Impact of short-term work on employment: Evidence from Italy

Daniele Biancardi* Claudio Lucifora† Federica Origo‡

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Abstract

This paper studies the impact of short time work (STW) intensity of use on firms' level outcomes. We focus on the interaction of STW use with the strength of industrial relations in the firm. Using panel data from the mechanical engineering industry and an estimation strategy based on both fixed effects and instrumental variables, we find that STW has a positive short-term effect on employment even after accounting for the mechanical effect of STW that keeps workers attached to the firm. The estimated elasticity for employment ranges from 0.14 and 0.17 in the IV specification. However, STW has a negative effect on productivity, as measured by value added per worker and TFP, and the ROE. Estimating the interactions between STW intensity and industrial relations we find a strong effect of unions that is positive on employment and negative for the other outcomes except TFP.

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*Universita' di Bergamo, Via dei Caniana, 2, Bergamo, Italy; daniele.biancardi@unibg.it

†Universita' Cattolica...; claudio.lucifora@unicatt.it

‡Universita' di Bergamo, Via dei Caniana, 2, Bergamo, Italy; federica.origo@unibg.it

1 Introduction

Employment policies have been the object of an increasing amount of economic literature after the 2008/2009 crisis. More specifically, there have been a significant growth in studies on the effects of short-time work (STW, hereafter) - due to its importance in several European countries during the recession (Sacchi et al., 2011). The literature on STW focused so far on estimating the short-term effect of the policy on employment, in particular on the amount of jobs saved during downturns (Arpaia et al., 2010; Boeri and Bruecker, 2011).

Only some theoretical papers try to examine possible long-term implications of STW on the labor market and welfare (Grape and Kolm, 2014). In the long run, it is not clear that STW reduces unemployment as it discourages job creation. Introducing STW improves welfare by mitigating distortions caused by public unemployment insurance (UI), but only if firms have access to private insurance (Braun and Brügemann, 2017). Optimal STW is substantially less generous than UI even if firms have access to private insurance. Osuna and García-Pérez (2015) calibrate a model of the Spanish labor market. They show that the availability of STW schemes does not necessarily reduce unemployment and job destruction. The effectiveness of the policy depends on the degree of subsidization of payroll taxes it may entail.

Cross-countries studies exploiting macro data tend to find positive effects of STW on employment. However, in some countries - despite the positive contribution in terms of job losses reduction - the inefficient design of STW led to a sizeable deadweight loss (Boeri and Bruecker, 2011). Brey and Hertweck (2018) find that STW is most effective when used as a fast-responding automatic stabilizer. STW helps to preserve jobs in a recession by making employment and unemployment less elastic with respect to output (Hijzen and Martin, 2013). Hijzen and Venn (2011) suggest that the positive impact of STW was limited to workers with permanent contracts, underlining the risk of increasing labor market segmentation between workers in regular jobs and workers in temporary and part-time jobs.

Most studies using microdata on workers and firms cover European countries with a long tradition of STW. Germany has attracted particular attention due to the fact that very few jobs were lost despite the depth of the 2009 recession (Crimmann et al., 2010). Brenke et al. (2013) find that STW has certainly contributed to the positive response of the German labor market to the crisis, but this is likely due to the country-specific context. Exploiting data on firms in the manufacturing sector in Germany, Hoffmann et al. (2011) find that small firms are less likely to utilize STW. Furthermore, they suggest that STW is significantly negatively correlated with employment growth. This points to

a period of jobless growth after utilization of STW. Kruppe and Scholz (2014) estimate the treatment effect of STW on employment at establishment level, their results do not indicate any effect of STW on employment. Cooper et al. (2017) suggest that even if STW can prevent increases in unemployment during a recession it leads to a decrease in the allocative efficiency of the labor market, resulting in significant output losses. These effects arise from a reduction in the vacancy filling rate resulting from the policy. A recent paper (Tilly and Niedermayer, 2016) evaluates the long-term effects of STW and stresses that - in contrast to unemployment - STW is not associated with a long-term loss in earnings. The main determinants of STW take-up are workers human capital and the duration of productivity shocks. They find that short-time work substantially reduced job loss in the recession. However, the welfare gains are limited, because workers who would have been laid off without STW are workers for whom the earnings loss associated with unemployment is low.

Cahuc and Carcillo (2011) using French data suggest that STW programs used during the 2009 downturn had significant positive effects on employment. However, these programs can have the unintended effect of inducing inefficient reductions in working hours and reduce the prospects of outsiders if used too intensively. Thus, the design of STW should include an experience-rating component. Boeri and Bruecker (2011) also find that STW should be temporary as during upturns may negatively affect employment and that specific design features such as experience-rating and disincentives to 100% reductions in working hours are important in improving the cyclical properties of STW. Evidence on the expansion of STW in France during the 2009 recession (Cahuc and Nevoux, 2018) shows that the reforms were mostly to the benefit of large firms which are recurrent STW users. The authors find that STW leads to significant production losses compared to an unemployment insurance scheme with experience rating. Finally, Cahuc et al. (2018) demonstrate that STW saved jobs in firms facing large drops in their revenues during the Great Recession, in particular when highly levered, but only in these firms. The measured cost per saved job is very low relative to that of other employment policies. Recent studies confirm that STW schemes help to retain the workforce during recessions. However, they can create inefficiency in the labor market (Cooper et al., 2017; Giupponi and Landais, 2018; Cahuc, 2019).

Some studies distinguish between the rule-based and the discretionary component of STW, finding that - while the first is cost-efficient at saving jobs - the second does not have any effect (Balleer et al., 2016). The effects of discretionary STW are time dependent and non-linear over the business cycle: it is effective at saving jobs in deep economic crises while in normal times and expansions, the effects are smaller or even negative (Gehrke and Hochmuth, 2018). This cyclical effect of STW is also found by Hijzen and Martin

(2013). Using quarterly data on a panel of countries, they find that STW helped avoiding job losses during the crisis, but its continued use during the recovery may have slowed the job-content of the recovery. By the end of 2010, the net effect of STW on employment was negligible or even negative.

Very few studies investigate the effect of STW on firm level outcomes, with two recent exceptions. Kato and Kodama (2019) use data from Japanese firms, they find that STW leads to improved profitability. Giupponi and Landais (2018) provide evidence of the effects of STW on a variety of firms' and workers' outcomes, and on reallocation in the labor market. They find negative effects of STW treatment on hours, but large and positive effects on headcount employment. Results on profitability and most other firm-level outcomes are not statistically significant. Employment effects disappear when the program stops, since STW offers no long term insurance to workers. They also find evidence of negative reallocation effects of STW, with reduced employment growth of untreated firms in the same local labor market.

Empirical papers discussing the potential interactions of STW with other institutions such as employment protection legislation and the degree of centralization of bargaining are almost non-existent (Boeri and Bruecker, 2011). The aim of this paper is to provide a first contribution to help filling this gap in the literature. Empirical evidence on the interaction between STW and other labor market institutions is especially relevant for countries with tightly regulated markets, as is the case in many European countries.

We focus on Italy because we think that it provides an interesting case study. First of all, STW has been widely used in Italy as a mechanism to protect jobs in relatively large firms. Secondly, industrial relations - especially national unions - have a very important role in Italian labor markets. Unions participate, for example, in the bargaining process for the determination of wages, that are set at the centralized national level in Italy, with relatively limited scope for firm-level bargaining.

We exploit detailed panel data on firms in the mechanic engineering sector for the period 2009 to 2015. Using specifications with firm fixed effects and an instrumental variables approach to solve the endogeneity problem, we investigate the effect of STW on employment and other firm level outcomes. We find that STW has a positive short-term effect on employment even after accounting for the mechanical effect of STW that keeps workers attached to the firm. However, STW has a negative effect on productivity, as measured by value added per worker and Total Factor Productivity (TFP), and the Return on Equity (ROE). Estimating the interactions between STW intensity and industrial relations we find a strong effect of unions that is positive on employment and negative for the other outcomes except TFP.

Our paper contributes to the literature in three ways. First, instead of focusing on

employment, we consider a wide range of firm-level outcomes. Second, most of the existing literature treated STW as a binary variable, while we study both STW intensity and use. Finally, we provide a first assessment of the interaction of STW with variables measuring the strength of industrial relations in the firm.

The paper proceeds as follows. Section 2 describes the institutional context. In Section 3 we describe our data. Section 4 explains the identification strategy, whose results are commented on in Section 5. Finally, Section 6 summarises the main findings and concludes the paper.

2 Short time work in Italy

The Italian version of STW - Cassa Integrazione Guadagni - is based on 3 pillars: Cassa Integrazione Guadagni Ordinaria (CIGO), Straordinaria (CIGS) and "in Deroga" (CIGD). CIGO is an instrument to absorb transitory shocks in the industrial sector. When CIGO is activated wages for hours non-worked by the employees are paid by social security (INPS). The subsidy covers 80% of the wage up to a not very high threshold. CIGO is awarded for an initial period of 3 months and can be extended up to a maximum of 12 months if needed. CIGS is requested by firms with more structural problems, for example in case of a plan for restructuring to regain competitiveness. CIGS can be requested by firms with at least 15 employees and it covers a wider range of sectors with respect to CIGO. The rules to access compensation are the same seen for CIGO. CIGS is usually meant to last for 12 months, but it can be extended until 36 months depending on the reason of the application. Finally, CIGD has been introduced and extensively used during the Great recession to cover firms that do not match the eligibility criteria to access CIGO or CIGS.

3 Data

3.1 Data sources and sample selection

The empirical analysis is based on a unique firm-level panel dataset combining detailed survey information with accounting data for a sample of metal engineering firms in Italy. The survey is carried out by the main national employers association of this industry with the aim to collect information on issues that may be relevant for industry collective bargaining, such as employment, wages and industrial relations. More specifically, the survey provides information on the following main aspects (corresponding to different Sections of the questionnaire): employment levels, composition and changes (with some information by skill, gender, education and type of contract); working hours and absenteeism; wage levels and composition by skill and job title; firm-level bargaining and industrial relations.

[1] This survey is run every year since 2009; for our analysis, we could access data referred to the 2009-2015 period. [2] On average, approximately 1,500 firms employing around 225,000 workers are surveyed each year, corresponding to almost one fifth of the employees in this industry. Overall almost 5,000 different firms took part to the survey in at least one of the years considered. Three quarters of the firms participated to the survey more than once, thus allowing to create an unbalanced panel over the period considered. Although the survey does not collect information on firms economic or financial performance, we could merge survey data with accounting data from AIDA dataset (*Analisi Informatizzata delle Aziende Italiane* - Computerized Analysis of Italian Firms) using the unique firm identifier (VAT number). This database is updated and distributed by Bureau van Dijk and it contains the financial statements of all the active and bankrupt Italian companies (excluding banks, insurance companies and public bodies). This procedure allowed us to successfully merge information for 3,392 different firms, corresponding to around 68% of the firms in the initial sample. We then dropped observations with missing or negative values for the variables used in the empirical analysis and excluded outliers (i.e., below and above the 1st and 99th percentile). The final sample for the baseline employment regressions consists of 3261 firms, for a total of 8112 firm-year observations. Summary statistics for the variables used in the empirical analysis are presented in Table 1. Splitting firm-year observations by STW use, we observe the existence of a selection of firms into STW. Firms using STW tend to be bigger in terms of employment, with 116.8 FTE workers vs 90.4 for the others. STW users tend to be less productive - as measured by TFP and value added per worker - and weaker financially, since return on equity (ROE) is higher and the stock of debt (leverage) is lower for firms not relying on STW. Firms taking up STW have - on average - stronger industrial relations, with 79% of them having national unions (compared to 66% for non users) and 60% of them with firm-level unions (only 43% for non users). Finally, firms using STW tend to have a lower share of white collar workers. From the table we can also observe that, on average, firms in the metal engineering industry reduce their workforce by around 10% through STW. In Figure 1 we plot the share of firms in our sample making use of STW by year. A clear cyclical trend can be observed, with more than 50% of firms taking up STW in 2009, the worst year of the crisis, and a sharp decline until 2011 followed by a new increase during the second crisis of 2012/2013. Figure 2 shows the average hours of STW per worker by occupation. Firms tend to use STW for blue collars than for white collars. Interestingly, a large majority of firms use STW for a relatively small share of total

[1] In specific waves, there are also additional questions on specific policies related to human resources management on firms perceptions about labour market reforms implemented over the period covered by the survey.

[2] We thank Federmeccanica for having provided the data used for the empirical analysis.

hours worked, with an average slightly above 200 hours per worker per year.

3.2 Main variables of interest

We use three measures of employment. The first is the total number of workers in the firm, the second is the number of workers "net" of STW users [3] and the third is the total number of hours worked "net" of STW. Our dependent variables on economic performance are: 1) the wage bill per worker, that measures the cost of labor for the firm; 2) the return on equity (ROE), a measure of firm's profitability; 3) value added per worker and 4) Total factor productivity [4], that are both proxies of firm's productivity (Note: keep only TFP? Value added per worker is also interesting to assess real changes in production per worker). All dependent variables, with the exception of ROE, are expressed in natural logarithms.

4 Empirical strategy

We are interested in the effect of Short-time work (STW) intensity of use on employment and other economic outcomes at the firm level. More specifically, we want to assess whether these effects are heterogeneous depending on some indicators of the strength of industrial relations. We use survey data on firms in the mechanical engineering sector merged with balance sheets data from AIDA for the period from 2009 and 2015, that is, the seven years between the financial crisis of 2008 and the reform of STW at the end of 2015. Our identification is based on two different strategies. The first strategy, relying on the panel nature of the dataset, is based on a fixed-effects specification that exploits only within-firm variation. Our baseline empirical specification is described by the equation:

$$Y_{it} = \alpha_0 + \alpha_1 STW_i + \sum\nolimits_i \alpha_{2i} D_i + \sum\nolimits_t \alpha_{3t} D_t + \epsilon_{it} \tag{1}$$

where i and t are firm and year subscripts, respectively. Y_{it} is one of the dependent variables listed above, D_i is a set of dummies defined at the firm-level - or firm-specific fixed effects, D_t are year fixed effects and STW_i , our variable of interest, is the logarithm of the number of hours of STW used by a firm in a given year [5]. ϵ_{it} is an error term. In this equation α_1 captures the change in the level of the outcome variables related to the intensity of STW use by a given firm. We control for time-invariant firm-specific characteristics [6] with firm

[3] We subtracted from the total number of employees the FTE number of employees in STW calculated from the information on total hours of STW used.

[4] TFP is computed using the using the AckerbergCavesFrazer method in Ackerberg et al. (2015).

[5] We also try to add a dummy for STW use in the same specifications, results are provided in the Appendix.

[6] Both observed and unobserved.

fixed effects and for cyclical economic conditions with year dummies. In a second equation we allow for both firm-specific and sector-year fixed effects:

$$Y_{ijt} = \alpha_0 + \alpha_1 STW_i + \sum\nolimits_i \alpha_{2i} D_i + \sum\nolimits_{jt} \alpha_{3jt} D_j \cdot D_t + \epsilon_{ijt} \tag{2}$$

where j represents a given sector.

Using this last specification, we interact the variable of interest with (time-invariant) dummies for the strength of national unions within the firm, the existence of a firm-specific union, decentralized bargaining (firm-specific contracts), workers' strikes and high leveraged firms. Our identification strategy relies on the assumption that there are not unobserved variables correlated with the use of STW and the outcomes. However, even estimating a quite demanding specification as the one in (2), there are some reasons to believe that this assumption could not be true. For example, we can expect that firms applying for STW will observe a different time trend in the outcomes than the ones that did not decide to take up STW.

To solve the possible endogeneity problem we rely on an instrumental variables specification. The instrument is build exploiting the rules to access STW and other employment policies. In order to be eligible for (most) types of STW, firms must have an average of at least 15 employees over the 6 months before the application. However, the same threshold applies for other labor market policies, such as employment protection (EPL). To disentangle the effect of STW from the possible effect of other policies we combine two instruments: a dummy for having at least 15 FTE employees and the interaction between being a multiplant firm and having at least 60 employees. We estimate the same specifications above with IV [7].

Taking equation (2) as an example, the second stage of the estimation procedure is:

$$Y_{ijt} = \beta_0 + \beta_{IV} Z_{ijt} + \sum\nolimits_i \beta_{2i} D_i + \sum\nolimits_{jt} \alpha_{3jt} (D_j \cdot D_t) + \eta_{ijt} \tag{3}$$

While in the first stage we have:

$$Z_{ijt} = \gamma_0 + \gamma_1 Inst + \sum\nolimits_i \gamma_{2i} D_i + \sum\nolimits_{jt} \alpha_{3jt} (D_j \cdot D_t) + \nu_{ijt} \tag{4}$$

We also try to assess the heterogeneity of the effects interacting the instruments with the dummies for industrial relations. The results are available in Table A3.

[7] i.e. a first equation with firm and year FEs and a second with firm and sector-year FEs.

5 Results

5.1 Baseline results

The estimates for the three employment outcomes are reported in Table 2, which consists of two panels. In the first panel we present estimates from equation (1) and the corresponding IV specification, while in the second we have results from equations (2) and (3). In columns 1-3 we show estimates from the fixed effects models, while in columns 4-6 we have results from the IV specifications. Since both the dependent variables and the variable of interest - hours of STW - are expressed in logarithm, the coefficients in the table can be interpreted as elasticities. Results are almost identical for the two specifications, so we will focus on estimates from Panel B, where the more demanding models - with both firm and sector-year fixed effects - are displayed. Column 1 shows no association between hours of STW and total employment. The coefficients in columns 2 and 3 are identical, and they point to a negative effect on employment and hours worked once we subtract the number of employees and hours "saved" by STW[8]. A 10% increase in the hours of STW leads to a 0.16% reduction in employment and hours worked net of STW. The results change when we move to the IV specification. The elasticity of employment to STW hours ranges from 0.14 and 0.17. Our estimates show that a 10% increase in STW hours lead to a 1.7% increase in total employment and a 1.4% increase in both employment and hours net of STW. All results are significant at the 1% level. The different results in the two set of estimates are coherent with the fact that with IV we control for endogeneity due to negative selection of firms into STW.

Table 3 presents the same regressions for different firm-level outcomes. Also in this case we comment on results from Panel B. Estimates from fixed effects specifications are all negative and statistically significant. IV specifications all present the same sign of FE regressions in this case, but with larger and much less precise coefficients. We will focus on IV results here. A 10% increase in STW hours leads to a 0.2% decrease in the wage bill per worker. However, the effect is not statistically significant. A negative association between STW intensity and the wage bill is not surprising and is due to the fact that firms use STW as a mean to reduce labor cost. An increase in STW intensity is also associated to a large and significant reduction in the ROE [9]. Finally, a 10% increase in STW hours is related to a 0.4% reduction in both value added per worker and Total Factor Productivity. Both results are statistically significant. This last finding point to the fact that, as underlined

[8]The idea behind these variables is to "clean" the estimates from the mechanical effect of job preservation due to STW.

[9]The effect is huge! Doesn't make much sense. A 1% increase in STW hours lead to a 6.96 decrease in ROE.

also in (Giupponi and Landais, 2018), reductions in hours worked are "real".

5.2 Heterogeneity

We now study the heterogeneity of the results along the industrial relations and financial leverage dimensions. Table 4 is split in 5 panels, one for each of the variables that we investigate. All estimates in this Table are based on the specification presented in Equation (2). In Panel A we add to the baseline specification an interaction of STW hours with a dummy for firms where national unions are strong[10]. We can interpret the coefficient on the interaction term as the differential effect of STW intensity for firms with strong unions with respect to the baseline effect. We observe a positive association between the interaction term and employment, with coefficients significant at the 5% level. For highly unionized firms, a 10% increase in STW leads to a 0.03% increase in total employment and a 0.14% decrease in employment net of STW. The coefficient for the interaction is smaller and not significant for hours net of STW. On the other hand, strong unions have a negative and statistically significant effect on wage bill per worker, ROE and value added per worker, while they do not seem to be correlated with TFP. A 10% increase in STW leads to a 0.09% decrease in the wage bill and a 0.21% decrease in value added for this group of firms. In Panel B we study the effect of firm-level unions. Coefficients on the interaction term are often smaller than the ones for national unions and statistically insignificant. The only exceptions are employment net of STW and hours worked net of STW, presenting coefficients that are slightly larger and significant at 1%. Panel C presents evidence on firms using firm-level contracts. We find a positive and significant effect on employment net of STW and hours net of STW and a negative and significant effect on ROE and value added per worker. Results for firms having more workers' strikes are presented in Panel D. Strikes do not seem to lead to a significant change in any outcome except TFP, for which we find a positive effect. Finally, as shown by panel E, we do not observe any differential effect for highly leveraged firms. In Table A3 we present estimates for interactions with the IV specifications.

6 Concluding remarks

This paper provides a first assessment of the role of industrial relations in shaping the relationship between STW and a number of firm-level outcomes, namely employment, productivity, costs and profitability. We estimate the causal effect of STW on the outcomes

[10]Here we define strong as above the median in terms of share of workers that are part of a national union.

of interest using a fixed effects specification and an instrumental variables approach. Exploiting a panel dataset with detailed firm-level information for the period from 2009 to 2015, our analysis shows that STW has a positive short-term effect on employment even after accounting for the mechanical effect of STW that keeps workers attached to the firm. The estimated elasticity for employment ranges from 0.14 and 0.17 in the IV specification, depending on the variable used. However, STW has a negative effect on productivity, as measured by value added per worker and TFP, and the ROE. Estimating the interactions between STW intensity and industrial relations we find a strong effect of unions that is positive on employment and negative for the other outcomes except TFP.

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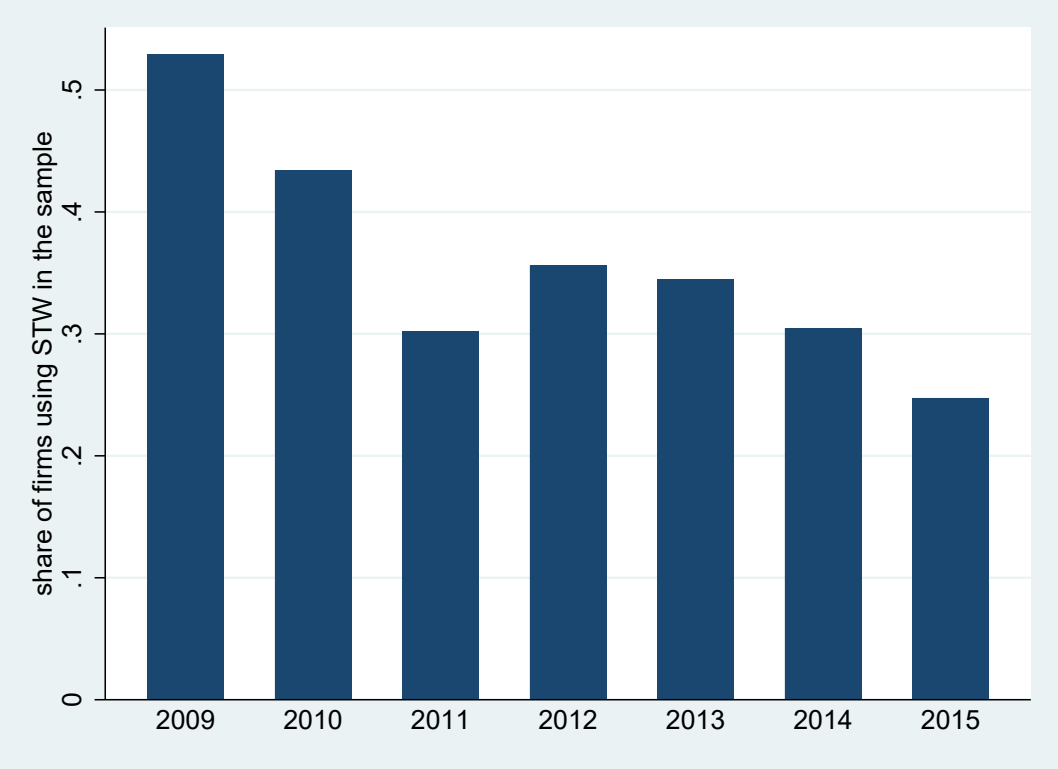
Table 1: Summary statistics

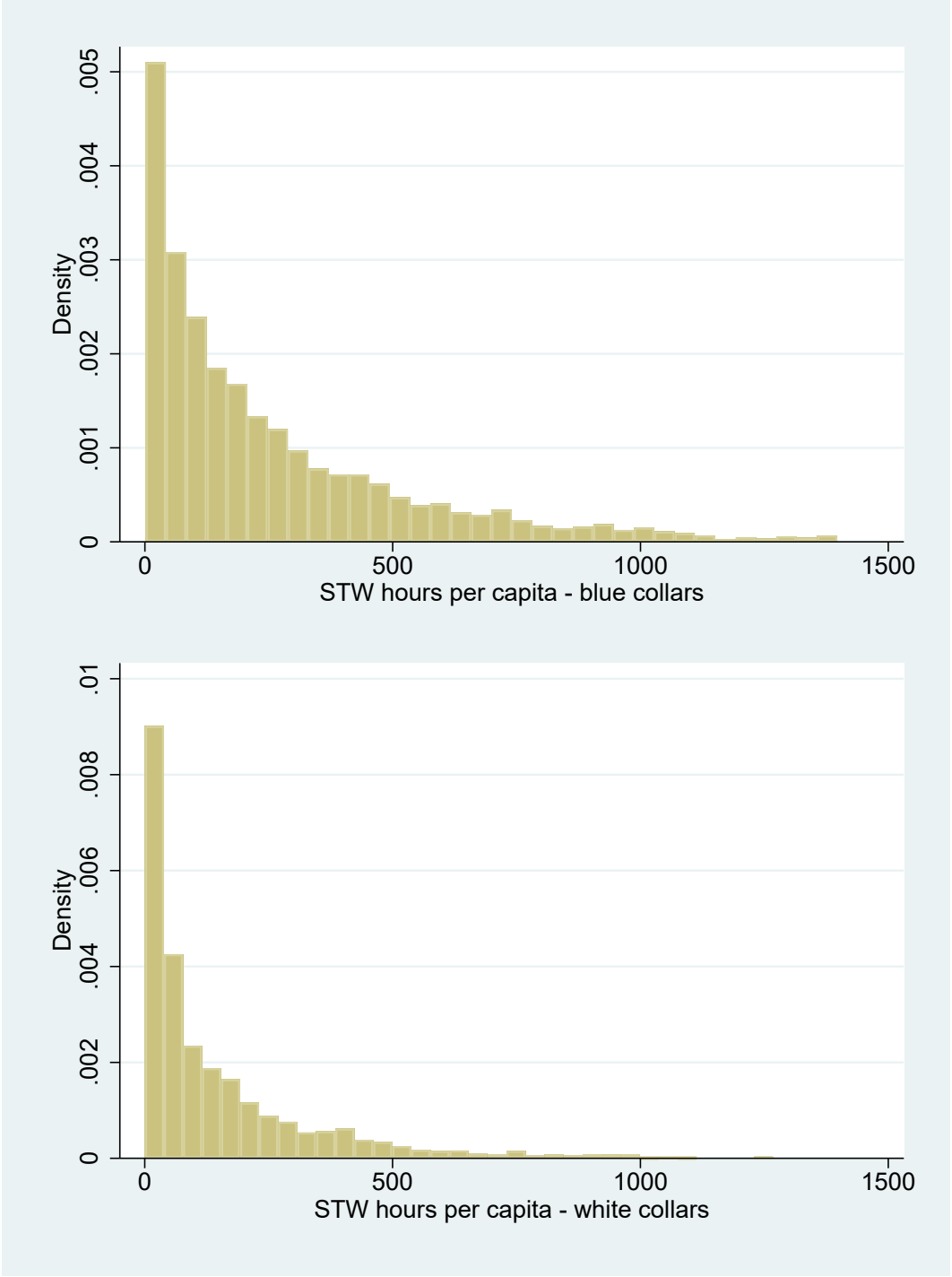
	No STW			STW		
	mean	sd	count	mean	sd	count
total employment	90.37	129.10	5104	116.81	157.18	3008
employment (net STW)	90.37	129.10	5104	105.31	146.28	3008
log(hours) (net STW)	11.23	1.17	5104	11.37	1.22	3008
value added per worker (th€)	72.67	31.25	4396	55.17	25.04	2582
wage bill per worker (th€)	49.87	18.58	4569	45.49	22.17	2757
return on equity (ROE)	7.55	19.69	4498	-2.37	24.29	2631
total factor productivity	1.37	0.45	4548	1.23	0.40	2751
STW user	0.00	0.00	5104	1.00	0.00	3008
STW hours per worker	0.00	0.00	5104	215.63	252.76	3008
union	0.66	0.47	4852	0.79	0.41	2896
firm-level contract	0.44	0.50	5104	0.50	0.50	3008
firm-specific union	0.43	0.50	4852	0.60	0.49	2896
strikes in the firm	0.43	0.50	5104	0.58	0.49	3008
financial leverage	17.77	19.57	4608	22.10	21.09	2786
total revenues (M€)	27.31	46.01	4401	30.51	61.29	2586
white collar share	0.42	0.23	5104	0.34	0.19	3008
female workers share	0.22	0.15	5104	0.22	0.16	3008
ateco 2 digits sector	32.09	12.58	5104	28.66	8.04	3008
year	2012.00	1.90	5104	2011.37	1.93	3008

Figure 1: Share of firms using STW in the sample by year



Note.

Figure 2: STW hours per worker by type of occupation



Note.

Table 2: Measures of employment - all outcomes in logs

	OLS			IV		
	total employment	employment net of STW	Hours worked net of STW	total employment	employment net of STW	Hours worked net of STW
Panel A. Eq. (1) and (3) - log hours STW						
log(Hours)	0.001	-0.016***	-0.016***	0.175***	0.150***	0.155***
	(0.001)	(0.001)	(0.001)	(0.059)	(0.056)	(0.059)
R^2	0.991	0.988	0.985			
Obs.	7320	7007	7005	7320	7007	7005
control variables:						
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Panel B. Eq. (2) and (4) - log hours STW						
log(Hours)	0.001	-0.016***	-0.016***	0.171***	0.142***	0.144***
	(0.001)	(0.001)	(0.001)	(0.056)	(0.051)	(0.053)
R^2	0.992	0.989	0.986			
Obs.	7232	6918	6916	7232	6918	6916
control variables:						
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
SectorXYear FE	Yes	Yes	Yes	Yes	Yes	Yes

*, **, *** statistically significant at the 10, 5 and 1% levels. Standard errors are clustered at the firm level. Samples in the two panels differ because some signletons are dropped in regressions with Sector-Year FEs.

Table 3: Other firm-level outcomes

	OLS				IV			
	wage bill per worker	return on equity	value added per worker	TFP	wage bill per worker	return on equity	value added per worker	TFP
Panel A. Eq. (1) - log hours STW								
log(Hours)	-0.007***	-0.643***	-0.016***	-0.006***	-0.019	-6.397***	-0.046*	-0.041*
	(0.001)	(0.083)	(0.001)	(0.001)	(0.019)	(2.468)	(0.024)	(0.023)
R^2	0.890	0.582	0.781	0.870				
Obs.	6503	6298	6170	6478	6503	6298	6170	6478
control variables:								
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel B. Eq. (2) - log hours STW								
log(Hours)	-0.007***	-0.649***	-0.016***	-0.006***	-0.021	-6.958***	-0.039*	-0.046**
	(0.001)	(0.084)	(0.001)	(0.001)	(0.019)	(2.639)	(0.021)	(0.022)
R^2	0.897	0.599	0.792	0.887				
Obs.	6412	6207	6081	6387	6412	6207	6081	6387
control variables:								
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SectorXYear FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*, **, *** statistically significant at the 10, 5 and 1% levels. Standard errors are clustered at the firm level.

Appendix

A Additional results

Table 4: All outcomes (OLS) - interactions

	total employment	employment net of STW	Hours worked net of STW	wage bill per worker	return on equity	value added per worker	TFP
			Panel A. Centralized Union				
log(Hours)	-0.001	-0.019***	-0.019***	-0.004***	-0.473***	-0.015***	-0.007***
	(0.001)	(0.002)	(0.002)	(0.001)	(0.122)	(0.002)	(0.002)
STW · Union	0.004**	0.005**	0.003	-0.005***	-0.488***	-0.006**	0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.162)	(0.003)	(0.002)
R^2	0.991	0.988	0.986	0.913	0.627	0.820	0.893
Obs.	4383	4179	4177	3861	3740	3554	3839
			Panel B. Firm-level union				
log(Hours)	-0.000	-0.019***	-0.020***	-0.005***	-0.706***	-0.015***	-0.007***
	(0.001)	(0.001)	(0.002)	(0.001)	(0.140)	(0.002)	(0.001)
STW · FLU	0.002	0.006***	0.006***	-0.002	0.078	-0.001	0.001
	(0.001)	(0.002)	(0.002)	(0.001)	(0.176)	(0.003)	(0.002)
R^2	0.992	0.989	0.986	0.896	0.594	0.789	0.887
Obs.	7104	6804	6802	6300	6099	5966	6274
			Panel C. Firm-level contract				
log(Hours)	0.001	-0.018***	-0.018***	-0.006***	-0.471***	-0.013***	-0.006***
	(0.001)	(0.001)	(0.002)	(0.001)	(0.129)	(0.002)	(0.001)
STW · FLC	0.000	0.004**	0.004*	-0.001	-0.321*	-0.005*	-0.000
	(0.001)	(0.002)	(0.002)	(0.001)	(0.171)	(0.003)	(0.002)
R^2	0.992	0.989	0.986	0.897	0.599	0.792	0.887
Obs.	7232	6918	6916	6412	6207	6081	6387
			Panel D. Firm-level strikes				
log(Hours)	-0.000	-0.017***	-0.017***	-0.006***	-0.664***	-0.015***	-0.009***
	(0.001)	(0.001)	(0.002)	(0.001)	(0.151)	(0.002)	(0.001)
STW · Strikes	0.002	0.003	0.002	-0.001	0.024	-0.001	0.004**
	(0.001)	(0.002)	(0.002)	(0.001)	(0.180)	(0.003)	(0.002)
R^2	0.992	0.989	0.986	0.897	0.599	0.792	0.887
Obs.	7232	6918	6916	6412	6207	6081	6387
			Panel E. Financial leverage				
log(Hours)	0.001	-0.015***	-0.015***	-0.006***	-0.678***	-0.016***	-0.006***
	(0.001)	(0.001)	(0.002)	(0.001)	(0.114)	(0.002)	(0.001)
STW · Leverage	-0.000	-0.000	0.000	-0.000	0.100	0.001	0.000
	(0.001)	(0.002)	(0.002)	(0.001)	(0.159)	(0.003)	(0.002)
R^2	0.992	0.988	0.986	0.896	0.603	0.792	0.889
Obs.	6504	6246	6244	6304	6109	5989	6279
control variables:							
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SectorXYear FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*, **, *** statistically significant at the 10, 5 and 1% levels. Standard errors are clustered at the firm level. Lower sample size for interaction with centralized union because we are generating a dummy from a measure of intensity that is not available for all firms.

Table A1: Measures of employment - all outcomes in logs

	OLS			IV		
	total employment	employment net of STW	Hours worked net of STW	total employment	employment net of STW	Hours worked net of STW
Panel A. Eq. (1) - STW use						
STW use	0.001	-0.102***	-0.105***	1.675***	1.510***	1.542**
	(0.005)	(0.007)	(0.008)	(0.586)	(0.577)	(0.601)
R^2	0.991	0.987	0.985			
Obs.	7350	7007	7005	7350	7007	7005
control variables:						
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Panel B. Eq. (2) - STW use						
STW use	-0.001	-0.101***	-0.104***	1.611***	1.383***	1.390***
	(0.005)	(0.007)	(0.008)	(0.570)	(0.523)	(0.535)
R^2	0.992	0.988	0.986			
Obs.	7262	6918	6916	7262	6918	6916
control variables:						
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
SectorXYear FE	Yes	Yes	Yes	Yes	Yes	Yes

*, **, *** statistically significant at the 10, 5 and 1% levels. Standard errors are clustered at the firm level. Samples in the two panels differ because some singletons are dropped in regressions with Sector-Year FEs.

Table A2: Other firm-level outcomes

	OLS				IV			
	wage bill per worker	return on equity	value added per worker	TFP	wage bill per worker	return on equity	value added per worker	TFP
Panel A. Eq. (1) - STW use								
STW use	-0.044***	-4.533***	-0.112***	-0.051***	-0.241	-58.421**	-0.483**	-0.372*
	(0.005)	(0.674)	(0.011)	(0.007)	(0.190)	(23.347)	(0.232)	(0.213)
R^2	0.889	0.580	0.779	0.870				
Obs.	6528	6323	6193	6503	6528	6323	6193	6503
control variables:								
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel B. Eq. (2) - STW use								
STW use	-0.039***	-4.602***	-0.108***	-0.050***	-0.240	-64.533**	-0.425*	-0.437**
	(0.005)	(0.680)	(0.011)	(0.007)	(0.186)	(26.893)	(0.218)	(0.217)
R^2	0.895	0.597	0.790	0.887				
Obs.	6437	6232	6104	6412	6437	6232	6104	6412
control variables:								
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SectorXYear FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*, **, *** statistically significant at the 10, 5 and 1% levels. Standard errors are clustered at the firm level.

Table A3: All outcomes (IV) - interactions

	total employment	employment net of STW	Hours worked net of STW	wage bill per worker	return on equity	value added per worker	TFP
			Panel A. Centralized Union				
log(Hours)	0.151***	0.132**	0.132**	-0.006	-5.268**	-0.025	-0.012
	(0.058)	(0.059)	(0.059)	(0.016)	(2.570)	(0.022)	(0.018)
STW · Union	-0.022	-0.027*	-0.029*	-0.005	0.217	-0.001	0.005
	(0.014)	(0.015)	(0.015)	(0.004)	(0.629)	(0.007)	(0.005)
Obs.	4383	4179	4177	3861	3740	3554	3839
			Panel B. Firm-level union				
log(Hours)	0.128**	0.091	0.098	-0.038*	-6.104***	-0.053**	-0.044*
	(0.061)	(0.069)	(0.070)	(0.023)	(2.349)	(0.022)	(0.023)
STW · FLU	0.167	0.185	0.162	0.101	-0.144	0.094	-0.044
	(0.405)	(0.450)	(0.451)	(0.131)	(10.354)	(0.092)	(0.194)
Obs.	7104	6804	6802	6300	6099	5966	6274
			Panel C. Firm-level contract				
log(Hours)	0.149***	0.127***	0.129***	-0.029	-4.600**	-0.042**	-0.040**
	(0.046)	(0.045)	(0.047)	(0.018)	(1.968)	(0.021)	(0.020)
STW · FLC	-0.135	-0.153	-0.156	0.015	2.618	0.088	-0.009
	(0.132)	(0.125)	(0.126)	(0.062)	(5.300)	(0.087)	(0.054)
Obs.	7232	6918	6916	6412	6207	6081	6387
			Panel D. Firm-level strikes				
log(Hours)	0.153**	0.138*	0.144*	-0.033	-6.480**	-0.044	-0.053*
	(0.071)	(0.075)	(0.079)	(0.028)	(3.216)	(0.030)	(0.029)
STW · Strikes	0.007	-0.022	-0.033	0.041	1.016	-0.000	0.011
	(0.120)	(0.109)	(0.111)	(0.048)	(4.672)	(0.043)	(0.058)
Obs.	7232	6918	6916	6412	6207	6081	6387
			Panel E. Financial leverage				
log(Hours)	0.132***	0.120***	0.120***	-0.016	-6.486*	-0.026	-0.065*
	(0.040)	(0.040)	(0.042)	(0.023)	(3.459)	(0.029)	(0.034)
STW · Leverage	-0.004	-0.007	-0.007	-0.003	-0.055	-0.042	0.045
	(0.008)	(0.009)	(0.009)	(0.043)	(4.786)	(0.041)	(0.051)
Obs.	6422	6170	6168	6304	6109	5989	6279
control variables:							
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SectorXYear FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*, **, *** statistically significant at the 10, 5 and 1% levels. Standard errors are clustered at the firm level. Lower sample size for interaction with centralized union because we are generating a dummy from a measure of intensity that is not available for all firms.