42% in the cleaned sample) hold multiple jobs, and around a third hold a job with a more secure contract. This is suggestive that ZHC jobs may act as a form of "top up" income for some workers, and additionally some ZHC workers may hold multiple ZHC jobs as a form of insurance due to the possibility of lack of hours.

Hourly wages for ZHC workers in our survey are on the whole high at £11.63 per hour; this is slightly higher than the same figure produced by the LFS for ZHC workers (£9.77). Figure 2 presents the hourly wage distribution for ZHC workers in our survey. It can be seen

that the modal hourly rate is £8 and that there is a large proportion of individuals paid around the region of the NLW rate of £7.50. Thus, it is likely to be the thicker right tail that is driving up the mean wage in the CEP survey compared to the LFS, rather than the entire distribution being centred higher.

The average number of hours worked is low (around 19 per week) and similar to the figure found in the LFS. This further concretes the fact that many ZHC workers are working less than full time. Figure 3 presents the weekly hour distribution. There is a large spread of the hours performed, with almost 10% of workers not doing any hours the previous week, which may well be reflective of the insecurity related to some ZHC jobs. There does appear to be a selection of workers performing full time (or above full time) hours, whether these hours are regular is however unclear.

What is striking is that around one third of ZHC workers do unpaid work each week, averaging at 7 hours per week. This would imply the average worker is losing out on approximately £80 per week. Such losses may be particularly important for social care workers (who we study in more detail below). As discussed in Rubery et al. (2014) domiciliary carers for example only get paid for face to face time, and time spent driving between clients may result in what they call a 'fragmented time contract'. Most workers on ZHCs have a substantial amount of labour market experience, with almost two thirds having been working for over five years. Conversely, over half of those sampled have less than one year experience on a ZHC, suggesting that an abundance of those on ZHCs have previously held non-ZHC working arrangements.

There are a few industries which stand out as having a large share of workers on ZHCs. In particular, retail, education, accommodation and food services, and health and social work. For retail and accommodation and food services this is unsurprising, as these professions are characterised by having a larger proportion of workers on part time contracts and may be

subject to seasonal fluctuations. The health and social work sector has the highest proportion of ZHC workers (15%). The social care sector, which falls under this heading, has not only a large number of low paid staff, but also faces an informal price cap for its output good, as a large proportion of those receiving social care are council funded. It is thus a perfect sector to analyse to assess whether firms facing growing wage bills due to the NLW are likely to use ZHCs to reduce their wage liability.

4.3 LSE-CEP Survey Representativeness

Table A2 in Appendix A presents demographic variables (similar to those in Table 6 and Table A1 in Appendix A) for both all respondents and ZHC workers from the LFS, and can be used to check for the representativeness of the CEP survey. In terms of overall representativeness, our survey fairs well with respect to age, qualifications and regional distribution. Our survey does however under sample those who did not have a job last week. Furthermore, the survey's representativeness of ZHC workers is generally good, however one can see that the mean hourly wage is just under £2 per hour higher in our survey. The median wages however are more similar (the gap reduces to £0.75), which suggests that the LSE-CEP survey has a slightly fatter right-hand tail of wages as discussed in section 4.2.

4.4 LSE-CEP Survey Results

In this subsection, we illustrate a second set of results that emerged from the survey of employees on ZHCs, with a focus on workers preferences and employment conditions.

An important question is whether workers choose to be on ZHCs for the flexibility that they offer, or would instead like a job with a minimum number of guaranteed hours but could only find employment as ZHC workers. Our survey results suggest an almost even split between workers who are satisfied with their number of hours (40 percent) and workers who would rather work more hours (44 percent), while a remaining 16 percent would like to work fewer hours (Figure 4). Of those wanting to work more hours, when asked about the reason

why there are unable to work more hours, 74 percent point to the lack of available work, followed by another 15 percent who are instead constrained by domestic commitments (Figure 5). As reported in Figure 6, domestic commitments are also the main reason brought about by people who would like to work fewer hours (38 percent), followed by the desire to spend more time on leisure and other unpaid activities (26 percent) or other types of work (14 percent), impediments due to illness or disability (10 percent) and study commitments (7 percent). In addition to the number of hours worked, the pattern of those hours may also be a relevant dimension of workers' satisfaction with their jobs. As with the desired number of hours, there appears to be an almost even split between respondents who would like to have a more regular pattern of hours (45 percent) and those who are satisfied with their current pattern of hours (43 percent), with the remaining 12 percent wanting a less regular schedule (Figure 7).

The survey responses regarding desired hours and work time patterns are suggestive of an almost even dichotomy between workers who are happy with the amount of work that they do, and workers who would like to work more but are unable to. We further investigate this issue by asking ZHC workers what are the reasons for their being on a ZHC (Figure 8). In line with our previous findings, the two main reasons that stand out are the inability to find employment in a job with a guaranteed number of hours (28 percent) and the flexibility to perform other activities (28 percent). Less prominent reasons are – in order of relevance – better remuneration than other available jobs (20 percent), complementing pay from other jobs (14 percent) and earning while studying (7 percent). Overall, 51 percent of respondents state that they are either satisfied or very satisfied with their ZHC job, 28 percent are neither satisfied nor dissatisfied, and the remaining 21 percent are dissatisfied or very dissatisfied (Figure 9).

Finally, we are interested in whether ZHC workers receive training and what type of training they would find most useful. According to our survey results, 55 percent of ZHC workers had received some form of training in the past year. As illustrated in column (1) of

Table 7, the most common types of training are – in order of importance – safety training (56 percent), skills training (54 percent), quality training (30 percent), and professional and legal training (22 percent). Training was paid for by employers, contractors, customers or someone else in 72 percent of cases, by the respondent in 16 percent of cases and free for the remainder 12 percent (Table 8). We also asked all ZHC respondents what type of training they would find useful for their future job prospects (column (2) of Table 7): skills training stands out as 50 percent of respondents indicate is as useful, followed by safety training (27 percent) and other types of training (all deemed useful by approximately 23 percent of respondents). It therefore seems that, when offered, training meets individual requirements.

5. ZHCs and Minimum Wages

5.1 Conceptual Framework

As documented in the previous sections, a large fraction of workers on ZHCs are paid the minimum wage. An interesting question that is relevant for policy is to assess whether ZHC jobs are inherently low-paid jobs – due to the tasks and skills required, and the flexibility that they provide – or, conversely, whether labour market policies such as minimum wage upratings are responsible for the spread of ZHC among low-paid jobs. ZHCs can help employers to buffer the wage cost shock due to the minimum wage increase by allowing them not to commit to a minimum number of hours. At the same time, though, they transfer the burden of insecurity onto employees, potentially worsening the employment conditions of individual workers. In this section, we exploit a large minimum wage increase recently implemented in the UK – the National Living Wage introduction – to shed light on the causal effect of minimum wage policies on the incidence of ZHCs. We do so in the context of the English adult social care sector, which previous research has demonstrated to be highly vulnerable to minimum wage increases (Machin, Manning and Rahman, 2003; Machin and Wilson, 2004; Giupponi and

Machin, 2018) and which can therefore provide a good testing ground for the effects of minimum wage policies.

Whilst there is a sample selection issue of studying care workers, and associated questions of generalisability for the UK workforce more widely, looking at the adult social care sector allows us to have good quality data on hourly wages and contractual arrangements (which are necessary to answer well the question that we ask). Also, the fact that flexible work arrangements are already largely in use in this sector means that – if NLW has impact on ZHC utilisation – this is a sector in which we can see it. Moreover, the estimates are relevant for other low-pay, ZHC-intense sectors, like hospitality and retail, which are those we care about the most when studying the economic effects of minimum wage floors.

5.2 The Introduction of the National Living Wage

The first UK national minimum wage policy dates back to April 1999, when the National Minimum Wage (NMW) was first introduced. At that time, a minimum hourly wage of £3.60 for workers aged 22 and over, and a lower rate of £3.00 for workers aged between 18 and 21 were established. Additional rates have been introduced in subsequent years, so that as of October 2015 the NMW rates were as follows: an adult minimum rate of £6.70 for workers aged 21 and over, a youth development rate of £5.30 for those aged 18-20, a youth minimum of £3.87 for 16-17 year olds and an apprentice rate of £3.30.

On July 8th 2015, the newly elected Conservative Party government called an emergency budget, in which the Chancellor George Osborne announced the introduction of the National Living Wage (NLW). This unexpected intervention changed the structure of minimum wages by introducing a new minimum wage rate of £7.20 an hour for workers aged 25 or above starting from April 1st 2016, while leaving the minimum wage rates for younger

workers unchanged.[10] Five minimum wage rates are now in operation in the UK: the NLW for workers aged 25 and over, the NMW for 21-24 year olds, the youth development rate for 18-20 year olds, the young worker rate for 16 and 17 year old, and the apprentice minimum wage.[11]

The NLW introduction was an unexpected and radical policy intervention. Firstly, it came from a political party that had traditionally been hostile to minimum wages, especially at the time of the NMW introduction in April 1999. Secondly, the NLW introduction generated a wage change much larger than recent uprates, namely an increase of 10.8 percent at the time of announcement in July 2015 and of 7.5 percent at the time of implementation on April 1st 2016. Most importantly for our analysis, the unexpected and sizable wage shock generated by the NLW introduction provides a unique "experiment" to study the consequences of the minimum wage increase on the use of ZHC.

5.3 The Adult Social Care Sector

The impact of the NLW introduction on ZHC utilisation is studied in the context of workers and firms in the English adult social care sector. Specifically, we will consider adult social care providers operating in the residential care home industry and the domiciliary care industry. Residential care refers to the provision of accommodation and personal care to adults in a communal residential centre, which may or may not provide nursing facilities. Members of staff in residential care homes are predominantly care assistants, who provide 24 hour supervision, meals and help with personal care needs. Domiciliary care – also referred to as home care – is a social care service provided to people who live in their own houses and require assistance with personal care routines, household tasks such as cleaning and cooking, or any other activities they may need to live independently. Domiciliary care assistants typically work

[10] Additionally, the NLW was set to achieve 60% of median earnings by 2020, which – at the time of the announcement – were forecasted to be £9.00 by the UK Office for Budget Responsibility.
[11] See Giupponi and Machin (2018) for a comprehensive discussion of minimum wages in the UK and for an empirical analysis of the wage and employment consequences of this significant change in the structure of minimum wages.

individually, and are often contracted on flexible working hours or zero-hour contracts since domiciliary care work tends to be organised into short and fragmented home visits.

The choice of focussing on the adult social care sector is motivated by various reasons. Firstly, the sector is highly vulnerable to minimum wages changes, as it has many low-paid workers. Of these, the vast majority are older than 25, making the setting especially suited to analysing the NLW introduction. Secondly, the sector is close to what can be considered a competitive labour market, as it consists of a large number of relatively small firms providing a rather homogeneous service, and it is very labour intensive and not unionised. Thirdly, residents' fees are regulated and paid for by local authorities, making it difficult for firms to pass higher costs onto prices. For all these reasons, a minimum wage change is likely to have a substantial impact on total costs and on economic outcomes of workers and firms in this sector, which therefore provides a useful testing ground for analysing the impact of minimum wage policies. In other words, the high vulnerability to minimum wage increases the likelihood of finding large effects from wage shocks. Finally, the incidence of ZHCs is high – particularly in the domiciliary care industry – making this setting especially suited to studying the impact of the NLW on ZHCs.

5.4 Data Sources

The main data source that is used to analyse the effect of the NLW introduction on ZHC utilisation is the National Minimum Dataset for Social Care (NMDS-SC).[12] This is an online system administered by Skills for Care and funded by the UK Department of Health that collects information on the adult social care workforce in England. Social care providers can use NMDS-SC to record and manage information about their workers, such as payroll data, training and development, job roles, qualifications and basic demographics. By having an account and regularly updating it, providers are given access to a set of tools to visualise and

[12] NMDS-SC (2013, 2014).

analyse their data, submit applications for training and development funds, compare their employment and pay structure with those of other providers locally, regionally or nationally, access publications about the social care sector and other e-learning resources for free, and directly share their data and returns with authorities such as the Care Quality Commission and the NHS. No fee is charged to use NMDS-SC. However, in order to benefit of certain facilities, providers must update their account at least once per year.

The dataset is a panel of matched employer-employee data. For each provider, we have information on the industry and main service provided, service capacity and utilisation, number of staff employed, geographic location and system update dates. For workers, we have information on demographics (gender, age and nationality), job characteristics (job role, contract type and qualifications), contracted weekly hours, hourly pay and update date of the hourly pay rate. We have access to the snapshot of the NMDS-SC online system at monthly frequency from March 2015 to March 2017, each snapshot including all providers in the system at that date.

A second data source is the Care Quality Commission (CQC) registry.[13] The registry contains a complete record of all active English care providers regulated by CQC at monthly frequency. It provides information on the activity status of providers and therefore allows us to identify when homes shut down and when new homes enter into the market.

5.5 Sample Design

Around 22,000 providers are registered with NMDS-SC as of March 2016. Of these, approximately 10,000 are residential care homes with or without nursing, and 3,800 are domiciliary care agencies. We match the sample of residential care homes and domiciliary care agencies with the CQC registry of active locations from March 2015 to March 2017, from

[13] The CQC is the independent regulator of health and adult social care in England. It is responsible for setting standards of care and for monitoring, inspecting and rating adult social care providers, to make sure that they meet fundamental standards of quality and safety.

which we can obtain information on whether a firm is active or closed in a given month. Our sample comprises care homes that meet the following three criteria: (i) being active from March 2016 through to March 2017 according to the CQC registry, (ii) having a record on NMDS-SC for all those months and (iii) having updated their NMDS-SC account at least once after March 2016.[14] This selection leaves us with a balanced panel of 5,345 firms that are active in March 2016 and remain open until March 2017.[15]

5.6 Descriptive Statistics

Table 9 reports descriptive statistics for all firms in the balanced sample, and for care homes and domiciliary care agencies separately, as of March 2016. The adult social care sector is characterised by relatively low hourly pay (£7.57 per hour on average) and a large fraction of workers aged 25 and over (88 percent on average), which are indicative of a high vulnerability to minimum wage increases in general and to the NLW introduction in particular.

The statistics reported in Table 9 also show that the care home sector is characterised by medium-sized establishments employing on average 45 employees. Domiciliary care agencies have a larger pool of employees as compared to care homes (63 vs 39 employees on average), and a remarkably higher proportion of zero hours contract workers (36 vs 5 percent) that translates into lower average weekly hours (16 vs 29 hours). Moreover, the proportion of workers on other flexible work arrangements such as temporary, bank or agency contracts, is almost twice as large in the domiciliary care sector (14 vs 8 percent). These differences most likely stem from the very nature of domiciliary care work, which tends to be organised into

[14] In order to avoid introducing sample selection driven by unobservable worker and firm characteristics correlated with the timing and frequency of updating, we do not condition our sample on a specific update date and only require that a firm update its records once in the twelve months after April 1st 2016. Approximately 90 percent of NMDS-SC users update within a year.

[15] In our sample we have a total of 4075 care homes and 1270 domiciliary care agencies. According to the 2017 report on the care home market of the Competition & Market Authority (2017), there are approximately 9500 care homes in England. This implies that our sample represents approximately 43 percent of the market for care homes. According to a 2016 report of the United Kingdom Home Care Association (2016), the total number of registered locations providing domiciliary care in England was 8,500 in March 2016. This implies that our sample represents approximately 15 percent of the market of domiciliary care agencies.

short and fragmented home visits to customers, so that domiciliary care assistants are often contracted on flexible working hours.

Apart from substantial differences in the types of working arrangements, the two sectors have an almost identical gender and age composition and similar wage rates. The main occupation in both sectors is care assistant and only a very small share of the workforce holds a nursing qualification. All these characteristics confirm that the adult social care sector is a pertinent context to the studying of the effects of the NLW introduction on wages and contractual arrangements.

5.7 NMDS-SC Representativeness

We check the representativeness of the NMDS-SC data using data from the ONS's Labour Force Survey (LFS). Table A3 in Appendix A reports the mean and standard deviation for a set of individual-level characteristics for care workers in the LFS. [16] The table also reports the same characteristics for care workers at the firm level in NMDS-SC. Demographic variables relating to gender, age and region line up very closely. The hourly wage rate and number of weekly hours worked are slightly higher in the LFS data, while the proportion of workers on ZHC is slightly lower. The discrepancy in average weekly hours in LFS and NMDS-SC is most likely due to the fact that the variable in LFS refers to actual hours worked, while in NMDS-SC to contractual hours, which – for ZHC workers – are equal to zero and therefore pull down the mean. The larger fraction of workers on ZHCs in NMDS-SC may be due to the fact that, in this dataset, we cannot account for multiple job holders, which tend to be more frequent in ZHC jobs. All in all, the statistics appear to line up quite satisfactorily.

[16] We select employees with standard occupation classification (SOC2010) marked as "care workers" in the LFS. LFS data refer to 2015Q4 and 2016Q1. NMDS-SC data refer to March 2016.

5.8 Empirical strategy

This section explores whether the minimum wage increase due to the NLW introduction had an impact on the share of workers on zero hours contracts. By tilting the composition of the workforce towards contracts without a guaranteed number of hours, employers can easily adjust employment at the intensive margin, either on top of or in substitution to adjustments along the extensive margin. Consistent with previous work (Giupponi and Machin, 2018), we will show that the NLW did not have a significant impact on employment, suggesting that any substitution toward contracts with flexible working arrangements is to be interpreted as an adjustment at the intensive margin.

The empirical strategy is based on the estimation of the following structural model:

$$\Delta Y_{j,t} = \alpha_1 + \beta_1 \Delta lnW_{j,t} + X'_{j,t-1}\gamma_1 + \varepsilon_{j,t} \quad (1)$$

where $\Delta Y_{j,t}$ is the change in the share of workers employed with a zero hours contract between March 2016 and March 2017; $\Delta lnW_{j,t}$ is the change in the natural logarithm of the average wage in firm j between March 2016 and March 2017; X is a vector of pre-NLW firm-level characteristics including the proportion of female workers, the average age, the proportion working as care assistants, the proportion with nursing qualification, the occupancy rate and a set of local authority districts fixed effects; ε is a disturbance term.[17] The parameter β_1 measures the causal effect of wage growth on ZHC utilisation.

Due to the potential endogeneity of $\Delta lnW_{j,t}$, we estimate equation (1) via a two-stage least square approach and instrument the change in the logarithm of the average wage $\Delta lnW_{j,t}$ with the proportion of workers paid less than the NLW in March 2016, which we indicate with

[17] There is a total of 325 local authority districts in our sample and of 326 local authority districts in England. They split England into 326 areas of local governance.

$MIN_{j,t-1}$.[18] The following wage equation can therefore be considered as the first stage of the instrumental variable model:

$$\Delta lnW_{j,t} = \alpha_2 + \beta_2 MIN_{j,t-1} + X'_{j,t-1}\gamma_2 + \eta_{j,t} \quad (2)$$

where all variables are defined as above and η is a disturbance term.

A first condition for a valid instrument is its relevance, i.e. the requirement that the instrument be correlated with the endogenous variable. We start by providing supporting evidence for the relevance of our instrument. Table 10 reports the regression estimates of the wage equation in model (2) for the balanced panel of firms. The specifications in columns (1) and (3) report the estimated coefficient β_2 for the pooled sample of care homes and domiciliary care agencies, while those in columns (2) and (4) allow β_2 to vary across the two sectors. The regression models in columns (2) and (4) include the above-listed firm-level controls. In all cases there is significant evidence of larger wage increases in firms with more low-wage workers in the pre-NLW period, as measured by the March 2016 proportion of low-wage workers. A one standard deviation increase in the proportion of low-paid workers (corresponding to a 34 percentage point change as reported in Table 9) implies a 1.8 percentage-point faster wage growth on a baseline of 4 percent, indicating a strong and significant relationship between minimum wages and wage growth. According to the estimates in columns (2) and (4), there is no differential relationship between the initial proportion of low-paid workers and wage growth in the domiciliary care and care home sector.

Figure 10 plots the evolution of the relationship between the low-paid proportion and wage growth for different post-reform quarterly intervals. Specifically, the graph plots the estimated coefficient β_2 for four models, in which hourly wage growth ($\Delta lnW_{j,t}$) is measured between March 2016 and, respectively, June 2016, September 2016, December 2016 and

[18] The variable is constructed as the proportion of workers that in March 2016 were paid below the age-specific minimum wage rate that would be in place as of April 2016. In other words, the variable provides a measure of the NLW bite at firm level.

March 2017. The underlying empirical specification allows for heterogeneity in β_2 between care homes and domiciliary care agencies and includes the full set of controls. The graph shows that the instrument is statistically significantly correlated with wage growth starting from the first quarter after the NLW introduction and that the correlation grows larger over time. The fact that the correlation builds up over time is due to the staggered updating of the records on NMDS-SC. However, since we require that all firms in our sample update their records at least once between April 2016 and March 2017, the estimate for the four-quarter difference does not suffer from attenuation due to non-updated records.

Having shown that homes with the highest potential to be affected by NLW introduction were indeed those that experienced larger wage growth in the quarters following the policy change, we provide additional evidence that the correlation between initial wages and wage growth is entirely due to the minimum wage change. The parameter β_2 identifies the causal effect of the minimum wage on wage growth only if – absent the minimum wage change – there was no relationship between the initial level of wages and wage growth. We provide supporting evidence for this identifying assumption by running a regression of quarter-on-quarter wage growth on leads and lags of our instrument. The regression specification reads as follows:

$$\Delta^{q} lnW_{j,t} = \alpha_3 + \delta_t + \sum_{\tau=-4,\tau\neq 0}^{4} \lambda_\tau MIN_{j,March\ 2016} + X'_{j,t}\gamma_3 + \xi_{j,t} \qquad (3)$$

where $\Delta^{q} lnW_{j,t}$ is quarter-on-quarter wage growth between quarter t and quarter $t-1$; δ_t a quarter indicator; $MIN_{j,March\ 2016}$ the proportion of low-paid workers as of March 2016; X the set of above listed covariates and ξ a disturbance term. The coefficients λ_τ for $\tau = -4, \dots, -1$ are treatment leads and provide an easy way to analyse pre-trends. The coefficients λ_τ for $\tau = 1, \dots, 4$ are instead treatment lags and identify treatment effect changes after the policy introduction. The coefficient estimates for model (3) are plotted in Figure A2 in Appendix A

and reported in Table A4 in Appendix A. Both report results for the balanced panel of firms that are active throughout all months between March 2015 and March 2017, and for the (unbalanced) panel of firms in our main sample. The results provide compelling evidence of the causal effect of the minimum wage on wage growth and that our instrument appears to be sufficiently exogenous in that it shows no correlation with wage growth prior to the NLW introduction.[19]

5.9 Main results

We now consider whether the wage cost shock induced by the NLW had consequences on ZHC utilisation. We start by estimating reduced-form equations, in which we regress the change in the share of ZHC workers ($\Delta lnY_{j,t}$) on our measure of the NLW bite ($MIN_{j,t-1}$), i.e. the pre-NLW proportion of low-paid workers. The reduced-form empirical model reads as follows:

$$\Delta lnY_{j,t} = \alpha_4 + \beta_4 MIN_{j,t-1} + X'_{j,t-1}\gamma_4 + \nu_{j,t} \quad (4)$$

where all variables are defined as above and ν is a disturbance term. Columns (1) to (4) of Table 11 report the regression estimates of the key parameter of interest, β_4. Estimates in columns (1) and (3) refer to the pooled sample of care homes and domiciliary care agencies, while those in columns (2) and (4) allow β_4 to vary across the two sectors. The reduced-form coefficient estimates reported in columns (1) and (3) are small and statistically insignificant. However, when we allow β_4 to vary across care home and domiciliary care sectors (columns (2) and (4)), the effect increases by an order of magnitude and turns marginally statistically significant in the domiciliary care sector. According to the results in column (4), in the

[19] A valid instrument must also satisfy the exclusion restriction, which requires that the proportion of workers paid below the NLW affect the change in the share of ZHCs only through its impact on wage growth. The exclusion restriction cannot be explicitly tested; however, it seems plausible to assume that if the initial level of wages indeed affected ZHC growth, this would be picked up by a change in wages. The evidence presented in Figure A2 and Table A4 in Appendix A does not appear to support this notion. We therefore assume that the exclusion restriction is satisfied in this context.

domiciliary care sector, a one standard deviation increase in the proportion of workers paid below the minimum is associated with a 1.2 percentage point larger increase in ZHC utilisation from a baseline of 6 percentage points.

Estimates of the structural coefficient β_1 are reported in columns (5) and (6) of Table 11, using the initial proportion of low paid workers as instrument for the wage change. Column (6) allows the coefficient β_1 to vary between care homes and domiciliary care. The structural estimates in column (5) do not point to any statistically significant relationship between wage growth and the incidence of zero hours contracts in the pooled sample. However, once we allow the structural parameter to vary across the two industries, the effect becomes larger and marginally significant in the domiciliary care sector. According to the estimate in column (6), in the domiciliary care sector, a 3.5 percent increase in wages (the average in the sample) leads to a 2.1 percentage point faster growth on a baseline of 6 percentage points. In the care home sector, the effect is instead small and statistically insignificant. We take this evidence as suggestive of an increase in the share of contracts with no minimum guaranteed hours in response to the minimum wage increase in a context – such as that of domiciliary care agencies – in which work tends to be organised into short and fragmented tasks.

Figure 11 further probes the relationship between wage growth and ZHC utilisation by plotting the coefficient β_1 for four models, in which the change in the share of ZHCs ($\Delta lnY_{j,t}$) is measured between March 2016 and, respectively, June 2016, September 2016, December 2016 and March 2017. The underlying empirical specification allows for heterogeneity in β_1 between care homes and domiciliary care agencies and includes the full set of controls. The graph shows a positive and statistically significant relationship between wage growth and ZHC utilisation starting from the second quarter after the NLW introduction and persisting over time.

An interesting question to ask is whether the increased share of ZHCs is due to the conversion of previously non-ZHC positions into ZHC ones, the creation of new ZHC jobs or

the displacement of workers on non-ZHC positions. For the first option to be true, we would need to observe no employment effects of the NLW introduction, for the second positive employment effects and for the third negative employment effects. We investigate this mechanism in Table A5 in Appendix A, where we report estimates of the reduced-form coefficient β_4 of model (4) and of the structural form coefficient $\beta_1$of model (1) using the change in the logarithm of employment headcount between March 2016 and March 2017 as outcome variable. Our results do not point to significant employment effects twelve months after the NLW introduction, thus suggesting that new ZHC jobs replaced non-ZHC positions.[20]

We also investigate whether the NLW introduction had an impact on the utilisation of other flexible contractual arrangements: temporary contracts, bank work and temporary agency contracts.[21] Regression estimates are reported in the various panels of Table A7 in Appendix A. For temporary contracts (Panel A) and agency contracts (Panel C), the structural estimates reported in column (6) are of limited magnitude and statistically insignificant. Conversely, the estimated IV coefficient for bank workers (column (6) of Panel B) indicates a positive, albeit marginally statistically significant, increase in the utilisation of bank workers in the domiciliary care sector. Specifically, a 3.5 percent increase in wages (the average in the sample) generates a 0.5 percentage point faster growth in bank utilisation on a baseline of -0.3 percentage points. This evidence well resonates with the notion that firms respond to the wage cost shock induced

[20] Being based on the balance sample of firms that remain active throughout the period of our analysis, this result may be actually due to the positive selection of surviving firms. We investigate whether the wage shock induced by the NLW introduction impacted the probability of survival of firms in Table A6 in Appendix A. We select the panel of firms that were active in March 2016 (but may close in subsequent months) and that we could match with the CQC registry to obtain information on their activity status at monthly frequency, and we run reduced-form linear probability models of the probability of having closed by March 2017 on the pre-NLW proportion of low-paid workers. All coefficient estimates are small and statistically insignificant, indicating that firms where the NLW bit the hardest were not more likely to go out of business in the twelve months after its implementation.

[21] We report here the formal definitions of these three contractual arrangements, as defined by NMDS-SC. *Temporary contract:* the worker is employed for a limited duration, normally either on a fixed term contract or for a fixed task, or on a spell of casual or seasonal employment as a "temp". *Bank worker:* the worker is retained by the organisation as a whole, but deployed on a casual or short term basis. *Temporary agency work:* the worker is supplied by an outside employment agency/bureau; this category includes staff employed by NHS professionals, and workers supplied on contract e.g. by outside catering and cleaning companies.

by the minimum wage increase by increasing the share of workforce on contracts with flexibility at the intensive margin instead of operating cuts in employment at the extensive margin.

5.10 Probing the Results for Low Paid Workers Using LFS Data

Finally, we test whether a change in the proportion of ZHC utilisation for care workers, and workers in other low paying industries, following the introduction of the NLW is also visible in the national statistics data. Figure 12 presents the evolution of the proportion of care workers on ZHCs around the introduction of the NLW using data from the LFS, for the period from 2014 to 2017. As can be seen, in the quarter following the introduction there is an increase in the proportion of ZHCs. The first two columns of Table 12 present an empirical counterpart to the graph from the following estimating equation:

$$ZHC_{i,t} = \alpha_5 + \beta_5 Post\ NLW_t + X'_{i,t}\gamma_5 + u_{it} \quad (5)$$

where ZHC is a binary indicator of ZHC status for worker i in period t; $Post\ NLW$ is a dummy taking value one after March 2016; X is a vector of individual-level controls including age, education, and dummies for gender, white ethnicity, British nationality, working in the public sector and regional location; u is a disturbance term. [22]

The results shown in the first two columns of Table 12 demonstrate that, following the NLW introduction, the proportion of workers employed in the social care sector on ZHCs increased. In the column (2) specification including controls, it rose by 1 percentage point, or a sizable 24 percent of the pre-NLW mean.[23] Furthermore, this positive association appears generalisable to other lowing paying industries. Columns (3) and (4) of Table 12 present results for estimates of equation (5) using a sample of all workers employed in low paying industries.[24]

[22] Twelve region dummies were included in total.
[23] A regression using only care workers (i.e. based on occupation rather than industry) yields a similar result, with a coefficient of 0.018 and a standard error of 0.007, representing a 17 percent increase on the pre-NLW mean.
[24] The low paying industries used are those in the UK's Low Pay Commission list, which can be found in LPC (2017), and are listed in Table A8 in Appendix A.

As can be seen, the results are almost identical to those for the social care industry. Table A8 in Appendix A breaks down the results into all 13 low paying industries and as can be seen all industries (aside from Security) have a positive β_5 coefficient (albeit with varying magnitudes and degrees of significance). Given the evidence outlined earlier in this section using the NMDS-SC data, we feel there is substantive evidence to suggest that the increase in ZHC utilisation in the social care industry and in low paying industries in general in the national statistics is due to the NLW introduction.

6. Conclusion

This paper contributes to the recent surge in academic and policy interest on the rise and nature of alternative work arrangements, with a specific focus on ZHCs in the context of the UK labour market. Combining both secondary and newly collected survey data, we provide a comprehensive assessment of the nature of ZHCs, which had been so far only limitedly studied in the economics literature. The survey data allow us to empirically document the characteristics of workers engaged in ZHCs and to better understand the trade-off between flexibility and insecure, low pay that is inherent in this type of work arrangement.

Furthermore, we investigate whether minimum wage policies have a role in the increased utilisation of ZHCs by firms. We do so by leveraging a novel matched employer employee dataset of English adult social care providers and credible identifying variation stemming from the NLW introduction in the UK labour market.

The analysis finds that workers on ZHCs are relatively low paid, with a large proportion being paid at or slightly above the minimum wage. Such relatively low pay, coupled with limited and fragmented hours, implies high levels of earnings insecurity for workers whose only option is to work on this type of arrangement. Indeed, a stark dichotomy emerges between workers who value the flexibility provided by ZHC jobs, and workers who would rather work

more and more regular hours and therefore appear to be engaged in ZHCs out of necessity rather than choice.

The analysis reveals that minimum wage policies appear to have some bearing on the increased utilisation of ZHCs. Specifically, in the context of the English adult social care sector, we find that the NLW introduction led to a larger incidence of ZHCs in the domiciliary care sector, i.e. a sector in which work is traditionally organised around fragmented hours. This suggests that firms exploit the flexibility of ZHCs in order to buffer the wage cost shock induced by the minimum wage increase. It remains to be understood whether these effects will stabilise or grow larger in the longer run – an issue we intend to study in due course. Similarly, the issue of whether there should be a higher minimum wage for ZHC workers (as suggested in the Taylor, 2017, review of modern work practices) is a research question that needs economic evidence to better inform its viability as a future option for labour market policy. In particular, our evidence suggests that a domiciliary worker paid the NMW experienced both an increase of 7.5% in their wages and 4.3% in their probability of being on a ZHC as a result of the NLW introduction, and such a tradeoff may have important welfare implications.

References

Aaronson, D. (2001) "Price Pass-Through and the Minimum Wage", Review of Economics and Statistics, 83, 158-69.

Abraham, K. G. and A. Amaya (2018) "Probing for Informal Work Activity," NBER Working Paper Number 24880.

Adams, A., J. Freedman and J. Prassl (2018) "Rethinking Legal Taxonomies for the Gig Economy", Oxford Review of Economic Policy, 34(3), 475-494.

Addison, J. and C. Surfield (2009) "Atypical Work and Employment Continuity", Industrial Relations: A Journal of Economy and Society, 48(4), 655-683.

Autor, D., A. Manning and C. Smith (2016) "The Contribution of the Minimum Wage to US Wage Inequality Over Three Decades: A Reassessment", American Economic Journal: Applied, 8, 58-99.

Baskaya, Y. S. and Y. Rubinstein (2015) "Using Federal Minimum Wages to Identify the Impact of Minimum Wages on Employment and Earnings Across the US States, Working Paper.

Beard, K and J. Edwards (1995) "Employees at Risk: Contingent Work and the Psychological Experience of Contingent Workers", Journal of Organizational Behaviour (1986-1998), 109.

Bell, B. and S. Machin (2018) "Minimum Wages and Firm Value", Journal of Labor Economics, 36, 159-95

Brown, C., C. Gilroy and A. Kohen (1982) "The Effect of the Minimum Wage on Employment and Unemployment", Journal of Economic Literature, 20, 487-528.

Butcher, T., R. Dickens and A. Manning (2012) "Minimum Wages and Wage Inequality: Some Theory and an Application to the UK", CEP Discussion Paper no. 1177. Centre for Economic Performance, LSE.

Card, D. and A. Krueger (1994) "Minimum Wages and Employment: A Case Study of the Fast-food Industry in New Jersey", American Economic Review, 84, 772-93.

Clemens, J, and M. Wither (2014) "The Minimum Wage and the Great Recession: Evidence of Effects on the Employment and Income Trajectories of Low-Skilled Workers", Working Paper no. 20724, National Bureau of Economic Research, Cambridge, MA.

Competition & Markets Authority (2017) "Care Homes Market Study. Final Report", https://assets.publishing.service.gov.uk/media/5a1fdf30e5274a750b82533a/care-homes-market-study-final-report.pdf

DiNardo, J., N. Fortin and T. Lemieux (1996) "Labor Market Institutions and the Distribution of Wages, 1973-92: A Semi-Parametric Approach", Econometrica, 64, 1001-44.

Draca, M., S. Machin and J. Van Reenen (2011) "Minimum Wages and Firm Profitability", American Economic Journal: Applied, 3, 129-51.

Dube, A., T. W. Lester and M. Reich (2010) "Minimum Wage Effects Across State Borders: Estimates Using Contiguous Counties", Review of Economics and Statistics, 92, 945-64.

Dube, A., T. W. Lester and M. Reich (2016) "Minimum Wage Shocks, Employment Flows, and Labor Market Frictions", Journal of Labor Economics, 34, 663-704.

Dube, A., J. Jacobs, S. Naidu and S. Suri (2018) "Monopsony in Online Labour Markets," NBER Working Paper No. 24416.

Eichhorst, E. and V. Tobsch (2013) "Has Atypical Work Become Typical in Germany?", IZA Discussion Paper No, 7609.

Eurofound (2015) "New forms of employment", Publications Office of the European Union, Luxembourg.

Eurofound (2017) "Atypical Work", European Industrial Relations Dictionary.

Gielen, A. and T. Schils (2014) "Non-Standard Employment Patterns in the Netherlands", IZA Policy Paper No.77.

Gilfillan, G. (2018) "Characteristics and use of casual employees in Australia", Research Paper Series 2017-2018, Parliament of Australia.

Giupponi, G. and S. Machin (2018) "Changing the Structure of Minimum Wages: Firm Adjustment and Wage Spillovers", CEP Discussion Paper no. 1533, Centre for Economic Performance, LSE.

Harasztosi, P. and A. Lindner (2017) "Who Pays for the Minimum Wage?", Working Paper.

Kalleberg, A. (2000) "Nonstandard Employment Relations: Part-time, Temporary and Contract Work", Annual Review of Sociology, 26(1), 341-365.

Katz, L. and A. Krueger (2016) "The Rise and Nature of Alternative Work Arrangements in the United States, 1995-2015", NBER Working Paper No. 22667.

Katz, L. and A. Krueger (2017) "The Role of Unemployment in the Rise in Alternative Work Arrangements", American Economic Review, 107(5), 388-392.

Kreiner, C., D. Reck and P. Skov (2017) "Do Lower Minimum Wages for Young Workers Raise their Employment? Evidence from a Danish Discontinuity", Working paper.

Lee, D. (1999) "Wage Inequality in the United States during the 1980s: Rising Dispersion or Falling Minimum Wage?", Quarterly Journal of Economics, 114, 977-1023.

LSE Growth Commission (2017) "UK Growth, A New Chapter", Centre for Economic Performance, LSE.

Low Pay Commission (2009), "National Minimum Wage", LPC Report.

Low Pay Commission (2017), "National Minimum Wage", LPC Report.

Machin, S., A. Manning and L. Rahman (2003) "Where the Minimum Wage Bites Hard: The Introduction of the UK National Minimum Wage to a Low Wage Sector", Journal of the European Economic Association, 1, 154-80.

Machin, S. and J. Wilson (2004) "Minimum Wages in a Low Wage Labour Market: Care Homes in the UK", Economic Journal, 114, 102-109.

MaCurdy, T. (2016) "How Effective Is the Minimum Wage at Supporting the Poor?", Journal of Political Economy, 123, 497-545.

Mas, A. and A. Pallais (2017) "Valuing Alternative Work Arrangements", American Economic Review, 107(12), 3722-3759.

McCrate, E. (2018) "Unstable and on-call work schedules in the United States and Canada", No. 994978592602676. International Labour Organization, 2018.

NMDS-SC (2013) "NMDS-SC Trend Briefing 1 – Care Worker Pay", Skills for Care.

NMDS-SC (2014) "NMDS-SC Trend Briefing 2 – Recruitment and Retentions", Skills for Care.

Nollen, S. (1996) "Negative Aspects of Temporary Employment", Journal of Labour Research, 17(4), 567-582

Polivka, A. and T. Nardone (1989) "On the Definition of Contingent Work", Monthly Lab. Rev., 112,9

Pyper, D. and A. Powell (2018) "Zero-hours contracts", House of Commons Briefing Paper no. 06553

O'Sullivan, M., Turner, T., McMahon, J., Ryan, L., Lavelle, J., Murphy, C., & P. Gunnigle (2015) " A study on the prevalence of zero hours contracts among Irish Employers and their Impact on Employees." Kemmy Business School, Limerick, University of Limerick.

Rodgers, G. and J. Rodgers (Eds.) (1989) "Precarious Jobs in Labour Market Regulation: the Growth of Atypical Employment in Western Europe", International Labour Organisation.

Rubery, J., D. Grimshaw and G. Hebson, G. (2014) "Zero Hours Contracts in Social Care", FairWRC Research Briefing No. 3.

Stewart, M. (2004) "The Impact of the Introduction of the UK Minimum Wage on the Employment Probabilities of Low Wage Workers", Journal of the European Economic Association, 2, 67-97.

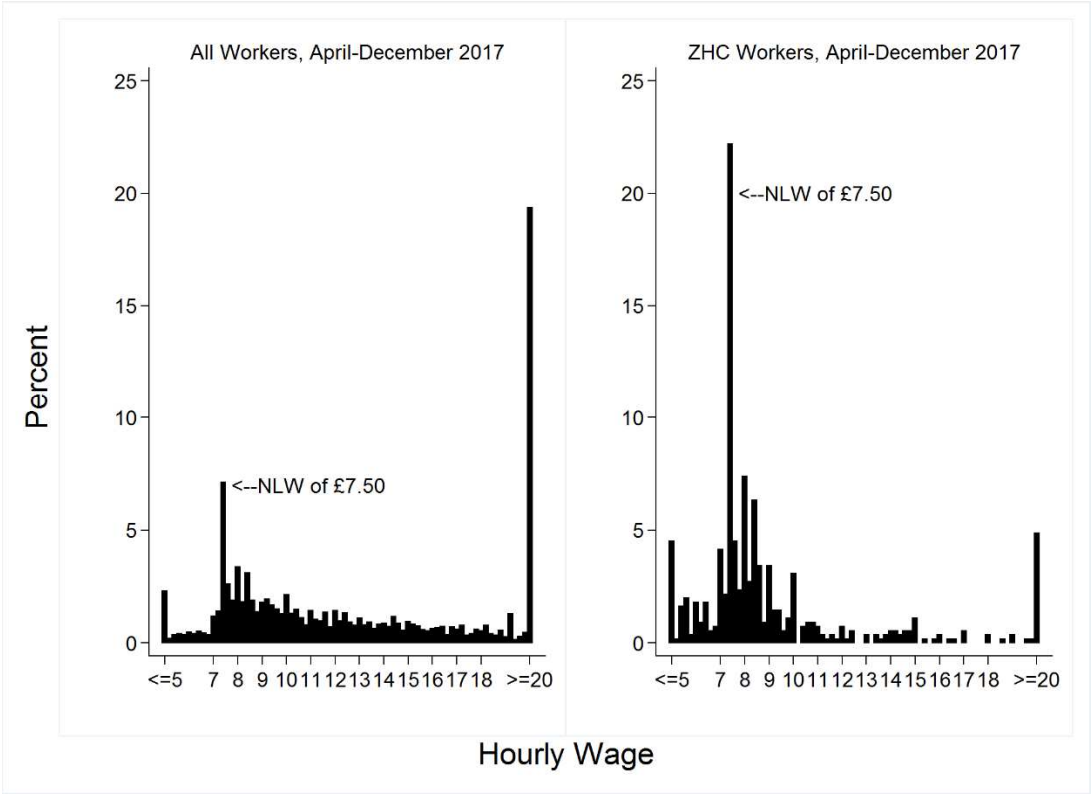
Stewart; M. (2012) “Wage Inequality, Minimum Wage Effects, and Spillovers”, Oxford Economic Papers, 64(4), 616–634.

Taylor, M. (2017) “Good Work: The Taylor Review of Modern Working Practices”, Department of Business, Energy and Industrial Strategy, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/627671/good-work-taylor-review-modern-working-practices-rg.pdf

United Kingdom Home Care Association (2016) “An Overview of the Domiciliary Care Market in the United Kingdom”, https://www.ukhca.co.uk/pdfs/DomiciliaryCareMarketOverview2015.pdf

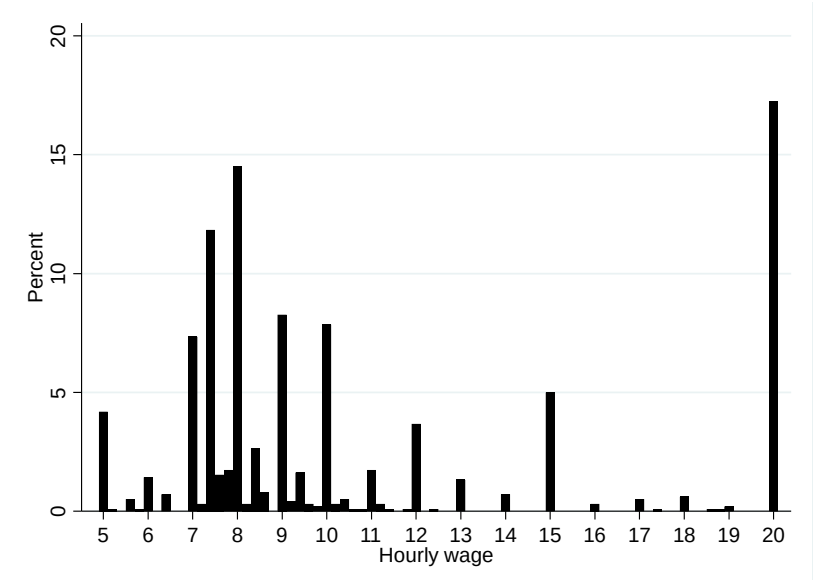
Wakeling, A. (2014) “Give and take? Unravelling the true nature of zero hour contracts”, ACAS Policy Discussion Papers.

Figure 1 – Hourly Wage Distribution for all Workers and Workers on ZHC



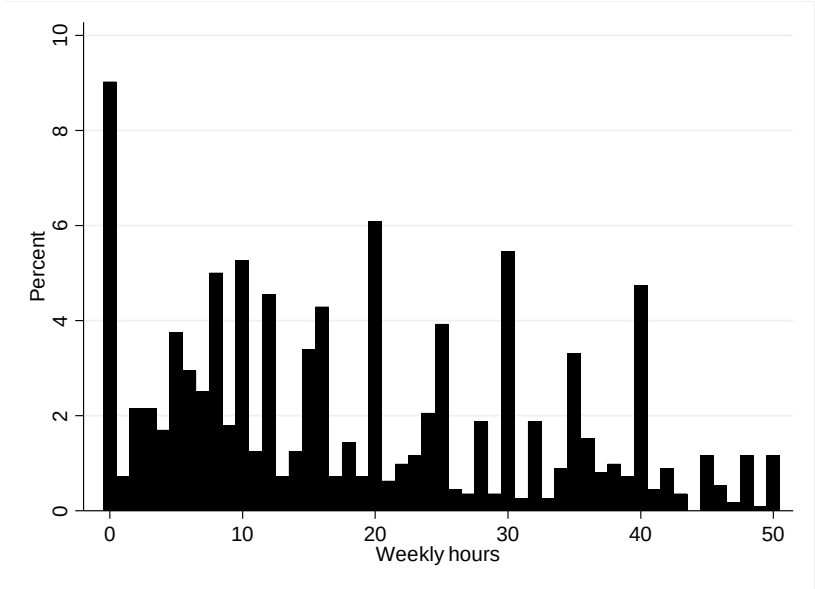
Note: The graphs show the distribution of hourly wages for all workers and workers who declare to be on a ZHC. The distribution is censored at £5 and £20.00. The data are binned into £0.20 bins.
Source: LFS. NLW denotes National Living Wage.

Figure 2 – Hourly Wage Distribution for Workers on ZHC



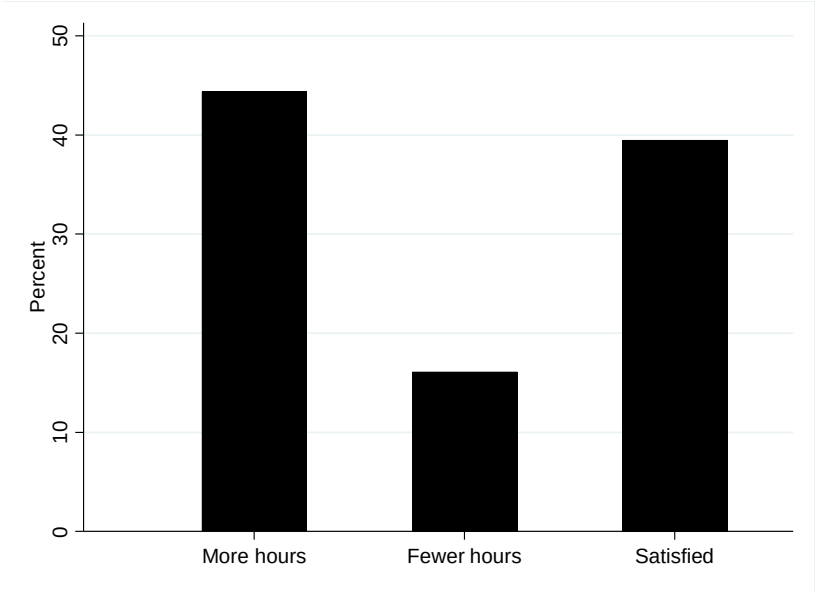
Note: The graph shows the distribution of hourly wages for respondents who declare to be on a ZHC. The distribution is censored at £5.00 and £20.00. The data are binned into £0.20 bins.
Source: LSE-CEP survey.

Figure 3 – Weekly Hours Distribution for Workers on ZHC



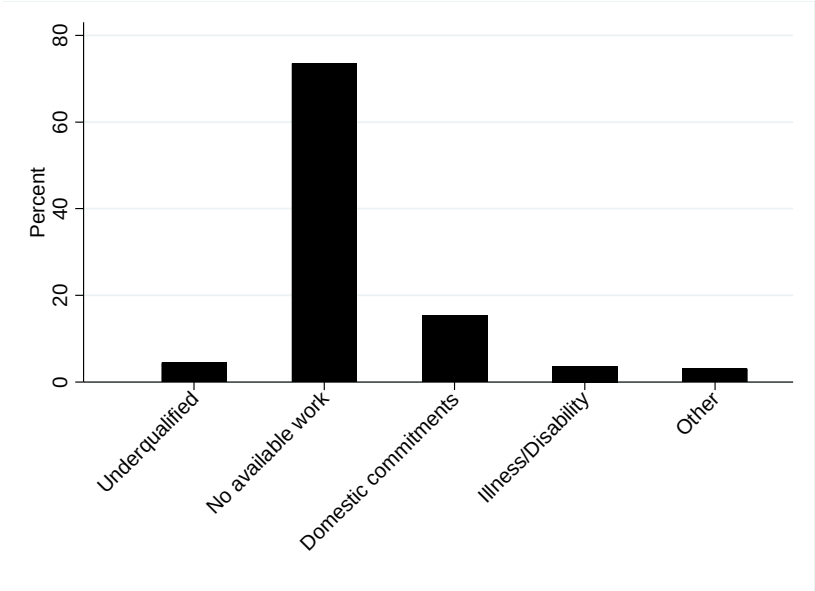
Note: The graph shows the distribution of weekly hours of work for respondents who declare to be on a ZHC. The distribution is trimmed at the 95th percentile.
Source: LSE-CEP survey.

Figure 4 – Desired Hours of Workers on ZHC



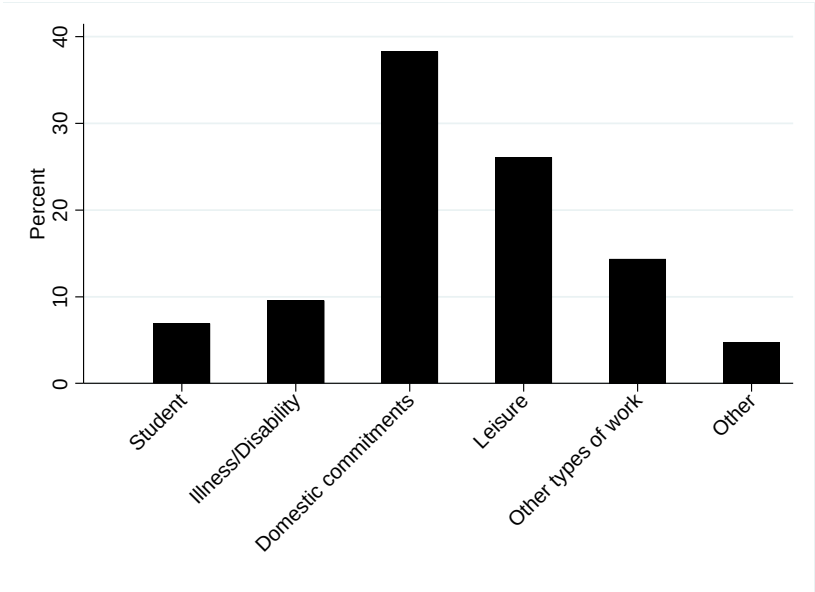
Note: The graph shows the distribution of responses to the question "Would you have preferred to work more or fewer hours last week in your zero hours contract or on-call job at that wage rate? Or were you satisfied with the number of hours you worked?".
Source: LSE-CEP survey.

Figure 5 – Reason for not Working More Hours (Workers on ZHC)



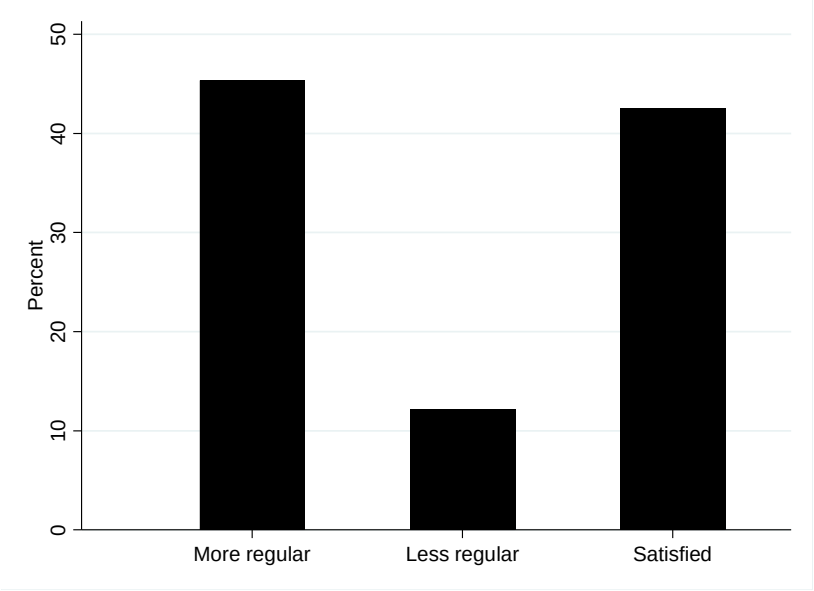
Note: The graph shows the distribution of responses to the question "Why were you NOT able to work more last week?".
Source: LSE-CEP survey.

Figure 6 – Reason for Wanting Fewer Hours (Workers on ZHC)



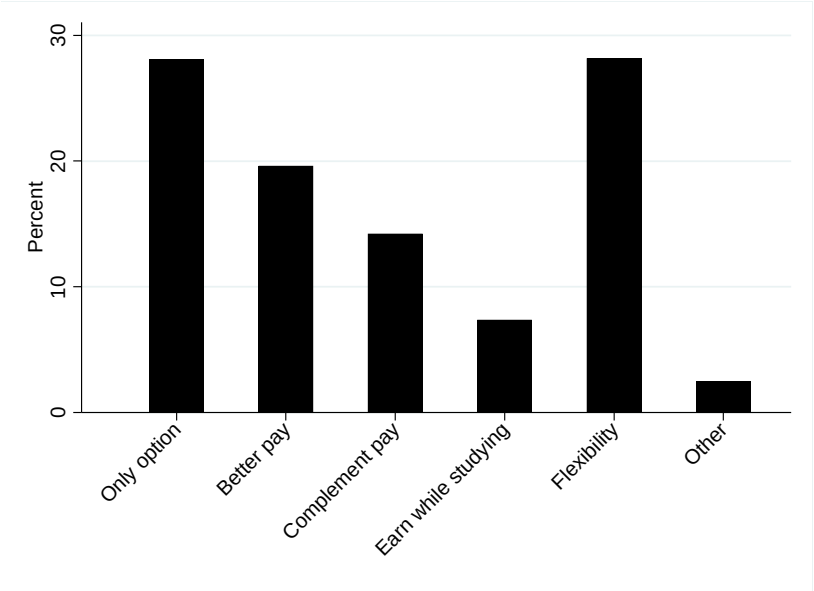
Note: The graph shows the distribution of responses to the question "Why would you want to work fewer hours?".
Source: LSE-CEP survey.

Figure 7 – Desired Pattern of Hours for Workers on ZHC



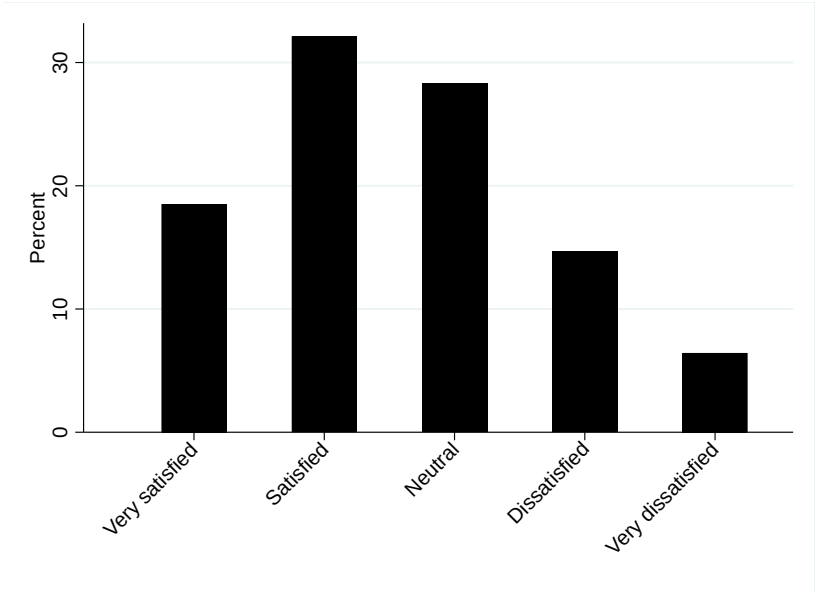
Note: The graph shows the distribution of responses to the question "Would you have preferred to work a pattern of more regular hours last week on your zero hours contract or on-call job at that wage rate? Or were you satisfied with the pattern of hours you worked?".
Source: LSE-CEP survey.

Figure 8 – Main Reason for Being on ZHC



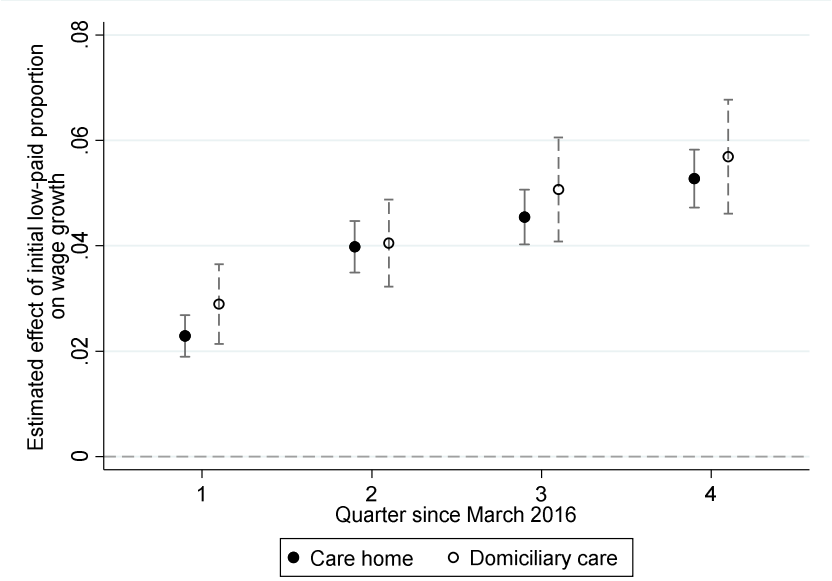
Note: The graph shows the distribution of responses to the question "Which is the most important reason why you work on a zero hours contract or on-call job?".
Source: LSE-CEP survey.

Figure 9 – Job Satisfaction of Workers on ZHC



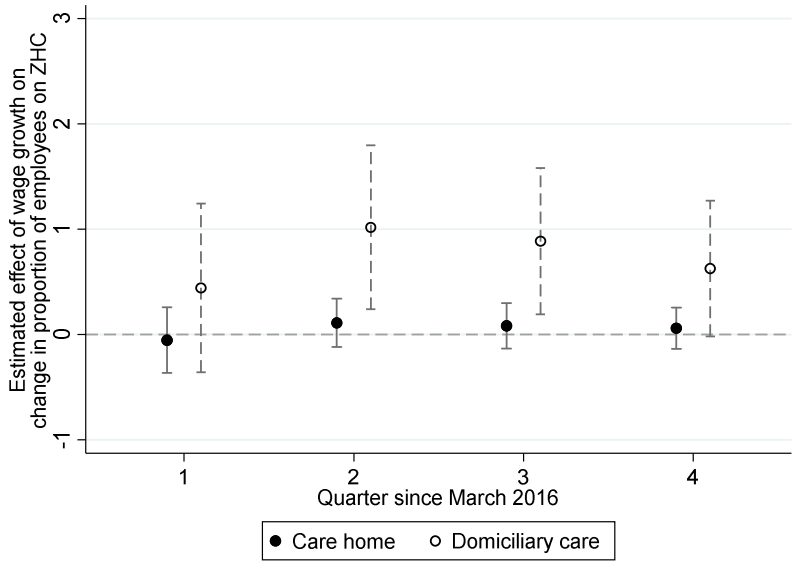
Note: The graph shows the distribution of responses to the question "How satisfied are you with working on a zero hours contract or on-call job?".
Source: LSE-CEP survey.

Figure 10 – Effect of Initial Low-paid Proportion on Wage Growth by Sector



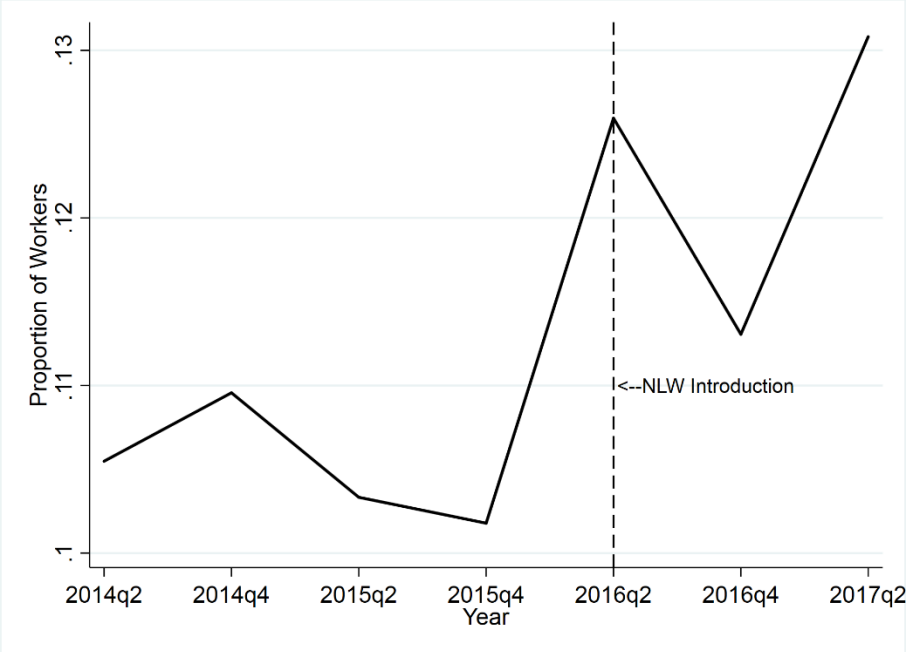
Notes: The graph reports the estimated coefficient $\hat{\beta}_2$ from model (2) for care homes and domiciliary care agencies, using as outcome the change in log average wages between March 2016 and one, two, three and four quarters after. The sample is a balanced panel of adult social care providers active between March 2016 and March 2017. The vertical bars indicate 95% confidence intervals based on robust standard errors. Control variables included in the underlying regression are the initial proportion female, proportion with nursing qualification, proportion of care assistants, average age (all workers), occupancy rate and local authority district dummies.
Source: NMDS-SC.

Figure 11 – Effect of Wage Growth on Proportion of Employees on ZHC by Sector



Notes: The graph reports the estimated coefficient $\hat{\beta}_1$ from model (1) for care homes and domiciliary care agencies, using as outcome the change in the share of workers on ZHC between March 2016 and one, two, three and four quarters after. The sample is a balanced panel of adult social care providers active between March 2016 and March 2017. The vertical bars indicate 95% confidence intervals based on robust standard errors. Control variables included in the underlying regression are the initial proportion female, proportion with nursing qualification, proportion of care assistants, average age (all workers), occupancy rate and local authority district dummies.
Source: NMDS-SC.

Figure 12 – Proportion of Care workers on ZHCs (LFS)



Notes: The graph presents the evolution of the proportion of care workers on ZHCs from April 2014 to April 2017. The dashed line marks the introduction of the NLW at the start of 2nd quarter in 2016.
Source: LFS

Table 1 – Examples of Zero Hour-Like Contracts in Europe and the United States

Country	Name	Description and/or Regulation
France	NA	ZHCs are outlawed in most cases. All part-time contracts must include the number and distribution of hours. Collective bargaining agreements require a minimum of 24 hours per week but can be reduced at the request of the employee. Exceptions for youth in education and temporary agency workers.
Germany	On-call work	Generally, contracts must specify weekly and daily working hours. If agreed by the employer and employee (or employee representative) a contract could avoid specifying weekly working hours, in which case 10 weekly working hours are deemed to be agreed. If the daily working hours are not specified, the employer is bound to call the employee for at least 3 consecutive hours per day.
Italy	On-call work	Contracts exist but are heavily regulated. Contracts must be justified by reference to production cycles and organisation needs, and companies who use them must notify the ministry of labour. Banned from public administration, weekend work and bank holiday work. Only workers under 25 and over 55 can be placed on them. Limits to 400 working days over 3 years and then automatic conversion into full-time permanent contract.
Sweden	On-call contracts	These contracts give no fixed hours and the employer can vary the working hours. No known regulation.
Norway	Zero Hour Contracts	Till recently such contracts made up around 0.8% of the workforce. Case law from 2005 and 2017 has deemed the use of permanent contracts where employees were to work only on-call as illegal and evading temporary employment law (which has strict usage and limitations). New regulation has been proposed by government to explicitly prohibit ZHCs.
Netherlands	Zero-hour Contract	Unlike the UK, there is an obligation on behalf of the employee to work when called upon. Each time an employee is called to worker, they must be paid a minimum of 3 hours wages (even if there is less than 3 hours work for them). Following 3 months of continuous employment on a ZHC, the agreed number of hours adjusts to the average number of hours during the previous 3 months.
	Min.-max. contract	Employees are given a guaranteed number of hours- weekly, monthly or annually. These are always paid even if the employer is unable to provide work. If the guaranteed number of hours per week is 15 hours or less, then similar regulation to the ZHCs is enforceable. During periods of high demand, employers and employees can agree upon extra hours.
United States	On-call / "Just-in-time" schedules	Diffusion of on-call working arrangements have increased from 1.6% in 1995 to 2.6% in 2015 (Katz and Krueger, 2016). There is no federal regulation, however eight states operate "show-up pay" laws, where employers are required to pay workers for a minimum number of hours (no matter how long they work), if they have been called to work. Coverage however varies across these eight states, and a number of exemptions exist.

	A few cities (e.g. San Francisco, Seattle, New York) operate fair scheduling ordinances, though the content of these may vary by city. As an example, the San Francisco ordinance requires new employees to receive a written estimate of their expected days and hours of shifts. Schedules must be posted at least two weeks in advance, changes with less than a weeks' notice results in compensation entitlement for the employee, and employees required to be on call but not working are also entitled to some compensation. Additionally, if employers have available hours, these must be offered to existing part-time employees before hiring additional part-time workers.

Source: Eurofound (2015), O'Sullivan et al. (2015), McCrate (2018).

Table 2 – LFS Descriptive Statistics

	All Employees		Zero Hour Contract Employees	
	2017		2017	
	Mean	S.D.	Mean	S.D.
Age	43.4	13.4	38.2	16.6
Prop. Female	0.49	0.50	0.59	0.49
Prop. In FT Education	0.03	0.17	0.17	0.37
Age When Completed FT (Conditional on Completed)	18.6	3.10	18.3	3.10
Median Tenure (Categorical)	5-10 Years		1-2 Years	
Prop. Part Time	0.29	0.45	0.67	0.47
Prop. Under 25	0.09	0.29	0.31	0.46
Hourly Wage	14.7	11.8	9.77	7.46
Hourly Wage (25+)	15.2	12.1	10.8	7.96
Hourly Wage (Under 25)	8.24	3.63	7.47	5.50
Median Hourly Wage	11.5		7.9	
Hours Worked In Reference Week	31.4	17.4	21.3	17.0
Like To Work More Hours	0.08	0.27	0.25	0.43
Sample Size	71,604		1,907	

Note: The table reports the mean and standard deviation of a set of individual characteristics for the employees from the LFS, for both all employees and ZHC workers, in 2017. The ZHC indicator only appears in April-June and October-December quarters of the LFS. Thus the above statistics use only those two quarters for each year. Wage data only appears in two waves of the survey, thus wage stats are based off approximately one fifth the number of observations.
Source: LFS.

Table 3 – The Bite of the National Living Wage

	All Employees				Zero Hour Contract Employees			
	2016		2017		2016		2017	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Proportion paid less than next NLW	0.20	0.40	0.20	0.40	0.54	0.50	0.49	0.50
Proportion paid less than next NLW (25+)	0.16	0.37	0.16	0.36	0.41	0.49	0.39	0.49
Proportion paid exactly NLW	0.06	0.23	0.06	0.24	0.18	0.38	0.20	0.40
Proportion paid exactly NLW (25+)	0.06	0.22	0.06	0.24	0.21	0.41	0.22	0.42
Sample Size	20,638		21,102		606		554	

Note: The table reports the mean and standard deviation of proportions of employees impacted by the NLW, for both all employees and ZHC workers, for the years 2016 and 2017.
Source: LFS.

Table 4 – Transitions Into ZHC Work (Between Quarter T and T+5)

	Status in period T+5							
	Inactive	Unemployed	FT – Emp.	PT-Emp.	FT-Self Emp.	PT-Self Emp.	ZHC	Total
Status in period T								
Inactive	84.89	3.79	2.23	5.68	0.38	1.82	1.21	100.00 (2,641)
Unemployed	21.20	36.71	19.94	15.19	0.63	1.90	4.43	100.00 (316)
Full Time - Employed	2.47	1.13	88.91	4.41	1.79	0.49	0.81	100.00 (4,697)
Part Time - Employed	7.20	1.55	9.50	76.22	0.75	1.55	3.22	100.00 (1,737)
Full Time - Self Employed	2.58	0.49	8.11	0.86	79.85	6.88	1.23	100.00 (814)
Part Time - Self Employed	11.50	1.47	2.95	6.19	10.03	66.08	1.77	100.00 (339)
ZHC	15.17	4.83	16.55	20.00	4.14	2.76	36.55	100.00 (145)
Total	24.62 (2,632)	2.92 (312)	42.69 (4,563)	16.71 (1,786)	7.47 (799)	3.63 (388)	1.96 (209)	100.00 (10,689)

Note: For each type of economic activity today, the table reports the percentage of respondents working arrangements in 5 quarters time. The data is pooled from the LFS panel survey, from January 2015 to March 2018. For all those in some form of employment, their primary job is reported. Sample sizes reported in parentheses.
Source: LFS.

Table 5 – Transitions out of ZHC Work (Between Quarter T-5 and T)

	Status in period T							
	Inactive	Unemployed	FT – Emp.	PT-Emp.	FT-Self Emp.	PT-Self Emp.	ZHC	Total
Status in period T-5								
Inactive	85.18	32.05	1.29	8.40	1.25	12.37	15.31	24.71 (2,641)
Unemployed	2.55	37.18	1.38	2.69	0.25	1.55	6.70	2.96 (316)
Full Time - Employed	4.41	16.99	91.52	11.59	10.51	5.93	18.18	43.94 (4,697)
Part Time - Employed	4.75	8.65	3.62	74.13	1.63	6.96	26.79	16.25 (1,737)
Full Time - Self Empl	0.80	1.28	1.45	0.39	81.35	14.43	4.78	7.62 (814)
Part Time - Self Empl	1.48	1.60	0.22	1.18	4.26	57.73	2.87	3.17 (339)
ZHC	0.84	2.24	0.53	1.62	0.75	1.03	25.36	1.36 (145)
Total	100.00 (2,632)	100.00 (312)	100.00 (4,563)	100.00 (1,786)	100.00 (799)	100.00 (388)	100.00 (209)	100.00 (10,689)

Note: For each type of economic activity today, the table reports the percentage of respondents working arrangements 5 quarters before. The data is pooled from the LFS panel survey, from January 2015 to March 2018. For all those in some form of employment, their primary job is reported. Sample sizes reported in parentheses.
Source: LFS.

Table 6 – Sample of ZHC Workers in LSE-CEP Survey

Variables	Mean	S.D.
Female	0.53	0.50
Age	36.28	13.21
Age 18-24	0.26	0.44
Age 25-34	0.25	0.43
Age 35-44	0.19	0.39
Age 45-54	0.18	0.38
Age 55-65	0.13	0.33
No qualifications	0.02	0.13
Some GCSE/O levels	0.10	0.30
5 or more GCSE/O levels	0.13	0.34
Trade/technical/vocational training	0.11	0.31
A levels	0.23	0.42
Bachelor's degree	0.27	0.45
Master's degree	0.11	0.31
Doctorate degree	0.03	0.16
North East	0.05	0.22
North West	0.12	0.32
Yorkshire and Humberside	0.06	0.23
East Midlands	0.08	0.27
West Midlands	0.09	0.29
Eastern England	0.08	0.26
London	0.19	0.40
South East	0.12	0.33
South West	0.08	0.27
Wales	0.04	0.20
Scotland	0.07	0.26
Northern Ireland	0.02	0.15
Married/Cohabiting	0.44	0.50
Widow/Separated/Divorced	0.10	0.30
Never married	0.45	0.50
Children	0.55	0.50
White	0.84	0.37
Mixed/Multiple ethnic group	0.04	0.20
Asian/Asian British	0.06	0.23
Black/African/Caribbean/Black British	0.06	0.23
Arab	0.00	0.06
Sample Size	1,167	

Table 6 – Sample of ZHC Workers in LSE-CEP Survey (Cont.)

Variables	Mean	S.D.
Multiple employers (ZHC jobs)	0.42	0.49
Non-ZHC job holder	0.34	0.47
Agriculture, forestry and fishing	0.01	0.08
Mining and quarrying	0.01	0.08
Manufacturing	0.07	0.25
Electricity, gas, steam and air conditioning supply	0.02	0.15
Water supply, sewerage, waste management	0.01	0.10
Construction	0.06	0.24
Wholesale and retail trade, repair of motor vehicles	0.09	0.29
Transportation and storage	0.06	0.24
Accommodation and food service activities	0.11	0.32
Information and communication	0.05	0.22
Financial and insurance activities	0.03	0.18
Real estate activities	0.01	0.07
Professional, scientific and technical activities	0.03	0.16
Administrative and support service activities	0.05	0.23
Public administration and defence	0.01	0.10
Education	0.09	0.29
Human health and social work activities	0.15	0.36
Arts, entertainment and recreation	0.06	0.24
Other service activities	0.06	0.23
Activities of households as employers of domestic personnel	0.01	0.12
Activities of extraterritorial organizations	0.00	0.07
Other	0.01	0.07
Hourly wage	11.63	8.16
Hourly Wage (median)	8.64	
Hours worked in previous week	18.62	13.67
Different days worked per week	4.06	1.71
Proportion doing unpaid hours	0.32	0.47
Average weekly unpaid hours	7.08	9.02
Less than one year of working experience	0.05	0.23
1-3 years of working experience	0.17	0.38
3-5 years of working experience	0.15	0.36
More than 5 years of experience	0.62	0.48
Less than one year of working experience in ZHC	0.52	0.50
1-3 years of working experience in ZHC	0.21	0.41
3-5 years of working experience in ZHC	0.14	0.35
More than 5 years of experience in ZHC	0.13	0.34
Received work-related training in the last year	0.55	0.50
Sample Size	1,167	

Note: The table reports the mean and standard deviation of a set of individual characteristics for the sample of respondents who declared to be on a ZHC in the week prior to taking the survey.
Source: LSE-CEP survey.

Table 7 – Training of Workers on ZHC

Variables	Received in last year (1)	Most useful to improve job prospects (2)
Technical or technology training	0.18	0.23
Quality training	0.30	0.24
Skills training	0.54	0.50
Continuing education	0.13	0.20
Professional training and legal training	0.22	0.24
Managerial training	0.15	0.23
Safety training	0.56	0.27
Other	0.01	0.02
Sample Size	644	1,167

Note: The table reports answers to the question "What type of training [did you receive last year]?" in column (1) and to the question "What type of training would you find most useful to improve your job prospects?" in column (2). The table reports the proportion of respondents who ticked each of the preset options.
Source: LSE-CEP survey.

Table 8 – Who Pays for the Training of Workers on ZHC

Variables	(1)
Me or a family member	0.16
A contractor or customer	0.11
My employer	0.59
Someone else	0.02
No one, it was free	0.12
Sample Size	664

Note: The table reports answers to the question "Who paid for the cost of the training?". The table reports the proportion of respondents who ticked each of the preset options.
Source: LSE-CEP survey.

Table 9 – NMDS-SC Summary Statistics

	All firms		Care homes		Domiciliary care agencies	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Firm level variables						
Number of employees	44.59	44.83	38.94	30.87	62.69	70.54
Proportion under 25	0.12	0.09	0.12	0.09	0.12	0.09
Hourly wage	7.57	1.07	7.54	1.09	7.68	1.01
Weekly hours	25.78	8.88	28.68	5.22	16.48	11.43
Weekly earnings	190.55	79.47	213.40	55.74	117.23	97.78
Hourly wage carer	7.11	0.91	7.01	0.94	7.45	0.71
Weekly hours carer	24.61	10.28	28.07	6.28	13.00	12.36
Proportion on ZHC	0.12	0.23	0.05	0.10	0.36	0.33
Proportion on permanent contract	0.88	0.17	0.90	0.11	0.82	0.27
Proportion on temporary contract	0.02	0.08	0.02	0.04	0.05	0.15
Proportion on bank contract	0.06	0.10	0.06	0.09	0.05	0.13
Proportion on agency contract	0.01	0.08	0.00	0.02	0.04	0.17
Female	0.84	0.13	0.84	0.13	0.86	0.12
Age	42.47	4.67	42.65	4.57	41.91	4.91
Proportion carer	0.61	0.20	0.56	0.16	0.75	0.23
Proportion with nursing qualification	0.03	0.06	0.04	0.07	0.00	0.01
Occupancy rate	0.77	0.33	0.92	0.15	0.27	0.30
Proportion paid below NLW	0.47	0.34	0.52	0.32	0.33	0.36
Number of firms	5,345		4,075		1,270	

Note: The table reports the mean and standard deviation of a set of firm-level variables for the balanced sample of firms used in the analysis. The statistics refer to March 2016, and are shown for the full sample, and for the sample of care homes and domiciliary care agencies separately.
Source: NMDS-SC.

Table 10 – Wage Equations

Dep. Var.: Change in log average hourly wage

March 2016 to March 2017

	(1)	(2)	(3)	(4)
Initial low-paid proportion	0.051***	0.051***	0.054***	0.053***
	(0.002)	(0.002)	(0.003)	(0.003)
Initial low-paid proportion x Domiciliary		0.003		0.004
		(0.006)		(0.006)
Observations	5,345	5,345	5,345	5,345
Controls	No	No	Yes	Yes
Mean of dep. var.:				
All firms	0.039			
Care homes	0.041			
Domiciliary care	0.035			

Notes: The table reports the estimated coefficient $\hat{\beta}_2$ from model (2). The sample is a balanced panel of adult social care providers active between March 2016 and March 2017. Robust standard errors are reported in parentheses. P-value: *** p<0.01, ** p<0.05, * p<0.1. Control variables are the initial proportion female, proportion with nursing qualification, proportion of care assistants, average age (all workers), occupancy rate and local authority district dummies.
Source: NMDS-SC.

Table 11 – Zero Hour Contracts Equations

Dep. Var.: Change in proportion of employees on zero hour contracts

March 2016 to March 2017

	(1)	(2)	(3)	(4)	(5)	(6)
Initial low-paid proportion	-0.006	0.001	0.005	0.003		
	(0.005)	(0.004)	(0.007)	(0.005)		
Initial low-paid proportion x Domiciliary		0.034*		0.032*		
		(0.018)		(0.018)		
Change in log average wage					0.101	0.060
					(0.126)	(0.100)
Change in log average wage x Domiciliary						0.566*
						(0.327)
Observations	5,345	5,345	5,345	5,345	5,345	5,345
Controls	No	No	Yes	Yes	Yes	Yes
Mean of dep. var.:						
All firms	0.020					
Care homes	0.007					
Domiciliary care	0.062					

Notes: The table reports the estimated reduced-form coefficient $\hat{\beta}_4$ from model (4) in columns (1)-(4), and the estimated IV coefficient $\hat{\beta}_1$ from model (1) in columns (5)-(6), using the change in the share of workers on ZHC as outcome variable. The sample is a balanced panel of adult social care providers active between March 2016 and March 2017. Robust standard errors are reported in parentheses. P-value: *** p<0.01, ** p<0.05, * p<0.1. Control variables are the initial proportion female, proportion with nursing qualification, proportion of care assistants, average age (all workers), occupancy rate and local authority district dummies.
Source: NMDS-SC.

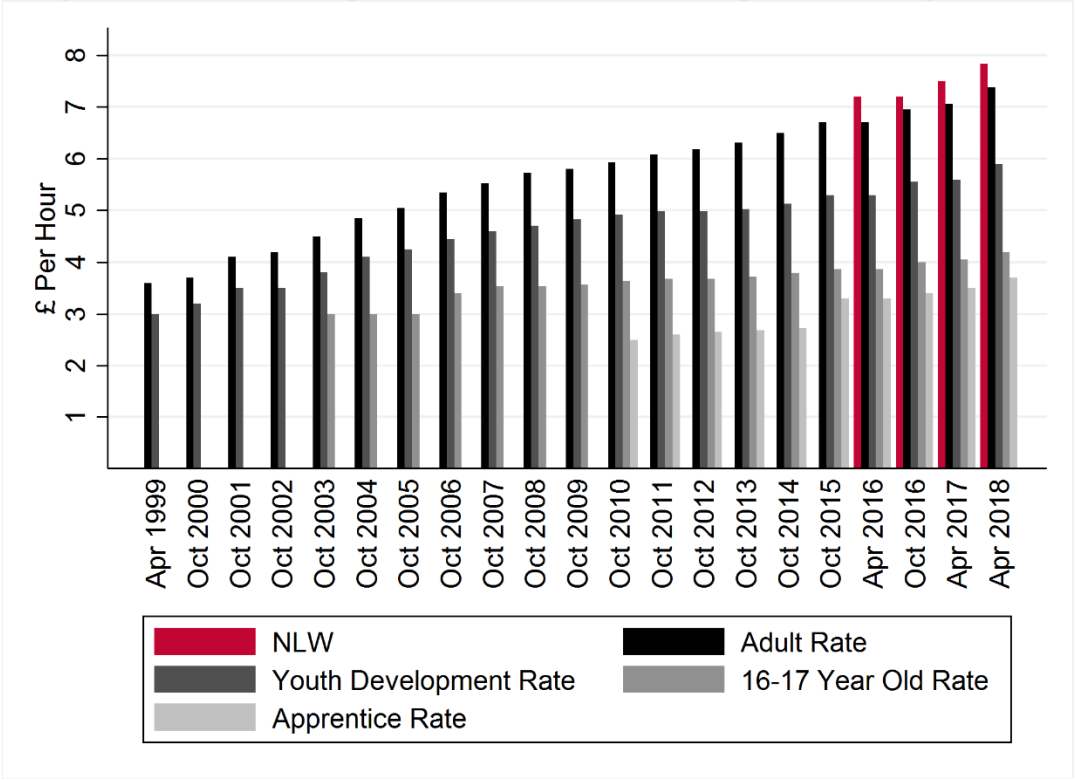
Table 12 – Zero Hour Contracts Equation (LFS Sample)

	Social Care Industry		Pooled Low Wage Industries	
	(1)	(2)	(3)	(4)
Post NLW	0.011***	0.010***	0.008***	0.010***
	(0.003)	(0.003)	(0.001)	(0.001)
Controls	No	Yes	No	Yes
Observations	25,191	25,191	91,362	91,362
Pre-NLW mean of dep. var.	0.042	0.042	0.041	0.041

Notes: The table reports the estimated coefficient $\hat{\beta}_5$ from the estimating equation (5). The sample for the first two columns is workers employed in the Social Care Industry, and for the second paid of columns is workers employed in Low Paying Industries (defined in LPC (2017)). The samples contain 4 pre-NLW quarters (2014-2015 quarter 2 and quarter 4) and 3 post-NLW quarters (2016 quarter 2 and quarter 4, and 2017 quarter 2). Controls include age, education, gender, a dummy for white ethnicity, a dummy for British nationality, a dummy for working in the public sector and twelve regional dummies
Source: LFS.

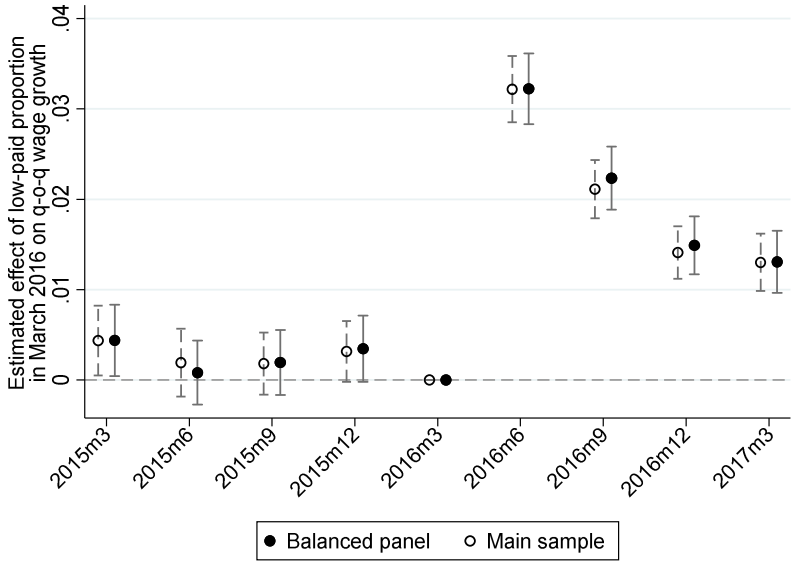
Appendix A

Figure A1 – Effect of Proportion of Initial Low-Paid Proportion on Wage Growth



Notes: The graph reports the various minimum wage rates in the UK between 1999 and 2018. The apprentice rate applies to apprentices. The 16-17 year-old rate to workers aged 16 and 17. The youth development rate to workers aged 18-20. The adult rate applied to workers aged 21 and over until March 2016. From April 2016, the adult rate applies to workers aged 21-24 and the NLW to those aged 25 and over.
Source: Low Pay Commission.

Figure A2 – Effect of Proportion of Initial Low-Paid Proportion on Wage Growth



Notes: The graph reports the estimated coefficient $\hat{\lambda}_\tau$ for $\tau = [-4, \dots, 4]$ from model (3), using as outcome the quarter-on-quarter change in log average wages. The graph reports estimates for both a balanced panel of adult social care providers always active between March 2015 and March 2017, and for the sample of firms used in the main analysis (i.e. the panel of firms always active between March 2016 and March 2017). The vertical bars indicate 95% confidence intervals based on robust standard errors. Control variables included in the underlying regression are the initial proportion female, proportion with nursing qualification, proportion of care assistants, average age (all workers), occupancy rate and local authority district dummies.
Source: NMDS-SC.

Table A1 – Sample of Survey Respondents of LSE-CEP Survey

Variables	Mean	S.D.
Female	0.53	0.50
Age	40.93	13.04
Age 18-24	0.14	0.35
Age 25-34	0.21	0.41
Age 35-44	0.22	0.41
Age 45-54	0.25	0.43
Age 55-65	0.19	0.39
No qualifications	0.04	0.19
Some GCSE/O levels	0.12	0.32
5 or more GCSE/O levels	0.13	0.34
Trade/technical/vocational training	0.12	0.33
A levels	0.22	0.41
Bachelor's degree	0.26	0.44
Master's degree	0.09	0.28
Doctorate degree	0.02	0.12
North East	0.05	0.22
North West	0.11	0.32
Yorkshire and Humberside	0.09	0.29
East Midlands	0.08	0.27
West Midlands	0.09	0.29
Eastern England	0.07	0.26
London	0.12	0.33
South East	0.15	0.35
South West	0.08	0.27
Wales	0.05	0.22
Scotland	0.08	0.27
Northern Ireland	0.02	0.14
Employed by government	0.17	0.38
Employed by private company	0.49	0.50
Employed by non-profit organization	0.07	0.26
Self-employed, with or without employees	0.11	0.32
Working in the family business	0.01	0.11
Only work last week was filling out surveys	0.03	0.17
Did not have a job last week	0.12	0.32
Sample Size	18,831	

Note: The table reports the mean and standard deviation of a set of individual characteristics for the full sample of respondents to the LSE-CEP Survey of Self-Employment and Alternative Work Arrangements.
Source: LSE-CEP survey.

Table A2 – CEP-LSE Survey Representativeness Based on LFS 2017

Variables	All 18-65 Mean	All 18-65 S.D.	ZHC 18-65 Mean	ZHC 18-65 S.D.
Female	0.52	0.50	0.60	0.49
Age	42.78	13.34	37.85	14.91
Age 18-24	0.11	0.32	0.28	0.45
Age 25-34	0.19	0.40	0.19	0.39
Age 35-44	0.22	0.41	0.16	0.37
Age 45-54	0.24	0.43	0.18	0.38
Age 55-65	0.24	0.43	0.19	0.39
No Qualifications	0.08	0.26	0.06	0.24
GCSE/O levels	0.20	0.40	0.22	0.41
Trade/Technical/Other	0.09	0.28	0.10	0.30
A Levels	0.23	0.42	0.28	0.45
Bachelor's Degree	0.30	0.46	0.23	0.42
Master's Degree	0.05	0.21	0.03	0.17
Doctorate Degree	0.01	0.10	0.00	0.06
North East	0.04	0.20	0.05	0.22
North West	0.11	0.31	0.09	0.29
Yorkshire & The Humber	0.09	0.28	0.08	0.28
East Midlands	0.07	0.26	0.08	0.27
West Midlands	0.09	0.28	0.08	0.26
East of England	0.09	0.29	0.09	0.29
London	0.11	0.32	0.12	0.32
South East	0.13	0.34	0.15	0.35
South West	0.09	0.29	0.11	0.32
Wales	0.04	0.21	0.01	0.11
Scotland	0.08	0.27	0.08	0.27
Northern Ireland	0.05	0.21	0.05	0.23
Employed by Public Sector	0.17	0.38	0.16	0.36
Employed by Private Sector	0.58	0.49	0.84	0.37
Self-employed, with or without employees	0.11	0.31	0.09	0.29
Does not have a job	0.24	0.43	0.00	0.00
Hourly Wage	14.7	11.8	9.77	7.46
Hourly Wage (median)	11.5		7.9	
Sample Size	108,983		1,686	

Note: The table reports summary statistics of individual level characteristics for all working age respondents and ZHC workers.
Source: LFS

Table A3 – NMDS-SC Survey Representativeness (Care Workers)

	LFS		NMDS-SC	
	Mean (1)	S.D. (2)	Mean (3)	S.D. (4)
Prop. female	0.85	0.36	0.86	0.15
Age	42.62	13.58	40.09	5.61
Hourly rate	7.91	1.50	7.11	0.91
Weekly hours	28.04	15.98	24.61	10.28
Proportion on ZHC	0.11	0.32	0.14	0.25
North East	0.07	0.25	0.06	0.23
North West	0.13	0.34	0.13	0.34
Yorkshire & Humberside	0.12	0.32	0.11	0.31
East Midlands	0.08	0.28	0.09	0.28
West Midlands	0.11	0.31	0.13	0.33
East England	0.12	0.32	0.13	0.34
London	0.09	0.28	0.06	0.24
South East	0.15	0.36	0.15	0.36
South West	0.13	0.34	0.15	0.33
Sample Size	2,025		5,354	

Note: The table reports the mean and standard deviation for a set of individual-level characteristics for care workers in the LFS (columns (1) and (2)). The table also reports the mean and standard deviation for the same set of characteristics at the firm level in NMDS-SC (columns (3) and (4)). The LFS data refer to 2015Q4 and 2016Q1, and the NMDS-SC data to March 2016. The ZHC indicator only appears in April-June and October-December quarters of the LFS. Thus the proportion of ZHC reported in column (1) is based on 2015Q4 data only. Wage data only appears in two waves of the LFS, thus wage statistics in columns (1) and (2) are based off approximately one fifth of the number of observations.
Source: LFS and NMDS-SC.

Table A4 – Identification Check

	Quarter-on-quarter change in log wage	
	(1)	(2)
March 2015	0.004**	0.004**
	(0.002)	(0.002)
June 2015	0.001	0.002
	(0.002)	(0.002)
September 2015	0.002	0.002
	(0.002)	(0.002)
December 2015	0.003*	0.003*
	(0.002)	(0.002)
March 2016 (omitted)	-	-
	-	-
June 2016	0.032***	0.032***
	(0.002)	(0.002)
September 2016	0.022***	0.021***
	(0.002)	(0.002)
December 2016	0.015***	0.014***
	(0.002)	(0.001)
March 2016	0.013***	0.013***
	(0.002)	(0.002)
Nr. of firms	4,680	5,345
Balanced sample	x	
Main sample		x
Controls	Yes	Yes

Notes: The table reports the estimated coefficient $\hat{\lambda}_\tau$ for $\tau = [-4, \dots, 4]$ from model (3), using as outcome the quarter-on-quarter change in log average wages. The table reports estimates for a balanced panel of adult social care providers always active between March 2015 and March 2017 in column (1), and for the sample of firms used in the main analysis (i.e. the panel of firms always active between March 2016 and March 2017) in column (2). Robust standard errors are reported in parentheses. P-value: *** p<0.01, ** p<0.05, * p<0.1. Control variables are the initial proportion female, proportion with nursing qualification, proportion of care assistants, average age (all workers), occupancy rate and local authority district dummies.
Source: NMDS-SC.

Table A5 – Employment Equations

Dep. Var.: Change in log number of employees

March 2016 to March 2017

	(1)	(2)	(3)	(4)	(5)	(6)
Initial low-paid proportion	-0.012	-0.012	-0.017	-0.016		
	(0.011)	(0.010)	(0.013)	(0.012)		
Initial low-paid proportion x Domiciliary		0.000		-0.006		
		(0.031)		(0.031)		
Change in log average wage					-0.316	-0.301
					(0.238)	(0.231)
Change in log average wage x Domiciliary						-0.092
						(0.566)
Observations	5,345	5,345	5,345	5,345	5,345	5,345
Controls	No	No	Yes	Yes	Yes	Yes
Mean of dep. var.:						
All firms	0.015					
Care homes	0.015					
Domiciliary care	0.018					

Notes: The table reports the estimated reduced-form coefficient $\hat{\beta}_4$ from model (4) in columns (1)-(4), and the estimated IV coefficient $\hat{\beta}_1$ from model (1) in columns (5)-(6), using the change in log headcount employment as outcome variable. The sample is a balanced panel of adult social care providers active between March 2016 and March 2017. Robust standard errors are reported in parentheses. P-value: *** p<0.01, ** p<0.05, * p<0.1. Control variables are the initial proportion female, proportion with nursing qualification, proportion of care assistants, average age (all workers), occupancy rate and local authority district dummies.
Source: NMDS-SC.

Table A6 – Closures

Dep. Var.: Indicator for Firm Closure

March 2016 to March 2017

	(1)	(2)	(3)	(4)
Initial low-paid proportion	-0.002	0.001	0.002	0.005
	(0.006)	(0.007)	(0.007)	(0.007)
Initial low-paid proportion x Domiciliary		0.006		0.004
		(0.016)		(0.016)
Observations	5,738	5,738	5,738	5,738
Controls	No	No	Yes	Yes
Mean of dep. var.:				
All firms	0.022			
Care homes	0.019			
Domiciliary care	0.033			

Notes: The table reports the estimated reduced-form coefficient $\hat{\beta}_4$ from model (4), using the probability of closure as of March 2017 as outcome variable. The sample is a balanced panel of adult social care providers active in March 2016, unconditional on their survival until March 2017. Robust standard errors are reported in parentheses. P-value: *** p<0.01, ** p<0.05, * p<0.1. Control variables are the initial proportion female, proportion with nursing qualification, proportion of care assistants, average age (all workers), occupancy rate and local authority district dummies.
Source: NMDS-SC.

Table A7 – Employment Contract Equations

Dep. Var.: Change in proportion of employees by contract type between March 2016 and March 2017

Panel A – Temporary contract

	(1)	(2)	(3)	(4)	(5)	(6)
Initial low-paid proportion	-0.001	-0.002	-0.001	-0.001		
	(0.003)	(0.002)	(0.003)	(0.002)		
Initial low-paid proportion x Domiciliary		-0.002		-0.005		
		(0.008)		(0.008)		
Change in log average wage					-0.027	-0.016
					(0.056)	(0.044)
Change in log average wage x Domiciliary						-0.086
						(0.151)
Observations	5,345	5,345	5,345	5,345	5,345	5,345
Controls	No	No	Yes	Yes	Yes	Yes
Mean of dep. var.:						
All firms	-0.002					
Care homes	-0.001					
Domiciliary care	-0.006					

Panel B – Bank

	(1)	(2)	(3)	(4)	(5)	(6)
Initial low-paid proportion	-0.000	-0.003	0.000	-0.003		
	(0.002)	(0.003)	(0.003)	(0.003)		
Initial low-paid proportion x Domiciliary		0.010		0.011*		
		(0.006)		(0.007)		
Change in log average wage					0.009	-0.063
					(0.054)	(0.061)
Change in log average wage x Domiciliary						0.209*
						(0.127)
Observations	5,345	5,345	5,345	5,345	5,345	5,345
Controls	No	No	Yes	Yes	Yes	Yes
Mean of dep. var.:						
All firms	-0.003					
Care homes	-0.003					
Domiciliary care	-0.003					

Panel C – Agency contract

	(1)	(2)	(3)	(4)	(5)	(6)
Initial low-paid proportion	0.003	-0.000	0.002	0.001		
	(0.002)	(0.000)	(0.002)	(0.001)		
Initial low-paid proportion x Domiciliary		0.002		0.002		
		(0.007)		(0.007)		
Change in log average wage					0.040	0.022
					(0.042)	(0.026)
Change in log average wage x Domiciliary						0.033
						(0.128)
Observations	5,345	5,345	5,345	5,345	5,345	5,345
Controls	No	No	Yes	Yes	Yes	Yes
Mean of dep. var.:						
All firms	-0.002					
Care homes	-0.000					
Domiciliary care	-0.009					

Notes: The table reports the estimated reduced-form coefficient $\hat{\beta}_4$ from model (4) in columns (1)-(4), and the estimated IV coefficient $\hat{\beta}_1$ from model (1) in columns (5)-(6), using the change in the share of workers on a given contract as outcome variable. The sample is a balanced panel of adult social care providers active between March 2016 and March 2017. Robust standard errors are reported in parentheses. P-value: *** p<0.01, ** p<0.05, * p<0.1. Control variables are the initial proportion female, proportion with nursing qualification, proportion of care assistants, average age (all workers), occupancy rate and local authority district dummies. *Temporary contract*: the worker is employed for a limited duration, normally either on a fixed term contract or for a fixed task, or on a spell of casual or seasonal employment as a "temp". *Bank worker*: the worker is retained by the organisation as a whole, but deployed on a casual or short term basis. *Temporary agency work*: the worker is supplied by an outside employment agency/bureau; this category includes staff employed by NHS professionals, and workers supplied on contract e.g. by outside catering and cleaning companies.
Source: NMDS-SC.

Table A8 –Zero Hour Contracts Equation, all Low Pay Industries (LFS Sample)

	(1) Retail	(2) Retail	(3) Hospitality	(4) Hospitality	(5) Social Care	(6) Social Care	(7) Employment Agencies	(8) Employment Agencies
Post NLW	0.001	0.002	0.0118**	0.014**	0.011***	0.010***	0.013	0.013
	(0.002)	(0.002)	(0.006)	(0.006)	(0.003)	(0.003)	(0.013)	(0.013)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Observations	27,058	27,058	12,446	12,446	25,191	25,191	1,701	1,701
Pre-NLW mean of dep. var.	0.017	0.017	0.102	0.102	0.042	0.042	0.072	0.072

	(9) Cleaning & Maintenance	(10) Cleaning & Maintenance	(11) Leisure, Travel & Sport	(12) Leisure, Travel & Sport	(13) Food Processing	(14) Food Processing	(15) Wholesale of Food	(16) Wholesale of Food
Post NLW	0.013***	0.014***	0.024**	0.025**	0.011*	0.013**	0.003	0.004
	(0.004)	(0.004)	(0.011)	(0.010)	(0.006)	(0.006)	(0.005)	(0.005)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Observations	5,729	5,729	3,541	3,541	2,885	2,885	1,915	1,915
Pre-NLW mean of dep. var.	0.019	0.019	0.099	0.099	0.025	0.025	0.010	0.010

	(17) Child Care	(18) Child Care	(19) Agriculture	(20) Agriculture	(21) Security	(22) Security	(23) Textiles	(24) Textiles
Post NLW	0.006	0.006	0.001	0.001	-0.024	-0.019	0.018**	0.019**
	(0.006)	(0.006)	(0.003)	(0.004)	(0.019)	(0.019)	(0.008)	(0.008)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Observations	3,246	3,246	3,084	3,084	1,057	1,057	996	996
Pre-NLW mean of dep. var.	0.031	0.031	0.010	0.010	0.115	0.115	0.009	0.009

	(25) Hairdressing	(26) Hairdressing	(27) Pooled	(28) Pooled
Post NLW	0.010*	0.010**	0.008***	0.010***
	(0.005)	(0.005)	(0.001)	(0.001)
Controls	No	Yes	No	Yes
Observations	2,513	2,513	91,362	91,362
Pre-NLW mean of dep. var.	0.013	0.013	0.041	0.041

Notes: The table reports the estimated coefficient $\hat{\beta}_5$ from the estimating equation (5) using different Low Paying Industry samples, as defined in LPC (2017). The samples contain 4 pre-NLW quarters (2014-2015 quarter 2 and quarter 4) and 3 post-NLW quarters (2016 quarter 2 and quarter 4, and 2017 quarter 2). Controls include age, education, gender, a dummy for white ethnicity, a dummy for British nationality, a dummy for working in the public sector and twelve regional dummies
Source: LFS.

Appendix B

LSE-CEP Survey of Self-employment and Alternative Work Arrangements

R1
What is the highest degree or level of school you have completed?
- ❍ No qualifications
- ❍ Some GCSE/O levels.
- ❍ 5 or more GCSE/O levels
- ❍ Trade/technical/vocational training
- ❍ A levels
- ❍ Bachelor's degree
- ❍ Master's degree
- ❍ Doctorate degree

R2
Are you?
- ❍ Male
- ❍ Female

R3
What is your age? [ALLOW INTEGER NUMBERS BETWEEN 15 and 99]
____

R4
Which region do you usually live in?
- ❍ North East
- ❍ North West
- ❍ Yorkshire and Humberside
- ❍ East Midlands
- ❍ West Midlands
- ❍ Eastern England
- ❍ London
- ❍ South East
- ❍ South West
- ❍ Wales
- ❍ Scotland
- ❍ Northern Ireland

S1. On your main job last week, were you employed by government, by a private company, a nonprofit organization, or were you self-employed or working in the family business? Or were you not working at all last week?

- ❍ Employed by government → GO TO S2
- ❍ Employed by private for-profit company → GO TO S2
- ❍ Employed by nonprofit organization including tax exempt and charitable organizations → GO TO S2
- ❍ Self-employed, with or without employees → GO TO S3
- ❍ Working in the family business → GO TO S3
- ❍ Only work last week was filling out surveys → SCREENS OUT
- ❍ Did not have a job last week → SCREENS OUT

S2. Many people work in self-employment, on either a part-time or full-time basis, doing things such as working on construction jobs, selling goods or services in their businesses, or working through a digital platform or intermediary, such as Uber, Upwork, Deliveroo or Avon. **Last week**, were you working or self-employed as an independent contractor, an independent consultant, or freelance worker? That is, someone who obtains customers on their own to provide a product or service.

- ❍ Yes
- ❍ No

S3. Last week, were you on a zero hours contract? Zero hours contracts are also known as casual contracts or 'on call' work. Under such contracts, people agree to be available for work as and when required, but have no guaranteed hours or times of work.

- ❍ Yes → GO TO QUESTION Q1
- ❍ No → GO TO QUESTION D1

Q1 In your employment as a zero hours contract or on-call worker last week, did you have more than one employer or contract? Please consider only jobs on zero hours contracts or on-call jobs when answering this question.

- ❍ Yes
- ❍ No

Q2 <u>Last week</u>, did you do any paid work as self-employed or on employment contracts other than zero hours contracts or on-call jobs?

- ❍ Yes
- ❍ No

Q3 In your zero hours contract or on-call job, how many <u>hours</u> did you work <u>last week</u>? Please, consider only hours you are paid for.
Please enter: _____ hours last week

Q4 In your zero hours contract or on-call job, how many hours <u>on average</u> in a week? Please, consider only hours you are paid for.
Please enter: _____ hours on average in a week

Q5 On how many (different) days per week do you usually work?
Please enter: _____ days per week

Q6 How much did you earn per hour in your zero hours contract or on-call job last week? Please, consider only hours you are paid for.
Please enter earnings: £_____ per hour

Q7 Did you do any hours of unpaid work in your zero hours contract or on-call job last week? E.g. travel time from one customer to another.

- ❍ Yes
- ❍ No

IF Q7 = YES
Q7a How many hours of unpaid work did you do in your zero hours contract or on-call job last week?
Please enter: _____ hours of unpaid work last week

Q8 Would you have preferred to work more or fewer hours last week in your zero hours contract or on-call job at that wage rate? Or were you satisfied with the number of hours you worked?

- ❍ More hours last week
- ❍ Fewer hours last week
- ❍ Satisfied with number of hours

IF Q8 = More hours last week
Q8a Why were you NOT able to work more last week?

- ❍ I am not qualified for the available work
- ❍ There isn't enough available work
- ❍ I have domestic commitments that prevent me from working more
- ❍ I am ill or disabled
- ❍ Other

IF Q8 = Fewer hours last week
Q8b Why would you want to work fewer hours?

- ❍ I am a student
- ❍ I am ill or disabled and do not feel I can take on more hours
- ❍ I have domestic commitments that prevent me from working more
- ❍ I want to spend more time on leisure or other unpaid activities
- ❍ I want to do other types of work
- ❍ Other

Q9 Would you have preferred to work a pattern of more regular hours last week on your zero hours contract or on-call job at that wage rate? Or were you satisfied with the pattern of hours you worked?

- ❍ More regular hours last week
- ❍ Less regular hours last week
- ❍ Satisfied with pattern of hours

Q10 How satisfied are you with working on a zero hours contract or on-call job?

- ❍ Very satisfied
- ❍ Satisfied
- ❍ Neither satisfied not dissatisfied
- ❍ Dissatisfied
- ❍ Very dissatisfied

Q11 Which of the following are reasons why you work on a zero hours contract or on-call job? Tick all that apply

- ❍ Could not find employment in a job with a guaranteed number of hours
- ❍ Pay is better than other available jobs
- ❍ To complement pay from other jobs
- ❍ To earn money while going to school
- ❍ Gives me flexibility to perform other activities
- ❍ Other

Q11a Which is the most important reason why you work on a zero hours contract or on-call job?

- ❍ Could not find employment in a job with a guaranteed number of hours
- ❍ Pay is better than other available jobs
- ❍ To complement pay from other jobs
- ❍ To earn money while going to school
- ❍ Gives me flexibility to perform other activities
- ❍ Other

IF Q11a = Could not find employment in a job with a guaranteed number of hours
Q11b Please indicate which of the following reasons contributed to you not finding employment in a job with a guaranteed number of hours:

- ❍ Lack of jobs near where I live
- ❍ I faced discrimination
- ❍ I am overqualified for the available jobs
- ❍ I am underqualified for the available jobs
- ❍ Other

Q12 For how long have you been working on a zero hours contract or on-call job?

- ❍ Less than one month
- ❍ 1 – 6 months
- ❍ 7 – 12 months
- ❍ 1 – 2 years
- ❍ 3 – 4 years
- ❍ 5 years or more

Q13 How much longer do you expect to remain in your zero hours contract or on-call job?

- ❍ Less than one month
- ❍ 1 – 6 months
- ❍ 7 – 12 months
- ❍ One year or more

Q14 Have you received any work-related training in the last year?

- ❍ Yes SKIP TO Q14a
- ❍ No SKIP TO Q14c

Q14a What type of training? (Mark all that apply)
[LIST IN RANDOM ORDER, BUT OTHER IS LAST]

- ☐ Technical or technology training
- ☐ Quality training
- ☐ Skills training
- ☐ Continuing education
- ☐ Professional training and legal training
- ☐ Managerial training
- ☐ Safety training
- ☐ Other (please specify: _____

Q14b Who paid for the cost of the training?

- ❍ Me or a family member
- ❍ A contractor or customer
- ❍ My employer
- ❍ Someone else
- ❍ No one, it was free

Q14c What type of training would you find most useful to improve your job prospects? (Mark all that apply)
[LIST IN RANDOM ORDER, BUT OTHER IS LAST]

- ☐ Technical or technology training
- ☐ Quality training
- ☐ Skills training
- ☐ Continuing education
- ☐ Professional training and legal training
- ☐ Managerial training
- ☐ Safety training
- ☐ Other (please specify: _____

Q15 In your job on a zero hours contract or on-call job, what kind of work do you do, that is, what is your occupation? (For example: plumber, typist, farmer)
Please enter your occupation: _____

Q15a What are your usual activities or duties at this job? (For example: typing, keeping account books, filing, selling cars, operating printing press, laying brick)
Please enter your usual activities or duties: _____

Q15b What kind of business or industry are you in at this job?

- ❍ (A) Agriculture, Forestry and Fishing
- ❍ (B) Mining and Quarrying
- ❍ (C) Manufacturing
- ❍ (D) Electricity, Gas, Steam and Air Conditioning Supply
- ❍ (E) Water Supply, Sewerage, Waste Management and Remediation Activities
- ❍ (F) Construction
- ❍ (G) Wholesale and Retail Trade, Repair of Motor Vehicles and Motorcycles
- ❍ (H) Transportation and Storage
- ❍ (I) Accommodation and Food Service Activities
- ❍ (J) Information and Communication
- ❍ (K) Financial and Insurance Activities
- ❍ (L) Real Estate Activities
- ❍ (M) Professional, Scientific and Technical Activities
- ❍ (N) Administrative and Support Service Activities
- ❍ (O) Public Administration and Defence, Compulsory Social Security
- ❍ (P) Education
- ❍ (Q) Human Health and Social Work Activities
- ❍ (R) Arts, Entertainment and Recreation
- ❍ (S) Other Service Activities
- ❍ (T) Activities of Households as Employers of Domestic Personnel, Undifferentiated Goods and Services Producing Activities of Households for Own Use
- ❍ (U) Activities of Extraterritorial Organisations and Bodies
- ❍ Other (please specify _____)

Q15c In your zero hours contract or on-call job, what is the main company you work for?
Please specify name: _____

D1 Which country were you born in?
Please specify: _____

D2 What is your nationality?
Please specify: _____

D3 Which category or categories below best describe your ethnic group? (Mark all that apply)

- ☐ White
- ☐ Mixed / Multiple ethnic group
- ☐ Asian / Asian British
- ☐ Black / African / Caribbean / Black British
- ☐ Chinese
- ☐ Arab
- ☐ Other (please specify: _____)

D4 How many years of working experience have you got?

- ❍ Less than one year
- ❍ 1 – 3 years
- ❍ 3 – 5 years
- ❍ 5 years or more

D5 Are you now married, widowed, divorced, separated or never married?

- ❍ Married
- ❍ Widowed
- ❍ Divorced
- ❍ Separated
- ❍ Never Married
- ❍ Other (please specify: _____)

D6 How many children do you have?

- ❍ 0
- ❍ 1
- ❍ 2
- ❍ 3 or more

D7 Which category represents your total individual income (before taxes) during the past 12 months? This should include money from all jobs, net income from a business or farm, and any rent, pensions, dividends, interest, social security payments or other money income you received.

- ❍ Less than £5,000
- ❍ £5,000 to 9,999
- ❍ £10,000 to 19,999
- ❍ £20,000 to 39,999
- ❍ £40,000 to 69,999
- ❍ £70,000 or more

D8 Which category represents total income (before taxes) of your household during the past 12 months? This should include money from all jobs, net income from a business or farm, and any rent, pensions, dividends, interest, social security payments or other money income that all members of your household received, including you.

- ❍ Less than £5,000
- ❍ £5,000 to 9,999
- ❍ £10,000 to 19,999
- ❍ £20,000 to 39,999
- ❍ £40,000 to 69,999
- ❍ £70,000 or more

D9 Do you use services such as Uber, TaskRabbit, Airbnb or Deliveroo?

- ❍ Yes
- ❍ No

D10 Could you tell us how interesting or uninteresting you found the questions in this survey?

- ❍ Very interesting
- ❍ Interesting
- ❍ Neither interesting nor uninteresting
- ❍ Uninteresting
- ❍ Very uninteresting