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Abstract

I investigate the links between the part-time employment opportunities and the labour supply adjustments of older workers, focusing on both the extensive and intensive margins. Utilising data for 30 European countries in the period from 2011 to 2021, I construct a quasi-panel that compares individuals aged 60-64 with those aged 55-59 from five years prior. I find that the employees in sectors offering more part-time jobs are more likely to stay in employment, and that the total hours worked by these employees decrease at a slower rate than those of the employees in sectors imposing more rigid hours constraints. These results are most pronounced for women in manual types of occupation, but are significant across all examined worker categories. The positive relationship between the part-time employment opportunities and the total hours worked of older employees is robust to various modifications in the empirical setup. However, this relationship is heterogeneous across countries, and is least pronounced in the countries with a high availability of part-time jobs.

Keywords: older workers, labour supply, part-time employment, minimum hours constraints

JEL: J22, J26

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1. Introduction

Understanding the labour supply of older workers is becoming increasingly important. Over the past few decades, the proportion of the working-age population belonging to the oldest age groups has been rising consistently throughout Europe, and numerous countries are expecting this proportion to increase further. Moreover, as life expectancy continues to climb, people will have to remain active in the labour market longer to ensure the sustainability of pension systems.

Older workers have a relatively strong preference for part-time employment, which is often unmet (Ameriks et al., 2020; Eurofound, 2017). Many of them prefer gradual retirement over a full-time job or full retirement (Gustman and Steinmeier, 1983; Kantarci and Van Soest, 2008). However, attaining the optimal mix of work and leisure is often not possible due to minimum hours constraints set by employers. Hours constraints may be useful, as they can, for example, facilitate the organisation of work (Battisti et al., 2022; Deardorff and Stafford, 1976), contain fixed costs (Hurd, 1996), or minimise the costly sharing of knowledge (Goldin, 2014).

Minimum hours constraints are bound to have a significant impact on the working patterns of people aged 60 or older. On the one hand, there is a negative impact on employment at the extensive margin. A shortage of part-time jobs may result in some overemployed older workers exiting labour market (Bell and Rutherford, 2013; Blau and Shvydko, 2011; Charles and Decicca, 2007; Gielen, 2009), and it can discourage inactive persons from searching for a job (Ameriks et al., 2020). On the other hand, in the absence of hours constraints, many older employees might choose to work fewer hours (Börsch-Supan et al., 2018). The overall impact on total working hours is determined by the balance of these two opposing effects.

The impact of part-time employment opportunities on the total working hours of older workers is under-researched. The existing evidence comes from reforms or experiments in which employees receive some form of subsidy or partial retirement (Börsch-Supan et al., 2018; Elsayed et al., 2018; Graf et al., 2011). These studies show that partial retirement opportunities are likely to reduce the total working hours of older workers. However, the interventions analysed operate more through financial incentives for employees than through the relaxation of hours constraints.

There are large differences in the prevalence of part-time employment across European countries. These differences reflect both supply-side factors, such as variations in income (Bick et al., 2018) and social norms (Wielers et al., 2014); as well as demand-side factors, such as the economic structure, the organisational culture, and the employment regulations (OECD, 2010). Governments can directly influence the availability of part-time jobs by limiting employers' ability to refuse part-time work requests (OECD, 2021, 2010).

This paper aims to assess the empirical relationship between the part-time employment opportunities and the employment of older workers. My strategy exploits the considerable variation in hours constraints across economic sectors within individual countries. My proxy for minimum hours constraints at the sector level is the share of women aged 20-49 working part-time. I analyse whether groups of workers who are more exposed to minimum hours constraints are more likely to reduce their total working hours as they approach retirement age than groups of workers in sectors that offer more part-time jobs. My analysis is adjusted for sector-specific shocks, and for the characteristics of the groups of workers who are compared. To minimise the risk that my results are driven by unobserved sector characteristics, I also repeat the analysis using variation in part-time employment opportunities between occupation groups, rather than between sectors.

My research contributes to the literature by applying a uniform analytical framework to the group of 30 European countries. My framework enables the investigation of the links between hours constraints and the labour supply of older workers, while accounting for potential heterogeneities among different types of

workers and countries. I focus on the 2011-2021 time period, which allows me to conduct comparable analyses utilising either sectoral or occupational variations in the availability of part-time jobs.

In line with the existing evidence, I find that the availability of part-time jobs is positively related to the labour market participation of older workers. The economic significance of this relationship is notable. In the median case, an increase in the standard deviation of the country-year distribution of sectoral part-time employment opportunities is associated with a 4.3% higher employment among persons aged 60-64. In contrast, the drop in the average working hours of ageing employees is only slightly larger in the sectors offering more part-time jobs. Consequently, I find that the availability of more part-time employment opportunities is associated with a smaller decline in the total hours worked of the cohorts entering the pre-retirement period. I also observe that the identified relationships are less pronounced in countries where part-time jobs are common in all sectors.

The rest of the paper is structured as follows. Section 2 briefly reviews related studies. Section 3 outlines my empirical strategy, and Section 4 presents the data. Section 5 reports the estimation results, while Section 6 contains the robustness analysis. Section 7 provides the conclusion.

2. Related literature

Results from observational studies indicate that older workers who are subject to minimum hours constraints are more likely to exit the labour market. Based on microdata from the US Health and Retirement Study, Charles and Decicca (2007) conclude that minimum hours constraints substantially increase the probability of exiting the labour market. Since participants were questioned about their potential ability to reduce their working hours, the authors could examine the impact of hours constraints independently of individual working time preferences. Blau and Shvydko (2011) show that US firms offering flexible working hours have lower exit rates among older employees compared to firms with less working time flexibility. Gielen (2009) focuses on gender differences in the UK context, finding that men are able to adjust their working hours with their current employer, while overemployed women are more likely to leave the labour market. Bell and Rutherford (2013) argue that overemployment is a significant predictor of retirement for older workers in the UK. However, since overemployed workers are compared with all others, including those preferring full-time work, part of this effect may be explained by the relationship between a preference for part-time work and the likelihood of early retirement.

Findings pointing to a positive association between the availability of part-time jobs and the employment of older workers are not confirmed by Boockmann et al. (2018). They evaluate the effects of subsidies for reduced working time in Germany, and find that workers participating in this program are more likely to retire earlier than workers in the control group. However, this result might not solely reflect the program's effects, as it could also be influenced by the workers' self-selection into the treatment based on their unobserved characteristics.

Ameriks et al. (2020) quantify the importance of part-time employment opportunities using a discrete choice experiment among older Americans. They show that the willingness to work among non-working individuals increases by 20 pp when they are allowed to choose the number of working hours. Importantly, the sample is composed of individuals with accounts at a specific investment management company, making it non-representative of the entire population.

There is much less evidence on the effects of part-time employment opportunities on the average hours and the total hours worked by older employees. Graf et al. (2011) find that a program subsidising part-time jobs in Austria significantly decreases the total working hours of older workers participating in the scheme. An

important mechanism of this program is that the government compensates employees for a substantial part of the reduced wage, therefore lowering their incentives to work full-time. In an analysis of aggregated labour data from nine countries that introduced flexible retirement policies, Borsch-Supan et al. (2018) find that such policies significantly decrease the average working hours of older employees, with the effect on the total working hours being less visible. Again, an important component of all the considered reforms is that part-time employees are provided with access to funding, either from their retirement account or from additional government subsidies. Eseyad et al. (2018) use a discrete choice experiment to analyse the potential effects of gradual retirement in the Netherlands. They find that the availability of gradual retirement opportunities would prolong the employment of older workers, but decrease their total working hours. The positive effects on labour market participation are shown to be larger among workers in bad health.

3. Empirical strategy

In my analysis, I examine the transitions that occur between the 55-59 age group in year t and the 60-64 age group in year $t+5$. I focus on three labour market outcomes: the log of persons employed, the average number of weekly working hours, and the log of total working hours. I compare these outcomes between the economic sectors and within the country-year cells. Formally, I estimate the following model:

$$\Delta y_{c,s,t,t+5} = \beta PTE_{c,s,t} + \gamma \Delta \text{sector controls}_{c,s,t,t+5} + \zeta \text{cohort controls}_{c,s,t} + \rho_{c,t} + \epsilon_{c,s,t} \quad (1)$$

where $\Delta y_{c,s,t,t+5}$ stands for a 5-year change in one of the three labour market outcomes in country c and sector s ; $PTE_{c,s,t}$, the explanatory variable of interest, is the share of women aged 20-49 working part-time in a given country-sector cell in year t , smoothed with the Hodrick-Prescott filter; the sector controls include the 5-year change in the labour market outcome of interest among persons aged 20-49, and the 5-year change in the stock of ICT capital per employee in the US; the cohort controls are based on the data for the 55-59 age group in year t and include the share of tertiary-educated workers, the share of manual workers, and the share of women; $\rho_{c,t}$ is a vector of country-year fixed effects; and t takes values from 2011 to 2016 with yearly frequency.

The sectoral differences in the shares of part-time employees are determined by sector-specific minimum hours constraints and the workforce composition. Hours constraints may be related to workers' complementarities (Battisti et al., 2022; Deardorff and Stafford, 1976), fixed costs (Hurd, 1996), or the costly sharing of knowledge (Goldin, 2014). I approximate part-time employment opportunities in an economic sector by the share of women aged 20-49 working part-time, as this demographic group is typically characterised by a strong preference for short working hours. Importantly, this variable is highly correlated with the shares of part-time workers among older workers (Table A1 in Appendix).

By including the changes in the labour market outcomes of young and prime-aged employees, I control for the sector-specific demand shocks that may affect the employment and the hours worked of older workers. Furthermore, technology adoption can represent a negative demand shock, especially for older workers (Ahituv and Zeira, 2011; Albinowski and Lewandowski, 2023). Therefore, I include an exogenous measure of computerisation that varies across sectors and time.¹

¹ It is not possible to use country-specific ICT controls, as these data are missing for many countries. However, as demonstrated by Albinowski and Lewandowski (2023), the US investment in ICT capital is a good instrument for actual investment at the country-sector level in European countries.

The cohort controls reflect the structure of sector employees aged 55-59, which may influence the employment patterns of the cohort over the next few years. Previous findings from the literature indicate that the timing of retirement is related to workers' educational attainment (Hanel and Riphahn, 2012; Solem et al., 2016; Vermeer et al., 2019) and their occupation (Seibold et al., 2023). The share of women is included because women work, on average, fewer hours than men, which can influence the size of the potential adjustments at the intensive margin in the pre-retirement age groups.

As an extension of the baseline analysis, I investigate whether the relationship between part-time employment opportunities and labour market transitions varies across gender and occupation types (manual or cognitive). Each employee is assigned to one of four samples, and I estimate regressions separately for each sample. Here, the part-time employment opportunities and controls for the changes in the labour market outcomes of young and prime-aged individuals are based on the sample of either manual or cognitive workers.

The inclusion of the country-year fixed effects implies that the relationship between part-time employment opportunities and dependent variables is analysed within country-year cells. Consequently, the cohorts compared are subject to the same country-wide legislation and social norms. However, there may still be some omitted variables correlated with both the part-time employment opportunities and the employment patterns of older workers. In that case, the estimation results would not fully reflect the causal effects of part-time employment opportunities. I address this issue to some extent with an alternative specification that uses occupations instead of sectors as units of observation.

I assign an equal weight to each country-year cell. However, a country-year's weight can be lowered when some sectors are dropped due to a small number of observations (fewer than 50 employees aged 55-59 or fewer than 50 women aged 20-49). The weights of particular sectors are based on their shares in the country's employment of people aged 55-59. When analysing samples based on gender and occupation type, the weight calculations are based only on the employees belonging to a given group.

4. Data

I use data from the EU Labour Force Survey (EU-LFS), which is the largest labour market survey harmonised across all EU countries. It is a highly reliable source of cross-country annual data on the employment and the hours worked in economic sectors (at the 1-digit NACE level) and occupations. The questionnaires are filled in based on the responses provided by individual employees. Therefore, the survey captures the informal economy and micro enterprises, which are not covered by the EU Structure of Earnings Survey (EU-SES) conducted among firms.

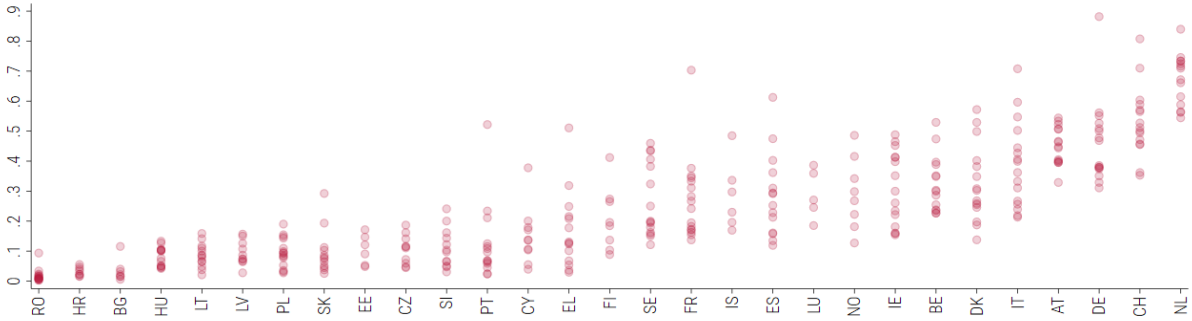
An important limitation of the EU-LFS is that it does not allow for the tracking of workers over time. However, its large sample size enables the construction of a quasi-panel at the sector-age group level. With age data grouped in 5-year intervals, we can observe the same cohort every five years. I utilise NACE Rev. 2 sectoral classification, which is available from 2008 onwards. I exclude the agriculture and education sectors. Education is excluded due to the inconsistent reporting of working hours by teachers. Furthermore, I add mining to manufacturing, and I combine sections D and E into one section representing utilities. As a result, I have data for 16 economic sectors.

In a robustness analysis, my observation units are based on occupation groups (2-digit level) rather than sectors. I use the ISCO-08 classification that has been applied to the EU-LFS data since 2011. After teachers and agriculture workers are dropped, 36 occupation groups enter the sample.

I define the time period of my analysis as 2011-2021, for which the new classification of occupations is available. My sample consists of 30 European countries: all the EU member states (except for Malta), as well as Iceland, Norway, Switzerland, and the United Kingdom. I drop from the sample the country-sector-year cells with fewer than 50 observed employees aged 55-59 or with fewer than 50 women aged 20-49. The baseline regression sample consists of 2,114 cells representing 1.02 million worker-level observations of persons aged 55-59 in the years 2011-2016. A median cell contains 237 observations. For the occupation-based analysis, the number of cells is 3,520, which represents a total of 0.99 million observations, with a median cell having 162 observations.

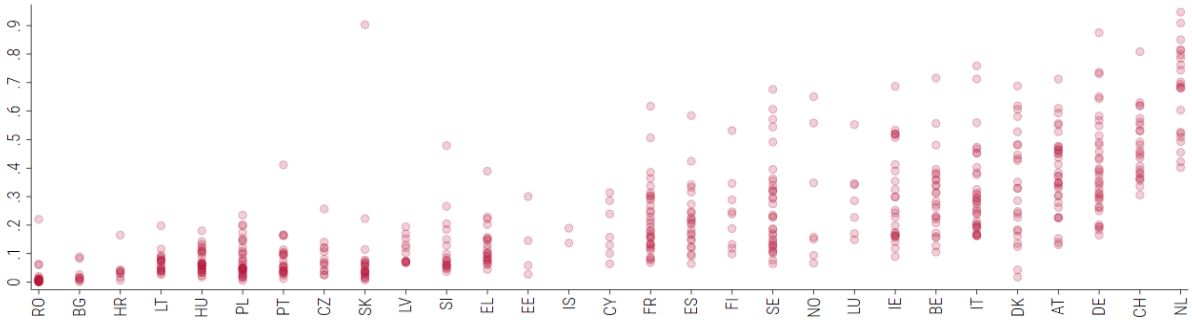
The explanatory variable of interest is the share of women aged 20-49 working part-time. For the purposes of this analysis, part-time work is defined as employment for fewer than 35 hours per week. A robustness check also considers a 30-hour threshold. This variable aims to capture the prevalent work norms within specific sectors. To mitigate the impact of year-to-year fluctuations, I smooth this variable with a Hodrick-Prescott filter. In the robustness check, results based on the unfiltered share of part-time employment are also reported.

Figure 1. Variation in the part-time employment share of women aged 20-49, by sector, 2015



Note: Each circle represents one sector. Source: Own elaboration based on EU-LFS.

Figure 2. Variation in the part-time employment share of women aged 20-49, by occupation, 2015



Note: Each circle represents one occupation group. Source: Own elaboration based on EU-LFS.

There is substantial variation in part-time employment within countries, which supports my empirical strategy. In Figure 1, I report the distribution of the main explanatory variable in a single year, with each circle representing one sector. In Figure 2, I report the variation between the occupation-based cells. There, the dispersion of part-time employment shares is even larger than in the case of sectors, with the highest values typically being observed for elementary occupations, such as cleaners. However, the circles in Figure 2 represent a smaller number of observed employees. In addition, for some countries, the number of

occupation-year cells entering the regression sample is lower than in the case of the analysis based on sectors.

I account for the potential labour market effects of new technologies by utilising sectoral variation in ICT capital. I use data for the United States, which is a country at the technology frontier. The data are obtained from the EU-KLEMS 2023 release and from the US Bureau of Economic Analysis. I add net stocks of three types of capital: computer hardware, telecommunications equipment, and computer software and databases. I use data expressed in chain-linked volumes to account for the systematic price decline of ICT capital. The variable entering the regression is the 5-year change in capital stock (in 10 thousands of USDs) per employee.

Table 1. Distributions of key variables

	Mean	p10	p25	p50	p75	p90
Whole sample						
Share of part-time employees, women aged 20-49	0.23	0.03	0.07	0.18	0.37	0.51
Average weekly hours worked at ages 55-59	39.5	34.5	37.2	39.8	41.6	44.4
5-year change in average weekly hours worked	-1.3	-4.1	-2.6	-1.1	0.0	1.5
5-year change in the log of employment	-0.47	-0.93	-0.67	-0.41	-0.24	-0.11
5-year change in the log of total hours worked	-0.51	-0.97	-0.71	-0.44	-0.27	-0.15
Share of women aged 55-59	0.44	0.16	0.26	0.42	0.59	0.79
Share of manual workers aged 55-59	0.45	0.13	0.23	0.47	0.66	0.76
Cognitive workers, women						
Average weekly hours worked at ages 55-59	37.1	30.4	34.3	37.5	40.1	41.9
5-year change in average weekly hours worked	-1.5	-5.1	-3.1	-1.1	0.2	1.6
5-year change in the log of employment	-0.55	-1.13	-0.77	-0.45	-0.26	-0.12
5-year change in the log of total hours worked	-0.60	-1.22	-0.84	-0.49	-0.30	-0.14
Cognitive workers, men						
Average weekly hours worked at ages 55-59	42.8	38.6	40.2	42.0	44.7	48.1
5-year change in average weekly hours worked	-1.5	-5.1	-3.2	-1.4	0.1	1.7
5-year change in the log of employment	-0.43	-0.91	-0.61	-0.37	-0.20	-0.05
5-year change in the log of total hours worked	-0.48	-0.93	-0.67	-0.41	-0.24	-0.08
Manual workers, women						
Average weekly hours worked at ages 55-59	34.6	25.3	30.5	35.0	39.3	41.8
5-year change in average weekly hours worked	-1.5	-5.6	-2.8	-1.1	0.4	2.1
5-year change in the log of employment	-0.61	-1.27	-0.87	-0.52	-0.27	-0.14
5-year change in the log of total hours worked	-0.67	-1.39	-0.92	-0.56	-0.31	-0.14
Manual workers, men						
Average weekly hours worked at ages 55-59	41.4	37.2	39.2	40.7	42.6	46.1
5-year change in average weekly hours worked	-1.4	-5.0	-2.8	-1.2	-0.1	1.5
5-year change in the log of employment	-0.51	-1.07	-0.73	-0.43	-0.24	-0.10
5-year change in the log of total hours worked	-0.55	-1.11	-0.76	-0.47	-0.27	-0.11

Note: Reported distributions are based on the regression samples and weights. An observation unit is a country-sector-year cell.

To define subsamples based on gender and occupation type, I use the classification of occupations developed by Lewandowski et al. (2020). The sector-year cells entering these subsamples meet the criteria of covering at least 50 observed employees aged 55-59 and at least 50 women aged 20-49 in a given occupation type. Therefore, the sample sizes are substantially smaller than those for the baseline analysis.

In Table 1, I report the distributions of the key variables under consideration. Employees aged 55-59 work, on average, 39.5 hours per week, with considerable variation along the gender dimension. On average, women in cognitive occupations work 37.1 hours per week, while women employed in manual occupations work 34.6 hours. For men, the respective figures are 42.8 hours and 41.4 hours. Employees aged 60-64 work, on average, 1.3 fewer hours per week than employees aged 55-59 in the same sector five years earlier. However, the most pronounced change occurs at the extensive margin. On average, the log of employed persons is reduced by 0.47 (representing a 37.5% decrease in employment) in the 60-64 age group. The total hours worked are, in turn, reduced by 40%. We observe larger reductions in the total hours worked in the manual occupations than in the cognitive occupations, and among women than among men.

5. Results

In sectors that offer more part-time jobs, older workers are significantly more likely to remain employed. For every 1 pp higher share of women aged 20-49 working part-time, the 5-year decrease in employment is reduced by 0.49 pp (Table 2). The economic relevance of this coefficient is high. When the part-time employment opportunities are larger by a median standard deviation of the country-year distribution (8.7 pp), the employment of people aged 60-64 is 4.3% higher. Notably, this relationship is stronger among manual workers. Manual jobs typically require greater physical exertion than cognitive jobs, which could make it challenging for ageing manual workers to maintain full-time positions.

Table 2. Estimation results for the log of employment

Sample	(1)	(2)	(3)	(4)	(5)
	All	Cognitive workers Women	Men	Manual workers Women	Men
Part-time employment opportunities	0.49*** (0.12)	0.41** (0.19)	0.57*** (0.18)	0.71*** (0.15)	0.71*** (0.11)
Δ Log of employment, workers aged 20-49	0.40*** (0.07)	0.20 (0.15)	0.31** (0.13)	0.60*** (0.11)	0.58*** (0.10)
Δ ICT capital	-0.01* (0.01)	-0.05* (0.03)	-0.01 (0.01)	-0.18 (0.20)	-0.05 (0.04)
Share of tertiary-educated	0.25*** (0.07)	0.24*** (0.08)	0.35*** (0.07)	1.24*** (0.46)	-0.14 (0.37)
Share of manual workers	-0.01 (0.04)				
Share of women	-0.02 (0.04)				
R-squared	0.66	0.61	0.51	0.75	0.75
No. of observations	2114	1087	1183	629	831

*Note: In this table, I present my baseline estimates for the specification with the 5-year change in the log of employment as the dependent variable. The observation unit is a country-sector cell. The employment of persons aged 55-59 is observed in the years 2011-2016, and is compared with the employment of persons aged 60-64 five years later. The part-time employment opportunities are proxied by the share of women aged 20-49 working part-time, smoothed with the Hodrick-Prescott filter. Country-year fixed effects are included. In the regression reported in column 1, I use the whole sample, while the regressions reported in columns 2-5 are estimated on the subsamples. Standard errors (in brackets) are clustered at the country-sector level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Source: the author's calculations based on the EU-LFS and EU-KLEMS data.*

The average working hours of older employees decrease more in the sectors that allow more part-time work (Table 3). However, the economic significance of this relationship is low. For every 10 percentage points higher share of women aged 20-49 working part-time, the 5-year decrease in average weekly hours is larger by 0.23; that is, by 14 minutes. Importantly, this result can be driven by two potentially counterbalancing mechanisms. First, individuals working in more flexible sectors are more likely to reduce their working hours in the pre-retirement period, in line with the argument that older workers often prefer gradual retirement over a sharp transition from a full-time job to retirement (Gustman and Steinmeier, 1983). Second, the composition of the remaining workforce can affect the average working hours. If the proportion of full-time employees among those who are exiting is larger in the sectors that offer fewer part-time jobs, then the higher availability of part-time employment opportunities could be associated with a smaller reduction in average hours. For manual workers and for women in cognitive occupations, I find that the coefficient of interest is not significantly different from zero. Only for men in cognitive occupations is there a clear positive relationship between part-time employment opportunities and the size of the reduction in average working hours.

Table 3. Estimation results for the average weekly working hours

Sample	(1)	(2)		(4)	(5)
	All	Cognitive workers		Manual workers	
		Women	Men	Women	Men
Part-time employment opportunities	-2.3*** (0.9)	-2.1 (1.7)	-4.4*** (1.2)	0.6 (1.4)	-1.8 (1.3)
Δ Average hours, workers aged 20-49	0.5*** (0.1)	0.3 (0.2)	0.8*** (0.2)	0.5*** (0.2)	0.6*** (0.1)
Δ ICT capital	0.1* (0.1)	0.3** (0.2)	0 (0.1)	0.6 (1.8)	0.1 (0.3)
Share of tertiary-educated	-0.4 (0.6)	0.1 (0.6)	-1.3** (0.6)	-4.0 (4.6)	-3.4 (2.8)
Share of manual workers	0.4 (0.4)				
Share of women	0.6 (0.4)				
R-squared	0.37	0.43	0.44	0.49	0.45
No. of observations	2114	1087	1183	629	831

*Note: In this table, I present my baseline estimates for the specification with the 5-year change in the average working hours per week as the dependent variable. The observation unit is a country-sector cell. The average working hours of persons aged 55-59 are observed in the years 2011-2016, and are compared with those of persons aged 60-64 five years later. The part-time employment opportunities are proxied by the share of women aged 20-49 working part-time, smoothed with the Hodrick-Prescott filter. Country-year fixed effects are included. In the regression reported in column 1, I use the whole sample, while the regressions reported in columns 2-5 are estimated on the subsamples. Standard errors (in brackets) are clustered at the country-sector level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Source: the author's calculations based on the EU-LFS and EU-KLEMS data.*

The estimation results for the 5-year changes in total working hours reveal patterns that are similar to those of the results for the changes in employment, although the coefficients pertaining to part-time employment opportunities are a bit lower (Table 4). When the measure of part-time employment opportunities is 1 pp higher, the 5-year reduction in total hours is reduced by 0.39 pp. Thus, the positive relationship between the availability of part-time jobs and the propensity to remain employed dominates the negative relationship with the average working hours. A variation in the part-time employment opportunities by a median standard deviation of the country-year distribution is associated with the total working hours of people aged 60-64 varying by 3.4%. While these estimates may not reflect pure causal effects, they suggest that providing older

workers with flexible jobs not only encourages them to participate in the labour market, it also increases their total labour supply.

Table 4. Estimation results for the log of total hours worked

Sample	(1)	(2)	(3)	(4)	(5)
	All	Cognitive workers Women	Men	Manual workers Women	Men
Part-time employment opportunities	0.39*** (0.12)	0.32 (0.21)	0.45** (0.18)	0.68*** (0.14)	0.65*** (0.11)
Δ Log of total hours worked, workers aged 20-49	0.42*** (0.07)	0.21 (0.15)	0.32*** (0.12)	0.61*** (0.10)	0.60*** (0.11)
Δ ICT capital	-0.01 (0.01)	-0.04 (0.02)	-0.01 (0.01)	-0.17 (0.22)	-0.04 (0.04)
Share of tertiary-educated	0.23*** (0.07)	0.24*** (0.09)	0.32*** (0.07)	1.07** (0.51)	-0.22 (0.37)
Share of manual workers	0.00 (0.04)				
Share of women	0.00 (0.05)				
R-squared	0.67	0.62	0.50	0.75	0.74
No. of observations	2114	1087	1183	629	831

*Note: In this table, I present my baseline estimates for the specification with the 5-year change in the log of total working hours as the dependent variable. The observation unit is a country-sector cell. The total working hours of persons aged 55-59 are observed in the years 2011-2016, and are compared with those of persons aged 60-64 five years later. The part-time employment opportunities are proxied by the share of women aged 20-49 working part-time, smoothed with the Hodrick-Prescott filter. Country-year fixed effects are included. In the regression reported in column 1, I use the whole sample, while the regressions reported in columns 2-5 are estimated on the subsamples. Standard errors (in brackets) are clustered at the country-sector level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Source: the author's calculations based on the EU-LFS and EU-KLEMS data.*

Next, I assess whether the identified relationships are uniform across the analysed countries. I split the countries into three terciles based on the incidence of part-time employment among women aged 20-49. The positive associations between part-time employment opportunities and both employment and total hours worked are not statistically significant for the countries in the top tercile in terms of the availability of part-time jobs (Figure 3). In contrast, these relationships are strongest in the countries in the bottom tercile. A possible interpretation of these results is that in the countries where part-time employment is more widespread, employees in all sectors have considerable latitude to adjust their working hours; whereas in the countries where part-time jobs are scarce, any relaxation of hours constraints may have significant effects.

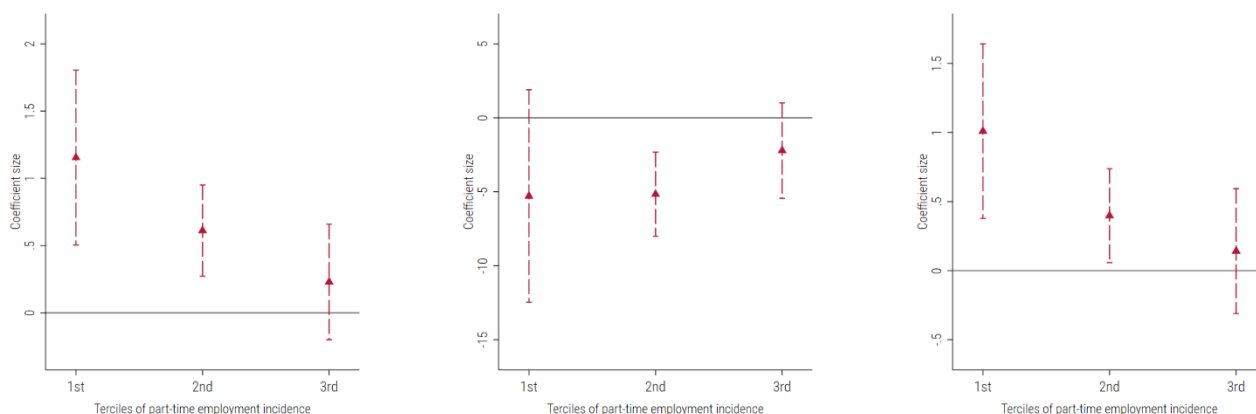
I also report the estimation results for individual countries (Table A2 in the Appendix). The country-level results should be interpreted with particular caution, as they are based on a small number of observations, and some estimates may be driven by unobserved sector-specific shocks. However, there are a number of interesting observations. First, the relationship between part-time employment opportunities and changes in average weekly working hours is highly heterogeneous across countries. In some Eastern European countries, the availability of more part-time jobs is associated with significant drops in average hours. Second, in the three countries with the highest incidence of part-time employment (the Netherlands, Switzerland, and Austria), there is no positive link between the sectoral availability of part-time jobs and the 5-year changes in employment, whereas the relationship with the 5-year changes in total working hours is even negative (though statistically insignificant). Third, no country exhibits a significant negative relationship between the availability of part-time employment and the 5-year changes in total working hours. Conversely, in 11 countries, there is a positive and statistically significant link.

Figure 3. Estimation results, countries split into groups based on the incidence of part-time employment

A: Log of employment

B: Average weekly working hours

C: Log of total hours worked



Note: In this Figure, I report the results of baseline specification, estimated separately for three groups of countries based on the incidence of part-time employment. The categorisation of countries into groups is reported in Table A2 in the Appendix. The dependent variable is denoted in the panel header. I only report the coefficients pertaining to the explanatory variable of interest, that is, the share of women aged 20-49 working part-time. The error bars represent 95% confidence intervals. Standard errors are clustered at the country-sector level. Source: the author's calculations based on the EU-LFS and EU-KLEMS data.

6. Robustness analysis

In this section, I verify whether my findings are sensitive to the methodological choices. First, I consider modifications to the baseline specification, which uses country-sector cells as observation units. Second, I repeat the estimation of the baseline specification using occupation groups instead of sectors.

The results are not sensitive to changes in the main explanatory variable of interest. For the baseline analysis, I define part-time employment as working less than 35 hours. In column 2 of Table 5, I report the results with the threshold lowered to 30 hours. The coefficient sizes increase because the stricter definition of part-time jobs results in lower values of the explanatory variable. In column 3, the measure of part-time employment opportunities is based on the exact share of women aged 20-49 working part-time in the year t , rather than being smoothed with the Hodrick-Prescott filter. This modification has only a minor impact on the coefficients of interest.

Next, I consider changes in the choice of the sample. In column 4, cells with fewer than 100 observed employees aged 55-59, or fewer than 100 women aged 20-49, are excluded from the sample. This reduces the number of observations by 22%, potentially leaving the noisiest ones out. The estimates are virtually unaffected. In column 5, I expand the sample by adding the years 2008-2010. These years are omitted from the baseline analysis. The classification change makes it impossible to conduct a parallel analysis using occupation groups for this period. However, their inclusion barely changes the results. The results are also robust to the exclusion of the pandemic period of 2020-2021 (not reported in the interests of space).

The coefficient sizes do depend on the choice of weights assigned to the cells. In the baseline analysis, each country is assigned equal weight, although this weight can be effectively reduced when certain cells are excluded from the regression sample. Another valid approach is to assign greater weight to cells with a higher number of observed employees, thereby reducing statistical noise. Such a decision leads to substantially larger coefficients of interest (column 6). Using weights that represent the actual employment of persons aged 55-59 in specific country-sector cells results in even larger estimates that are almost double those of the baseline (column 7). This variation in the results is consistent with the previously reported

heterogeneity between countries. It also indicates that the baseline approach provides conservative estimates of the relationship between part-time employment opportunities and the changes in the labour supply of older workers.

Table 5. Robustness analysis

	(1) Baseline	(2) Stricter definition of part- time job	(3) Measure of part- time jobs not filtered	(4) Cells with at least 100 obs.	(5) Years 2008- 2010 included	(6) Weights: sq. root of obs.	(7) Weights: sectors' actual employ- ment
A: Log of employment							
Part-time employment opportunities	0.49*** (0.12)	0.65*** (0.13)	0.44*** (0.11)	0.51*** (0.13)	0.53*** (0.12)	0.69*** (0.14)	0.84*** (0.20)
B: Average weekly working hours							
Part-time employment opportunities	-2.34*** (0.87)	-2.87*** (1.02)	-2.29*** (0.80)	-2.13** (0.89)	-2.77*** (0.87)	-2.44*** (0.84)	-1.79* (0.92)
C: Log of total working hours							
Part-time employment opportunities	0.39*** (0.12)	0.53*** (0.13)	0.35*** (0.11)	0.40*** (0.13)	0.42*** (0.12)	0.57*** (0.13)	0.74*** (0.20)
No. of observations	2114	2114	2114	1645	3172	2114	2114

*Note: In this table, I present the set of robustness checks of the baseline analysis using country-sector cells as observation units. In panel A, I report the results for the log of employment; in panel B, I report the results for the average working hours; and in panel C, I report the results for the log of total working hours. I only report the coefficients pertaining to the explanatory variable of interest, that is, the share of women aged 20-49 working part-time. In column 1, I repeat the baseline results. In the regressions reported in column 2, part-time work is defined as working less than 30 hours per week, instead of the baseline threshold of 35 hours. In the regressions reported in column 3, the explanatory variable of interest is not smoothed with the Hodrick-Prescott filter. The regressions reported in column 4 are estimated on the sample that excludes cells with fewer than 100 employees aged 55-59 or fewer than 100 women aged 20-49. In the regressions for column 5, I include in the analysis cohorts aged 55-59 observed in the years 2008-2010. In the regressions reported in column 6, the weights for country-sector cells are derived from the square root of the number of observed employees aged 55-59; whereas in the regressions for column 7, the weights are based on the actual employment in the country-sector cells. Standard errors (in brackets) are clustered at the country-sector level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Source: the author's calculations based on the EU-LFS and EU-KLEMS data.*

As a major robustness check, I utilise the variation in part-time employment opportunities between occupation groups rather than between sectors. This alternative approach allows me to rule out the possibility that the baseline results are driven by some unobserved sector-specific factors correlated with the explanatory variable of interest.²

The results for the log of employment (Table 6) are mostly similar to the baseline findings (Table 2). For the whole sample, the coefficient pertaining to part-time employment opportunities is very close to the baseline result (0.42 compared with 0.49). The only significant difference concerns the sample of men in manual occupations. In the identification using occupation groups, the coefficient of interest is much lower and is not statistically significant.

Unlike in the baseline results, the negative relationship between part-time employment opportunities and the change in average working hours lacks statistical significance for the entire sample (Table 7). However, a subsample analysis reveals patterns that are similar to those in the baseline specification, where a significant negative coefficient is observed exclusively for men in cognitive occupations.

² In the specification that utilizes occupation groups, I do not control for changes in ICT capital, which are observed at the sectoral level, nor do I control for the share of manual workers, as this variable would constitute a fixed effect for manual occupations.

Table 6. Estimation results for the log of employment, occupation-based cells

Sample	(1)	(2)	(3)	(4)	(5)
	All	Cognitive workers Women	Men	Manual workers Women	Men
Part-time employment opportunities	0.42*** (0.16)	0.42*** (0.14)	0.46*** (0.12)	0.86*** (0.21)	0.39 (0.26)
Δ Log of employment, workers aged 20-49	0.55*** (0.06)	0.85*** (0.13)	0.69*** (0.07)	0.37* (0.21)	0.52*** (0.16)
Share of tertiary-educated	0.15*** (0.04)	0.06 (0.05)	0.20*** (0.05)	0.60 (0.48)	0.11 (0.30)
Share of women	-0.08 (0.06)				
R-squared	0.52	0.64	0.55	0.66	0.60
No. of observations	3520	1354	1409	785	882

Note: In this table, I present the robustness analysis for the specification with the 5-year change in the log of employment as the dependent variable. The observation unit is a country-occupation group cell. The employment of persons aged 55-59 is observed in the years 2011-2016, and is compared with the employment of persons aged 60-64 five years later. The part-time employment opportunities are proxied by the share of women aged 20-49 working part-time, smoothed with the Hodrick-Prescott filter. Country-year fixed effects are included. In the regression reported in column 1, I use the whole sample, while the regressions reported in columns 2-5 are estimated on the subsamples. Standard errors (in brackets) are clustered at the country-occupation group level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Source: the author's calculations based on the EU-LFS data.

The findings related to total working hours (Table 8) closely align with the baseline specification, except for the already noted difference for men in manual occupations. Taken together, the two alternative identification strategies imply that the reduction in total working hours is smaller among older employees who are exposed to more part-time employment opportunities. While this relationship is most pronounced among women working in manual occupations, it is economically relevant in all of the considered groups.

Table 7. Estimation results for the average weekly working hours, occupation-based cells

Sample	(1)	(2)	(3)	(4)	(5)
	All	Cognitive workers Women	Men	Manual workers Women	Men
Part-time employment opportunities	-0.8 (0.8)	-1.3 (1.4)	-4.0*** (1.4)	-1.5 (1.2)	-0.6 (1.2)
Δ Average hours, workers aged 20-49	0.5*** (0.1)	0.2* (0.1)	0.6*** (0.1)	0.6*** (0.1)	0.7*** (0.1)
Share of tertiary-educated	0.0 (0.2)	-0.1 (0.4)	-0.8** (0.3)	-0.8 (3.7)	-3.4 (2.1)
Share of women	-0.3 (0.3)				
R-squared	0.30	0.48	0.36	0.51	0.48
No. of observations	3520	1354	1409	785	882

Note: In this table, I present the robustness analysis for the specification with the 5-year change in the average working hours per week as the dependent variable. The observation unit is a country-occupation group cell. The average working hours of persons aged 55-59 are observed in the years 2011-2016, and are compared with those of persons aged 60-64 five years later. The part-time employment opportunities are proxied by the share of women aged 20-49 working part-time, smoothed with the Hodrick-Prescott filter. Country-year fixed effects are included. In the regression reported in column 1, I use the whole sample, while the regressions reported in columns 2-5 are estimated on the subsamples. Standard errors (in brackets) are clustered at the country-occupation group level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Source: the author's calculations based on the EU-LFS data.

Table 8. Estimation results for the log of total hours worked, occupation-based cells

Sample	(1)	(2)	(3)	(4)	(5)
	All	Cognitive workers Women	Men	Manual workers Women	Men
Part-time employment opportunities	0.37** (0.14)	0.34** (0.16)	0.37*** (0.13)	0.80*** (0.19)	0.38 (0.23)
Δ Log of total hours worked, workers aged 20-49	0.55*** (0.06)	0.82*** (0.12)	0.70*** (0.07)	0.35* (0.21)	0.49*** (0.15)
Share of tertiary-educated	0.15*** (0.04)	0.06 (0.06)	0.18*** (0.05)	0.68 (0.50)	0.02 (0.29)
Share of women	-0.10* (0.06)				
R-squared	0.53	0.65	0.54	0.70	0.61
No. of observations	3520	1354	1409	785	882

Note In this table, I present the robustness analysis for the specification with the 5-year change in the log of total working hours as the dependent variable. The observation unit is a country-occupation group cell. The total working hours of persons aged 55-59 are observed in the years 2011-2016, and compared with those of persons aged 60-64 five years later. The part-time employment opportunities are proxied by the share of women aged 20-49 working part-time, smoothed with the Hodrick-Prescott filter. Country-year fixed effects are included. In the regression reported in column 1, I use the whole sample, while the regressions reported in columns 2-5 are estimated on the subsamples. Standard errors (in brackets) are clustered at the country-occupation group level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Source: the author's calculations based on the EU-LFS data.

7. Conclusions

From a theoretical perspective, the impact of the availability of part-time jobs on the total labour supply of older workers is uncertain. The existing empirical evidence is based on the policies promoting gradual retirement. Typically, the negative effects of such policies on the average working hours are found to be larger than the positive employment effects. This results in a lowered total hours worked by older employees. However, these programs provide the older part-time employees with additional funding, thus lowering their incentives to work full-time.

In this study, I examine the role of differences between sectors and occupation groups in the incidence of part-time employment. Specifically, I use the share of women aged 20-49 working part-time to abstract from the demographic determinants of the part-time work. The differences in this indicator largely reflect the hours constraints and work norms characteristic of different jobs. Hence, in sectors in which smaller proportions of women in their child-rearing years work part-time, older employees may find it more difficult to reduce their working hours.

I find that older employees in more flexible sectors or occupations have a higher propensity to remain employed during the preretirement period. Furthermore, these employees tend to reduce their total working hours less than employees in sectors or occupations with stricter hours constraints. The economic significance of this relationship is sizable, but it varies between countries. Most notably, this relationship is not statistically significant for the group of countries with the highest incidence of part-time employment. In these countries, part-time jobs are available in all sectors and occupation groups.

It is important to note that the findings from this study cannot be extrapolated to younger groups of workers. The availability of part-time employment opportunities may significantly delay the outflow of older workers from the labour market, which could have a positive impact on the total hours worked by older employees. In contrast, the potential gains at the extensive margin may be more limited for prime-aged employees, whose labour market participation is usually already high.

The findings of this study point to the potential for labour market reforms in countries where part-time employment is less common. Such reforms could enable older employees to better align their working hours with their personal preferences. A key reform might involve limiting the ability of employers to deny the part-time work requests of older workers. As well as empowering these workers, this would foster a work culture in which reduced hours are normal for those nearing retirement. While encouraging extended employment, it is unlikely that such a reform would diminish the total working hours of older employees. However, this approach may lead to some costs for firms, necessitating adjustments in their managerial practices. To mitigate these costs, the detailed design of the regulations should include appropriate provisions. Examples include a reasonable notice period before a part-time work request becomes effective, or exemption clauses for specific circumstances.

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Appendix A. Additional Tables

Table A1. The relationships between the shares of part-time employees among women aged 20-49 and persons aged 55-59

Sample	(1)	(2)	(3)	(4)	(5)	(6)
	Women	All Men	Cognitive workers Women	Cognitive workers Men	Manual workers Women	Manual workers Men
Share of women aged 20-49 working part-time	0.88*** (0.04)	0.30*** (0.03)				
Share of women aged 20-49 in cognitive occupations working part-time			0.80*** (0.05)	0.18*** (0.04)		
Share of women aged 20-49 in manual occupations working part-time					0.94*** (0.05)	0.32*** (0.04)
R-squared	0.93	0.55	0.95	0.57	0.96	0.69
No. of observations	2113	2113	1087	1183	629	831

Note: The dependent variable is the sectoral share of individuals aged 55-59 working part-time. In each regression, I control for the country-year fixed effects. Standard errors (in brackets) are clustered at the country-sector level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Source: author's elaboration based on the EU-LFS data.

Table A2. Country-level results

Country group: bottom tercile	Romania	Bulgaria	Croatia	Slovakia	Hungary	Lithuania	Poland	Czechia	Estonia	Latvia
A: Log of employment										
Part-time employment opportunities	6.17* (2.89)	3.26*** (0.40)	-6.64 (3.76)	0.37 (0.52)	1.67** (0.69)	2.51*** (0.63)	1.70*** (0.27)	1.09 (0.81)	1.65* (0.74)	0.79** (0.34)
B: Average working hours										
Part-time employment opportunities	-47.1* (25.8)	-11.1** (4.7)	-37.3 (22.1)	8.2*** (2.5)	-20.7* (11.3)	-4.5 (13.4)	-10.2*** (3.4)	-26.8*** (7.2)	-5.7 (10.7)	-15.5* (8.2)
C: Log of total working hours										
Part-time employment opportunities	4.67 (2.98)	3.09*** (0.42)	-8.14 (4.88)	0.7 (0.49)	1.01 (0.98)	2.59*** (0.80)	1.34*** (0.26)	0.48 (0.93)	1.44 (0.92)	0.37 (0.25)
No. of observations	87	45	42	81	86	72	90	58	36	54
Country group: second tercile	Slovenia	Portugal	Greece	Cyprus	Finland	France	Spain	Sweden	Iceland	Ireland
A: Log of employment										
Part-time employment opportunities	1.35 (1.00)	0.56 (0.44)	0.61 (0.68)	-0.19 (1.06)	0.83* (0.43)	2.65*** (0.46)	0.78** (0.36)	0.26 (0.18)	-0.23 (1.27)	1.16*** (0.29)
B: Average working hours										
Part-time employment opportunities	-16.7** (5.9)	-4.3* (2.3)	-0.4 (6.4)	5.8 (9.9)	-7.3* (3.5)	-7.4** (2.5)	7.1** (2.9)	-2.9 (2.4)	25.9* (11.6)	-11.8 (7.0)
C: Log of total working hours										
Part-time employment opportunities	0.91 (1.06)	0.36 (0.43)	0.67 (0.69)	-0.06 (1.07)	0.39 (0.38)	2.30*** (0.46)	1.00** (0.37)	0.16 (0.20)	0.15 (1.03)	0.83*** (0.26)
No. of observations	71	86	89	56	47	96	80	90	24	86
Country group: top tercile	Norway	Luxem.	Belgium	Denmark	Italy	UK	Germany	Austria	Switzerland	Netherlands
A: Log of employment										
Part-time employment opportunities	-0.54 (0.45)	-3.17 (1.97)	1.42* (0.77)	0.71*** (0.23)	0.78*** (0.25)	0.98*** (0.16)	0.64*** (0.14)	0.03 (0.43)	-0.01 (0.41)	-0.59 (0.49)
B: Average working hours										
Part-time employment opportunities	0.8 (4.6)	21.5 (15.5)	1.0 (5.6)	-6.7*** (1.7)	-0.5 (1.3)	3.4 (2.4)	-4.9*** (1.3)	-5.2 (5.1)	-6.9* (3.5)	-5.9* (3.3)
C: Log of total working hours										
Part-time employment opportunities	-0.67 (0.43)	-1.87 (2.12)	1.54* (0.78)	0.56* (0.27)	0.77*** (0.25)	1.07*** (0.22)	0.47*** (0.12)	-0.15 (0.39)	-0.29 (0.46)	-0.78 (0.47)
No. of observations	40	28	83	90	96	55	92	91	82	81

*Note: In this table, I report the regression results of the baseline specification estimated separately for each country. Countries are sorted based on the incidence of part-time employment opportunities. In panel A, I report the results for the log of employment; in panel B, I report the results for the average working hours; and in panel C, I report the results for the log of total working hours. I only report the coefficients pertaining to the explanatory variable of interest, that is, the share of women aged 20-49 working part-time. Standard errors (in brackets) are clustered at the country-sector level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Source: author's elaboration based on the EU-LFS data.*



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