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The impact of flexible work on SME Performance: An analysis of flexible working arrangements, innovation and productivity in Scotland

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The Impact of Flexible Work on SME Performance: An Analysis of Flexible Work Arrangements, Innovation and Productivity in Scotland

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EXECUTIVE SUMMARY

One out of three jobs currently advertised in Scotland offers flexible working (Timewise, 2023) and recent legislation — the Employment Relations (Flexible Working) Act 2023, effective from April 6, 2024 — grants employees the right to request flexible working from day one in a new job. This new legislation highlights the increasing demand for flexible work arrangements (FWAs), addresses the recruitment difficulties due to an increased level of economic inactivity post-pandemic, offers the possibility of a better work-life balance to workers while adapting to their needs, and potentially improves productivity and innovation as several studies have found around the world. However, the factors behind FWAs adoption and its impact on business performance for small and medium enterprises (SMEs) in the UK remain underexplored. Drawing on data from Scottish SMEs in the Longitudinal Small Business Survey (LSBS) between 2015 and 2022, this report provides a comprehensive evidence-based analysis of the determinants of FWAs adoption and its relationship with SME productivity and innovation. We do this by investigating both any FWAs as an aggregate and disaggregating FWAs into eight distinct types (flexitime, annualised hours contract, term-time working, job sharing, nine-day fortnight, four-a-half-day week, zero hours contracts and on-call working) in addition to a nineth type comprising any other flexible working hours arrangement. In modelling productivity and innovation, we control also for a set of other business characteristics like sector, age, location in rural areas, female ownership, exporting status, plans for the future and major obstacles to business success allowing a rich analysis of Scottish SMEs behaviour.

It is found that, overall, three out of four Scottish SMEs with employees offer some form of flexible working arrangements. The type of contract more likely to be adopted is flexitime, or flexible working hours, offered on average in the period 2015-22 by more than two out of three FWAs firms, and just over half of all Scottish SMEs with employees.

Other key findings reveal that innovation plays a crucial role in the adoption of FWAs among Scottish SMEs. Firms characterised by innovative practices are more likely to adopt flexible arrangements, such as flexitime and alternative work schedules. Additionally, the adoption patterns of FWAs vary across sectors. The primary and the construction sectors are less likely to offer any type of FWAs, while ITCs and the professional and scientific sector are more likely to offer flexitime, the hospitality and the healthcare and social sectors are more likely to offer zero-hours contracts, in the education sector term-time work is more prevalent and in the administrative and support services sector there is a higher chance of finding on-call working arrangements. Some

of these sectoral differences in the adoption of FWAs are related to the different prevalence of females working in them, as female-dominated roles are more prone to be offered flexible work contracts (Timewise, 2023). Location seems to matter for on-call working which is more likely to be offered by SMEs in rural areas. Also, business size matters for the adoption of FWAs. Medium-sized firms exhibit a stronger preference for FWAs. This indicates that policy initiatives should particularly target smaller firms to maximise the benefits associated with flexible work. We also shed some light on the differences in adopting two types of contracts used by businesses to manage their variability of demand for labour: on-call working and zero-hours contracts.

Considering SME productivity, the results indicate that the overall adoption of FWAs does not have a statistically significant impact on labour productivity, except for the nine-day fortnight working, which is positively associated with improved productivity and statistically significant, but it is also the least used flexible work contract among those adopted by SMEs.

Regarding innovation, we consider both actual innovation in the previous three years and the intention to innovate in the following three years. Our analysis shows that SMEs offering flexible working arrangements, particularly flexitime, are more likely to report innovation. This supports the argument that flexibility fosters a creative environment, enhancing product and process development as found in the literature. The results also indicate that different types of FWAs contribute to the intention to innovate, particularly flexitime and term-time working contracts. These findings highlight how flexible work models can be a win-win arrangement for workers and the firm, stimulating innovation plans and activities that help the firm compete and stay in the business.

Finally, we provide some policy implications of these novel findings in the UK context and suggest future research directions.

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1. INTRODUCTION

Scotland's labour productivity has increased between 2008 and 2022 with an average annual growth rate of real output per hour at 1.0% (Scottish Government, 2023). However, despite this growth, productivity in Scotland, measured by output per hour worked (measured in current prices), remains below the UK average (ONS, 2023) and falls below the median OECD level (Tsoukalas, 2021). Furthermore, there has been a slowdown in Scotland's productivity growth in recent years due to the impact of Brexit and Covid-19 crisis (Tsoukalas, 2021). To address the low level of productivity, the Scottish Government has introduced several strategies and action plans to close the productivity gap with the rest of the UK in recent years. One of these action plans is "Fair Work Nation," which aims to promote fair and inclusive workplaces across Scotland by 2025 (Scottish Government, 2022). Fair work can be a significant driver of productivity (Rogers and Richmond, 2016) and fosters positive behaviours among employees that enhance innovation and business performance in Scotland (Scottish Government, 2022). However, evidence on these links remains scant and early evidence suggested that Scotland's performance in fair work, as measured across its different elements, was generally mixed to poor (Rogers and Richmond, 2016, Tsoukalas, 2021).

Fair work entails providing secure employment with equitable pay and conditions, where workers are respected, have opportunities for advancement, and their voices are heard and represented (Scottish Government, 2022). It seeks to strike a balance between the rights of employers and workers, benefiting both society and the economy. In practice, fair work encompasses various aspects such as pay, working hours, holiday entitlements, training opportunities, health and safety standards, and flexible working arrangements, all of which yield positive outcomes for both workers and employers (Scottish Government, 2023). In particular, in today's dynamic work environment, flexible working arrangements have garnered considerable attention, affording employees the autonomy to adjust when and where they fulfil their responsibilities (Maxwell et al., 2007). These arrangements encompass a broad spectrum of practices, including part-time work, flexitime, teleworking, and job sharing, among others. They not only accommodate diverse lifestyle needs but also contribute to achieving a better work-life balance for employees (Frame and Hartog, 2003; Halpern, 2005), which can enhance work performance, new idea generation, and overall firm productivity (Rogers and Richmond, 2016; Forbes et al., 2020). Flexible hiring – advertising job vacancies as flexible from day one – is a key building block for fair access to work, hence benefiting workers, but also allowing employers to attract more talent; and helping to tackle inequality at a

societal level. For this reason, the social enterprise Timewise started to produce the UK's Flexible Jobs Index annual report now in its nineth edition (Timewise, 2023), in addition to a Scottish Flexible Jobs Index report for the Scottish government, now in its fourth edition (Timewise, 2022). According to Timewise (2023), 33% of vacancies posted between 1st January and the 30th June 2023 in Scotland offered flexible working.[1] This is a considerable jump compared to the 28% figure found in Scotland for 2022 (Timewise, 2022) placing now Scotland's flexible work availability for new jobs higher than the UK-wide average of 31%. It also represents a significant growth over time since the Scottish Flexible Jobs Index was published for the first time in 2017, when the proportion of Scottish jobs advertised with flexible working arrangements was only 16% out of the total vacancies, COVID-19 was the game changer pushing the index from 18% in 2019 to 27% in 2021 (Timewise, 2022).

The labour market conditions in Scotland have also changed since COVID-19. The fallback from the pandemic resulted in a reduction in the employment rate for 16 to 64 year olds, which was 73.7% based on seasonally-adjusted estimates for June to August 2024[2] (Scottish Government, 2024a), that is 1.2% lower than what was recorded for December 2019 to January 2020 (74.9%), the last data point before the COVID-19 pandemic (Scottish Government, 2020). Symmetrically, estimates for the economic inactivity rate (the proportion of people aged 16 to 64 years who are not working and not seeking or available to work) in Scotland was 23.2% (Scottish Government 2024a), and, although on a positive trend in recent months, this rate is still higher compared to the pre-pandemic level of 22.3% recorded in the November 2019-January 2020 estimates (Scottish Government, 2020). The higher inactivity rate is driven by long-term ill health since the pandemic, as being long-term sick or disabled was reported as the main reason for being economically inactive in Scotland[3]. At the same time the ONS' Business Insights and Conditions Survey (BICS) data for May 2024 show that an estimated 26.8% of businesses reported experiencing difficulties in recruiting employees (Scottish Government, 2024b).

[1] The data used by Timewise is sourced from Lightcast.
[2] These estimated were released in October 2024 and based on the Labour Force Survey.
[3] In the period April 2023 to March 2024 an estimated 32.7% of those people aged 16 to 64 who were inactive gave their reason for being inactive as "long-term sick or disabled", the highest percentage in the series. This is higher than the UK proportion of 27.6% (Scottish Government, 2024b).

With the introduction of the Employment Relations (Flexible Working) Act 2023 (legislation.gov.uk, 2023), which from 6th April 2024 granted employees the right to request flexible working from day one in a new job, firms are increasingly expected to offer flexible working hour arrangements.[4] The extent to which firms need to reorganise internally to accommodate this flexibility could have significant implications for their productivity. On one hand, the flexibility in working arrangements might encourage workers to remain in employment when their life needs prevent them from doing so under more inflexible working arrangements (for example of people with caring responsibilities or long-term ill health) reducing turnover and retaining valuable experience and knowledge. On the other hand, some firms might find it more onerous to manage more staff on a reduced-hours schedule or job sharing, for example they might bear higher management and administrative costs with more staff and more training costs to equip a higher number of employees to cover roles previously handled by fewer staff members, while at the same time firms may also face the cost of managing larger flows of information due to more work handover.

Beyond productivity, Scotland also aims to be one of the most innovative nations in the world. According to the OECD (2023), Scotland is ranked among the top 20% of European regions, particularly for its strong university-firm collaborations and innovation skills. Flexible working arrangements can contribute to the Scottish innovation ecosystem as they are often recognised as key drivers of innovation within firms (Storey et al., 2002; Azeem and Kotey, 2023; Tiwasing et al., 2023). These efforts align with Scotland's National Innovation Strategy 2023-2033, which highlights innovation as a tool for creating a fairer, more equal, wealthier, and greener country (Scottish Government, 2023). Innovation is essential for the long-term competitiveness and growth of firms, particularly in industries reliant on technology, creativity, and knowledge-sharing (Henley and Song, 2020; Gkypali et al., 2021). Adopting flexible working arrangements may ease a firm's difficulty to attract and retain talent, reducing its costs for recruiting and training new staff, besides retaining valuable experience and knowledge that leaves the firm

[4] From 6 April 2024, the right to request flexible working has become a 'day-one' right, meaning employees no longer have to wait until they have six months' service with an employer before being eligible to make a request. Employers can refuse the request based on a statutory business reason, which means on the basis of specific grounds. These include grounds relating to costs, customer demand and impact on performance. Hence employers do need to follow the statutory process, or they are likely to risk discrimination claims and damage to recruitment and retention. This points to the potential costs and, ultimately, adverse impact on staffing levels and productivity for employers who refuse such requests.

when staff leave. Having easier access to and retaining talent could also lead to more knowledge creation and innovation, since more human capital may accumulate when more people with flexible working contracts work on the same problem or project (two brains solving the same problem are better than one) or when motivation and staff morale (due to a better work-life balance) are higher. Recent studies suggest that flexible working arrangements can foster a more innovative environment by enhancing employee satisfaction, reducing burnout, and accommodating diverse working styles, which can lead to creative problem-solving and new idea generation (Coenen and Kok, 2014; Azeem and Kotey, 2023). Additionally, flexible work can help firms attract and retain a more diverse workforce, which is known to enhance innovation by introducing a variety of perspectives and approaches to challenges (Storey et al., 2002). However, the potential impacts of these arrangements on innovation have been empirically underexplored. Also, not all flexible working contracts are the same, employers offering zero-hours contracts might be less concerned about increasing human capital and more about reducing labour costs in low-skilled jobs, while flexitime contracts might be designed to attract and retain high-skilled workers (Golden, 2012). Distinguishing among the typologies of flexible working contracts therefore seems also important to understand their impact on productivity and firm's performance, but again evidence on this is scant.

It is still too early to determine how SMEs in Scotland will respond to the UK's new flexible working legislation and Scotland's Fair Work Nation plan. However, we can use historical lenses to investigate whether there is any association between flexible working hours and labour productivity and innovation performance using data from the Longitudinal Small Business Survey (LSBS) from 2015 to 2022. This allows us to start filling the evidence gap on the effects of flexible working arrangements on SME productivity and innovation in Scotland. Given the lack of systematic *firm-level* data on the flexibility of working arrangements by typology of employment contracts held by UK employees, and the absence of recent linked employer-employee datasets for the UK,[5] the LSBS offers unique information as it has included one question since 2015, only asked in Scotland, on the firm's adoption of nine different types of working hours arrangements for

[5] The 2011 Workplace Employment Relations Study (also known as WERS6) was the sixth, and last, in a series of national surveys of employment relations at the workplace level carried out by the former UK Department for Business, Innovation and Skills and co-funded by the ESRC. Earlier surveys were conducted in 1980, 1984, 1990, 1998 and 2004. Forth and Bryson (2022), in a report to the ESRC, provided the case for a new linked employer-employee survey which could make a significant contribution to debates in the areas of productivity, job quality, corporate governance, inequality and the future of the employment relationship. However, it is not yet known when and if such survey will be launched.

employees: flexitime (or flexible working hours), an annualised hours contract, term-time working, job sharing, a nine-day fortnight, a four and a half day week, zero-hour contract, on-call working, and any other type not listed above.[6] This study will unpack the impacts of these different types of flexible working arrangements on productivity and innovation, offering valuable insights for policymakers and business leaders. The findings will help identify effective strategies to boost productivity and foster innovation, contributing to Scotland's economic growth and aligning with initiatives like the Scottish Government's 'Fair Work Nation' plan and 'National Innovation Strategy 2023-2033'. By addressing the interplay between flexible work and firm performance, this research starts filling a gap of evidence needed for enhancing workplace practices and fairness, improving employee recruitment and retention, and ensuring long-term business success. In addition, we will make recommendations on current data gaps to the Office for National Statistics and suggest future directions for research.

The report is structured as follows: Section 2 discusses underpinning theories, Section 3 reviews relevant literature and develops hypotheses, Section 4 discusses the methodology adopted in the empirical analysis, while Section 5 describes the secondary data we use to fit our empirical models and present their descriptive statistics. Results from our estimations are discussed in Section 6, followed by Section 7 concluding with policy recommendations.

2. CONCEPTUAL FRAMEWORK AND RELEVANT LITERATURE

When discussing flexible working time arrangements, the literature has pointed out that such arrangements are typically initiated by employers and should allow workers at least some discretion in adjusting the length and/or scheduling of their working time to meet their preferences. Instead, when working time is adjusted exclusively to meet business needs for flexibility, this in the literature is referred to as "variability", and the number of hours worked or schedules may not meet the worker's preferences (see Golden, 1998; Costa et al., 2006; Lambert and Henly, 2012; McNamara et al., 2013, Golden, 2012). Previous studies generally support the benefits of flexible work arrangements and have

[6] This was question K24 in the LSBS between 2015 and 2021, except in 2017 when it was question I14. The question, which hasn't changed since 2015, unfortunately does not include working entirely remotely or hybrid work, which have increased over time especially since the pandemic. This paper therefore focuses only on time flexibility and not location flexibility. Also, although the LSBS asks about part-time work, the number of part-time employees is lumped together with full-time ones, not allowing to gauge the prevalence at firm level of the most recurring type of flexible work.

shown positive outcomes at individual and enterprise levels (Marks et al., 1998; Baldry et al., 2007). In particular, flexible provisions can increase firm productivity and innovativeness (Golden, 2012; Wahab and Tatoglu, 2020; Boltz et al., 2023). However, there is sporadic evidence of a direct link between different types of working hour arrangements and business performance, particularly firm productivity and innovation.

To help understand the relationship between flexible working conditions and business performance we draw on the Job Demand-Resource (JD-R) framework and the Resource-Based View (RBV) theory to underpin this study. The JD-R framework, developed by Demerouti et al. (2001), explains how organisational context interacts with job design. It classifies occupational factors into two groups: 1) job demands, which are elements that require physical or psychological effort, and 2) job resources, which are characteristics that help employees manage those demands (Oldham and Fried, 2016). This framework suggests that, when job resources are high, employees can better cope with demanding environments, leading to more positive outcomes. Therefore, according to this framework, flexible working conditions can be seen as tools that allow employees to choose their working hours, location, and how they complete tasks. Such arrangements are effective in boosting productivity, creativity, and innovation among employees (Appiah-Mfodwa et al., 2000; Boltz et al., 2023; Qi et al., 2023). In the context of SMEs, flexible working conditions can foster innovation by retaining and attracting valuable human capital, increasing motivation and stimulating their working enthusiasm (Azeem and Kotey, 2023). They can motivate employees to work more efficiently and creatively, reducing turnover rates, absenteeism, and boosting overall firm productivity (Maxwell et al., 2007; Whyman and Petrescu, 2015).

At the firm level, we follow the notion of the Resource-Based View (RBV) theory to focus on the internal resources and capabilities of firms as determinants of competitive advantage and performance (Barney et al., 2011). In this context, flexible working arrangements can be considered as a valuable internal resource that gives an edge to the firm in attracting and retaining talent (Working Families, 2008; CIPD, 2018), especially if firms in a similar industrial sector and/or location are less keen to do so. Therefore, firms that effectively manage and utilise their resources, including working hour arrangements promoting employee well-being, are more likely to achieve superior performance outcomes (Whyman and Petrescu, 2015). This theory suggests that SMEs with flexible and fair working arrangements may be better positioned to enhance productivity, innovativeness and competitiveness compared to those with less effective resource management practices (Maxwell et al., 2007; Azeem and Kotey, 2023).

Previous research has shown the benefits of flexible working agreements on firm productivity. For example, using firm-level panel data from the pharmaceutical industry in the US, Shepard III et al. (1996) reveal that flexible working hours improve firm productivity through effects on absenteeism and turnover, organizational attachment, and job attitudes, among others. Similarly, using data for 195 public, for-profit firms, Konrad and Mangel (2000) demonstrate that flexible-life programmes are significantly associated with firm productivity improvements. Viete and Erdsiek (2015) further support that workplace flexibility and trust-based working time are positively associated with productivity using data for 1132 German ICT service firms. In the UK, Park et al. (2016) found that flexible labour management strategies, including numerical (variable amount of labour) and functional (redistribution between tasks and departments) flexibility and zero-hour contracts, contribute to improved firm productivity in the tourism industry. However, using Japanese firm panel data for 1998, 2004, 2007, and 2008, Yamamoto and Matsuura (2014) indicate that there is no significant relationship between work-life balance practices and total factor productivity (TFP) in the medium or long term when controlling for firm-specific factors.

Focusing on the association between flexible working arrangements and innovation, several studies suggest that flexible work can promote innovative behaviour and enhance innovation within organisations (Coenen and Kok, 2014; Qi et al., 2021; Azeem and Kotey, 2023). For instance, using a survey data of 2,700 UK companies, Storey et al. (2002) indicated that a higher proportion of flexible working can positively impact product and process innovation. They suggest that flexible arrangements can help core employees dedicate time and resources to innovative projects, allowing firms to explore uncertain new business areas without the obligations of hiring full-time employees. Coenen and Kok (2014) also found that flexible work schedules significantly improve the performance of teams in new product development, based on case studies from Dutch telecommunications firms. Using longitudinal data for 1,513 SMEs in Australia, Azeem and Kotey (2023) indicate that offering flexitime and flexi-leave significantly enhances firm innovation. These flexible working arrangements provide employees with the mental space and diversity needed to foster knowledge creation, sharing, and exploitation, ultimately encouraging innovation. Godart et al. (2017) also showed that flexible working agreements, particularly trust-based work contracts, are positively associated with product and process innovation in German firms. However, they suggest that this positive relationship is attributed to the level of employee control and self-management over working hours, rather than just the flexibility of working-time arrangements, i.e. in

terms of what we previously referred to as flexibility vs. variability it is the flexibility that drives Godart et al.'s (2017) findings.

To sum up, this study builds on existing literature demonstrating that flexible working arrangements can significantly enhance firm productivity and innovation. Both the JD-R framework and the Resource-Based View (RBV) theory provide valuable theoretical foundations for understanding this relationship. The JD-R framework highlights how flexible work serves as a critical job resource, improving employee well-being and performance by helping them manage job demands, leading to higher engagement and creativity (Qi et al., 2021). Instead, the RBV theory views flexible work arrangements as a strategic resource that contributes to a firm's competitive advantage by attracting and retaining talent, fostering innovation, and enhancing overall business productivity (Barney et al., 2011; Qi et al., 2021). Despite these insights, there still lacks comprehensive empirical evidence of a direct link between various flexible working arrangements and business performance, particularly in the UK. This study would be of interest in particular to Scotland given the geographical remoteness of some of its firm locations, which increases the challenges and opportunities of staff recruitment and retention (Miller et al., 2020), possibly exacerbating the impact on firms of this new legislation. Therefore, our study provides new evidence-based analysis to inform policymakers, senior managers/business owners, and academics about the potential implications of different types of working hour arrangements on firm's productivity and innovativeness, particularly in Scotland. This study not only contributes to the existing literature, but also offers insights for decision-makers tasked with addressing the complexities of staff recruitment, retention, and productivity and innovation enhancement.

3. DATA AND DESCRIPTIVE STATISTICS

We use the Longitudinal Small Business Survey (LSBS) data between 2015 and 2022 commissioned by the UK's Department for Business and Trade (previously named Department for Business, Energy and Industrial Strategy, BEIS) to explore the impact of flexible working agreements on firm's productivity and innovation performance. This analysis focuses solely on Scottish SMEs since the information on flexible contracts is available only for Scotland. Our study aims to address two primary research questions:

1) What are the determinants of the flexible working arrangements adoption among SMEs in Scotland?

2) Do Scottish SMEs that adopt flexible working arrangements report higher productivity and innovation?

To answer these questions, following Henley et al. (2020), Gkypali et al. (2021), and Johnston and Prokop (2024), SME productivity is measured in terms of turnover divided by the number of employees due to the data availability. In LSBS, SMEs were asked about the approximate figure of their turnover in the past 12 months and the total number of employees including working owners, partners, contractors and self-employed staff. We acknowledge the limitations of using LSBS data to measure productivity. Specifically, the survey lacks data on capital and intermediate inputs, making it impossible to estimate total factor productivity or value added per employee. The absence of data on hours worked limits us to measuring productivity as turnover per employee, rather than productivity per hour worked. Additionally, when employees do not work full time and turnover is simply divided by the number of employees without a correction for those who work part-time, this would underestimate the true labour productivity. However, since not all flexible work arrangements involve reduced hours (e.g., flexitime), this measure still has value. Moreover, it is important to note that using the approximate figure of turnover for measuring productivity significantly reduces the number of observations in the analysis. For instance, there were 1,095 Scottish SMEs in 2015, but only 781 provided a response to this question. Similarly, in 2016, the total number of Scottish SMEs was 1,050, with only 796 responding to the turnover question. However, this is the best variable available for measuring productivity in the LSBS, given the limitations of data and the constraints of panel analysis.[7]

To mitigate these limitations, we also use innovation as an alternative measure of firm's performance to productivity, since flexible working conditions can also impact innovation as discussed in the previous section. For innovation performance, firms were asked whether in the previous three years they have introduced new or significantly improved goods or services, and, in a separate question, they were asked if they introduced new processes in the previous three years. As the sample size becomes quite small when we use innovation measured in this way as the outcome variable (due to the need to lag

[7] In future research we will link the LSBS with the Business Structural Database in the Secure Research Service lab, where precise turnover information is available for each firm.

all explanatory variables by two years), we combine the two innovation indicators into a unique variable capturing products, services and processes innovation in the previous three years to maximise the sample size. Thus our analysis, different from Tiwasing et al. (2023) and Johnston and Prokop (2024), does not distinguish between product and process innovation. In addition, since this measure of innovation limits substantially the sample size, we measure innovation with the intention to innovate indicator, which captures whether the business has any plan to develop and launch new products or services in the following three years and allows us to use a much bigger sample for the analysis.

The main data of interest for the analysis are the binary variables related to flexible working hours as SMEs were asked whether they offered their employees any of the eight types of working hours arrangements listed in Table 1, in addition to the nineth option “none of these” indicating alternative flexible work arrangements (FWAs) not listed. Firms can adopt more than one type of contract. Table 1 shows the number of Scottish SMEs adopting such arrangements, with a breakdown by type of contract and year. We also calculate the percentage of each type of FWAs with respect to the total number of firms offering any type of FWAs in each year, and on average over the period 2015-22, and the percentage of FWA firms out of the total SMEs in Scotland on average over the period.

Table 1 - The number and proportion of SMEs with different types of working hours arrangements in Scotland, by year and on average

Type of contracts	Number of Scottish SMEs that respond to the flexible work questions for each year								Average SMEs for 2015-22
	2015	2016	2017	2018	2019	2020	2021	2022	
A) Flexitime (flexible working hours)	428 (68%)	373 (70%)	384 (71%)	416 (71%)	435 (72%)	266 (53%)	369 (73%)	398 (70%)	384 (69%) [51%]
B) An annualised hours contract	183 (29%)	154 (29%)	148 (28%)	176 (30%)	201 (33%)	90 (18%)	155 (31%)	186 (33%)	162 (29%) [22%]
C) Term-time working	144 (23%)	119 (22%)	120 (22%)	152 (26%)	131 (22%)	71 (14%)	120 (24%)	126 (22%)	123 (22%) [16%]
D) Job sharing	158 (25%)	114 (21%)	105 (20%)	143 (24%)	131 (22%)	71 (14%)	87 (17%)	99 (17%)	114 (20%) [15%]
E) A nine-day fortnight	42 (7%)	33 (6%)	40 (7%)	50 (9%)	44 (7%)	29 (6%)	38 (7%)	32 (6%)	38 (7%) [5%]
F) A four and a half day week	151 (24%)	125 (23%)	119 (22%)	149 (26%)	122 (20%)	69 (14%)	100 (20%)	104 (18%)	117 (21%) [16%]
G) Zero-hour contracts	114 (18%)	93 (17%)	91 (17%)	122 (21%)	127 (21%)	91 (18%)	124 (24%)	127 (22%)	111 (20%) [15%]
H) On-call working	141 (23%)	117 (22%)	89 (17%)	121 (21%)	98 (16%)	57 (11%)	95 (19%)	125 (22%)	105 (19%) [14%]
I) None of these	190 (30%)	243 (45%)	201 (37%)	242 (41%)	244 (40%)	142 (28%)	168 (33%)	178 (31%)	201 (36%) [26%]
J) Any type of flexible working agreements	625 (76%)	536 (68%)	538 (73%)	584 (70%)	606 (71%)	505 (99%)	507 (75%)	571 (76%)	559 (75%) [75%]
K) Total SMEs with employees	820	781	740	838	854	509	677	751	746
Total Scottish SMEs in LSBS	1,095	1,050	1,042	1,090	1,100	667	826	906	972

Source: Authors' elaboration based on the LSBS 2015-22.

Note: The column Average represents the average number of SMEs over 2015-2022 using the relative row values. For rows A-I, the percentages in brackets are calculated with respect to the total of each column in row J, while the percentages in squared brackets in the column Average are calculated with respect to the total in row K in the same column Average. For row J, the percentages in brackets are calculated with respect to the total in each column in row K.

Table 1 shows that, overall, 75% of all Scottish SMEs with employees offer some form of flexible working arrangements. The most prevalent type of contract is flexitime, or flexible working hours, offered on average in the period 2015-22 by 69% of firms adopting flexible working arrangements, that is more than two out of three FWA firms, and 51% of all Scottish SMEs with employees. And this pattern has been unchanged over the period 2015-22, except for the drop in 2020 due to the pandemic but reversing after that to its average value.

An average of 29% of FWA firms offered an annualised hours contract and, over this period, this type of contract has slightly grown in importance being 33% in both 2019 and 2022, even if it dipped during the pandemic to 18%.

22% of FWA firms on average offered term-time working, with a very stable pattern over time, seeing only a dip to 14% during 2020, again due to the pandemic.

Job sharing instead shows over time a steady decline in its adoption, starting with 25% in 2015 and ending at 17% in 2022, and averaging at 20%. The pandemic hit also the job sharers since in 2020 the frequency of job sharing among the FWA firms dropped to 14%.

A nine-day fortnight contract has been offered in quite a stable fashion over the period by 7% of FWA firms, and it was not particularly affected by the pandemic, while the 4.5-day-a-week contract has shown a steady decline over time, starting in 2015 at 24% and ending in 2022 at 18%, except for peaking in 2018 at 26% and dropping in 2020 at 14%.

Zero-hours contracts were averaging at 20% over the 2015-22 period, expanding since 2018 at 21% or above, except in 2020 when they dropped to 18%, while 19% of FWA firms on average adopted on-call working during this same period, but with significant fluctuations, reaching 16% in 2019 and 11% in 2020.

Lastly, during the period 2015-22 on average 36% firms indicated that they adopted none of the FWAs listed above, but some other type. The proportion of these firms fluctuates from a peak of 45% in 2016 to a minimum of 28% in 2020.

Overall, it is clear to see that the COVID-19 pandemic in 2020 led to a drop in the number of firms offering each type of flexible working arrangements, and a recovery of the pattern pre-pandemic since 2021. However, when we look at the proportion of Scottish firms offering FWAs out of the total firms with employees, we unveil an interesting fact: while the average proportion of firms offering any FWAs is 75% over the period, the pandemic led to a spectacular increase in firms offering FWAs, with 99% of them doing so. This fact might seem to contradict the drop in the proportion of firms offering each single type of flexible work contract, but since each firm can offer more than one type of FWAs, this signifies that firms in Scotland responded to the pandemic with a reduction in types of contracts offered by each firm, but at the same time nearly all firms adapted to the exceptional circumstances by adopting some forms of FWAs. This result might also be driven by the extent to which each contract type is adopted across industries and job

types, which were impacted differently by the pandemic (Forbes et al., 2020; Cullen et al., 2021).

Table 2 presents the key variables used in the analysis, along with their descriptive statistics. The statistics are summarised based on the number of observations between 2015 and 2022 and they are based only on Scottish SMEs with employees. We excluded from the analysis all those firms with no employees that did not respond to question K24 on FWAs because it did not apply to them.

As outcome variables we use labour productivity (sales divided by the number of employees, including casual and temporary workers but excluding owners and business partners) and innovation. In terms of productivity, Scottish SMEs have an average of £139,211.20, but to account for the wide distribution and to normalise the data, productivity values are rescaled using the natural logarithmic monotonic transformation, making them more suitable for linear regression analysis. Innovation is measured as a dummy representing whether the business introduced any new product, service or process in the previous three years. Since all the questions on innovation in the LSBS are covering activities undertaken in the previous three years, any measure of innovation that is used as outcome variable requires all explanatory variables to be lagged by two years, i.e. to explain innovation in 2017 we need the variables for flexible work arrangements and all other control variables in 2015, for innovation in 2018 we use the variables in 2016, and so on. Consequently, a Scottish firm needs to be present in the LSBS for at least three consecutive years to enter our innovation analysis, and this reduces substantially the sample size to around 480 observations for 2015-2022.

We can see from Table 2 that, on average, 41.9% of firm-year observations innovate either in products, services, or processes, 72.9% offer at least one type of flexible working hours arrangements. Among these, flexitime is the most common (51%), followed by the non-specified category grouping all FWAs not explicitly listed in the LSBS (26.9%), annualised hours contracts (21.6%), term-time working contracts (16.5%), four-and-a-half-day week contracts (15.7%), job sharing (15.2%), zero-hours contracts (14.9%), on-call working (14.1%), and nine-day fortnight contracts (5.2%).

In terms of characteristics that do not change for the individual firm over time, 33.4% of firm-time observations are rural, 7.0% are in the primary sector, 9.4% in the manufacturing sector, 9% in construction, 14.8% in the wholesale and retail sector, 4.4% in the transport/storage sector, 11.7% in the hospitality sector, 3.8% in the information and telecommunications (ITCs) sector, 3.9% in the financial and real estate sector,

12.8% in the professional and scientific sector, 7.2% in the administrative and support services sector, 2% in the education sector, 6.9% in the healthcare and social work services sector, 16.9% in the arts and entertainment sector, and 18.4% are women-led businesses.

Other characteristics that change very little over time, although of course they can change, are age and size of the business as they are coded in bands: 11.7% of firm-year observations are start-ups, i.e. firms up to 5-year old; 50.2% are 20-year old or older; 28.9% are small businesses, i.e. they have between 10 and 49 employees; and 13.7% are medium businesses, i.e. they have between 50 and 249 employees. For completeness we report also on characteristics not reported in Table 2: 34% of firm-year observations are micro-businesses, i.e. with up to 9 employees, 1.3% are large businesses with 250 or more employees (these firms were not present in the LSBS 2015 by design, but since they grew over time if resampled they appear under the new size category).

For the remainder of the variables we report that 31.3% of firm-year observations receive support in the form of information or advice in the last 12 months; 38.1% have a formal written business plan; 35.4% reported that recruitment and skills are a major obstacle to business success; 45.4% felt that regulations and red tape are the major obstacle; 44.3% instead indicated that market competition is the major obstacle; 62.9% planned to invest in the skills of their workers in the following three years; 42.7% planned to invest in capital (machinery, premises, etc.) in the following three years; 38.5% planned to develop and launch new products and services in the next three years; 41.3% planned to introduce new working practices in the next three years; and 41.3% are exporters of goods or services.

Although we do not report the results here, we tested for the existence of multicollinearity between all variable pairs and it does not appear to be a major concern, as the highest correlation between independent variables is 0.45 between MICRO and SMALL.

Table 2 - Descriptive statistics of key variables used in the analysis

Variable	Description	Scottish SMEs, 2015-2022		
		Obs	Mean	SD
PROVT	Turnover (£) per employee in logarithm (continuous)[9]	5,058	11.126	1.101
INNO	1=if a firm has new or significantly improved goods or services or processes in the last 3 years, 0=otherwise	5,317	0.419	0.493
DEVLP	1=if a firm plans to develop and launch new products/services in the next 3 years, 0=otherwise	4,643	0.385	0.486
ALLFLEX	1=if a firm offers any types of flexible working hours arrangements, 0=otherwise	5,938	0.729	0.444
FLEXITIME	1= if a firm offers flexitime (flexible working hours), 0=otherwise	5,938	0.514	0.499
ANNUAL	1=if a firm offers an annualised hours contract, 0=otherwise	5,938	0.216	0.412
TERMTIME	1=if a firm offers a term-time working contract, 0=otherwise	5,938	0.165	0.371
JOBSH	1=if a firm offers job sharing contract, 0=otherwise	5,938	0.152	0.359
NINEDAY	1=if a firm offers a nine-day fortnight contract, 0=otherwise	5,938	0.052	0.221
FOUR	1=if a firm offers a four and a half day week contract, 0=otherwise	5,938	0.157	0.364
ZERO	1=if a firm offers zero-hour contracts, 0=otherwise	5,938	0.149	0.356
ONCALL	1=if a firm offers on-call working contract, 0=otherwise	5,938	0.141	0.348
NONE	1=if a firm offers none of these [working hours arrangements], 0=otherwise	5,938	0.269	0.444
RURAL	1=if a firm is located in rural areas, 0=Urban areas	7,762	0.334	0.472
PRIM	1=if a firm operates in the primary sector, 0=otherwise	7,776	0.070	0.256
MANU	1=if a firm operates in the manufacturing sector, 0=otherwise	7,776	0.094	0.292
CONST	1=if a firm operates in the construction sector, 0=otherwise	7,776	0.090	0.286
WHOLE	1=if a firm operates in the wholesale/retail sector, 0=otherwise	7,776	0.148	0.356
TRAN	1=if a firm operates in the transport/storage sector, 0=otherwise	7,776	0.044	0.206
ACCOM	1=if a firm operates in the accommodation/food services sector, 0=otherwise	7,776	0.117	0.322
INFORM	1=if a firm operates in the information/communication sector, 0=otherwise	7,776	0.038	0.192
FINAN	1=if a firm operates in the financial/real estate sector, 0=otherwise	7,776	0.039	0.194
PROF	1=if a firm operates in the professional/scientific sector, 0=otherwise	7,776	0.128	0.335
ADMIN	1=if a firm operates in the administrative/support sector, 0=otherwise	7,776	0.072	0.258
EDUC	1=if a firm operates in the education sector, 0=otherwise	7,776	0.020	0.141
HEALTH	1=if a firm operates in the health/social work sector, 0=otherwise	7,776	0.069	0.253
ARTS	1=if a firm operates in arts/entertainment sector, 0=otherwise	7,776	0.030	0.169

AGE05	1=if the age of the business is between 0 and 5 years, 0=otherwise	7,232	0.117	0.321
AGE20	1=if the age of the business is 20 years or over, 0=otherwise	7,232	0.502	0.500
SMALL	1=if a firm has between 10 and 49 employees, 0=otherwise	7,776	0.289	0.453
MEDIUM	1=if a firm has between 50 and 249 employees, 0=otherwise	7,776	0.137	0.345
WOMEN	1=if more than 50% of the business is owned by women, 0=otherwise	7,184	0.184	0.388
SUPPORT	1=If a firm used information/advice in the last 12 months, 0=otherwise	7,672	0.313	.463
BPLAN	1=if a firm has a formal written business plan, 0=otherwise	7,581	0.381	0.486
STAFF	1=if staff recruitment and skills are a major obstacle to the business success, 0=otherwise	4,643	0.354	0.478
SKILL	1=if a firm plans to increase the skills of the workforce in the next 3 years, 0=otherwise	4,643	0.629	0.483
REDTP	1=if regulations/red tape are a major obstacle to the business success, 0=otherwise	4,643	0.454	0.498
COMPT	1=if competition in the market is a major obstacle to the business success, 0=otherwise	4,643	0.443	0.497
CAPT	1=if a firm plans to invest in capital (in premises, machinery etc.) in the next 3 years, 0=otherwise	4,643	0.427	0.495
PRACT	1=if a firm plans to introduce new working practices in the next 3 years, 0=otherwise	4,643	0.413	0.492
EXPORT	1=if a firm export goods or services, 0=otherwise	7,745	0.413	0.4924

Source: Authors' elaboration based on the LSBS 2015-22.

4. EMPIRICAL APPROACH

4.1 The determinants of adoption of flexible working hours arrangements

Given the paucity of quantitative studies on flexible work in the UK, our first contribution is to investigate the determinants of the adoption of FWAs by businesses in Scotland when the flexibility is in terms of working time (rather than location). To our knowledge, this is the first study to comprehensively examine the factors that influence adoption of FWAs across nine distinct types (see Table 1) in the UK. A panel logit model with random effects is used to analyse the determinants of FWA adoption across Scottish SMEs from 2015 to 2022. The choice of a panel logit model with random effects accounts for the binary nature of the FWA variable (indicating adoption or non-adoption) while addressing unobserved heterogeneity across firms. To analyse the determinants, the estimated equation can be written as:

$$\Pr(FWA_{it} = 1 | \boldsymbol{X}_{1it}) = \alpha + \boldsymbol{X}_{1it}\beta + \mu_{1i} + \varepsilon_{1it} \qquad (1)$$

where Pr(FWA) is the probability of adopting a specific FWA (e.g. All types of FWAs, Flexitime, Term-time contract, Job Sharing, etc.) by i-th firm in t-th year; $\mathbf{X}_{1it}$ is a vector of determinants deemed to influence the adoption of FWAs (see Table 2); μ_{it} is a firm-specific random effect to account for unobserved heterogeneity; e_{it} is the idiosyncratic error term.

In equation (1), we explore different key determinants that can affect the adoption of FWAs such as business size, age of business, sector, rural location, women-led ownership, use of information/advice, perception of major obstacles to the business success (like recruitment/skills, market competition, regulations/red tape), business intentions for the future (invest in capital or workforce's skills, innovate, adopt new working practices), and having a business plan. We also include a measure of innovation as an independent variable, specifically whether the SME introduced new and/or significantly improved goods, services and processes in the last 3 years. Some studies highlight the potential endogeneity concerns between flexible work and innovation (Storey et al., 2002; Wachsen and Blind, 2016; Kato and Zhou, 2018.), since endogeneity may arise when more innovative firms are also more likely to adopt flexible work arrangements and *vice versa*. However, in our analysis, we address this concern by highlighting that the innovation variable is measured in the previous three years, while the adoption of FWAs may not occur within the same time frame. To corroborate the absence of endogeneity we perform the Two-Stage Residual Inclusion (2SRI) approach, commonly used for non-linear regression (Terza et al., 2008; Terza, 2017), since innovation and flexible working agreements are binary variables. In our case, the estimated residuals were found to be statistically insignificant (p-value > 0.05), suggesting that the endogeneity is not a significant concern in our analysis[8]. Therefore, we proceed with the assumption that innovation is exogenous in its effect on the FWAs adoption.

4.2 Impact of flexible working agreements on SME productivity

For the relationship between the adoption of FWAs and SME labour productivity, we start with using both fixed- and random-effects models to account for the unobserved heterogeneity across firms. To determine the most appropriate model, we perform the Hausman test, which suggests that the random-effects model is more suitable for our

[8] The full result of this analysis is available upon request.

data. This is because the key variable of interest, flexible work arrangements, and some control variables (e.g. sectors, rural location, women-led ownership) do not exhibit sufficient within-firm variation over time to justify using a fixed-effects model. The random-effects model allows us to exploit both the within-firm and between-firm variation in flexible work adoption, while controlling for firm-specific characteristics that remain constant over time.

We first examine the overall impact of offering all types of flexible working hours and then investigate the specific effect of each type on SME productivity. It is important to note that the observations in the LSBS are not consistent across all eight years, as some SMEs dropped out and new ones were added in different years and, as shown in Table 1, the sample size of firms also changes. This does not allow a balanced panel analysis, i.e. exploiting the full temporal dimension of the survey for all firms (in fact, only 14 firms are present in the dataset from 2015 to 2022. We also face limitations when the outcome variable is labour productivity, as this analysis focuses only on Scottish SMEs reporting their exact figures for turnover.

Despite these challenges, we apply an unbalanced panel analysis using linear regression with random effects to capture the association of flexible work with productivity. Our model specification is as follows:

$$PROVT_{it} = \alpha + \boldsymbol{FWA}_{it}\beta_1 + \boldsymbol{X}_{2it}\,\beta_2 + \gamma_t + \mu_{2i} + \varepsilon_{2it} \qquad (2)$$

where $PROVT_{it}$ is the labour productivity per employee of SME i-th at time t-th, measured in logarithmic terms (log); $\boldsymbol{FWA}_{it}$ represents a vector of all types and each type of flexible working agreements (binary) for SMEs i-th at time t-th; $\boldsymbol{X}_{2it}$ is a vector of time-varying control variables (e.g., firm size, sector, rural location, etc.) as per Table 2; γ_t captures the time-specific effects (i.e. year dummies) that may influence productivity for all SMEs, like the Covid-19 pandemic in 2020 and 2021; μ_i is the unobserved firm-specific effect; and ϵ_{it} is the idiosyncratic error term.

4.3 Impact of flexible working agreements on innovation

Since in the LSBS all measures of *actual* innovation are based on activities in the previous three years, when using innovation (measured by INNO) as the outcome variable, we lagged all independent and control variables in the model by two years. This approach allows us to analyse the impact of FWAs on actual innovation without making the mistake of predicting a variable in the past with explanatory variables set in the future. Since this 2-year lag reduces substantially the number of observations, we do not

consider separately product and process innovation, but rather we look at both types of innovation with a single binary measure.

We follow the same analytical procedure as for the productivity analysis by considering any type and then each type of flexible work. However, unlike the productivity analysis, we apply a panel logit model with random effects to account for the binary nature of the innovation variable and unobserved heterogeneity across firms. Our model is specified as follows:

$$\Pr(INNO_{it} = 1 | \boldsymbol{X}_{3t-2}) = \alpha + \boldsymbol{X}_{3it-2}\beta_3 + \mu_{3i} + \varepsilon_{3it-2} \quad (3)$$

where Pr(INNO) is the probability of i-th firm reporting in t-th year new and/or significantly improved goods or services or processes in the previous three years. $\mathbf{X_3}$ is a vector of FWAs and control variables for the i-th firm in t—2th year.

To capture alternative measures of innovation, we also use the *intention* to innovate retrieved from the business plan question R4 on developing and launching new products/services in the following three years (what we described as DEVLP variable in Table 2). This measure is particularly important because it reflects forward-looking innovation activities that may not yet have materialised, but indicate a firm's commitment and ambition to innovation. We use this binary intention-to-innovate variable as the dependent variable and assess the impact of FWAs on the firms' innovative potential. To analyse this relationship we apply a panel logit model with random effects, specified as follows:

$$\Pr(DEVLP_{it} = 1 | \boldsymbol{X}_{4it}) = \alpha + \boldsymbol{X}_{4it}\,\beta_4 + \mu_{4i} + \varepsilon_{4it} \quad (4)$$

where Pr(DEVLP) is the probability for the i-th firm to plan at time t-th some product or process innovation in the following three years. $\mathbf{X_4}$ is a vector of FWAs and control variables for the i-th firm in t-th year.

The results for equations (3) and (4) provide valuable insights into the effects of different types of flexible work arrangements on firm-level innovation and the intention to innovate. This complementary analysis contributes to a more nuanced understanding of how specific flexible work practices influence innovation outcomes.

5. EMPIRICAL RESULTS

Table 3 reports the results from the regression analysis as per (equation (1) undertaken to shed light on the key determinants of the FWAs adoption in Scotland during 2015-22.

In the first column, the outcome variable is the dummy variable that captures whether a business adopted any type of FWAs, as indicated in Table 1, row J. The subsequent columns A-I show the results of the regressions when the outcome variable is each individual type of flexible working hours contract, as defined in Table 1 in the rows identified by the same letters A-I. In bold we highlight the statistically significant estimated coefficients.

Table 3 – Key determinants of flexible working hours arrangements in Scotland, 2015-22

	ALLFLEX J	FLEXITIME A	ANNUAL B	TERMTIME C	JOBSH D	NINEDAY E	FOUR F	ZERO G	ONCALL H	NONE I
INNO	**0.628***	**0.756***	0.225	**0.615***	0.460	**0.726****	**0.496****	0.269	0.238	**-0.632*****
	(0.176)	(0.181)	(0.186)	(0.206)	(0.237)	(0.364)	(0.194)	(0.258)	(0.230)	(0.176)
RURAL	0.300	0.290	0.215	0.255	0.023	-0.219	**-0.379***	0.358	**0.470***	**-0.305***
	(0.184)	(0.195)	(0.197)	(0.212)	(0.255)	(0.377)	(0.204)	(0.277)	(0.246)	(0.185)
PRIM	**-1.073***	0.154	**-1.572****	**-1.461***	**-3.283*****	-0.491	**-1.426****	-0.507	0.563	**1.086***
	(0.614)	(0.637)	(0.698)	(0.764)	(1.131)	(1.098)	(0.720)	(0.969)	(0.879)	(0.617)
MANU	-0.837	-0.217	-0.625	**-1.279****	**-1.638****	-1.083	0.175	-0.715	-0.113	0.843
	(0.561)	(0.570)	(0.568)	(0.649)	(0.777)	(1.007)	(0.569)	(0.865)	(0.814)	(0.561)
CONST	**-1.116***	-0.585	-0.705	**-1.281***	**-1.925****	-1.005	-0.708	-1.358	0.695	**1.122****
	(0.554)	(0.571)	(0.567)	(0.661)	(0.820)	(1.007)	(0.587)	(0.912)	(0.812)	(0.554)
WHOLE	-0.731	0.022	-0.433	-0.375	-0.275	-1.219	-0.354	-0.791	-0.003	0.725
	(0.533)	(0.543)	(0.531)	(0.586)	(0.676)	(0.973)	(0.549)	(0.835)	(0.788)	(0.535)
TRAN	-0.289	0.098	-0.938	0.072	-0.635	-0.568	-0.647	-0.386	1.431	0.295
	(0.624)	(0.650)	(0.672)	(0.690)	(0.843)	(1.136)	(0.681)	(0.983)	(0.879)	(0.627)
ACCOM	0.124	0.822	-0.260	0.790	-0.024	-1.191	-0. 236	**2.029****	0.205	-0.130
	(0.554)	(0.563)	(0.543)	(0.589)	(0.692)	(0.993)	(0.565)	(0.867)	(0.804)	(0.554)
INFORM	-0.164	**1.360****	-0.830	-0.653	-1.320	**-3.056***	-1.103	**-2.856****	0.759	0.154
	(0.657)	(0.672)	(0.645)	(0.710)	(0.873)	(1.591)	(0.695)	(1.445)	(0.896)	(0.653)
FINAN	-0.892	0.182	**-1.210***	-0.766	0.181	-1.107	-0.451	**-2.500***	0.050	0.901
	(0.636)	(0.662)	(0.703)	(0.760)	(0.813)	(1.223)	(0.675)	(1.495)	(0.955)	(0.637)
PROF	0.184	**1.371****	**-1.357****	-0.129	-0.892	0.253	-0.343	0.290	0.253	-0.180
	(0.572)	(0.588)	(0.593)	(0.612)	(0.733)	(0.936)	(0.578)	(0.855)	(0.825)	(0.572)
ADMIN	-0.248	0.113	-0.617	-0.048	0.007	-0.447	-0.874	0.205	**1.540***	0.244
	(0.572)	(0.583)	(0.579)	(0.627)	(0.720)	(1.000)	(0.609)	(0.866)	(0.830)	(0.573)
EDUC	0.813	1.071	0.704	**1.862*****	1.453	-0.165	-0.318	-	0.638	-0.814
	(0.973)	(0.898)	(0.819)	(0.842)	(0.972)	(1.414)	(0.883)		(1.148)	(0.974)
HEALTH	0.881	0.498	-0.094	0.720	0.777	-0.533	0.180	**1.640***	1.707**	-0.886
	(0.677)	(0.634)	(0.604)	(0.656)	(0.754)	(1.044)	(0.614)	(0.927)	(0.867)	(0.677)
ARTS	0.480	0.849	0.840	0.321	0.113	0.347	-0.671	1.603	-0.216	-0.474
	(0.816)	(0.804)	(0.743)	(0.826)	(0.955)	(1.223)	(0.843)	(1.069)	(1.163)	(0.819)
AGE05	-0.049	-0.323	0.274	0.040	-0.034	0.354	0.038	-0.039	-0.544	0.037
	(0.262)	(0.274)	(0.270)	(0.298)	(0.360)	(0.544)	(0.286)	(0.384)	(0.371)	(0.263)
AGE20	-0.172	-0.137	-0.234	-0.137	-0.160	0.460	-0.039	**-0.699****	-0.227	0.170
	(0.184)	(0.193)	(0.200)	(0.214)	(0.252)	(0.382)	(0.199)	(0.295)	(0.244)	(0.185)
SMALL	0.118	**-0.540*****	-0.141	-0.386	-0.020	0.468	-0.081	**0.998*****	0.344	-0.115
	(0.190)	(0.274)	(0.208)	(0.229)	(0.273)	(0.388)	(0.209)	(0.320)	(0.262)	(0.191)
MEDIUM	**0.445***	-0.069	-0.060	-0.062	**0.975*****	0.105	0.197	**1.762*****	**0.826****	**-0.445***
	(0.261)	(0.261)	(0.266)	(0.284)	(0.325)	(0.490)	(0.261)	(0.392)	(0.326)	(0.258)
WOMEN	0.32	0.200	0.116	-0.213	0.223	-0.155	-0.141	-0.059	-0.356	-0.126
	(0.227)	(0.238)	(0.240)	(0.270)	(0.304)	(0.462)	(0.254)	(0.352)	(0.320)	(0.228)
SUPPORT	0.251	0.288	-0.326	-0.017	**0.449****	-0.141	0.206	0.117	0.041	-0.258
	(0.172)	(0.175)	(0.186)	(0.197)	(0.227)	(0.331)	(0.181)	(0.250)	(0.218)	(0.173)
BPLAN	0.252	-0.015	**0.446****	0.087	0.201	**0.734****	0.269	**-0.588****	**0.440***	-0.251
	(0.171)	(0.175)	(0.187)	(0.197)	(0.231)	(0.347)	(0.184)	(0.263)	(0.225)	(0.172)
STAFF	0.046	0.149	**0.319***	0.040	-0.309	0.488	-0.130	-0.019	0.088	-0.039
	(0.162)	(0.168)	(0.180)	(0.192)	(0.223)	(0.327)	(0.177)	(0.243)	(0.215)	(0.164)
REDTAP	0.220	0.215	-0.175	0.217	**0.427***	-0.029	0.247	**-0.428***	0.131	-0.223
	(0.162)	(0.166)	(0.173)	(0.190)	(0.223)	(0.320)	(0.173)	(0.242)	(0.213)	(0.162)
COMPT	0.187	0.077	-0.200	-0.195	0.211	**-0.793****	0.112	0.279	0.105	-0.192
	(0.158)	(0.163)	(0.173)	(0.188)	(0.221)	(0.335)	(0.174)	(0.243)	(0.213)	(0.158)
SKILL	**0.401****	0.245	**0.456***	-0.019	0.516	0.110	**0.480****	-0.018	**0.552***	**-0.399****
	(0.197)	(0.213)	(0.240)	(0.251)	(0.316)	(0.441)	(0.245)	(0.329)	(0.305)	(0.198)
CAPT	0.062	-0.145	-0.018	0.159	**0.473***	0.130	0.092	**0.582****	0.386	-0.060
	(0.175)	(0.180)	(0.188)	(0.206)	(0.242)	(0.350)	(0.191)	(0.276)	(0.236)	(0.176)
DEVLP	**0.314***	**0.482*****	0.111	0.199	0.287	0.358	-0.100	-0.288	0.107	-0.290
	(0.182)	(0.184)	(0.193)	(0.208)	(0.241)	(0.356)	(0.193)	(0.259)	(0.241)	(0.181)
PRACT	**0.352****	0.023	**0.551*****	0.292	0.077	-0.078	**0.322***	0.194	0.133	**-0.351***
	(0.175)	(0.180)	(0.191)	(0.207)	(0.238)	(0.348)	(0.191)	(0.260)	(0.232)	(0.176)
Constant	0.327	**-1.247****	**-2.216*****	**-2.663*****	**-3.925*****	**-4.520*****	**-2.842*****	**-4.169*****	**-4.841*****	-0.338
	(0.544)	(0.567)	(0.579)	(0.634)	(0.804)	(1.248)	(0.598)	(0.979)	(0.957)	(0.546)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Number of observations	1,852	1,852	1,852	1,852	1,852	1,852	1,852	1,852	1,852	1,852
Wald chi2(df)	92.21(32)	80.52(32)	6031(32)	63.28(32)	66.46(32)	26.44(32)	55.78(32)	61.36(32)	50.51(32)	93.64(32)
Prob > chi2	0.000	0.0000	0.0018	0.0008	0.000	0.0408	0.0058	0.0009	0.0199	0.0000
LR test of rho=0: chibar2(01)	38.57 (p=0.00)	71.30 (p=0.00)	29.86 (p=0.00)	24.56 (p=0.00)	34.40 (p=0.00)	22.62 (p=0.00)	23.07 (p=0.00)	29.64 (p=0.00)	29.19 (p=0.00)	39.34 (p=0.00)

Notes: Estimates from a linear panel with random effects. *, **, and *** denote statistical significance at 10%, 5% and 1%.

The results from Table 3 indicate that if the business is innovative, having introduced new products, services or processes in the previous three years, then it is more likely to adopt FWAs, with an estimated positive coefficient of 0.628 significant at 1% confidence level. Innovation plays a positive impact also on flexitime (coefficient 0.756, significant at 1%), on term-time working (coefficient 0.615, significant at 1%), on the nine-day fortnight working (coefficient 0.726, significant at 5%), on the 4.5-day a week working (coefficient 0.496, significant at 5%), but it exerts a negative impact on “none of these” FWAs, i.e. the category of FWAs not explicitly specified in the LSBS (-0.632, significant at 1%). This depicts a picture whereby innovative businesses are more likely to offer flexible working hours arrangements. Using the variable innovation measured with reference to the previous three years guarantees that these results are not affected by the endogeneity issue.

Being located in a rural area makes it more likely for a business to offer on-call FWAs (coefficient 0.470, significant at 10% level), but less likely to offer 4.5-day-a-week work or any other type of FWAs not explicitly listed (coefficients -.0379, -0.305 respectively, both significant at 10%). The coefficients associated with the variable rural for all the other FWAs are positive but insignificant, including for job sharing where interestingly the coefficient is approaching zero, which, even if not precisely estimated, could suggest that it may be more difficult for a rural firm to offer job sharing work, probably due to the difficulty of finding the right worker match in rural areas.

We then have a set of determinants that describe the industrial sectors. If a business belongs to the primary sector, it is less likely to offer all types of FWAs (ALLFLEX) and less likely to offer an annualised hours contract, term-time working, job sharing and the four-and-a-half-day week, with coefficients all negative and quite large, in particular the one explaining job sharing is –3.283 and significant at 1% confidence level. However, a business in the primary sector is more likely to offer alternative FWAs not explicitly listed (NONE), with a coefficient of 1.086 significant at 10% level. If the business belongs to the manufacturing sector or the construction sector, this negatively impacts the

probability of offering term-time working and job sharing, with construction impacting negatively also the probability of adopting any type of FWAs (ALL FLEX) but positively other alternative types of FWAs (NONE). If the business is in the ITCs sector, it is more likely to concede flexitime (coefficient 1.360, significant at 5%) but less likely to offer nine-day fortnight (-3.056, significant at 10%) and zero-contract hours (-2.856, significant at 5%). If the business is in the accommodation or hospitality sector, then there is a higher probability that the business adopts zero-our contracts (large coefficient of 2.029, significant at 5%). Zero-hours contracts are also more prevalent in the healthcare sector (coefficient 1.640, significant at 10%) but less so in the financial/real estate sector (coefficient -2.500 significant at 10%). Businesses in the professional/scientific services sector are instead more likely to offer flexitime (1.371, significant at 5%) and less likely to offer an annualised hours contract (-1.357, significant at 5%), the latter being less likely to be offered also by financial/real estate services firms (-1.210, significant at 10%). The administrative and support services sector is instead more likely to employ staff using on-call working arrangements (1.540 significant at 10%), while the education sector, not surprisingly, is more likely to employ staff on term-time working contracts (1.862 significant at 1%).

Being a start-up firm, i.e. having an age up to 5 years, does not seem to have an impact on the adoption of FWAs, but being older than 20 years is associated with a statistically significant negative coefficient for zero-hours contracts (-0.699, significant at 5%). Small firms are less likely to offer flexitime (-0.540, significant at 1%) but more likely to adopt zero-hours contracts (-0.998, significant at 1%). Medium firms are more likely to offer any type of FWAs (ALLFLEX), more likely to offer job sharing (0.975, significant at 1%), zero-hours contracts (1.762, significant at 1%) and on-call working (0.826, significant at 5%), but less likely to offer alternative FWAs (-0.445 significant at 10%).

Women-led businesses are not more likely to adopt FWAs compared to men-led businesses or businesses where women own less than 50% of the business. Receiving support in the form of information or advice in the last 12 months leads only to a higher probability of offering job sharing (0.449 significant at 5%).

If the business has a formal written business plan, which indicates the strong ability to plan ahead and strategise, it is more likely to offer annualised hours contracts (0.446, significant at 5%), nine-day fortnight contracts (0.734, significant at 5%) and use more on-call working (0.440, significant at 10%) but it is less likely to adopt zero-hours contracts (-0.588, significant at 5%).

If staff recruitment and skills are a major obstacle for the business' success, then the business is more likely to adopt annualised hours contracts (0.319, significant at 10%). If regulations and red tape are a major obstacle, then the business is more likely to offer job sharing (0.427, significant at 10%) but less likely to adopt zero-hours contracts (-0.428, significant at 10%). If competition in the market is a major obstacle, the business is less likely to offer nine-day fortnight contracts (-0.793, significant at 5%).

When the business is willing to invest in the skills of its workforce in the next three years, showing on one hand commitment to its employees and investment into them, but also possibly revealing a staff retention strategy, there is a higher probability that the business offers any type of FWAs (the coefficient for ALLFLEX is 0.401 and significant at 5%), annualised hours contracts (0.456, significant at 10%), 4.5-day a week contracts (0.480, significant at 5%) and on-call working (0.552, significant at 10%) and it is less likely to offer alternative FWAs (NONE has a coefficient of -0.399 with significance level of 5%).

When the business plans to invest in capital in the next three years, which could signal both expansion ambitions but also technological upgrading and labour-saving plans, there is a higher probability that it will offer job sharing (0.473, significant at 10%) and zero-hours contracts (0.582 significant at 5%).

If the business plans to introduce new products, services or processes in the following three years, it will be more likely to adopt any type of FWAs (ALLFLEX coefficient is 0.314, significant at 10%) and offer flexitime contracts (0.482, significant at 1%). So the intention to innovate is a significant driver of FWAs.

Finally, when the business plans to introduce new working practices in the following three years, it is more likely to adopt any type of flexible work (ALLFLEX coefficient is 0.352, significant at 5%), annualised hours contracts (0.551, significant at 1%), the 4.5-day week contract (0.322, significant at 10%) but less likely to adopt the alternative FWAs (-0.351, significant at 10%).

Overall, from this analysis, it emerges a complex picture with many determinants of FWAs. It appears that both actual innovation and intention to innovate are significant drivers of FWAs, along with being a medium business, and possessing a strategy or ambitions to invest in the business' workforce. Different types of FWAs are adopted in different measure across sectors, which is not unexpected.

We also uncovered that zero-hours contracts have different determinants than on-call working contracts, despite both being more a 'variability' rather than a 'flexibility' type of

contracts. While zero-hours contracts are to be found more in the hospitality and healthcare sectors, on-call working is more rural-based and used for administrative and support services jobs. Zero-hours contracts are used by both small and medium enterprises, whereas on-call working is prevalent only among medium enterprises. Firms with a written business plan, hence with clear strategies for the future, are more likely to adopt on-call working but less likely to adopt zero-hours contracts. Firms that plan to invest in the skills of their staff are more likely to adopt on-call working, whereas firms that plan to invest in capital (possibly substituting labour) are keener on adopting zero-hours contracts. So overall we can speculate that while both these types of contracts allow the firm to manage its variability of demand for work, zero-hours contracts may be adopted more often than on-call working to just compress the labour costs with less regard for the future development of the staff, while on-call working tends to be associated with firms doing more staff development and it is probably used to face recruitment difficulties due to the location of the businesses in rural areas.

Table 4 shows the results of the relationship between flexible working arrangements and SME labour productivity using panel logit models as per equation (2). Overall, Models I and II demonstrate statistically significant overall fits, as indicated by a Wald Chi-squared test with a p-value of below 0.05.

Table 4 - The relationship between flexible working arrangements and SME labour productivity in Scotland, 2015-22

Variable	Model I		Model II	
	Coefficient	S.E.	Coefficient	S.E.
ALLFLEX	0.010	0.040		
FLEXITIME			0.014	0.039
ANNUAL			0.049	0.046
TERMTIME			0.052	0.051
JOBSH			-0.008	0.059
NINEDAY			0.162*	0.084
FOUR			-0.053	0.052
ZERO			-0.075	0.057
ONCALL			0.002	0.057
RURAL	0.003	0.060	0.006	0.061
PRIM	**1.385*** **	0.223	**1.379*** **	0.224
MANU	**1.204*** **	0.205	**1.213*** **	0.206
CONST	**1.154*** **	0.205	**1.160*** **	0.207
WHOLE	**1.262*** **	0.199	**1.264*** **	0.200
TRAN	**0.735****	0.227	**0.731*** **	0.228
ACCOM	**0.431***	0.204	**0.448****	0.205
INFORM	**0.903*** **	0.233	**0.908*** **	0.234
FINAN	**1.241*** **	0.238	**1.252*** **	0.239
PROF	**0.953*** **	0.2061	**0.946*** **	0.207
ADMIN	**0.515****	0.210	**0.532****	0.211
EDUC	0.372	0.3071	0.357	0.309
HEALTH	-0.111	0.2350	-0.107	0.236
ARTS	0.419	0.312	0.404	0.314
AGE05	**-0.207*** **	0.069	**-0.216*** **	0.069
AGE20	**0.146*** **	0.053	**0.143*** **	0.053
SMALL	**0.104***	0.054	**0.103***	0.055
MEDIUM	-0.035	0.074	-0.032	0.074
WOMEN	**-0.255*** **	0.072	**-0.252*** **	0.072
SUPPORT	-0.007	0.039	-0.003	0.038
BPLAN	0.005	0.041	0.002	0.041
STAFF	0.007	0.037	0.001	0.037
SKILL	-0.027	0.047	-0.030	0.047
CAPT	**0.091****	0.041	0.090**	0.041
DELOP	0.027	0.041	0.019	0.041
PRACT	-0.0745	0.038	-0.070	0.038
EXPORT	**0.292*** **	0.062	**0.289*** **	0.062
Constant	**9.727*** **	0.197	**9.730*** **	0.198
Year dummies	Yes		Yes	
sigma_u	0.861		0.861	
sigma_e	0.3404		0.396	
rho	0.819		0.824	
Number of observations	1,769		1,769	
Wald chi2(df)	385.369(35)		390.37 (42)	
Prob > chi2	0.0000		0.0000	

Notes: Estimates from a linear panel with random effects. *, **, and *** denote statistical significance at 10%, 5% and 1%.

In Model I, we consider the association between the adoption of any type of flexible working agreement and SME labour productivity and the results indicate that firms offering any type of flexible working agreements do not show a statistically significant difference in productivity levels. This finding implies that, on average, the implementation of these flexible working arrangements does not lead to enhanced or reduced productivity outcomes for SMEs. There could be several explanations for this finding. One possibility could be unobserved heterogeneity (such as different working practices). Another one could be due to the fact that we excluded all those businesses that did not report an accurate measure of turnover. If this underreporting is systematically correlated to some labour market variable, then by excluding these businesses we might have adversely selected the sample biasing the results. However, the simpler, and for us most plausible, explanation is due to measurement errors since the lack of distinction between full-time and part-time staff most likely underestimates the labour productivity for those firms employing part-timers, but since we do not know which firms employ part-time workers nor how many part-timers are 'hiding' in our data in each firm, we cannot correct the biased estimates nor say how large the bias might be.

In Model II we explore the relationship between each type of flexible working arrangement and firm labour productivity. The results reveal that SMEs that only offer a nine-day fortnight contract are positively and significantly associated with productivity. A nine-day fortnight is an arrangement where employees work their regular hours over nine days instead of ten, resulting in a day off every two weeks (Keune and Galgóczi, 2006). Typically, employees work longer hours on the nine days, such as nine hours per day, to maintain the total required hours. This flexible work schedule enhances work-life balance, reduces commuting time, and can lead to improved employee morale and productivity (Metcalf, 2024). Additionally, a shorter work week can reduce fatigue and improve focus, sustaining or even boosting productivity (Horgan, 2010). However, as Table 1 and Table 2 show, this type of flexible working hours contract is the least frequent, being only offered by 7% of Scottish firms in our sample, and it occurs in only 5.2% of our firm-time observations.

The results also show that Scottish SMEs operating in primary (PRIM), construction (CONST), wholesale/retail (WHOLE), transport/storage (TRAN), accommodation/food services (ACCOM), information/communication (INFORM), financial/real estate (FINN), professional/scientific (PROF), and administrative/support (ADMIN) sectors are positively associated with higher labour productivity. Scottish SMEs that reported

exporting[9] goods or services (EXPORT) in the previous twelve months, SMEs that plan to invest in capital (premises, machinery etc.) in the following three years (CAPT) and those SMEs that have operated their businesses for more than 20 years (AGE20) are associated with higher productivity. On the other hand, start-up SMEs that have run their businesses for up to 5 years (AGE05) and women-led businesses (WOMEN) report lower productivity.

Table 5 reports the results from the estimation of equation (3) regarding the association between flexible working hours arrangements and firm actual innovation. Overall, the Wald chi-square statistic suggests that the overall model is statistically significant for both Models III and IV. The likelihood-ratio (LR) test of rho for Models III and IV is significant, suggesting that a random effects model is appropriate.

All independent and control variables are lagged by two years since innovation is measured with reference to activities undertaken in the previous three years. The results shown in Table 5 demonstrate that adopting just any type of FWAs does not lead to more innovation as ALLFLEX has a positive but statistically insignificant coefficient. However, when we consider each type of flexible working arrangements separately, we found that firms offering flexible working hours (FLEXITIME) (coef. 0.584, significant at 5%) and term-time working contracts (TERMTIME) (coef. 0.711, significant at 10%) are more likely to report innovation. Flexitime is the most commonly offered flexible working hours contract by Scottish SMEs (see Table 1), which makes this association between flexitime and innovation an important result. The positive association of innovation with these two types of flexible work could be driven by the high-skill jobs that may be covered by these contracts, this is certainly the case for term-time working, adopted predominantly in education, childcare and related services. Our findings regarding innovation and FWAs are aligned with Martínez-Sánchez et al., (2008), Soriano et al., (2019), Qi et al., (2021), and Azeem and Koey (2023) as they found a positive relationship between flexible working arrangements and product (goods or services) and operational process innovation.

[9] Conscious that the vast international trade literature treats exporting as endogenous to productivity, we ran both models first excluding the variable exporting and then lagging it by one year and the results are qualitatively the same. Hence to maximise the sample size, we report the results including exporting. These additional results are available upon request.

Table 5 - The relationship between flexible working hours arrangements and innovation in Scotland, 2015-22

VARIABLE	Model III (INNO)		Model IV (INNO)	
	Coefficient	S.E.	Coefficient	S.E.
ALLFELX $_{t-2}$	0.188	0.305		
FLEXITIME $_{t-2}$			**0.584****	0.219
ANNUAL $_{t-2}$			-0.667	0.354
TERMTIME $_{t-2}$			**0.711***	0.423
JOBSH $_{t-2}$			-0.257	0.379
NINEDAY $_{t-2}$			0.746	0.628
FOUR $_{t-2}$			-0.275	0.372
ZERO $_{t-2}$			0.104	0.380
ONCALL $_{t-2}$			-0.038	0.375
RURAL $_{t-2}$	-0.152	0.291	-0.187	0.278
AGE05 $_{t-2}$	-0.566	0.453	-0.564	0.432
AGE20 $_{t-2}$	-0.278	0.301	-0.305	0.296
SMALL $_{t-2}$	0.213	0.313	0.068	0.305
MEDIUM $_{t-2}$	0.189	0.382	0.058	0.380
WOMEN $_{t-2}$	-0.015	0.412	-0.030	0.405
SUPPORT $_{t-2}$	0.198	0.279	0.045	0.250
BPLAN $_{t-2}$	0.255	0.286	0.224	0.274
STAFF $_{t-2}$	-0.101	0.275	0.094	0.251
SKILL $_{t-2}$	**1.080****	0.416	**0.942****	0.386
PRACT $_{t-2}$	0.746	0.301	**0.536***	0.291
DEVLP $_{t-2}$	**0.797****	0.332	**0.720****	0.312
EXPORT $_{t-2}$	0.636*	0.355	0.644*	0.343
Constant	**-1.598*****	0.539	**-1.816****	0.783
Sector dummies	Yes		Yes	
Year dummies	Yes		Yes	
Number of observations	481		481	
Wald chi2(df)	33.61(19)		38.67(26)	
Prob > chi2	0.0039		0.0341	
LR test of rho=0	3.14 (p=0.036)		2.84 (p=0.046)	

Notes: Estimates from a panel logit with random effects. *, **, and *** denote significance at 10%, 5% and 1%.

There are several potential reasons why flexible working conditions can contribute to firm innovativeness. First, flexible working arrangements often enhance employee satisfaction and engagement, which can foster a more creative and motivated workforce (Azeem and Koey, 2023). In particular, firms that offer flexible hours may create a working environment where their employees can collaborate more effectively across departments, leading to enhanced brainstorming sessions that result in new product

ideas (Qi et al., 2021). Similarly, flexible working arrangements can optimise operational and managerial processes by allowing teams to analyse workflows and identify inefficiencies more readily, thus improving their internal processes (Azeem and Koey, 2023). Additionally, flexible working contracts can attract a diverse talent pool, bringing in varied perspectives and skills that can lead to novel solutions and innovations (Storey et al., 2002). Therefore, these dynamics suggest that FWAs not only support employee well-being but also serve as a catalyst for driving innovation in both product ideas and operational efficiencies within SMEs.

Regarding the other variables in Table 5, their estimated coefficients highlight that SMEs planning to increase the skills of the workforce (SKILL) and develop/launch new products, services or processes (DEVLP) in the following three years are more likely to be innovative. Additionally, SMEs that have exported goods or services (EXPORT) are more likely to report innovation.

Next, we consider the association between FWAs and the intention to innovate. Table 6 reports the results showing that firms offering any type of FWAs (ALLFLEX) (coef. 0.425, significant at 1%) are more likely to plan to develop and launch new products or services in the following three years (DEVLP). Focusing on each type of FWAs, the estimates suggest that only SMEs offering flexible working hours (FLEXITIME) (coef. 0.367, significant at 1%) and term-time working contracts (TERMTIME) (coef. 0.325, significant at 10%) tend to have a business plan to innovate in the next 3 years. This set of results corroborates and strengthens what we found for actual innovation in Table 5, establishing flexitime and term-time working as the two types of FWAs that are associated with both innovation and the intention to innovate, but it also adds the positive association between any type of FWAs and intention to innovate. These are novel results in the UK context. Although we do not know why these flexible working hours contracts enhance innovation or the intention to innovate, the literature has found that flexitime can lead to improved work-life balance, increased job satisfaction, and reduced stress levels, which in turn can enhance creativity and innovation within organizations (Azeem and Koey, 2023). Kröll and Nüesch (2019) also suggest that flexitime can lead to improved work attitudes and lower absenteeism, facilitating the sharing of insights and ideas. This enhanced collaboration helps build social and organisational knowledge, which can then be leveraged to drive innovation and improve overall firm performance.

In Table 6, the results also reveal the impacts of different business characteristics on the intention to innovate. In terms of differences across sectors, firms in health and social work (HEALTH), primary (PRIM), construction (CONST), and transport and storage

(TRAN) sectors are less likely to plan to develop and launch new products or services (DEVLP). However, firms in the ITCs (INFORM) sector are more likely to intend to innovate (DEVLP). The estimates also indicate that younger firms up to five years (AGE05) are more likely to plan to innovate, whereas firms at least 20-year-old (AGE2) are less likely to do so. Further, firms that have exported their goods or services (EXPORT) and those that seek external advice and information to increase business success (SUPPORT) tend to have a plan to develop and launch new products/services. Similarly, SMEs that have a formal written business plan (BPLAN), those that plan to increase the skills of the workforce (SKILL) or invest in capital (CAPT) or introduce new working practices (PRACT) are more likely to intend to innovate.

Table 6 - The relationship between flexible working agreements and intention to innovate in Scotland, 2015-22

	Model V Intention to innovate (DEVLP)		Model VI Intention to innovate (DEVLP)	
	Coefficient	S.E.	Coefficient	S.E.
ALLFELX	**0.425*** **	0.152		
FLEXITIME			**0.367*** **	0.138
ANNUAL			0.047	0.161
TERMTIME			**0.325***	0.186
JOBSH			0.196	0.197
NINEDAY			0.349	0.300
FOUR			-0.059	0.181
ZERO			-0.254	0.196
ONCALL			0.023	0.187
RURAL	-0.159	0.156	-0.156	0.156
PRIM	**-1.161** **	0.509	**-1.122** **	0.506
MANU	-0.153	0.445	-0.082	0.442
CONST	**-1.067** **	0.454	**-1.002** **	0.450
WHOLE	0.280	0.421	0.282	0.418
TRAN	**-0.953***	0.521	**-0.944***	0.517
ACCOM	-0.258	0.433	-0.166	0.431
INFORM	**1.385** **	0.566	**1.361** **	0.562
FINAN	-0.511	0.535	-0.534	0.530
PROF	-0.559	0.443	-0.559	0.440
ADMIN	-0.672	0.454	-0.676	0.451
EDUC	-0.703	0.676	-0.779	0.673
HEALTH	**-1.046** **	0.490	**-1.018** **	0.487
ARTS	0.381	0.649	0.392	0.644
AGE05	**0.442** **	0.223	**0.449** **	0.221
AGE20	**-0.267** **	0.154	**-0.288** **	0.153
SMALL	-0.242	0.161	-0.178	0.161
MEDIUM	-0.064	0.208	-0.028	0.209
WOMEN	-0.083	0.188	0-.098	0.187
SUPPORT	**0.510*** **	0.140	**0.493*** **	0.139
BPLAN	**0.300*** **	0.140	**0.275** **	0.139
STAFF	-0.122	0.135	-0.106	0.134
SKILL	**1.485*** **	0.198	**1.472*** **	0.195
CAPT	**0.647*** **	0.143	**0.630*** **	0.142
PRACT	**1.191*** **	0.1477	**1.172*** **	0.147
EXPORT	**1.289*** **	0.199	**1.239*** **	0.196
Constant	**-2.322*** **	0.466	-2.271	0.457
Year dummies	Yes		Yes	
Number of observations	2,623		2,623	

Wald chi2(df)	225.28 (34)	229.26 (41)
Prob > chi2	0.0000	0.0000
rho	0.435 (0.057)	0.426 (0.057)
LR test of rho=0: chibar2(01)	62.25 (p=0.000)	59.25 (p=0.000)

Notes: Estimates from a panel logit with random effects. *, **, and *** denote significance at 10%, 5% and 1%.

6. CONCLUSION AND RECOMMENDATIONS

Using the LSBS 2015-2022, this report finds that, overall, three out of four Scottish SMEs with employees offer some form of flexible working arrangements.[10] The type of contract that SMEs are more likely to adopt is flexitime, or flexible working hours, offered on average in the period 2015-22 by more than two out of three FWA firms, and just over half of all Scottish SMEs with employees. And this pattern has been unchanged over the period 2015-22, except for the drop in 2020 due to the pandemic with a recovery after that. The second most prevalent type of FWAs is the annualised hours contract offered by 29% of FWAs firms (or 22% of all Scottish SMEs with employees) followed by the term-time working at 22% (16%), the 4.5-day week contract at 21% (16%), job sharing at 20% (15%), zero-hours contracts at 20% (15%), on-call working at 19% (14%) and the nine-day fortnight working at 7% (5%). Interestingly, we discovered that the category "none of these" is chosen by 36% of FWA firms (or 26% of all Scottish SMEs) meaning that more than one-third of firms that offer flexible working hours do so under different types of arrangements, which could be ad-hoc arrangements to suit specific needs, for example part-time with changing work schedules.

We then provide a comprehensive evidence-based analysis of the key determinants of different types of flexible working arrangements adoption among Scottish SMEs. Our results reveal that innovation is a significant driver of FWAs among SMEs, with innovative firms more likely to adopt various FWAs, including flexitime and alternative work schedules. The analysis also highlights the differences in the adoption of FWAs across different sectors. The primary and the construction sectors are less likely to offer any type of FWAs, while ITCs and the professional and scientific sector are more likely to offer flexitime, the hospitality and the healthcare and social sectors are more likely to offer zero-hours contracts, in the education sector term-time work is more prevalent and in the administrative and support services sector there is a higher chance of finding on-

[10] These are unweighted statistics based on the observations in the LSBS.

call working arrangements. As highlighted by Timewise (2023) gender clearly plays a role in the degree to which businesses adopt FWAs, as we found them to be more prevalent in the education, healthcare/social and administrative/support services sectors, where there are more female-dominated roles, but not so much in construction or the primary sectors, which are male-dominated. However, these sectoral differences can self-reinforce the job segregation by gender as they can be perceived as barriers to entering inflexible professions by those workers who need such flexibility. This distinction suggests that tailored sector-specific policies may be necessary to address the unique challenges and needs of different industries.

Furthermore, business size matters in the adoption of FWAs: while medium-sized firms are inclined to adopt any type of FWAs, smaller firms are less likely to offer flexitime (the most common type of FWAs among SMEs in Scotland) and instead they rely more on zero-hours contracts. Understanding what prevents small firms from adopting more of the other types of FWAs would be a first step in addressing this disparity across business sizes. It also suggests that policy support initiatives should focus on the smaller firm segment of the business population with campaigns to inform about the benefits of introducing FWAs both for the employees (better work-life balance) and for their employers (improving staff recruitment and retention).

We also shed some light on the differences in adopting two types of contracts used by businesses to manage their variability of demand for labour: on-call working and zero-hours contracts. Zero-hours contracts are prevalent in the hospitality and healthcare sectors, while on-call working arrangements are more common in rural areas and administrative roles. SMEs with formal business plans and those planning to invest in the development of their workforce are more likely to adopt on-call working, whereas SMEs planning to invest more in capital are more likely to rely on zero-hours contracts. This different strategic approach to workforce management again requires more investigation, especially in light of the disruptive impact of artificial intelligence (AI) and robotisation in production, which may further push some firms to reduce their reliance on labour with secure contracts and resort to more FWAs without guarantee of work. Although on-call working and zero-hours contracts may often be viewed as less preferable, they remain critical in some sectors such as healthcare and hospitality, where flexibility is necessary to meet fluctuating demands. The current government pledged to ‘making work pay’ in their manifesto (Labour Party, 2024) promising greater in-work security as part of a ‘New Deal for Working People’. However, it is important for policymakers to recognise the nuanced role of these contracts, which may be chosen for their flexibility by workers (like students working in the hospitality sector to help pay for

their studies while retaining the possibility to refuse to work when called). Hence, we recommend a balancing act between the need for flexibility on the part of the employers and workers and the need to avoid exploitative contracts where workers work regular hours but are not given secure contracts. In such cases, policymakers should consider designing regulation to incentivise the adoption of alternative FWAs, for example an annualised hours contract which would give workers a more predictable income.

Our analysis also unpacks the relationships between flexible working agreements and labour productivity and innovation of Scottish SMEs. The results show that offering flexible working arrangements does not influence labour productivity in a statistically significant way, except for the nine-day fortnight working, which is positively associated with improved productivity and statistically significant, but it is also the least used flexible work contract among those adopted by SMEs.

The lack of any association between labour productivity and FWAs more generally could be due to data issues and is therefore unsurprising. This is because despite the most frequently used form of flexible employment in the UK being part-time, accounting for 24% of all employees (75% of whom are women) (Rubery et al., 2024), the LSBS data does not allow to consider the number of part-timers due to the lack of granularity of the survey information on the quantity of labour employed by SMEs, instead lumping together the number of both full-time and part-time workers.[11] Ideally, we would need the number of hours worked, rather than the number of employees, but collecting such information would be quite taxing for SMEs via a survey. We are also limited to only use a measure of whether a business adopts any FWAs because the LSBS does not record how many employees are covered by such agreements, hence it is impossible to know the extent of their usage and draw quantitatively firm conclusions on their impact. To go in this direction, we recommend the introduction in the UK of a linked employers-employees survey which would allow combining a rich dataset on workers' characteristics and employment contracts with firm-level performance measures in order to accurately capture firm productivity and understand its relationship with the workforce. Existing surveys, instead, are either focused on the side of businesses or the side of workers but this produces a lack of systematic coverage of all the workforce employed

[11] An attempt could be made to match the LSBS with the Business Register Employment Survey (BRES) through the ONS secure research service as the BRES records both part-time and full-time employees on a specific date in the year for an annual sample of approximately 87,000 businesses in England, Wales and Scotland, but the success of the matching depends on the overlap of the surveys.

by an individual firm, while administrative data recording hours worked and wages lack the richness of variables collected via surveys on workers characteristics and type of contracts. A linked employers-employees survey would allow a systematic and deeper understanding of the drivers of firm productivity in terms of employment characteristics and dynamics. Such a survey, if covering a representative sample of the business population, would capture comprehensively both quality and quantity of labour going beyond what is possible from individual case studies, and that seems especially important in an age at the cusp of dramatic changes in employment and production practices due to flexible work, AI and other disruptive technologies.

As per innovation, we considered both actual innovation in the previous three years and the intention to innovate in the following three years. We find that SMEs offering flexible working hours arrangements, particularly flexitime, are more likely to report innovation. This supports the argument that flexibility fosters a creative environment, enhancing product and process development as found in the literature. The results also indicate that different types of FWAs contribute to the intention to innovate, particularly flexitime and term-time working contracts. These findings highlight how flexible work models can be a win-win arrangement for workers and the firm, stimulating innovation plans and activities that help the firm compete and stay in the business. We cannot pinpoint the exact mechanisms at work that allow flexible working firms to be more innovative both in their actual innovation activities and in their future plans to increase innovation, but we speculate that it could be partly down to recruitment and retention of talent, hence a workforce auto-selection effect, whereby more innovative and diverse workers tend to work in places that offer more flexibility, in addition to flexibility spurring more working motivation as it allows a better work-life balance. We leave the answer to this question for future research.

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