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The Effects of the Legal Minimum Working Time on Workers, Firms and the Labor Market

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The Effects of the Legal Minimum Working Time on Workers, Firms and the Labor Market

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Abstract

This paper examines the effects of working time regulations on the allocation of workers and hours. I exploit a unique reform introducing a minimum workweek of 24 hours in France in 2014, affecting 15% of jobs. Drawing on administrative data and an event study design, I find a firm-level reduction in total hours worked, showing imperfect substitutability between workers and hours. The effects differ by gender: women working part-time were replaced by men working longer hours. Importantly, workers also reallocate between firms. To quantify the aggregate impact accounting for these effects, I build and estimate a search and matching model with firm and worker heterogeneity. Overall, the minimum workweek increased total hours worked by 1% due to positive general equilibrium effects, but concentrated hours among fewer workers as unemployment rose by 2%. Gender inequality increased because of the within-firm effects and less reallocation of women between firms.

JEL Codes: J08, J23, J41, E24

Keywords: Working time regulations, Hours of work, Reallocation effects, Gender inequality

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1 Introduction

Hours of work are not only determined by labor demand and labor supply, but are also shaped by working time regulations. These institutions include the legal definition of the full-time workweek, the maximum number of hours and the conditions for the use of overtime. Policymakers often introduce changes in these regulations to achieve specific objectives. For instance, work-sharing policies have reduced the full-time workweek in many countries with the aim to reduce unemployment (OECD 2021). The effects of working time regulations depend on the degree of substitutability between workers and hours and on the allocation of jobs between firms. Furthermore, allocating hours differently may have distributional effects as workers supply hours heterogeneously.

This paper exploits a unique reform implementing a minimum workweek in France to provide new evidence on how working time regulations affect the allocation of workers and hours. The reform consists of a legal minimum working time of 24 hours per week, targeting new hires starting in 2014. The policy shock was sizable as 15% of jobs had a workweek below 24 hours before that date. To the best of my knowledge, this is the first paper on the effects of a minimum workweek. I provide evidence on the effects within firms, between firms and at the aggregate level. I first quantify these effects for all workers and then decompose them between men and women. I offer a comprehensive assessment by combining administrative data, reduced-form methods and a structural general equilibrium model. This allows me to document the effects of a minimum working time on employment (in terms of jobs and hours), welfare and gender inequality. Beyond the causal effects of the policy, my analysis provides a better understanding of (i) the labor demand determinants of hours, especially the firm-level substitutability between hours and workers, (ii) the reallocation effects of labor market reforms between firms, and (iii) gender heterogeneity in labor supply and in the effects of working time regulations. My analysis proceeds in three steps.

First, I rely on French linked employer-employee data and an event study design to estimate the impact of the minimum workweek at the firm level. My empirical strategy leverages firm-level differences in the pre-reform share of jobs with a workweek below 24 hours. Identification assumes that firms with different shares of affected jobs would have had the same evolution in employment, had the reform not been implemented. I show that this assumption is credible over the pre-reform period.

I find that the minimum workweek decreased the number of workers employed in the firm. This negative extensive margin effect is driven by a reduction in low-hour jobs. Meanwhile, there is a positive effect on average hours per job (intensive margin effect), driven by an increase in the number of full-time workers. Overall, the negative extensive margin effect dominates: total hours worked in the firm decrease. An initial share of jobs below 24 hours higher by 1 percentage point results in a 0.2% decrease in hours. This result suggests that firms cannot flexibly substitute between hours and workers.

Importantly, the minimum workweek has heterogeneous effects between men and women. The firm-level decrease in total hours worked is mostly driven by a reduction in female employment. Two channels explain these differences. First, the negative impact on the number of jobs is stronger for women, which is consistent with the fact that women were more likely to have a workweek below 24 hours before the reform. Second, the increase in the number of jobs with longer hours is stronger for men. These results hold within industries and occupations, suggesting that men working longer hours have replaced women with low hours for the same jobs.

Second, I analyze the potential reallocation of workers between firms. Since firms more exposed to the policy are shrinking, the unemployment pool becomes larger, making it easier for firms less exposed to hire new workers. To investigate indirect effects, I consider simultaneously the effects of the firm-level exposure and the leave-one-out average exposure at the market level on firm's employment. I find that the number of jobs increased in firms operating in a market where other firms were more exposed to the policy. This result implies that the aggregate impact of the minimum workweek can be very different from the firm-level estimates. A structural general equilibrium model allows me to take into account both the firm-level effects as well as indirect reallocation.

Third, to quantify the aggregate impact of the minimum workweek, I build and estimate a search and matching model with two-sided heterogeneity. The framework is a random search model with multiple-job firms and bargaining over hours and wages. Men and women differ ex-ante with respect to their labor disutility, as suggested by differences in preferred working time in the French Labor Force Survey. Firms differ in their production technologies, characterized by two components: productivity and the distribution of tasks duration. The predictions of the model for the partial equilibrium effects of the minimum workweek are in line with the reduced-form results: employment decreases but average hours per job increase. The model also accounts for general equilibrium adjustments due to changes in the labor market tightness and workers' outside options, which can generate positive feedback employment effects. I develop an estimation strategy allowing me to separately identify labor supply and labor demand parameters. I combine information on preferred working time from the Labor Force Survey, with data from job ads, informative about firms' demand in hours, and administrative data on actual hours worked in the economy. The policy parameter corresponding to the minimum workweek is identified using the reduced-form result.

Taking into account both firm-level and general equilibrium adjustments, I estimate that the minimum workweek increased the unemployment rate by 2.0% (2.2% for women and 1.8% for men). Women are both more impacted by the negative within-firm effects and less likely to benefit from between-firm reallocation. Importantly, the model uncovers new results for the total number of hours worked: while within-firm reallocation of hours is limited, I estimate an increase in total hours worked by 1.3% once accounting for general equilibrium adjustments. The reform reallocates workers to firms less exposed to the policy, hence relying on jobs with longer hours. This result indicates that after the policy, there are more hours worked but concentrated among fewer workers (more likely to be men). Finally, I find a 3.5% decrease in average worker welfare, driven by the decrease in employment probability. As women are more impacted by the negative employment effects, the gender gap in welfare increases.

This paper contributes to three strands of the literature.

First, I add to the literature on policy evaluation and on the effects of working time regulations. Several papers have studied the effects of reductions of the full-time workweek (Hunt (1999), Marimon & Zilibotti (2000), Crepon & Kramarz (2002), Rocheteau (2002), Chemin & Wasmer (2009), Raposo & van Ours (2010), Goux et al. (2014), Lopes & Tondini (2022), Batut et al. (2023)). These papers find no employment increase in response to workweek reductions, consistent with my firm-level results indicating limited substitutability between workers and hours. The existing literature also provides evidence on the effects of regulating atypical types of contracts (Scarfe (2019) and Dolado et al. (2022) on zero-hour contracts in the United Kingdom, and Carrillo-Tudela et al. (2021) on mini-jobs in Germany). This paper exploits a new type of regulation, minimum working hours, to study the effects of restricting part-time jobs. I uncover two types of effects. First, I find that working time regulations affects gender inequality, revealing that the average effects of such policies can cover up sizable composition effects. Second, I quantify large general equilibrium effects in response to working time regulations. Reallocation or indirect effects of labor reforms have been documented with other types of policies (Crépon et al. (2013), Hagedorn et al. (2013), Dustmann et al. (2021), Giupponi & Landais (2022)). This paper contributes to the literature on the aggregate effects of labor reforms (Hopenhayn & Rogerson (1993), Flinn (2006), Gautier et al. (2018), Boone et al. (2021), Engbom & Moser (2022), Cahuc et al. (2023)) by combining reduced-form evidence with a structural model.

Second, this paper adds to the literature on the determination of working hours and firms labor adjustments. A large literature focuses on part-time jobs and hours (Altonji & Paxson (1988), Aaronson & French (2004), Hirsch (2005), Blundell et al. (2008), Prescott et al. (2009), Booth & Ours (2013), Kline & Tartari (2016), Devicienti et al. (2018), Devicienti et al. (2020), Kopytov et al. (2023), Borowczyk-Martins & Lalé (2019), Bick et al. (2022), Labanca & Pozzoli (2022), Lachowska et al. (2023)). This paper considers jointly the role of labor supply and labor demand in the determination of hours as well as both intensive and extensive margin adjustments. The firm-level effects provide new evidence on how firms allocate hours between workers and the lack of substitutability between the two. The estimation of labor supply parameters by gender also contributes to the literature on gender differences in labor supply (Flabbi & Moro (2012), Goldin (2015), Kleven et al. (2019), Erosa et al. (2022)).

Third, I build a new structural model with intensive and extensive magin adjustments and develop an identification strategy for the two-sided heterogeneity. My framework contributes to the search and matching literature and especially models with hours. I add to Bloemen (2008) and Frazier (2018) by including both intensive and extensive margin adjustments in a general equilibrium framework. My model features two-sided heterogeneity and hence differs from Cooper et al. (2007), Fang & Rogerson (2009), Cooper et al. (2017), Dossche et al. (2019) and Kudoh et al. (2019). Combining data from job ads, employment records and the Labor Force Survey, I identify separately labor supply and labor demand parameters, an estimation procedure that could be used in different contexts.

The rest of the paper is structured as follows. Section 2 describes the institutional context and the minimum workweek reform. Section 3 presents the data and some aggregate descriptive evidence. In Section 4, I detail the reduced-form strategy and the firm-level effects of the reform. In Section 5, I discuss the relationship between reduced-form and aggregate effects. I then present the structural model, its estimation, and the results for the aggregate impact. Section 6 concludes.

2 The reform implementing the minimum workweek

2 .1 Institutional context

The legal minimum working time was introduced in France for the first time in 2014. However, there were already several regulations affecting working hours. These regulations include (1) the working time of full-time jobs, (2) rules regarding the use and compensation of overtime hours as well as (3) the maximum legal working time. First, individual labor contracts specify the regular number of hours of work per week and the compensation. Since 2002, the regular full-time workweek has been equal to 35 hours.[1] A few firms and industries have exceptions to the 35h-rule and can implement a workweek between 35 and 39 hours.

Second, hours worked on top of contractual hours are overtime hours. They are subject to specific rules. For full-time workers, overtime hours are paid at a higher rate than standard hours. This rate depends on the size of the firm. For employees working fewer than 35 hours per week, overtime hours are paid at the same rate as contractual hours but are subject to a limit of $1/10^{th}$ of contractual hours.

Third, there is a legal maximum number of hours worked, decided at the European Union level. A worker can never work more than 48 hours per week, including overtime. Furthermore, the working time should not exceed 44 hours per week on average over a period of 12 weeks.

[1] The French full-time workweek was 39 hours until 2000. From 2000 to 2002, most firms implemented the 35h full-time workweek.

On top of working time laws, two additional regulations shape the design of labor contracts in France. First, there is a national hourly minimum wage, supplemented by minimum wages in collective agreements that are industry and occupation-specific. Second, there are two main types of labor contracts: fixed-term and open-ended contracts. Fixed-term contracts have a specified duration while open-ended contracts can only be terminated under specific circumstances. Rules regarding hours worked are the same for both types of contracts.

2 .2 The 24h minimum workweek

In July 2014, the French government introduced a legal minimum workweek equal to 24 hours per week.[2] This floor on hours worked was decided for several reasons. First, the government targeted low-income workers, aiming to increase total earnings by boosting work hours. A second objective was reducing involuntary part-time employment. Before this reform, a third of part-time workers were willing to work more hours at the same hourly wage.[3] Third, this policy was seen as a tool to increase hours worked by women and hence to reduce the gender gap in earnings.

Policy. The reform introduced a minimum number of working hours for jobs created after July 2014. While there is no systematic check of compliance with the policy, workers can sue their employers in labor court for working time lower than 24h. In that case, the judge will decide on a compensation usually equal to the wages the worker would have had, had she been working 24h.[4] The minimum workweek was implemented with some exceptions. The primary exception permits workers to request jobs with fewer than 24 hours per week. In practice, the worker should explain in a letter the reasons why she prefers to work fewer than 24h (e.g. family constraints). The letter is then given to the employer as a proof that the worker is asking for an exception. However, the risk of being sued still exists in this case. There are also cases in which the judge ruled in favor of the worker, even though the employer presented the letter, as there was a risk that the worker signed the letter under pressure. This exception is not directly observed in the data. Because of the way the policy is enforced and this exception, the reform can be seen as making jobs with working time below 24h more costly and risky for employers, rather than a strict ban.

Exceptions. The minimum workweek policy allowed for other types of exceptions that are more specific and in some cases, observable in the data. An exception can apply if (1) the worker is a student younger than 27, (2) the worker is employed by a household (e.g.

[2] Or equivalently a floor of 104 hours per month if the contractual working time is specified on a monthly basis.

[3] Source: Labor Force Survey, 2013.

[4] Labor court rulings are not systematically digitalised, making it impossible to know the number of workers going to court on that ground. However, there are many examples of compensations for working time below 24h decided in appeal courts, which are published by the Ministry of Justice.

gardener, housekeeper), (3) the job is a fixed-term contract lasting less than a week, (4) the job is a fixed-term contract used to temporarily replace a worker on sick leave usually working fewer than 24h. Moreover, when the policy was implemented, the government allowed for the possibility to negotiate collective industry agreements with exceptions to the 24h rule. I collected these agreements and found that 40 industries have bargained exceptions since 2014 (see Online Appendix A .1). In the data, I am able to identify firms and jobs covered by such agreements and exclude them for the analysis. Industries with exceptions employ 4.33% of the workforce over the pre-reform period and account for 7.69% of jobs with fewer than 24 hours in 2013. Two facts can be emphasized about these agreements. First, many agreements apply only to very specific occupations. For instance, in the sports equipment retail industry, the minimum number of hours is 24 for all workers except accountants and cleaning staff. Second, most of these agreements specify minimum working hours above 10 hours per week. For instance, it is 18 hours for publishing activities, 14 hours for zoological parks and 16 hours for medical biology laboratories.

Timing. The minimum workweek was implemented in July 2014 but announced in June 2013. A few changes occurred between the announcement and the implementation. First, the minimum number of hours was supposed to be mandatory for hires starting January $1st$, 2014, while firms would benefit from a two-year transition period for jobs created before 2014. Hence, the law initially targeted all jobs. On January 2014, the government decided to postpone its application arguing that firms were not ready to change their organization. It was decided that the reform would finally be effective in July 2014. On July 1^{st}, 2014, the mandatory minimum number of hours was implemented for new hires. Finally, in January 2015, the government announced that workers hired before the implementation of the reform would not be subject to the minimum workweek. Hence jobs already created finally did not have to comply. As a result of this change, it is very unlikely that firms anticipated the implementation of the law by hiring more workers with fewer than 24h since the reform was supposed to be extended to all jobs at the end of the transition period.

Other policy changes. The 24h-rule was part of a package of labor market reforms (*Loi Sécurisation de l'Emploi*) aiming at improving labor market trajectories. On top of the minimum workweek, another change targeted part-time jobs. Before the reform, part-time workers were not allowed to work more overtime hours than $1/10^{th}$ of contractual hours. The law removed this cap, increased the wage rate for hours below $1/10^{th}$ of contractual hours by 10% and the wage rate for hours above this cutoff by 25%. This regulatory change is unlikely to have significant effects for two reasons. First, before 2014, firms did not rely much on overtime hours for part-time workers, even if there was no wage premium. In 2010, 34% of part time workers were working overtime hours. On average, they were doing 14 minutes per week of overtime hours (Pak 2013). Second, other papers have found no effect of policies affecting the compensation of overtime hours in the French context (Cahuc & Carcillo 2014). I describe the other policy changes, that are unrelated to the working time, as well as details about the legislative process in Online Appendix A .2.

3 Data and descriptive evidence

3 .1 Data

To investigate the effects of the minimum workweek, I combine rich data at the firm and worker levels. First, I rely on administrative data to compute job- and firm-level outcomes. Second, I use survey data and job ads to recover information on labor demand and labor supply.

Administrative data. The main job-level and firm-level outcomes are measured from the French employment records, the *Déclarations Annuelles des Données Sociales* (DADS) over 2003-2017. They are built by the French Institute of Statistics (INSEE) and provide information at the job spell level from firms' mandatory fiscal declarations. Every year, firms have to declare, for each job $\times$ worker, the wage, the number of hours worked and the length of the employment spell in days. The data include demographic details such as age and gender. They also include the type of contract (open-ended or fixed term), industry and occupation codes. I restrict the sample to private sector firms. I exclude workers employed by households or associations because these contracts are subject to specific rules. I also exclude workers in temporary agencies because we cannot identify in which firm they actually work. The data provide the collective agreement number, hence allowing to identify the firms covered by exceptions to the reform.

For each year and each firm, I compute the average workweek of each job spell using the total number of hours worked, the starting date and the end date of the job spell. This has two implications. First, the total number of hours observed for each job spell is the number of hours paid by firms, which is the sum of contractual and overtime hours. It is not possible to distinguish between the two. Second, I am not able to observe variations in working time within the year. I aggregate spell-level data to recover employment, total hours worked and the share of women at the firm level. Finally, firms can be followed over time using a unique identifier.

Employees working fewer than 24h in 2013 are more likely to be women (58% against 39% for jobs above 24h) and in low-skilled white-collar occupations. These jobs are over-represented in the services, and especially in accommodation and food services (15% of jobs below 24h are in accommodation and food while this industry represents 9% of jobs above 24h). Online Appendix Table B .1 presents descriptive statistics on jobs with workweek below and above 24h before the implementation of the minimum workweek. The large differences in the share of jobs below 24h between industries and occupations suggest structural differences in firms' demand for these jobs.

Finally, I combine the DADS with balance sheet data (Ficus-Fare) to investigate additional firm-level outcomes. These data provide information on value added, the stock of capital, total wage bill and purchased services. The French Institute of Statistics compiles these data from firms' tax declarations.

Other data. I complement the administrative information with data on firms' recruitment behavior and on workers' preferences. The former is obtained from job ads. The French Public Employment Service (*Pôle Emploi*) administers a centralized job search platform. This platform offers employers the possibility to include job ads with a standard application procedure. Pôle Emploi estimates that they deal with about 50% of the total French vacancies.[5] Since 2013, the number of hours of work required for the job has been observed for 70% of job ads. Half of the vacancies contain information on both the number of hours and the hourly wage. Applying the same industry restrictions as for the administrative data, there are 744,293 job ads in 2013 in which both the required hours and the wage are observed.

Information on the worker side is obtained from the French Labor Force Survey. Each year, the survey is administered to a representative sample of about 75,000 households. Interestingly, employed workers are asked both about their preferred working time, keeping the current hourly wage constant, and about their actual working time. The Labor Force Survey is also useful to observe additional demographic characteristics not observed in the linked employer-employee data (see Online Appendix Table B .2 for descriptive statistics by household composition and hours of work).

3 .2 Aggregate descriptive evidence

In Figure 1, I document the aggregate evolution in the use of jobs below 24h. Panel (a) shows the evolution of the share of new hires for jobs with a workweek below 24h, to consider the bite and compliance with the reform. I separately consider all industries and the ones not affected by exceptions. From 2002 to 2013, the share of new jobs with fewer than 24 hours increased. In 2013, the year before the implementation of the minimum workweek, 30% of new hires were for jobs with working time below 24h (industries with exceptions excluded). From 2014 onwards, this share progressively declined, dropping to 15% by 2017. The reform was hence followed by a large decrease in hires below 24h. Because workers can ask for an exception and the absence of systematic enforcement, we don't expect the share to reach 0%. The lack of an immediate sharp decline suggests incomplete awareness of the policy among

[5]See Cahuc et al. (2018) for details.

workers and employers upon its implementation.[6] Panel (b) shows that for women, jobs below 24h represented 40% of new hires in 2013, while it was 23% for men. Following the reform, the share was divided by two for both women and men, reaching 20% and 11% respectively in 2017. The evolution of the share of jobs with fewer than 24h in the stock of jobs followed a similar evolution (Panel (c)), even if the share in the stock was initially lower than for new hires (15% when exceptions are excluded). The last panel of Figure 1 presents the evolution of the share of job ads with working time below 24h. While 18% of job vacancies required a working time lower than 24h in 2013, this share is between 10% and 14% after the reform. These graphs show that, even with imperfect enforcement and several exceptions, the use of jobs with working time below 24h strongly decreased from 2014. This indicates that firms internalized the risk of workers going to labor courts and reduced their demand for low-hour jobs.

Changes in the aggregate share of jobs below the 24h cutoff suggest important changes in the distribution of hours worked. In Panel (a) of Figure 2, I plot the distribution of hours worked in the stock of jobs before the implementation of the minimum workweek. There are two striking patterns. First, there is a large spike at 35h, corresponding to full-time jobs. Second, there is a sizable share of jobs below 24h, uniformly distributed between 1 and 30 and representing 15% of employment in 2011-2012. Second, Panel (b) of Figure 2 shows the change in the distribution, following the implementation of the reform. The decrease in the share of jobs below 24h comes from all types of workweeks below that cutoff. There is a slight increase in the number of jobs with exactly 24h but this increase is small compared to the bunching that could be expected with this type of policy. In contrast, there is an important increase in the number of full-time jobs. Figure B .2 in Online Appendix shows similar patterns for men and women, with greater magnitudes of variations for the latter. These figures provide suggestive evidence that some substitutions took place with long-hour jobs instead of part-time jobs at exactly 24h. These aggregate changes raise two questions. Are the substitutions between part-time and full-time jobs taking place in the same firms? Second, are they for the same types of workers or due to composition effects? The next section provides evidence on the within-firm substitutions.

4 Firm-level effects

In this Section, I quantify the effects of the minimum workweek at the firm level. First, I focus on the employment effects, both in terms of total hours worked and number of jobs. I then decompose the effects between male and female workers. Second, I investigate additional margins of adjustments and analyze labor flows.

[6] Online Appendix Figure B .1 decomposes the evolution by industry and by firm size and shows that even if initial shares are heterogeneous between firms, there is a decrease for all types of firms.

4 .1 Reduced-form strategy

The reduced-form strategy leverages differences in the use of jobs with fewer than 24h between firms. Before implementation of the French minimum working time, the demand of those jobs was very heterogeneous between firms. To capture these differences, I define a firm-level variable measuring the intensity of exposure to the policy. This variable is a proxy for the firm's structural need for jobs below 24h. I denote Share24$_i$ this variable, which is equal to the pre-reform share of workers working fewer than 24h per week in firm i. I compute this exposure variable on average over 2009-2013, to have a measure that is not volatile and sensitive to temporary shocks. The period of interest is 2009-2017. Hence, the main reduced-form strategy relies on the comparison of firms with different initial shares of affected jobs before and after the reform. I estimate the following specification

$$y_{it} = \sum_{\substack{k=-4 \\ k\neq 0}}^{k=4} \beta_k \times \text{Share24}_i \times \mathbb{1}_{t=2013+k} + \psi_t X_i + \mu_i + \eta_t + \epsilon_{it}, \quad (1)$$

where y_{it} is the outcome variable, for instance the logarithm of the number of workers employed in firm i in year t.[7] μ_i are firm fixed effects and control for firms' characteristics that are constant over time. η_t are year fixed effects and X_i are firm characteristics, hence allowing the time effects and impact of firm characteristics (ψ_t) to vary flexibly over time. I estimate three versions of Equation (1): (i) the model with only firm and year fixed effects, (ii) the one with added industry-year and area-year fixed effect, and (iii) the full model with also time-varying size and age effects. β_k corresponds to the effect of Share24 being equal to 100% instead of 0, k years after implementation of the policy or to placebo parameters in pre-reform years. As a result, estimates of this specification measure the effect of being more versus less exposed to the policy, at different dates before and after implementation of the minimum workweek. This type of identification strategy has been extensively used in the policy evaluation literature (see for instance Harasztosi & Lindner (2019) for an application to the minimum wage and Saez et al. (2019) about payroll tax cuts). The identification assumption is that, without the reform, firms with varying exposures would have followed similar employment trajectories. As a check, Figure 3 shows that the relationship between Share24 and the outcomes of interest was very stable in the years preceding the reform. Furthermore, estimates of the parameters over the pre-reform period allow me to test this parallel trend assumption before implementation of the policy.

To investigate the drivers of Share24, I first compute a variance decomposition of this variable. I find that between-industry variation explains between 30% (at 2-digits) and 42% (at 5-digits) of the total variation in exposure to the reform. This means that at least 58% of the variance is due to within-industry variation. Second, I regress the Share24 variable on

[7] For outcome variables that can be equal to 0 (e.g. low-hour jobs in the firm), I use the inverse hyperbolic sine transformation, such that $y_{it} = log(Y_{it} + \sqrt{1 + Y_{it}^2})$, where Y_{it} is the variable in levels.

firm characteristics, by industry, to understand the drivers of within-industry variations. Table B .3 presents the R^2 of OLS regressions from which one set of regressors is removed at a time. The distribution of occupations in the firm, within industry, is one of the main drivers of exposure to the policy.

Equation (1) is estimated over a balanced panel of firms. The sample is composed of firms with 5 workers or more before implementation of the minimum workweek that are not covered by collective agreements with a different minimum workweek. I show in Section 4 .3 that the results are robust to alternative samples and that firm entry and exit are not impacted by the reform. The balanced panel is composed of 187,065 firms in retail, manufacturing, services (accommodation and food and other services) and construction. Table 1 presents summary statistics on the estimation sample. Average firm size in the sample is 46.86 workers and average exposure to the reform is 12% (respectively 8% for the median). Figure B .3 in Online Appendix shows the distribution of Share24, the pre-reform exposure to the minimum workweek.

4 .2 Main results

Employment effects. Figure 4 presents estimates of β_k for several versions of Equation (1). A natural first step is to consider the effect of the floor on hours worked on jobs targeted by the reform, shown by Panel (a). First, over the pre-reform period (2009-2013), estimated parameters are very close to 0, even if significant.[8] From 2014, the first post-reform year, there is a decrease in the number of jobs below 24h. This decrease in the stock of jobs below 24h becomes even larger over time, consistent with the fact that the policy applied to new hires only. In Table 2, I show that this impact on the stock of jobs is actually driven by the hiring margin. Regarding the magnitude of the effect, I find that a 1 percentage point higher share of jobs below 24h before the reform implies a decrease in the number of jobs below 24h in the firm by 1.6% in 2016. Due to this drop in low-hour jobs, the total number of jobs decreases, as depicted by Panel (b). This figure presents estimates for the log number of workers in the firm. The number of jobs declined by 3.8% more in firms where 100% of pre-reform jobs where below 24h relative to firms with no such job. Some jobs below 24h have been replaced by jobs with longer hours: Panel (c) shows that the number of full-time workers increases in the firm in response to the policy. However, I don't find any increase in jobs with workweek between 24 and 35 (see Online Appendix Figure C .1). Overall, the increase in long-hour jobs is not enough to offset the decrease in the number of jobs: the total number of hours worked

[8]The standard errors are particularly small for two reasons: The sample size is very large because of comprehensive data and the outcomes are in logarithm. As a robustness check, I compute in Section 4 .3 alternative confidence intervals accounting for potential differential pre-trends using the procedure by Rambachan & Roth (2023) and find consistent results.

in the firm every year is decreasing.[9] An initial share of jobs below 24h higher by 1 percentage point is associated with a decrease in total hours by 0.17% in 2016 (Panel (d)). The negative effect on the extensive margin dominates the positive effect on the intensive margin. Firms more exposed to the reform are shrinking relatively to firms with a lower exposure. This result suggests that hours of work and workers cannot be flexibly substituted within firms.

Other adjustment margins. Consistent with the negative effects on total hours, I find a decrease in total output and other inputs. Panel (a) of Figure C .3 shows estimates for total sales in the firm. A 1 percentage point higher exposure to the policy decreases sales by 0.2% in 2016. The decrease in output suggests that the workers hired on full-time jobs are not producing more to compensate for the decrease in the number of workers in the firm. Panels (b) and (c) show that the stock of capital decreases proportionately in the firm. Finally, using purchased services as a proxy for outsourcing, I study whether firms have relied more on external contractors to mitigate the impact of the policy. Panel (d) of Figure C .3 shows that firms do not increase service expenditures, indicating that the decrease in employment is not compensated by purchasing services to self-employed workers.

As the reform only targeted new hires from July 2014 onward, firms may have had incentives to keep previous hires longer to avoid implementing the policy. Online Appendix E describes the worker-level difference-in-discontinuity analysis I implement to investigate what happened to jobs created before 2014. I find that a worker with a workweek below 24h before the reform is more likely to continue to work in the same firm by almost 1 percentage point (2% of baseline outcome) in 2016 relative to a job with a workweek above 24h. Even if the magnitude of the effect is small, this is significant evidence of a small hoarding effect of jobs with fewer than 24h created before the policy.

Gender heterogeneity. I now consider firm-level outcomes separately for men and women. I estimate Equation (1) where the outcome is gender specific, for instance the number of women (or men) working in the firm. Exposure to the policy is, as before, Share24, the share of affected jobs in the firm before the reform. Figure 5 depicts the main results. The negative employment effects are much stronger for women than for men, both in terms of number of jobs and total hours worked in the firm. An increase of 1 percentage point in exposure to the policy is associated with a decrease in the number of jobs by 0.2% for men and 0.4% for women in 2016 (Panel (a)). Panel (b) shows that the majority of the decrease in total hours worked in the firm is driven by hours work by women. For total hours, the semi-elasticity is -0.1 for men and -0.4 for women. Online Appendix Figure C .2 shows that two margins explain these different employment effects by gender. First, the percentage change in the number of jobs below 24h is similar for the two groups (Panel (a)), but the

[9] Online Appendix E shows that the reform is unlikely resulting in workers having one long-hour job instead of several part-time jobs: only 3.5% of part-time workers hold multiple jobs before the reform (3.3% after).

initial level is higher for women. Hence the decrease in the number of jobs below 24h is larger for women. Second, the increase in the number of jobs with longer hours is stronger for men, as shown by Panel (b). These findings indicate that, at the aggregate level, part of female part-time employment has been replaced by males working full-time because of the reform.[10] These substitutions between gender may explain why there has been an increase in full-time jobs rather than part-time jobs with exactly 24h: the workers hired after the reform are different from the workers hired before, hence the optimal hours are not the same. The structural model presented in the next Section features ex-ante heterogeneity between workers to account for this channel.

To understand if the different effects between men and women are driven by composition effects, I estimate the impact of the reform separately within occupations, industries and firm types. Figures D .1 and D .2 in Online Appendix plot the results. When the outcome is the number of jobs (Panel (a) of both Figures), estimates are negative and significant for all occupations for women, both the high-skilled ones (managers, engineers and technicians) and the low-skilled ones (clerks and blue-collars). For men, estimates depend on the occupation considered and are typically smaller (in absolute value) from women's estimates. Panels (b) show estimates for total hours worked and are negative for most occupations and industries for women. For men, the impact on hours is very heterogeneous between occupations, with positive effects for several high and low-skilled occupations. The fact that men and women may have different jobs is not driving the differential impact of the reform: even for a given type of jobs, the effects of the policy are very different for men and women.

4 .3 Robustness analysis

In this Section, I discuss the validity of the parallel trend assumption and examine the robustness of the firm-level results, to mean reversion, to the definition of exposure to the policy and to changes in the estimation sample. I discuss the robustness checks for the two main outcomes, namely the number of jobs and total hours worked.

Parallel trend assumption. The analysis assumes that without the policy, firms with different shares of jobs below 24h would have evolved similarly. Although untestable during the treatment period, I test for this assumption in the pre-reform years. First, for all outcomes of interest, I have presented placebo estimates over years 2009 to 2012. In all cases, the estimates are very small in magnitude, relative to the post-reform estimates. In addition, Figure 3 shows that the relationship between Share24 and outcomes is extremely stable over time over the pre-reform period. This relationship is different after implementation of the minimum workweek: the higher the exposure, the larger the change in outcomes

[10] Online Appendix Table C .1 confirms that these findings also hold when computing the corresponding changes in levels. The average decrease in the number of jobs in the firm is 1.65 for women and 0.90 for men.

compare to the pre-reform period. Third, I apply the procedure proposed by Rambachan & Roth (2023) and find that the significant decrease in the number of jobs and total hours is robust to potential differential pre-trends before the policy (Figure G .1 in Online Appendix).

Mean reversion. The share of affected jobs is computed on average over a period of five years (2009-2013) for firms above 5 workers so that identification of the effects relies on a source of variation not too volatile and sensitive to temporary shocks. Second, to provide additional checks, I estimate difference-in-difference regressions over two-year rolling periods by computing exposure in the first year and defining the second year as the treated year. For example, the estimate in 2010 comes from a difference-in difference regression estimated on 2009 and 2010, with Share24 computed in 2009. Online Appendix Figure G .2 shows that, for both outcomes, the pre-reform estimates are significant but very small in magnitude compared to the estimates after implementation of the policy. For the number of jobs, estimates are in the range (-0.07, -0.02) for the pre-reform period while the point estimate is equal to -0.21 in 2014, the year the policy is implemented. For the total number of hours worked, estimates over 2009-2013 are in the range (0.01, 0.09) while the estimate in 2014 is -0.30. Even with this method, which is more likely to be affected by mean reversion as exposure is computed over one year only, I find that mean reversion cannot drive the results found.

Balanced sample. The main results are estimated over a balanced panel of firms. Hence, they do not take into account potential effects of the policy on firm entry nor exit. I compute exposure to the policy at the industry level in 2009-2013 and estimate Equation (1) where the outcome is the firm entry or exit rate of the industry for each year. Figure G .3 in Online Appendix shows that, for both outcomes, there is no effect. This result shows that while firms are shrinking because of the minimum workweek, they tend to remain on the market. Second, to check that the estimated effects are not specific to older firms, I estimate Equation (1) on alternative and less restrictive samples, including younger firms. Each sample is composed of firms existing during at least 5, 4, 3, 2 and 1 year before implementation of the policy. I find that estimates for β_k are very close to the ones previously estimated (Online Appendix Figure G .4). If anything, including younger firms in the sample increases slightly the magnitude of estimates.

Definition of exposure to the reform. I find that Share24 is highly persistent over time (see Online Appendix Figure G .5). Hence, the former exposure to the policy should be a good proxy for the firms' current exposure. As a robustness check, I reproduce the analysis using an alternative proxy for firm exposure to the policy. I compute a GAP-exposure to the reform: the average increase in hours that would be needed in the firm to have all workers working at least 24h. The GAP is computed on average over 2009-2013. Figure G .6 in Online Appendix plots estimates of β_k from Equation (1) in which Share24 is replaced by the GAP variable. The results are consistent with the main firm-level effects: both the number of jobs and total hours worked in the firm decrease.

This Section has presented relative changes in outcomes in firms with a high exposure to the minimum working time, relative to firms with a low exposure. Overall, I find a decrease in the total number of hours worked at the firm level, indicating that firms do not reallocate hours flexibly between workers. The effect is very heterogeneous by gender: while women are highly impacted by the negative extensive margin effects, they are also less likely than men to benefit from an increased working time. The objective of the next section is to relate these relative differences between firms to the aggregate employment effects.

5 Aggregate effects

In this Section, I investigate the aggregate effects of the minimum workweek. First, I provide evidence that the 24h regulation had indirect between-firm effects resulting from the reallocation of workers. Second, I present the general equilibrium model and estimation used to quantify the aggregate impact. Finally, I discuss the effects of the reform on total employment, unemployment and welfare.

5 .1 Between-firm effects

The reduced-form results indicate a decrease in the number of workers employed in firms initially relying more on low-hour jobs. One may wonder whether these workers became unemployed or if they reallocated to firms less exposed to the policy. This would have two important implications. First, it would lead to a potential bias for the main reduced-form results. Second, the aggregate employment effects of the minimum workweek would be different from the firm-level results. The question of aggregation matters for policy purposes since we are interested in the effects of the reform on total hours worked in the economy and on the total number of workers employed. To investigate whether the policy had such indirect effects, I compare firms operating in markets with different average exposures. In particular, I test whether employment in a given firm is affected, conditional on the exposure of the firm, when this firm shares a market with highly exposed firms. If there are indirect effects, firms sharing a market with highly exposed firms should benefit more from the reallocation. I rely on the following event study specification at the firm level

$$y_{imt} = \sum_{\substack{k=-4 \\ k\neq 0}}^{k=4} (\lambda_k \times \mathsf{Share24}_i + \gamma_k \times \mathsf{Share24}_{m(-i)}) \times \mathbb{1}_{t=2013+k} + \mu_i + \eta_t + \delta_m + \epsilon_{imt}. \quad (2)$$

where y_{imt} is the log number of jobs in firm i, operating in market m in year t. In the main specification, a market m is a commuting zone $\times$ industry (aggregated at 2-digits). I present results for different definitions of a market. As previously, Share24$_i$ is the average share of affected jobs in firm i, computed over 2009-2013. Share24$_{m(-i)}$ is the leave-one-out average share of affected jobs in market m, computed over the same period. μ_i, η_t and δ_m are firm, year and market fixed effects, respectively. λ_k are parameters indicating the direct impact of the reform on firm-level employment and γ_k are the indirect between-firm effects. γ_k corresponds to the employment effects of operating in a market marginally more exposed to the policy, conditional on the firm's own exposure.

Figure 6 shows estimates of λ_k and γ_k for all years from 2009 to 2017, separately for the number of men and the number of women in the firm. First, estimates of the direct effects are still negative, significant, and stronger for women. Second, I find that market exposure had different effects for men and women. I estimate a positive and significant effect for men, which suggests between-firm reallocation. A 1 percentage point increase in average market exposure is associated with an increase by 0.3% in the number of men employed in the firm. For women, I find no evidence of indirect effects: estimates are both small and non-significant. The lack of reallocation for women is consistent with different labor supply by men and women: women willing to work part-time are less likely to reallocate. Online Appendix Table H .1 shows that estimates of the indirect effects are robust to different definitions of the market in which firms operate.

Evidence of indirect effects between firms in response to the minimum working time implies that the overall impact of the policy cannot be deduced from the reduced-form results relying on the comparison of different firms. While reduced-form evidence shows there is some indirect reallocation taking place within markets, it cannot quantify all of the general equilibrium effects, for instance reallocation between markets. In the next Section, I build and estimate a general equilibrium model that takes into account both the firm-level effects and the general equilibrium adjustments to quantify the aggregate impact.

5 .2 Structural model pre-reform

To study the aggregate impact of the 24h minimum workweek, I build a structural model of the labor market. The framework is a random search and matching model based on Pissarides (1985) to which I incorporate (i) multiple-job firms, (ii) two-sided heterogeneity and (iii) bargaining over hours and wages. The model features both within- and between-firm heterogeneity in working hours. While hiring decisions are endogenous, I assume that separations are exogenous. I first present the pre-reform framework and then describe how the reform is introduced.

5 .2.1 Population and technology

The framework is a random search and matching model with multiple-job firms. Time is discrete and the horizon of individuals is infinite. There is a large number of workers and an endogenous number of firms. Both workers and firms are risk neutral and share the same discount rate β. Firms all produce an identical homogeneous good, using labor as the only input. Firms make endogenous hiring decisions and jobs are destroyed exogenously at constant rate μ. Firm entry is endogenous and firms are exogenously destroyed at rate δ. I denote by $\sigma = \delta + (1-\delta)\mu$ the probability that a job is destroyed, independently from the cause. Except job and firm destruction, the environment is deterministic.

Technology. Firms differ in their production technologies. First, a firm is ex-ante characterized by a productivity y, where y is constant over time. Second, firms require tasks with heterogeneous duration. A task is characterized by a maximum number of productive hours, z, which represents the number of hours necessary to perform a given job. After z hours of work, marginal production drops to 0. For each job, z is drawn when a firm-worker match is formed in a firm-specific distribution, characterized by the cumulative distribution function $H_y(.)$. It implies that ex-ante, firms differ in their productivity and their distribution of maximum numbers of productive hours. The latter determines the firm's exposure to the minimum workweek in the model. In the data, more productive firms tend to rely on longer hours on average, but also have lower dispersion in hours (see Online Appendix Figure J .1). The model also allows for correlation in both first and second order moments between productivity an hours. Denoting h the number of hours worked in a job, the production of a job is

$$\begin{cases} yh^{\alpha} & \text{if } h < z \\ yz^{\alpha} & \text{otherwise.} \end{cases} \quad (3)$$

α is common to all firms and characterizes returns to scale at the job level. I do not make any assumption on how α compares to 1 and will estimate this parameter.

Entry and vacancies opening. I assume that there is a large pool of potential entrepreneurs who might decide to create a firm. An entrepreneur has to pay a fixed red tape cost k to draw a firm productivity, y. y is drawn in the cumulative distribution function $F(.)$.

To hire workers, an entrepreneur has to open vacancies, the number of which is denoted $v(y)$ for a type-y firm, at cost $C(v(y))$, which is increasing and convex. Vacant jobs are matched with workers at a rate $m(\theta)$, where $\theta = \frac{v}{u}$ is the labor market tightness, v the total number of vacancies posted by all firms and u is the total number of unemployed workers. The matching function $m(.)$. describes the matching technology. Unemployed workers meet employers at rate $\theta m(\theta)$.

Population. Workers are ex-ante heterogeneous and differ with respect to their labor disutility. There are $\mathcal{N}$ types of workers in the economy, and each type, denoted i, is in large number. The estimated version of the model features 6 types of workers ex-ante (3 types of men and 3 types of women). Hence, in the model, men and women differ in terms of preferences for hours worked. This assumption is supported by the different distributions of preferred working time from the Labor Force Survey, shown in Online Appendix Figure I .1. I assume that the instantaneous utility of a worker is equal to

$$c - \Phi(h, \epsilon^i), \tag{4}$$

where c is equal to consumption and $\Phi(h, \epsilon^i)$ is the disutility associated with h hours of work. ϵ^i is a parameter characterizing labor disutility. It is type-specific and constant over time.[11]

Timing. The timing of events for a given period is as follows: (1) Matches occur thanks to vacancies posted during previous period. (2) When a match is formed, the firm observes i, the worker type and draws z, the maximum number of productive hours. All parameters are observed by the firm and the worker. (3) For new matches, firms and workers bargain over the number of hours of work and the wage. The bargaining process is described below. A job is created when the surplus of the job is positive. Otherwise, the job remains vacant and the worker unemployed. Contracts are unchanged for workers hired during previous periods.[12] (4) Workers hired in current and previous periods produce during the number of hours specified in the contract and get paid. (5) A share μ of jobs is destroyed and a share δ of firms exits the market. (6) New firms enter the market. (7) New and existing firms decide how many vacancies to open.

In what follows, I first present the value of filled jobs, for workers and firms. Then, I describe the labor supply and demand equations.

5 .2.2 Value of filled jobs

The consumption of a worker is equal to total income, which is denoted by b for an unemployed worker and which corresponds to earnings for an employed worker. Earnings equal the product of the number of hours worked, h, and the hourly wage, w. As a result, the value of a job for a type-i worker in a type-y firm, with maximum number of productive hours z is:

$$W^i(y, \epsilon^i, z) = wh - \Phi(h, \epsilon^i) + \beta(1-\sigma)W^i(y, \epsilon^i, z) + \beta\sigma W^i_u, \tag{5}$$

[11] I normalize labor disutility to 0 for unemployed workers ($\Phi(0, \epsilon) = 0$) and assume that disutility increases in hours and in ϵ ($\Phi_\epsilon(h, \epsilon) \geq 0$ and $\Phi_h(h, \epsilon) \geq 0$).

[12] There is no shock for surviving jobs, which implies no renegotiation.

where W_u^i is the value of unemployment for a worker of type i. Conditional on the job surviving, the continuation value is the same as there is no other shock than job destruction.

For the firm, the instantaneous profit of a job is equal to the difference between the production of the job and the wage paid. For a type-y firm, the value of a job with hours h, maximum productive hours z, and worker of type i is denoted by $J^i(y, \epsilon^i, z)$ and is equal to

$$J^i(y, \epsilon^i, z) = y \min(h^\alpha, z^\alpha) - wh + \beta(1 - \sigma)J^i(y, \epsilon^i, z). \tag{6}$$

To account for the fact that the contract parameters, w and h, depend on the type of the worker, the value function for the firm is also indexed by i. If the job is destroyed or if the firm exits, the value of the job for the firm is equal to 0.

The firm determines the number of vacancies exhausting all profitable opportunities. As a result, on the equilibrium path, the value of the marginal vacant job is equal to 0. We can define the surplus of a job when all types and parameters are observed as follows:

$$S^i(y, \epsilon^i, z) = W^i(y, \epsilon^i, z) + J^i(y, \epsilon^i, z) - W_u^i. \tag{7}$$

The surplus of a job is computed in Online Appendix K .1. It is independent from the hourly wage but depends on the number of hours. Conditional on forming a match between a vacant job and an unemployed worker, the job is created if it yields a positive surplus. We can define a cutoff for z above which the surplus of the job is positive for each set of job parameters:

$$\underline{z}^i(y, \epsilon^i) = \left\{ z | S^i(y, \epsilon^i, z) = 0 \right\}. \tag{8}$$

This cutoff depends on the worker type not only because of the value of the disutility parameter, but also because of the value of the worker's outside option, W_u^i.

Determination of contracts. When a match is formed, the worker and the employer bargain over the hourly wage and the number of hours. I assume that the bargaining power of the worker is equal to γ while the power of the firm is $1 - \gamma$. The contract variables, w and h solve the following Nash problem

$$\max_{h,\ w} (W^i(y, \epsilon^i, z) - W_u^i)^\gamma (J^i(y, \epsilon^i, z))^{1-\gamma}. \tag{9}$$

As shown in Online Appendix K .1, I obtain that the number of hours is surplus maximizing and the hourly wage is such that the worker obtains a share γ of the job surplus:

$$\gamma S^i(y, \epsilon^i, z) = W^i(y, \epsilon^i, z) - W_u^i. \tag{10}$$

The bargained number of hours is optimal since the condition for hours yields equality between marginal disutility of work and marginal product. While bargained hours can be below z, it is never optimal to work more than z hours. Hence, the model features two types of low-hour jobs. First, some jobs have a small number of hours because the firm only needs a small number (z is small). Second, other jobs can have low hours because the number of hours equalizing marginal disutility of labor with marginal production is small. This is the case whenever the worker wants a part time job (ϵ high) or if the firm is not very productive (y low).

Even if the number of hours is optimal at the match level, there can be involuntary part-time employment in the model. Taking as given the hourly wage resulting from the bargaining, the number of hours that is optimal for the worker (or for the firm) does not necessarily correspond to the number that is bargained. [13]

5 .2.3 Job creation

In this Section, I present the unemployment value functions, for the $\mathcal{N}$ types of workers as well as the labor demand equation that determines vacancy posting. These equations will be crucial to determine the labor market equilibrium. First, the expected surplus of a match in a type-y firm and for a type-i worker is defined as

$$S^i(y) = \int_{\underline{z}^i(y,\epsilon^i)} S^i(y, \epsilon^i, z)\mathrm{d}H_y(z). \tag{11}$$

$S^i(y)$ is the surplus when the type of the worker and the type of the firm are known, before observing the maximum number of productive hours, z. Matches with z below the threshold $\underline{z}^i(y, \epsilon)$ will be destroyed and hence yield a 0 surplus. The labor supply equation is given by the value of unemployment, computed in Online Appendix K .3. There are $\mathcal{N}$ labor supply equations, for the $\mathcal{N}$ types of workers. Using the solution of the bargaining from Equation (10), we get

$$W_u^i(1-\beta) = b + \beta\theta m(\theta)\gamma \int S^i(y)\frac{v(y)}{v}\mathrm{d}F(y). \tag{12}$$

When a worker is matched with a type-y firm, which happens at rate $\theta m(\theta)\frac{v(y)}{v}\mathrm{d}F(y)$, she receives a value of $\gamma S^i(y)$.

Due to random matching, a firm cannot target a specific type of worker. Hence, the probability to be matched with a type-i worker depends on the distribution of types among unemployed workers. This distribution is endogenous, but observed by firms. I denote u^i the

[13] The definition of involuntary part-time employment used by institutions and the one in the Labor Force Survey is the share of part-time workers willing to increase hours of work for same hourly wage. Online Appendix K .2 shows the details.

number of unemployed workers of type i and $s^i = \frac{u^i}{\sum_{i=1}^{\mathcal{N}} u^i}$ the share of type-i workers in the unemployment pool. The value of a marginal vacant job is computed in Online Appendix K .3 and equals 0 in equilibrium. Using the surplus sharing rule from Equation (10), we obtain the labor demand equation

$$C'(v(y)) = \beta m(\theta)(1-\gamma) \sum_{i=1,\ldots,\mathcal{N}} s^i S^i(y). \tag{13}$$

In equilibrium, the marginal cost of posting an additional vacancy is equal to its marginal profit. This equation pins down the firm size since the cost to open vacant jobs is convex in the number of vacancies.

5 .2.4 Firm entry

There is a large pool of potential entrepreneurs that may decide, at each period, to pay a cost k to draw a productivity y to create a firm. Entrepreneurs exhaust all profitable opportunities. Hence, the expected value of a firm is such that

$$\int \Pi(y) \, \mathrm{d}F(y) = k. \tag{14}$$

where $\Pi(y)$ is the value of a type-y firm, computed in Online Appendix K .4. I show that the firm value is proportional to the expected surplus of new jobs. This Equation determines the number of firms operating, denoted n.

5 .2.5 Equilibrium

This Section determines the general equilibrium of the model in the pre-reform situation. There are 6 types of variables that solve the model equilibrium: the labor market tightness, the distribution of worker types among unemployment, the expected utility of unemployment, the number of vacancies and the number of firms operating.

Definition 1 *The general equilibrium of the model consists of a vector* $(\theta, \{s^i\}_{i=1,\ldots,\mathcal{N}}, \{W_u^i\}^i{}_{i=1,\ldots,\mathcal{N}}, \{v(y)\}_y, n)$ *which solves:*
(i) Labor supply equations for type-i workers, in Equation (12), for $i = 1, \ldots\mathcal{N}$
(ii) Labor demand, in Equation (13)
(iii) Entry condition from Equation (14)
(iv) Labor market clearing: $s^i \frac{v}{\theta} = u^i$, for $i = 1, \ldots, \mathcal{N}$, where the left hand side is determined from labor supply and demand and the right hand side is given by the Beveridge curve (Equation (26) in Online Appendix K .5)

For each type of worker, labor supply and labor demand equations provide a relationship between the market tightness and the distribution of types among unemployment. The Beveridge curve, defined by the unemployment Equation (26) in Online Appendix K .5, gives another relationship between tightness and the distribution of types. In general equilibrium, the two should coincide. Finally, the number of firms in the economy is determined by the entry condition. Conditional on the general equilibrium of the model, I can then compute employment and total hours worked (in Online Appendix K .6). The estimated version of the model features 6 types of workers. In that case, the general equilibrium consists of 14 endogenous variables solving a system of 14 equations.

5 .3 Reform in the model

The strategy compares the model's equilibrium without the minimum workweek to the equilibrium with a 24-hour workweek floor.

In the model, the policy is introduced as a cost to create jobs with workweek below 24h. This cost is supported by firms and is a red tape cost.[14] I do not model a strict ban on jobs below 24h as there are still many of these in the data after the reform. The cost represents the risk and consequences of being sued by a worker for working time below 24h. Hence, in the model, compliance with the policy is endogenous: firms can decide to create a job with fewer than 24h and pay the cost or create a job above 24h or to not create the job. I denote as $\mathcal{C}(\max(24-h, 0))$ the cost associated with jobs with a workweek below 24h, with $\mathcal{C}'(.) > 0$. I first describe the direct effects of the reform at the firm level. Then, I present the predictions of the model for the general equilibrium adjustments.

Direct effects. Introducing the minimum workweek reduces the expected surplus to create new jobs because of the cost. As a result, firms decrease the number of vacancies posted, according to labor demand Equation (13). Moreover, conditional on being matched with a worker, the probability that the job is created decreases. The job creation threshold, defined in Equation (8), increases. Since hires are reduced and the separation rate is unaffected, firm-level employment is decreasing. For workers, the decrease in the probability to meet a firm due to the decrease in the number of vacancies is the same for all types, since they search for a job on the same market. However, conditional on being matched with an employer, the decrease in the probability that the job is created is stronger for workers with higher work disutility. On the other hand, hours worked increase for jobs created after the reform, even beyond 24h: it may be optimal to destroy low-hour matches to create higher-hour matches in the subsequent periods. The theoretical predictions of the model for the direct effects of the policy at the firm level are in line with the reduced-form results. The model also

[14] A transfer from the firm to the worker would be neutral since wages are flexibly bargained.

allows for indirect general equilibrium effects that are not taken into account in reduced form.

Indirect effects. Because of the direct effects of the policy, workers are less likely to find a job. It decreases the expected value of unemployment, as shown by the labor supply Equation (12). The decrease in W_u^i has a positive effect on the surplus of jobs, according to the surplus definition (7). It has a positive feedback effect on the number of vacancies posted, according to the labor demand Equation (13). Furthermore, there are more unemployed workers in the economy, because of the direct negative employment effects of the reform. Consequently, vacant jobs are filled at a faster rate. It also increases the marginal gain of opening vacant jobs. These two mechanisms create a positive employment feedback effects. Hence, the policy can reallocate workers from firms with a high share of affected jobs to firms with a low share of affected jobs. The decrease in the value of unemployment should be stronger for workers with a strong labor disutility, as they are more impacted by the reform. These workers contribute more to the positive feedback effects on the surplus of new jobs. But these effects may benefit more workers with a low labor disutility, as those are more likely to have their matches converted into jobs.

The aggregate impact of the reform depends on how the policy affects the congestion externality. Because of the labor market frictions, low productive firms may be inefficiently too large, hence competing with highly productive ones. As those firms are also the ones relying on low-hour jobs, the policy could, in theory, improve the market efficiency. The effects on welfare and output are ex-ante ambiguous.

5 .4 Empirical strategy

The model is calibrated and estimated over the period preceding the implementation of the minimum working time (2011-2013). I then identify the policy parameter for the 24-hour rule using the reduced-form results.

5 .4.1 Assumptions

Regulation of full-time jobs. In France, there is a large spike in the distribution of hours at 35, as depicted in Panel (a) of Figure 2, because of the the full-time workweek regulation. In the model, I represent this institution as a cost for firms to create jobs with more than 35h, denoted τ. This cost is proportional to the gap to 35, consistent with the overtime premium.[15] τ is estimated together with the firm technology parameters.

[15] This cost also represents administrative constraints faced by firms using hours above the regular full-time workweek. Employers have to consult workers' representative for the use of overtime hours and declare those hours to the local authority.

Functional forms and distributions. I assume that the cost function to open vacant jobs is $C(v) = c_0 v^{c^1}$. The vacancy cost function is homogeneous of degree $c^1 > 1$ and I assume $c_0 > 0$. The matching function is Cobb-Douglas with, $m(\theta) = m_0 \theta^{-m_1}$, where m_1 is the elasticity of the matching function with respect to unemployment. I assume that the labor disutility function is $\Phi(h, \epsilon) = h^\epsilon$, where $\epsilon > 1$. I quantify the model with six types of workers (3 types of women and 3 types of men), hence with 6 values for ϵ.

The firm productivity, y, is drawn in a Gamma distribution, with cumulative distribution function $F(.)$ characterized by a scale and a shape parameter. Finally, the firm-specific distribution of the maximum number of productive hours, z, is uniformly distributed over $[z(y); z_{max}]$. The lower bound of the uniform distribution is $z(y) = z_1 y + z_2 y^2$ and depends flexibly on the firm type. In particular, I do not impose any restriction on the value of z_1 and z_2 and these parameters are estimated. The upper bound of the uniform distribution, z_{max}, is the same for all firms.

Parameter values fixed externally. Values of the parameters are all shown in Table 3. The discount factor, β, is set using the average interest rate for the period 2011-2013. μ is calibrated to match the job separation rate in the French linked employer-employee data, equal to 8%. δ matches the firm exit rate (3.6% in the DADS). The elasticity of the matching function, m_1, is set to 0.5. Workers' bargaining power, γ, is set to 0.5 as well.

5 .4.2 Calibration and estimation of the structural parameters

The model estimation is composed of four main steps and makes use of administrative and survey data. Table 3 presents the structural parameters with their definition and the step at which each parameter is estimated. In what follows, I describe the main procedure for each step. Additional details are provided in Online Appendix L .

Step 1: Disutility parameters. I estimate the 6 values of ϵ, corresponding to the 6 types of workers in the model, from the Labor Force Survey over 2011-2012. I rely on the sample of employed workers for whom I observe the hourly wage, the preferred number of hours and their gender. In the data, I observe the preferred workweek for a given hourly wage. The corresponding optimal number of hours for a given wage in the model is defined in Online Appendix Equation (22). First, I residualize the preferred number of hours and hourly wage in the data, to remove sources of heterogeneity not accounted for in the model. Second, for each worker in the data, I can deduce the corresponding value of ϵ. I then obtain 2 discrete distributions with 3 values each (one for men and one for women). I find a stronger marginal work disutility for women: on average, ϵ is equal to 1.57 for women and to 1.54 for men.

Step 2: Technology parameters. Parameters estimated at this step are α, the elasticity of the production function, z_1 and z_2, the parameters of the polynomial determining the lower bound for the z distribution, z_{max}, the upper bound, τ, the cost of jobs with more than 35h, and y_{scale} and y_{shape}, the scale and shape parameters of the Gamma distribution of firm productivity. The parameters are estimated using information from vacant jobs posted on the website of the French unemployment service. In particular, I use joint observations of hours and wages on vacant jobs, denoted (h_j, w_j). I do not make any assumption on the determination of the posted wage but I assume that conditional on this wage, firms post the ex-ante optimal number of hours. In the model, for a given hourly wage, the optimal number of hours for the firm is computed in Online Appendix Equation (21). I fix z_{max}, common to all firms, by taking the 99th percentile of posted hours in the data. Then, I search for the vector of parameters $\Theta = (\alpha, z_1, z_2, \tau, y_{shape}, y_{scale})$ maximizing the likelihood of observing the job ads (hours and wages) from the sample:

$$\max_{\Theta} \mathcal{L}((h, w)|\Theta) = \prod_{j=1}^{n} l((h_j, w_j)|\Theta). \tag{15}$$

The estimate of α is equal to 0.82, suggesting decreasing returns to scale of hours. Estimates of (z^1, z^2) are equal to (0.68, -0.0001) which indicates a positive and concave relationship between the productivity of the firm and hours. It also implies that the dispersion of hours decreases with the productivity. Both features are consistent with what is observed in the data (see Figure J .1). Step 1 and Step 2 are independent: what is posted by firms in job ads does not depend on the particular worker met on the labor market.

Step 3: convexity of vacancy cost. Step 3 builds on Step 1 and Step 2 and relies on the distribution of hours worked in the linked empoyer-employee data. I calibrate the elasticity of the vacancy cost function to reproduce the share of jobs with a working time below 24h in the economy. While the parameters estimated in the Step 2 of the process provide a relationship between the firm productivity and task duration, the mapping into actual hours in the economy depends on the relative weight of each firm type in the economy. This is what c^1 identifies.

Panel (a) of Figure 7 shows the distribution of hours worked in the administrative data (DADS) and in the model. While the share of jobs with workweek below 24h is targeted to estimate c^1, the other moments of the distribution are not. Hence, the fact that the theoretical distribution is close to the empirical one is reassuring about the labor supply and demand parameters estimated in Step 1 and Step 2. However, the model does not explain well the existence of jobs with very low hours (below 10) as neither the information provided in the Labor Force Survey nor the job ads can explain those jobs. Panel (b) splits the distribution between men and women, in the data and in the model. The estimated parameters reproduce the fact that women are more likely to work part time than men, but under-estimate the differences in hours between the two groups. The unexplained gap is likely due to other factors than differences in labor supply, for instance discrimination or composition effects.

Step 4: matching efficiency and cost of firm creation. The scale of the matching function, m_0, is calibrated to reproduce the empirical unemployment rate in the model. The instantaneous utility of unemployed workers, b, is set to have consistency between the different labor supply Equations (12) between types. I allow for one value of b for each type. The cost to create firms is pinned down by the number of firms operating in the economy (taken from Table 1). While the model does not target anything related to firm size, the model average size (47) is close to the empirical one (51) (Online Appendix Table L .1).

5 .4.3 Estimation of the policy parameter

In the model, the 24h-reform corresponds to the introduction of a cost for jobs with workweek below 24h. I assume the cost to be linear in the gap to 24: $\mathcal{C}(\max(24-h,0)) = \rho\max(24-h,0)$. This is consistent with the way the compensation is computed in labor courts. I estimate the value of ρ reproducing the reduced-form result for the number of jobs below 24h in the firm. To do so, I simulate a regression in the structural model that is the counterpart of the reduced-form specification. It is estimated after general equilibrium adjustments and is also affected by indirect effects. Figure L .1 in Online Appendix shows that the difference-in-differences estimate in the model is monotonous in ρ, which guarantees a unique value. I find that $\hat{\rho} = 9.1$, meaning that a job with one hour lower than 24 costs 9.1€ to the firm per week.

While the reduced-form estimate for the number of jobs with workweek below 24h is used to estimate ρ, the estimates for the other outcomes are not. Hence, as a robustness check, I compare the difference-in-difference results obtained in reduced form with the model counterparts for the other outcomes (Table L .2 in Online Appendix). I find a -0.38 semi-elasticity for the number of jobs in reduced form and -0.35 with model simulations. For total hours, I estimate -0.17 with both the reduced-form strategy and the model.

The strategy relies on the comparison of two steady states. The model converges fast to the new steady state, as it is usually the case in these frameworks.[16] The new level of employment is reached after two years. Hence, I use the reduced-form estimate for 2016, 2 years after the introduction of the reform to calibrate the policy parameter. The results should be interpreted as medium-run effects. First, it is likely that the transition of the model is faster than in the data. Second, the model does not allow for technological change in response to the reform (which does not seem to happen in the short run, based on the impact on capital in Online Appendix Figure C .3).

[16] See Jolivet et al. (2006).

5 .5 Simulation results

Employment and unemployment. Table 4 presents the employment effects of the minimum workweek, for each type of job. I differentiate between partial equilibrium (where market tightness and unemployment value remain constant) and general equilibrium to show how general equilibrium adjustments compare to the direct effects. First, I estimate a decrease in the total number of jobs with workweek below 24h in the economy by 69% following the reform. The reduced-form estimates in the data yield a decrease by 67% once aggregated, as depicted in Table C .1. This indicates that the magnitude of the policy shock introduced in the structural model is consistent with changes in the data. In partial equilibrium, I find a decrease in the total number of jobs in the economy by 1.9% (2.03% for women and 1.78% for men). Accounting for general equilibrium adjustments (in both the labor market tightness and the value of unemployment) strongly attenuates these employment effects. There is an overall decrease in the number of jobs in the economy by 0.21% (0.23 for women and 0.20 for men). This negative impact on the number of workers employed yields an increase in the unemployment rate by about 2% (2.16% for women and 1.83% for men).[17] The number of firms operating in the economy is almost the same after the policy, consistent with the reduced-form evidence: it decreases by 0.02% in the simulations.

The number of jobs with hours above 24 increases already in partial equilibrium, by 5% for men and 1% for women. This increase is due to two main reasons. First, some jobs that would have been created with hours below 24h are now created with more hours, within the same firms. Second, some men working long hours are replacing women working part-time as some jobs are not profitable anymore for workers with strong labor disutility. The increase in jobs with long hours is much stronger once accounting for general equilibrium effects. At the aggregate level, these jobs increase by 8.9% (7.7% for women and 10.1% for men). This is because some workers are reallocating from firms relying heavily on part-time jobs to firms more likely to use jobs with longer hours. This reallocation of workers between firms has to be accounted for to compute the impact on total hours worked in the economy. When considering partial equilibrium effects only, I find a decrease in total hours worked, twice stronger for women compared to men, consistent with the firm-level effects. But accounting for the reallocation of workers between firms, I find a positive total effect on hours. They increase by 1.3%. The magnitude of the increase is similar for men and women because there are also composition effects happening within the group of women: women with low labor disutility are reallocating to different firms while employment of women with high work disutility is decreasing. These results indicate that there are more hours worked in the economy after im-

[17] Comparison of the evolution of the French unemployment rate following 2014 with a synthetic control group of other European countries, in Online Appendix Figure (L .2), shows that a 2% increase in the unemployment rate is credible.

plementation of the French minimum working time, but these hours are concentrated among fewer workers, who are more likely to be men.

Wages and welfare. Table 5 shows the effects of the policy on wages and welfare. I find an increase in average hourly wages of 0.3% for men and 0.1% for women, despite having estimated decreasing returns to scale in hours. This is because firms offering long-hour jobs are on average more productive. Annual earnings also increase, by 1.8%, partly because of higher hourly wages and mostly because of longer average hours per job. A substantial share of the positive impact on average earnings stems from mechanical composition effects: workers with low hours and low wages are the ones more likely to be unemployed after the reform. This is particularly true for women, for whom unemployment increases more. Consequently, the apparent decrease in the gender gap in earnings, of 8.5% is driven by composition effects and the welfare analysis is more informative as it accounts for both employed and unemployed workers.

The average welfare of unemployed workers is decreasing by 12.0% for women and 11.8% for men. This is mostly because unemployed workers have to wait longer before finding a job. The probability to find a job decreases for two reasons: (i) workers are less likely to be matched with a vacant job, and this effect impacts men and women in the same way and (ii) conditional on being matched with a firm, the job is less likely to be created. The latter is stronger for women because bargained hours were more likely lower than 24 for them before the reform. For employed workers, I also find a decrease in the average welfare, by 3.2% for women and 3.0% for men. The decrease is driven by two factors. First, workers have to work more hours on average, and the labor disutility is convex. Second, it accounts for the fact that once the current job separates, they have to wait longer to find a new job. Both are stronger for women, which explains the stronger decrease in welfare for employed women. Finally, the effect on the average welfare is computed accounting for the change in the share of men and women unemployed after the reform. Overall, I find that the French minimum working time decreases the average individual welfare by 3.5%, the decrease being stronger for women.

Total output. Table 6 shows the changes in production and costs after introduction of the minimum workweek. I find a positive effect on gross total production in the economy, by 1.2%. This is due to the reallocation of workers to more productive firms and to the increase in hours (even though returns on hours per job are decreasing). However, the effect on total net output is very small (-0.005%). This is because costs also increase with the reform: hiring costs (even though total hires decrease, those are concentrated in larger firms and hiring costs are convex), costs due to the full-time workweek regulation (there are more full-time jobs after the reform), unemployment cost and 24h-rule cost. Two costs explain most of the gap between the change in gross and in net output. About half of the additional production after the reform is supporting unemployment costs and the other half is offset by deadweight costs of the 24h-regulation (that include the labor court cases and organizational costs).

6 Conclusion

Working time regulations are widely used as policy tools. This paper provides a comprehensive assessment of the margins along which firms and the labor market adjust to the introduction of a minimum working time. I exploit the implementation of a floor of 24 hours per week in France in 2014 to document the firm-level and macroeconomic effects of a restriction on low-hour jobs.

In response to the minimum workweek, I find a decrease in the number of workers employed and in total hours in firms ex-ante more exposed to the reform, relative to firms less exposed. This result suggests that workers and hours are not perfect substitutes within firms. I find that workers hired with more hours, because of the minimum workweek, are not the same as the workers who would have been hired with low hours. In particular, men working long hours are replacing women working fewer than 24h per week.

While within-firm reallocation of hours is limited in response to the policy, I find evidence of strong reallocation of workers between firms. Hence the aggregate impact of the reform is different from the relative comparison of firms with different levels of exposure. The reform allows the reallocation of workers from firms relying on low hours to firms relying on longer hours, so that the total number of hours increased by 1% in the economy. At the aggregate level, the impact is also heterogeneous by gender: the unemployment rate increases by 2.2% for women and by 1.8% for men. The minimum working time increased gender inequality, both in terms of employment and welfare.

Finally, this paper sheds new light on the reallocation effects and gender heterogeneous impact of working time regulations. These effects are likely relevant with other types of regulations such as workweek reduction policies, zero-hours contracts or minijobs. The developed structural framework and estimation strategy offer tools to analyze other regulations that may differentially impact workers based on their labor supply.

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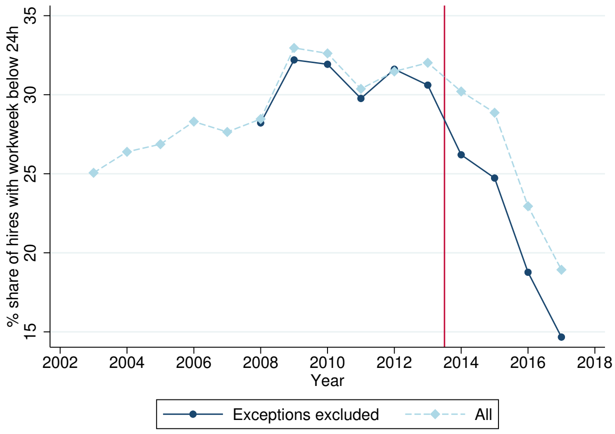
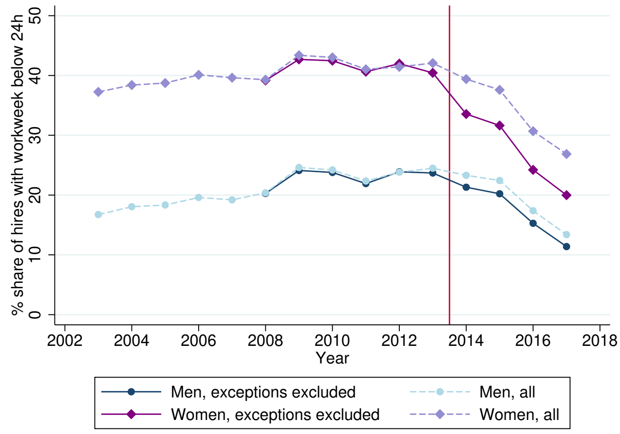
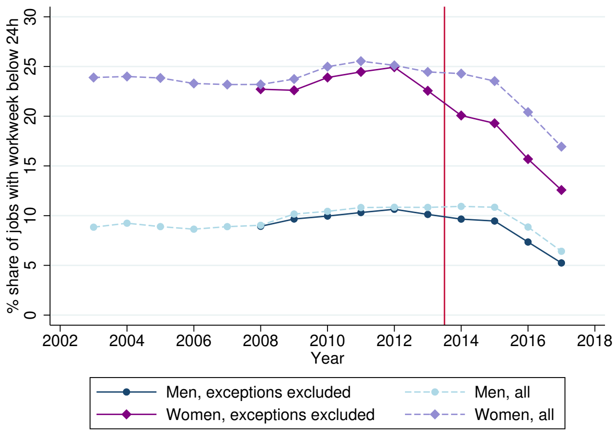
FIGURES



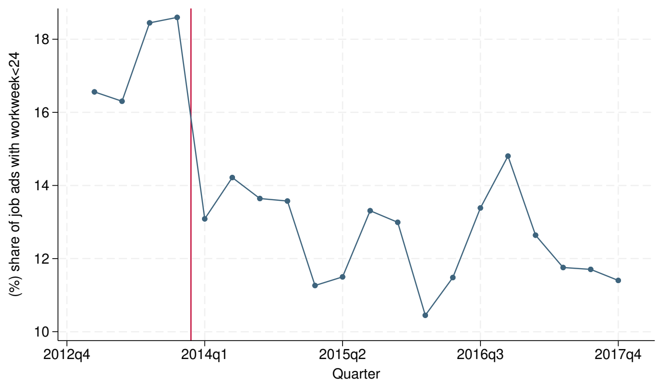
(a) New hires, all



(b) New hires, by gender



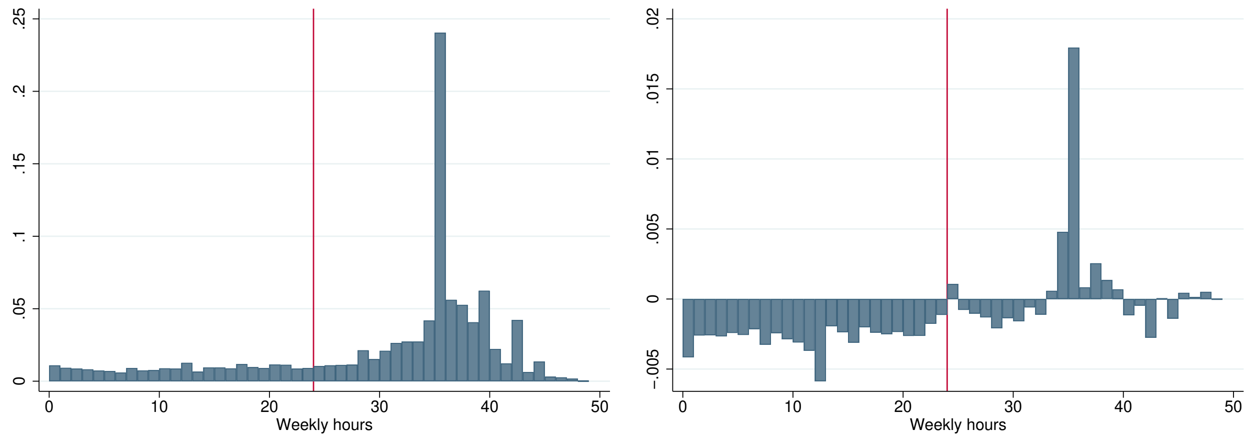
(c) Stock of jobs, by gender



(d) Job ads

Figure 1: Aggregate use of jobs with working time below 24h over time

Notes: Panels (a), (b) and (c) show the share of jobs below 24h among new hires and in the employment stock, per year. 'Exceptions excluded' indicates that firms covered by industry agreements with different minimum working times are removed. They are obtained from the DADS. Panel (d) plots the quarterly share of job ads posted with required working time below 24h. It is computed using the Pôle Emploi data.

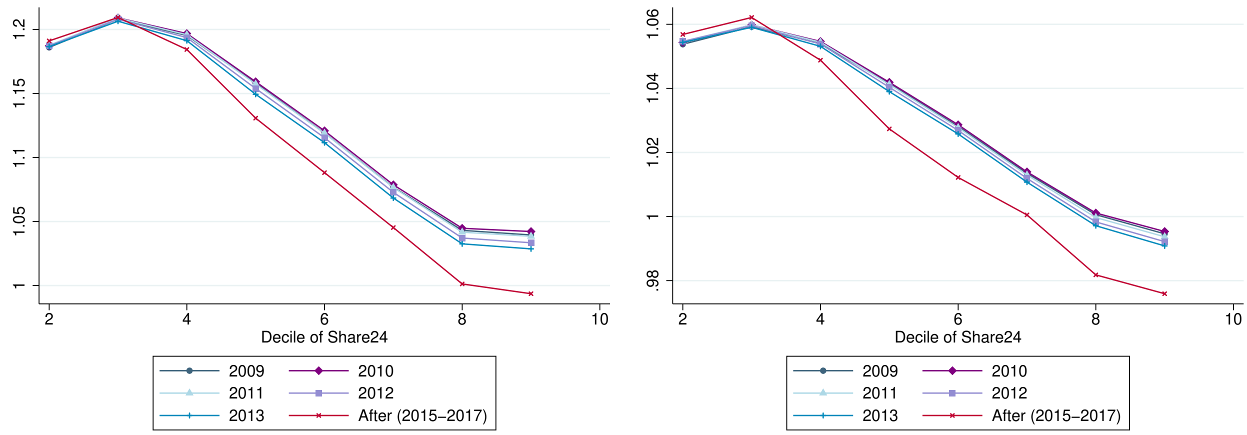


(a) Pre-reform

(b) Change after reform

Figure 2: Distribution of working time

Notes: This figure plots the distribution of weekly hours worked in the stock of jobs on average over 2011-2012 (Panel (a)) and the change between 2015-2016 and 2011-2012 (Panel (b)). The average workweek includes both contractual and overtime hours. Computed from the DADS. Private sector only. Workers younger than 24 years old excluded. Industries covered by exceptions to the 24h-rule are excluded. In Panel (b), each bar shows the difference between the number of jobs in the bin after the policy and the number before, normalized by the total number of jobs before: $\frac{NbJobs(h)_{after} - NbJobs(h)_{before}}{NbJobs_{before}}$.

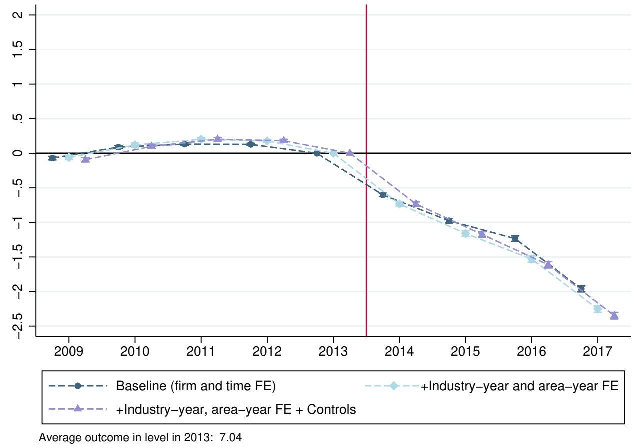


(a) Number of jobs

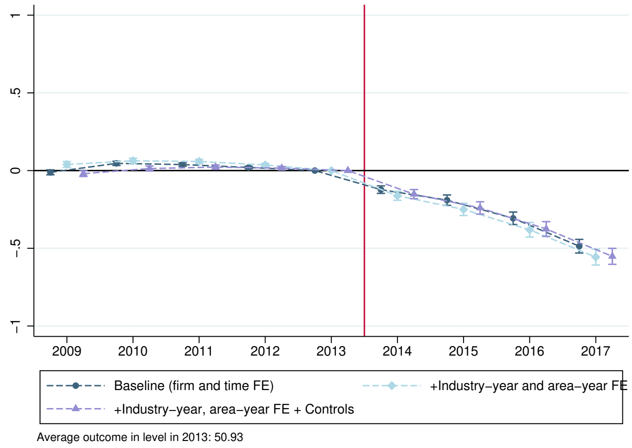
(b) Total hours

Figure 3: Relationship between Share24 and outcomes over time

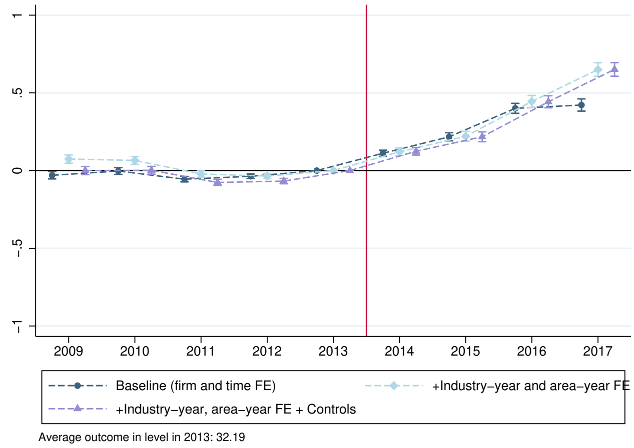
Notes: This Figure plots, for each decile of exposure to the reform (Share24), the average log outcome, for every year. For each year, log outcomes are normalized by the value of the variable in the first decile. All post-reform years (2015 to 2017) are pulled together and pre-reform years are computed separately. 2014 is excluded because it is only partially treated. Outcomes are computed in the baseline estimation panel of firms, from which firms smaller than size 5 before the policy and firms covered by industry agreements with exceptions to the policy are excluded.



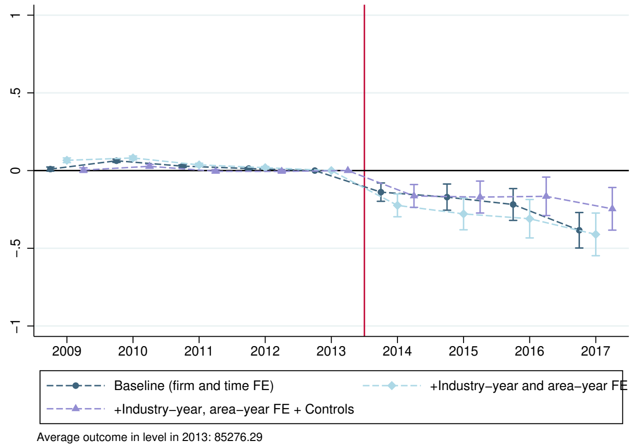
(a) Jobs<24h



(b) Number of jobs



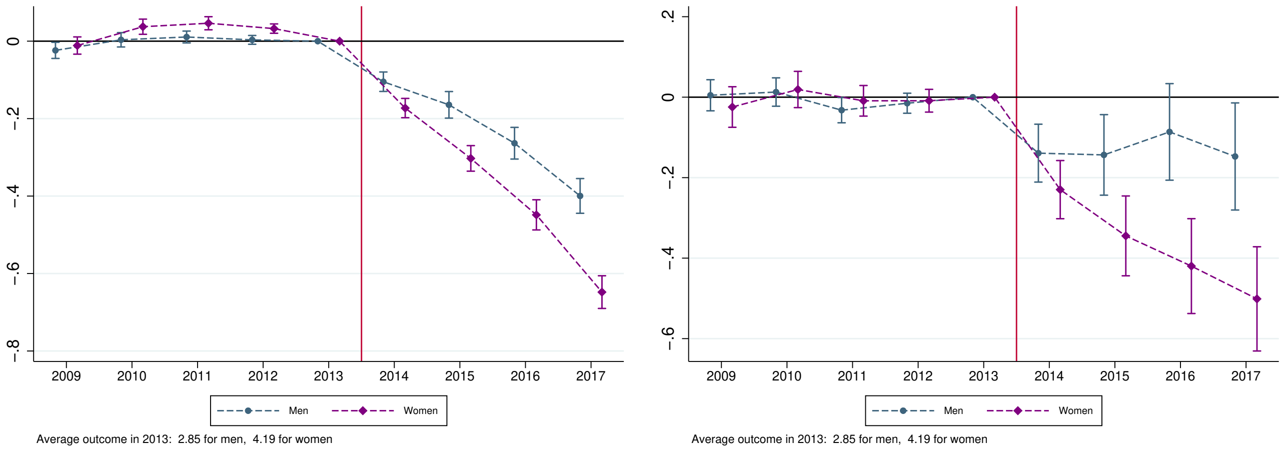
(c) Full-time jobs



(d) Total hours

Figure 4: Firm-level effects

Notes: This figure plots the estimates of the β_k parameters in Equation (1), for each year, as well as the 95% confidence intervals (standard errors are clustered at the firm level). For each outcome, I report estimates of a regression with firm and year fixed effects only (Baseline), with added industry-time and area-time fixed effects and the full model with also time-varying age and size effects. Estimation on the balanced panel of firms from which firms smaller than size 5 before the policy and firms covered by industry agreements with exceptions to the policy are excluded. Interpretation for 2016 for the full model: a 1 percentage point higher share of jobs below 24h before the policy is associate with a decrease of 1.6% in the number of jobs below 24h, of 0.4% in the total number of jobs, of 0.2% in total hours worked in the firm and an increase by 0.4% in the number of full-time jobs.



(a) Number of jobs

(b) Total hours

Figure 5: Firm-level effects by gender

Notes: This figure plots the estimates of the β_k parameters in Equation (1), for each year, as well as the 95% confidence intervals (standard errors are clustered at the firm level). The regression in which the outcome is for men has been estimated separately from the one in which the outcome is for women. Estimation on the balanced panel of firms from which firms smaller than size 5 before the policy and firms covered by industry agreements with exceptions to the policy are excluded. Reported estimates are for the full model with firm and year FE, time-varying industry, area, age and size effects. Estimated coefficients (y-axis) can be interpreted as the % change in outcome associated with a 1 percentage point increase in exposure to the reform.

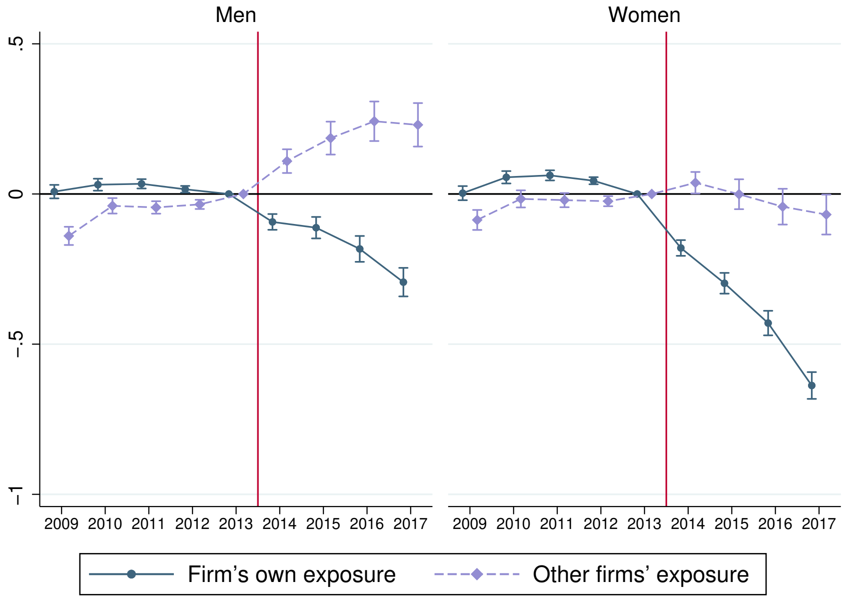
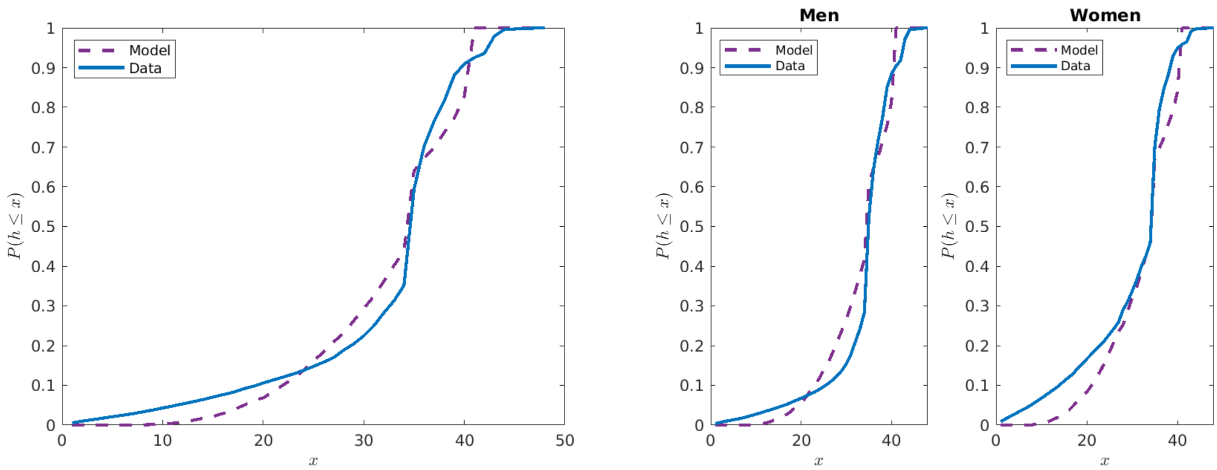


Figure 6: Direct and indirect effects on the number of jobs

Notes: This figure plots estimates of λ_k and γ_k in Equation (2) and 95% confidence intervals. The solid blue line connects estimates for the λ_k and the dashed purple line connects estimates for the γ_k. Both are estimated in a unique regression (with separate regressions for men and women). Estimation using the balanced panel of firms with at least 5 workers before implementation of the policy. Firms covered by industry agreements with exceptions to the 24h-rule are excluded. Estimated coefficients (y-axis) can be interpreted as the % change in outcome associated with a 1 percentage point increase in firm-level or market-level exposure to the reform.



(a) All workers

(b) By gender

Figure 7: Pre-reform distribution of hours in model and data

Notes: This figure plots the distribution of hours worked in the economy, computed with the DADS, and in the model for estimated values of the structural parameters. The aggregate share of jobs below 24 is targeted to calibrate c^1, the degree of homogeneity of the vacancy cost function. Other moments from these distributions are not targeted.

TABLES

		All	Acc & food	Construction	Manuf.	Services	Retail
Number of workers		46.86	25.43	26.49	70.69	53.18	43.27
Part-time share		0.33	0.41	0.49	0.24	0.31	0.27
Average workweek		33.71	31.78	33.43	34.94	33.43	34.12
Permanent jobs		0.85	0.68	0.89	0.89	0.85	0.84
GAP		2.01	4.25	1.03	0.98	2.78	1.59
Share24	Mean	0.12	0.22	0.09	0.07	0.15	0.11
	SD	0.16	0.19	0.09	0.09	0.20	0.12
	p5	0.00	0.00	0.00	0.00	0.00	0.00
	p25	0.01	0.08	0.00	0.00	0.01	0.01
	p50	0.08	0.17	0.07	0.05	0.08	0.08
	p75	0.16	0.32	0.13	0.11	0.18	0.16
	p95	0.44	0.63	0.25	0.24	0.64	0.33
Number of firms		187,065	16,879	31,399	32,677	60,831	45,279

Table 1: Firm-level summary statistics of characteristics in 2013

This table shows summary statistics of the firms in the main sample. All characteristics are evaluated in 2013 (one year before the implementation of the reform). Firms smaller than 5 workers are excluded, as well as firms subsequently covered by agreements with exception to the 24h-rule. Share24 corresponds to the average share of jobs below 24h. The GAP measures the average increase in hours per week needed to have all jobs above 24h.

	Jobs < 24h	Full-time	Part time $\geq$ 24h	All jobs	Total hours
A. All workers					
Share24 x After	-0.880***	0.158***	-0.006	-0.587***	-0.862***
	(0.016)	(0.013)	(0.012)	(0.018)	(0.062)
Mean in 2013	1.572	2.598	1.217	5.387	7529.094
B. Women					
Share24 x After	-0.594***	0.085***	0.029**	-0.443***	-0.918***
	(0.014)	(0.009)	(0.009)	(0.015)	(0.062)
Mean in 2013	0.929	0.917	0.565	2.411	2943.650
C. Men					
Share24 x After	-0.627***	0.123***	0.006	-0.415***	-0.791***
	(0.014)	(0.011)	(0.010)	(0.015)	(0.064)
Mean in 2013	0.643	1.681	0.651	2.976	4585.444
N	748,264	748,264	748,264	748,264	748,264

Table 2: Difference-in-difference estimates for new hires

Notes: This table shows estimates of a difference-in-difference equation estimated over 2013-2017 when the outcome corresponds to the type of new hires described in the first row. 2014 is excluded so that estimates present the average effect over 2015-2017. Estimation on the balanced panel of firms from which firms smaller than size 5 and firms covered by industry agreements with exceptions are excluded. Reported estimates are for the full model with firm and year FE, time-varying industry, area, age and size effects. Rows 'Share24 x After' show the % change in hires of the type of job indicated in the first row, associated with a 1 percentage point increase in Share24. For instance, a 1 percentage point increase in Share24 is associated with a decrease in hours worked by new hires by 0.9% on average over 2015-2017. Standard errors clustered at the firm level and shown in parentheses. Significance levels: * 0.10, ** 0.05, *** 0.01.

Parameter	Definition	Target / Source	Value
A. Fixed externally			
β	Discount rate	Interest rate	0.9709
μ	Job destruction rate	DADS	0.0810
δ	Firm exit rate	DADS	0.0364
m_1	Matching elasticity	Fixed	0.5
c_0	Scale, vacancy cost	Normalized	1
γ	Workers' bargaining power	Fixed	0.5
B. Workers' preferences			
$[\epsilon^{M1}, \epsilon^{M2}, \epsilon^{M3}]$	Disutility parameters, men	LFS	$[1.41, 1.53, 1.65]$
$[\epsilon^{W1}, \epsilon^{W2}, \epsilon^{W3}]$	Disutility parameters, women	LFS	$[1.46, 1.58, 1.70]$
$[s^{M1}, s^{M2}, s^{M3}]$	Probability distri., men	LFS	$[0.06, 0.31, 0.12]$
$[s^{W1}, s^{W2}, s^{W3}]$	Probability distri., women	LFS	$[0.12, 0.32, 0.07]$
C. Firms' technology			
α	Elasticity of production	Job ads	0.8236
τ	Cost of hours above 35	Job ads	8.39
$[z^1, z^2]$	z distribution parameters	Job ads	$[0.68, -0.0001]$
z_{max}	maximum task duration	Job ads	40
$[y_{shape}, y_{scale}]$	y distribution parameters	Job ads	$[5.71, 7.26]$
D. Firm size			
c^1	Elasticity of vacancy cost	Share of jobs<24	5.10
E. Unemployment and equilibrium			
m_0	Scale matching function	U. rate	0.86
k	Firm creation cost	Number of firms	6.93 $\times 10^6$
$[b^{M1}, b^{M2}, b^{M3}]$	Utility, unemployed men	Labor supply eq.	$[-1.4, -1.2, -1.0] .10^5$
$[b^{W1}, b^{W2}, b^{W3}]$	Utility, unemployed women	Labor supply eq.	$[-1.3, -1.0, -0.9] .10^5$
F. Policy			
ρ	Cost, jobs>24h	DiD result	9.13

Table 3: Parameters of the structural model

Notes: This Table shows all the parameters of the structural model. It indicates if the parameter was fixed, calibrated or estimated and the source. Details on the procedure are presented in Section 5 .4. Parameters from Panel A. to Panel E. are set using data on the pre-reform period. The policy parameter ρ is calibrated using the reduce-form estimate for the post-reform period. ϵ^{M1} is the value of the disutility parameter for the first type of men and s^{M1} is the corresponding share of these workers in the economy. There are three types of men and three types of women.

	Partial equilibrium			General equilibrium		
	Men	Women	All	Men	Women	All
Number of jobs	-1.777	-2.027	-1.903	-0.200	-0.233	-0.217
Number of jobs < 24h	-57.428	-23.032	-38.861	-84.795	- 56.080	-69.295
Number of jobs ≥24h	5.017	0.963	2.983	10.127	7.716	8.918
Total hours worked	-0.227	-0.411	-0.320	1.270	1.371	1.321
Unemployment rate	0.970	1.207	1.173	1.829	2.157	1.995

Table 4: Employment effects in partial and general equilibrium (% changes)

Notes: This table presents the % variations in aggregate employment and unemployment in the model after implementation of the policy. The first three columns present the results in partial equilibrium, when the market tightness and the expected value of unemployment do not adjust. The last three columns present the changes in the new general equilibrium, after adjustments of all endogenous variables. For example, after implementation of the policy, 0.22% of all jobs are destroyed compared to the pre-reform steady state. In the pre-reform steady state, the unemployment rate is 9%.

	All	Men	Women	Gender gap
A. Welfare				
Unemployed	-11.768	-11.274	-11.974	-
Employed	- 3.097	-3.001	-3.185	7.914
Weighted average	-3.533	-3.422	-3.643	9.323
B. Wages				
Annual earnings	1.787	1.628	1.948	-8.513
Hourly wage	0.195	0.300	0.088	2.868

Table 5: Effects of the minimum workweek on welfare and wages (% changes)

Notes: This table presents the % variations in average welfare and wages. The first two columns present the results for men and women, respectively. The third column shows % changes in the gender gap between men and women. Panel A. focuses on the welfare effects, for employed and unemployed workers. The last raw of Panel A. computes the change in average welfare, defined as the weighted average of the welfare of employed and unemployed workers. The initial gap in average welfare between men and women is 2.17% of men's welfare. Panel B. is for employed workers only. Annual earnings corresponds to average employment income per worker. The initial gap in earnings is 3.6% of men's earnings and the hourly wage gap is 6.8% of men's hourly wage.

	% Δ	% Δ(Production - c_j)	% Δ (Production - $\sum_{i=1}^{j} c_i$)
Production	1.182	-	-
Aggregate costs c_j:			
Hiring costs	1.514	1.164	1.164
Cost due to full-time regulation	1.234	1.182	1.163
Unemployment cost	3.038	0.515	0.419
Cost due to the 24h-rule	-	0.900	-0.005
Total net output	**-0.005**	-	-

Table 6: Effects of the reform on aggregate output (% changes)

Notes: This table presents the % variations in aggregate market production, aggregate red tape costs and production net of costs, after the introduction of the policy in the model. 'Unemployment cost' corresponds to $b \times U$, where the estimated b is negative. 'Cost due to full-time regulation' are expenses to create jobs with workweeks above 35h, induced by parameter τ. The first column present the % change in aggregate production, aggregate costs and production net of all costs following the reform. The second column shows the change in the production net of the cost indicated on the same row in first column. The last column shows variations in total production net of all costs indicated in all rows up to current row in the first column. As an example, the total red tape costs associated with jobs with workweeks above 35h have increase by 1.23%, the market production net of these costs has increased by 1.18% and the market production net of these costs and hiring costs has increased by 1.16%.

ONLINE APPENDIX

A Details about the 24h-reform

A .1 Collective industry agreements with exceptions

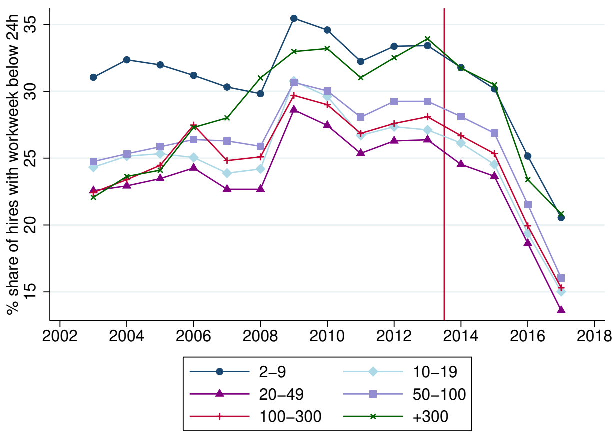
Between 2014 and 2017, 40 industries signed collective agreements with different minimum hours than 24. Below is a list of these industries. This list is characterized by heterogeneity: in a few cases, the exception is for all workers of the industry while in most cases, the exception only applies to specific occupations. For instance, in publishing and zoological gardens, the exception covers all workers while in tourism agencies and retail of sport equipment, they are only for a set of occupations. In a few cases, the application of the exception also depends on the size of the firm. This is for instance the case for social centers and bakeries.

List of industries with exceptions: private education, training providers, journalism, funeral services, entertainment, veterinary clinics, sport, deli meats retail, law firms, private sector live entertainment, dental offices, outdoor accommodation, tourism agencies, social centers, recreational boating, zoological gardens, recycling manufacturing and retail, retail pharmacy, retail of sport equipment, shoe-making, bakeries, private online learning, furniture trading, shipping companies, building caretaker, medical biology laboratories, agricultural cooperatives, milk inspection agencies, cooperative wineries, pharmaceutical distribution, equipment maintenance companies for agriculture or public works, medical offices, wellness and spa services, technical services for artistic activities, real estate, workers in social housing, cleaning services, employed veterinarian, publishing, employees of equestrian centers.

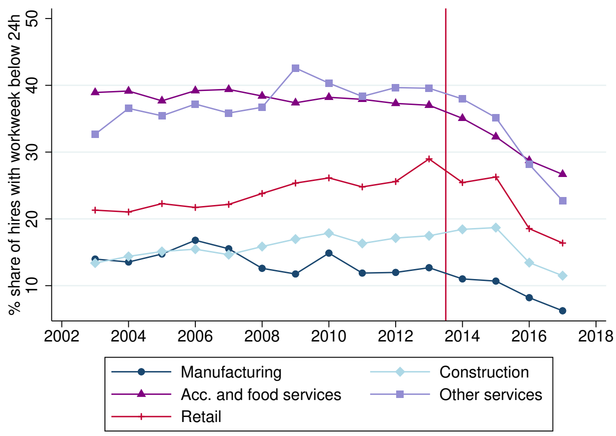
A .2 Loi Sécurisation de l'Emploi

The law 2013-504 (*Loi de Sécurisation de l'Emploi*) was announced by the government on June 14 2013 while François Hollande was the French president. First, on January 11 2013, three unions of workers (CFDT, CFTC and CGC) and three unions of employers (Medef, CGPME and UPA) signed an agreement to create this new law. This reform is the result of a bargaining between unions. Most of the elements of this agreement were kept in the final law decided in June 2013. This law was a package of several labor market reforms with two objectives. The first objective was to create new individual rights for workers. Four reforms were related to this objective: (i) generalization of supplemental health insurance with minimum insurance requirements for dental and optical cares, (ii) creation of a new system of on-the-job training that follows the worker even if she changes labor market situation, (iii) possibility to try working for a new firm without leaving the current firm to foster job-to-job mobility and (iv) workers in boards who can vote and who are trained for this. As a result, reforms targeting the first objective are unrelated to the number of hours of work and have nothing to do with the 24h floor. Workers on part time jobs are also entitled to these new rights. The second objective of the law was to reduce precarious employment. For this second objective, a first reform is a change in the unemployment insurance system for workers who alternate between employment spells and spells of unemployment. After the reform, if a worker finds a job before exhaustion of unemployment benefits, these benefits will be postponed to the next unemployment spell. A second reform for the second objective is to tax fixed-term contracts and to implement hiring credits for the first months of employment of young workers under open-ended contracts. This policy has been documented as ineffective because many industries, occupations and contracts were exempted.[18] The last reform of the second objective is the minimum workweek and changes for the wage rate of overtime hours for part-time jobs, described in section 2 .2. More details about those policies can be found at https://www.gouvernement.fr/action/la-securisation-de-l-emploi.

B Descriptive evidence of the use of jobs<24h



(a) By firm size



(b) By industry

Figure B .1: New hires of jobs with workweek below 24h over time

Notes: This Figure plots the share of jobs with working time below 24h among new hires. Panel (a) decomposes by firm size and Panel (b) by industry. Computed from the DADS.

[18]Details in Cahuc, P., Charlot, O., Malherbet, F, Benghalem, H. & Limon, E. (2019), 'Taxation of Temporary Jobs: Good Intentions with Bad Outcomes?', The Economic Journal.

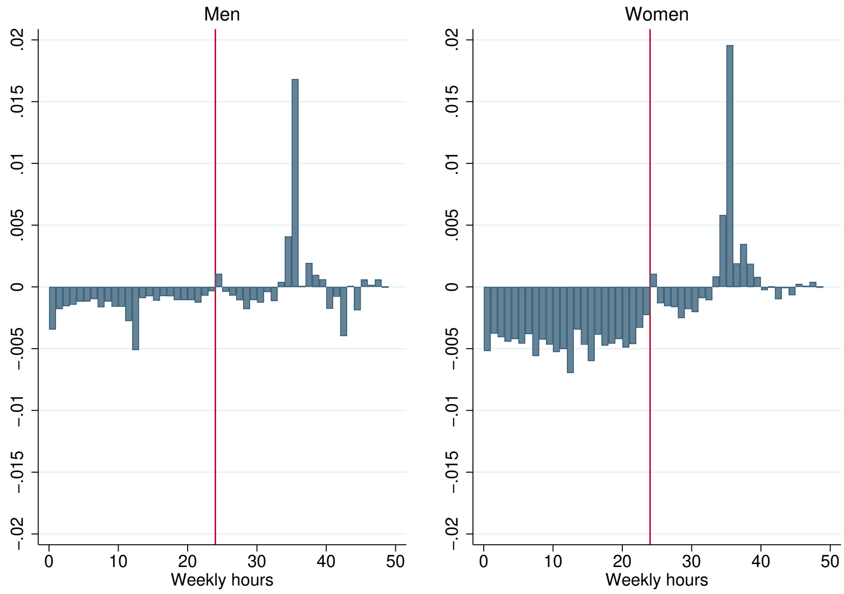


Figure B .2: Change in the distribution of hours by gender

Notes: This figure plots the change in weekly hours worked between 2015-2016 and 2011-2012, separately for men and women. The average workweek includes both contractual and overtime hours. Computed from the DADS. Private sector only. Workers younger than 24 years old are excluded. Industries covered by exceptions to the 24h-rule are excluded. Each bar shows the difference between the number of jobs in the bin after the policy and the number before, normalized by the total number of jobs before: $\frac{NbJobs(h)_{after} - NbJobs(h)_{before}}{NbJobs_{before}}$.

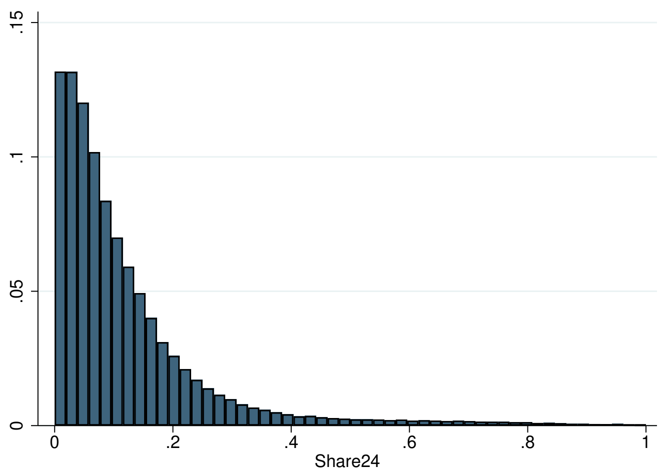


Figure B .3: Distribution of Share24 in estimation sample in 2013

Notes: This figure plots the distribution of the share of jobs below 24h at the firm level over 2009-2013 in the estimation sample. Firms with size smaller than 5 or covered with industry agreements with exceptions to the 24h-rule are excluded.

	Before (2013)		After (2016)	
	$h < 24$	$h \geq 24$	$h < 24$	$h \geq 24$
1. Demographics				
Age less than 27	0.30	0.24	0.28	0.24
Age 27-49	0.46	0.56	0.45	0.54
Age more than 50	0.24	0.20	0.26	0.22
Women	0.58	0.39	0.59	0.39
2. Industry composition				
Manufacturing	0.06	0.19	0.05	0.18
Construction	0.05	0.10	0.04	0.09
Retail	0.18	0.23	0.17	0.23
Accommodation and food	0.15	0.09	0.16	0.09
Other services	0.57	0.39	0.58	0.41
3. Labor contract				
Hourly wage <1.2 x Min wage	0.39	0.24	0.46	0.26
Fixed-term contracts	0.25	0.16	0.39	0.21
4. Occupations				
Managers	0.13	0.17	0.10	0.19
Technicians and professionals	0.14	0.17	0.15	0.18
White collars (low-skilled)	0.42	0.34	0.43	0.33
Blue collars	0.31	0.32	0.31	0.29
5. Most frequent occupations with $h < 24$				
Janitors	0.16	0.02	0.17	0.02
Kitchen help	0.05	0.02	0.05	0.02
Waiters	0.03	0.01	0.03	0.01
Secretaries	0.02	0.02	0.02	0.02
Waiters	0.04	0.02	0.04	0.02
Retail technicians	0.02	0.00	0.02	0.01

Table B .1: Summary statistics at the job level in 2013 and in 2016

Notes: This Table shows how jobs below 24h and jobs with at least 24h are distributed along a set of characteristics. The first two columns are for 2013, the last year before implementation of the policy. The two subsequent columns are for 2016, a year and a half after the reform. The table shows statistics for jobs in the private sector.

	h <24	h ≥24
A. All		
Married	0.49	0.48
Have kids	0.48	0.54
Average number of kids (if have some)	1.87	1.79
Have kids younger than 6	0.17	0.21
B. Women		
Married	0.52	0.47
Have kids	0.54	0.56
Average number of kids (if have some)	1.87	1.74
Have kids younger than 6	0.18	0.20
C. Men		
Married	0.38	0.49
Have kids	0.31	0.52
Average number of kids (if have some)	1.82	1.84
Have kids younger than 6	0.14	0.22

Table B .2: Family situation of workers by on working time

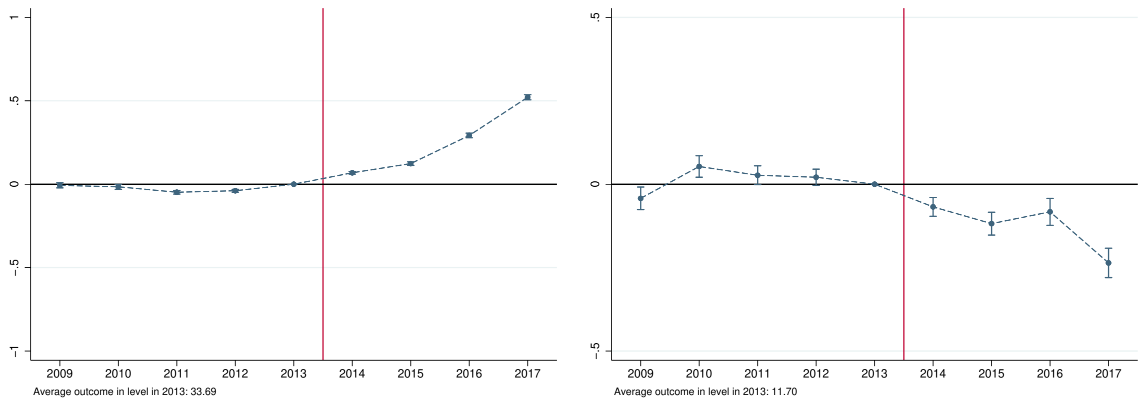
Notes: This table presents some average characteristics about the household composition, separately for workers with a workweek above 24h and for the ones with a workweek below, in 2013. The first panel corresponds to all employed workers with age between 18 and 64. Panels B and C decompose between men and women. Variables 'Married', 'Have kids' and 'Have kids younger than 6' are average shares. These statistics are computed from the Labor Force Survey. Observations are weighted thanks to the weights provided by INSEE.

	All	Acc. & food	Construction	Manuf.	Services	Retail
All regressors	0.332	0.251	0.085	0.209	0.438	0.202
Firm size	0.332	0.251	0.083	0.208	0.437	0.202
Firm location	0.328	0.221	0.075	0.200	0.434	0.191
Share of women	0.318	0.247	0.085	0.194	0.433	0.183
Share of OEC	0.331	0.244	0.081	0.206	0.426	0.200
Distri. of occupations	0.112	0.166	0.042	0.109	0.107	0.141
Distri. of workers' age	0.322	0.194	0.077	0.200	0.424	0.187

Table B .3: Explanatory power of determinants of exposure to the reform at the firm level

Notes: The first row reports the R^2 of an OLS regression with Share24 (exposure to the policy) as dependent variable and including all regressors stated in rows 2-7. Rows 2-7 reports R^2 of the regressions in which the set of regressors reported in first column is dropped. "Share of OEC" corresponds to the share of workers employed under open-ended contracts in the firm.

C Additional firm-level results

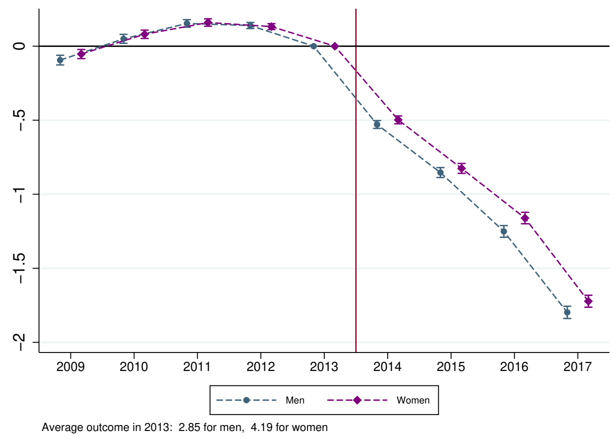


(a) Average weekly hours per job

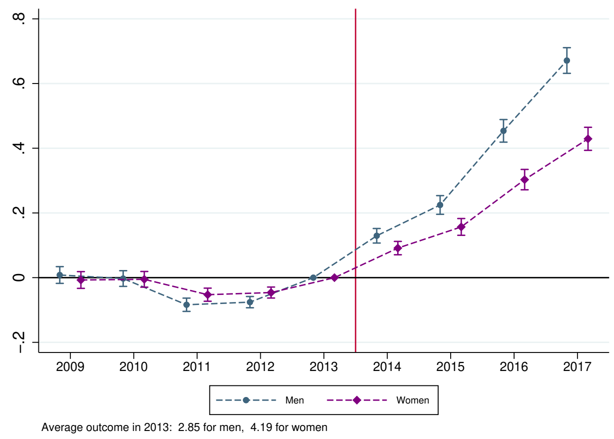
(b) Jobs with hours between 24 and 35

Figure C .1: Firm level effects: additional outcomes

Notes: Notes: This figure plots the estimates of the β_k parameters in Equation (1), for each year, as well as the 95% confidence intervals (standard errors are clustered at the firm level). Estimation on the balanced panel of firms from which firms smaller than size 5 before the policy and firms covered by industry agreements with exceptions to the policy are excluded. Reported estimates are for the full model with firm and year FE, time-varying industry, area, age and size effects. Estimated coefficients (y-axis) can be interpreted as the % change in outcome associated with a 1 percentage point increase in exposure to the reform.



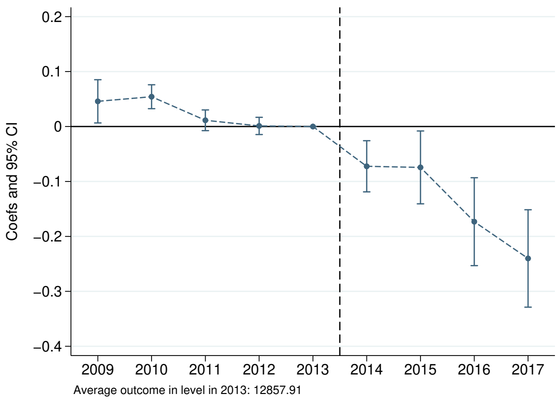
(a) Jobs < 24h



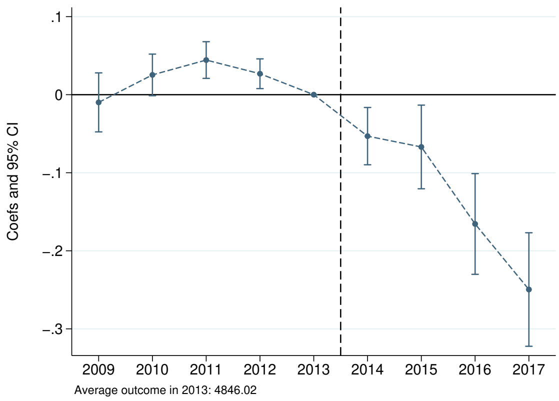
(b) Full-time jobs

Figure C .2: Firm-level effects by gender by type of jobs

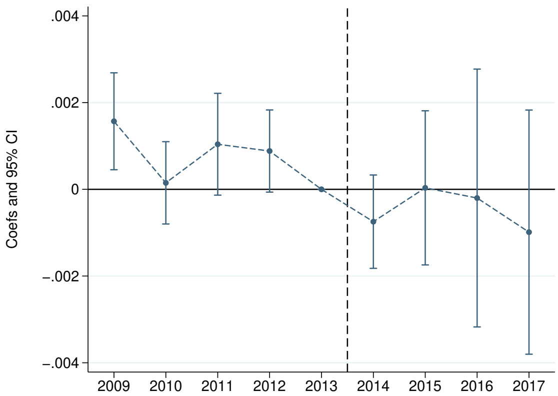
Notes: This figure plots the estimates of the β_k parameters in Equation (1), for each year, as well as the 95% confidence intervals (standard errors are clustered at the firm level). The regression in which the outcome is for men has been estimated separately from the one in which the outcome is for women. Estimation on the balanced panel of firms from which firms smaller than size 5 before the policy and firms covered by industry agreements with exceptions to the policy are excluded. Reported estimates are for the full model with firm and year FE, time-varying industry, area, age and size effects. Estimated coefficients (y-axis) can be interpreted as the % change in outcome associated with a 1 percentage point increase in exposure to the reform.



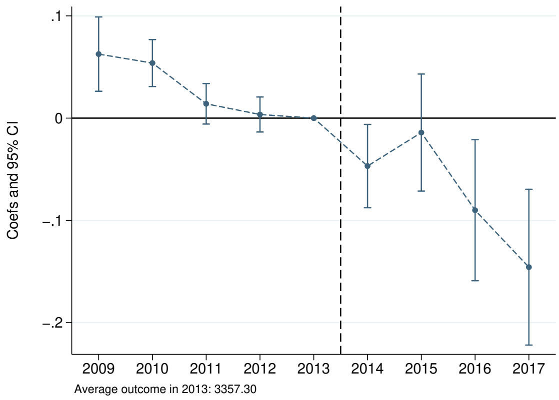
(a) Total sales



(b) Stock of capital



(c) Capital-to-labor ratio



(d) Purchased services

Figure C .3: Firm-level effects: other inputs and output

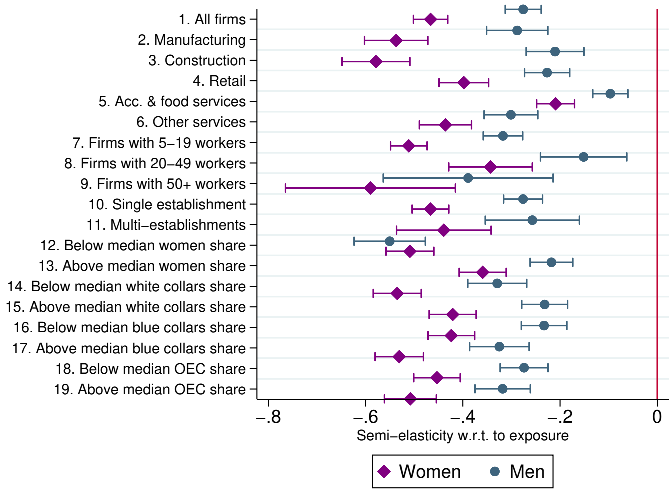
Notes: This figure plots the estimates of the β_k parameters in Equation (1), for each year, as well as the 95% confidence intervals (standard errors are clustered at the firm level). Outcome variables are computed from the Ficus-Fare. Estimation on the balanced panel of firms from which firms smaller than size 5 before the policy and firms covered by industry agreements with exceptions to the policy are excluded. Estimated coefficients (y-axis) can be interpreted as the % change in outcome associated with a 1 percentage point increase in exposure to the reform.

	Jobs <24h	Full-time jobs	All jobs	Total hours
A. All				
Estimate (2016)	-1.613***	0.443***	-0.376***	-0.166**
	(0.023)	(0.020)	(0.024)	(0.063)
Average in level	-4.716	1.202	-2.674	-1471.719
Total in %	-66.990	3.734	-5.250	-1.726
B. Women				
Estimate (2016)	-1.161***	0.303***	-0.449***	-0.420***
	(0.020)	(0.016)	(0.020)	(0.060)
Average in level	-2.118	0.323	-1.650	-1710.757
Total in %	-50.552	3.092	-8.343	-5.637
B. Men				
Estimate (2016)	-1.251***	0.454***	-0.264***	-0.086
	(0.020)	(0.018)	(0.021)	(0.061)
Average in level	-1.376	0.748	-0.905	-414.863
Total in %	-48.253	3.442	-2.904	-0.755

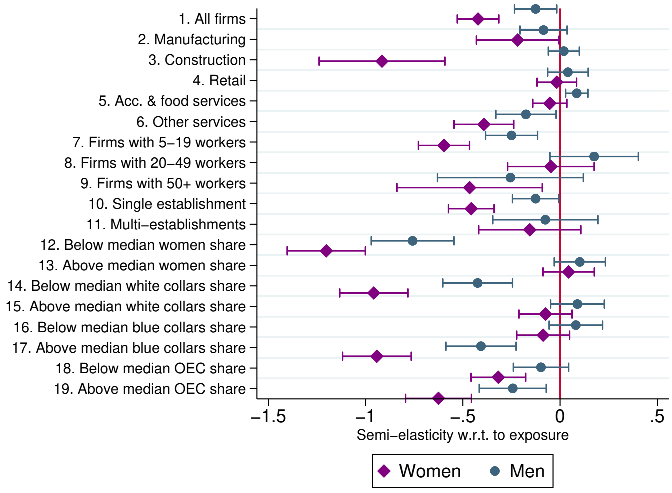
Table C .1: Corresponding employment changes in level

Notes: This table presents the back-of-the-envelope results for the effects of the policy in level on average and in % in the economy. 'Estimate (2016)' corresponds to β_{2016} in Equation (1). Standard errors clustered at the firm level are in parentheses. The average effect in level for outcome Y is computed from $\hat{\beta}_{2016}\frac{1}{N}\sum_{i=1}^{N} Share24_i \times Y_{i,2013}$, where i is a firm. "Average change in level" gives the change in the number of jobs on average for a firm. "Total in %" shows the corresponding variation as percentage of the outcome in the economy. Significance levels: * 0.10, ** 0.05, *** 0.01.

D Heterogeneity analysis



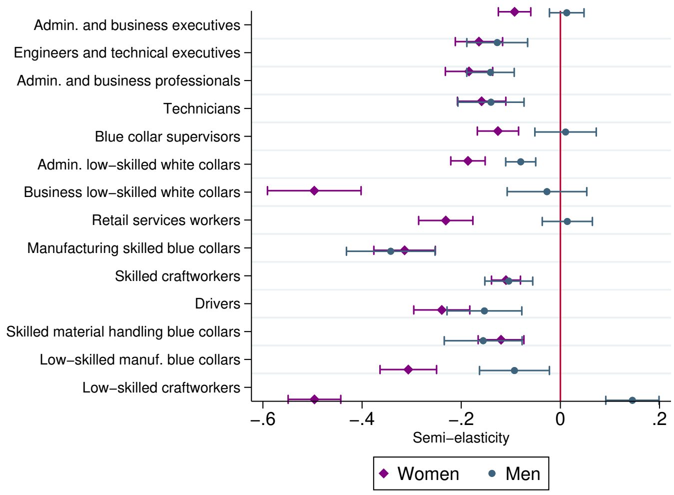
(a) Number of jobs



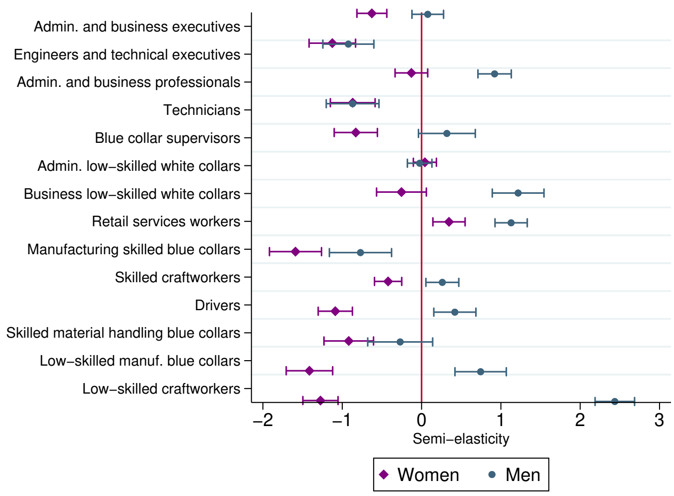
(b) Total hours

Figure D .1: Heterogeneity of the effects by firm type

Notes: This Figure plots estimates of a difference-in-differences specification for the period 2013-2017 for different subgroups of firms, and 95% confidence intervals. 2014 is excluded as it is partially treated, so that estimates show the average effects for 2015-2017. Each regression has been estimated separately in the corresponding subsample of firms. Subsamples are extracted from the baseline balanced panel, which means that each subsample is also a balanced panel with firms larger than 5 workers before the policy. Firms covered by industry agreements with exceptions to the 24h-rule are excluded. Reported estimates are for the full model with firm and year FE, time-varying industry, area, age and size effects. The estimates plot the semi-elasticity with respect to exposure: the % change in outcome associated with a 1 percentage point increase in Share24.



(a) Number of jobs



(b) Total hours

Figure D .2: Effects by occupation

Notes: This Figure plots estimates of a difference-in-differences specification for the period 2013-2017 as well as 95% confidence intervals. The regression has been estimated at the firm level, when the outcome variable is the number of workers of a given gender in a given occupation. Each estimate comes from a different estimation. Estimated on the balanced panel with firms larger than 5 workers before the policy. Firms covered by industry agreements with exceptions to the 24h-rule are excluded. Reported estimates are for the full model with firm and year FE, time-varying industry, area, age and size effects. The estimates plot the semi-elasticity with respect to exposure: the % change in outcome associated with a 1 percentage point increase in Share24.

E Jobs created before the reform

The French minimum working time only targeted new jobs created from July 2014. Since jobs created before that date do not have to comply with the reform, one may wonder if firms tried to keep these workers longer to avoid the policy. In this Section, I investigate the effect of the minimum working time on existing jobs. I combine the event-study design with a regression discontinuity approach. I now rely on individual-level data. It allows me to compare workers working fewer than 24h before the policy with the ones working more. I exploit the panel version of the DADS (Panel DADS), which provides a worker identifier allowing me to follow workers over time. This panel is a random sample of 1/12th of the standard DADS, composed of workers born in October of each year. I estimate the following specification

$$\text{JobExists}_{jt} = \sum_{\substack{k=-2 \\ k\neq 0}}^{k=4} \alpha_k \times \mathbb{1}_{h<24,j} \times \mathbb{1}_{t=2013+k} + \mu_j + \eta_t + \epsilon_{jt}, \tag{16}$$

where JobExists_{jt} is a variable equal to 1 if the job j exists in year t, meaning that a given worker works in a given firm. On the right hand side is an interaction between a year dummy and a variable equal to 1 if the worker is working fewer than 24h in the firm in 2010. I estimate the regression on the panel of jobs that exist in 2010. μ_j and η_t are job and year fixed effects, respectively. I estimate this equation over the balanced panel of jobs with workweeks between 19 and 29 hours in 2010. These jobs are in firms from the main balanced panel of firms. Figure E .1 presents estimates of the α_k parameters for each year between 2011 and 2017. I find that a worker with a workweek below 24h before the reform is more likely to continue to work in the same firm by 1 percentage point in 2016 relative to a job with a workweek above 24h in 2010. The baseline outcome in 2013 is 47%. Even if the magnitude of the effect is small, this is significant evidence of a small hoarding effect of jobs with less than 24h created before the policy. Two different reasons may explain why the magnitude of the effects if small. First, jobs with low hours are more likely to be fixed-term contracts, implying that these jobs are going to end anyway. Second, the reform changes outside options on the labor market and some workers may be more likely to quit their jobs.

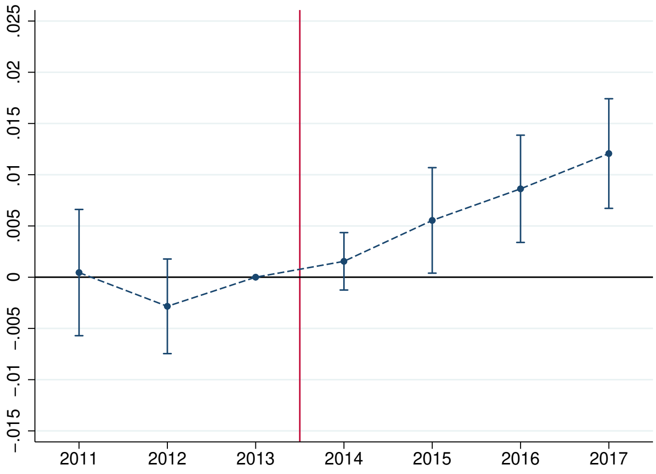


Figure E .1: Job-level analysis: survival probability for jobs created before the reform

Notes: This figure plots the results of the difference-in-discontinuity design estimating the hoarding effect for jobs below 24h created before implementation of the policy from Equation (16). The coefficients are estimated on the sample of jobs having between 19 and 28 hours of work and existing in 2010. Jobs considered are in firms from the baseline balanced panel. The outcome is a dummy variable equal to 1 if the jobs still exists in the given year. Average outcome is equal to 0.47 in 2013.

F Multiple job holding

Does the policy allow workers previously having several part-time jobs to get access to a unique job with more hours? To provide evidence on this, I investigate the impact of the reform on the multiple job holding rate.

I rely on a panel version of the linked employer-employee data, the *Panel DADS*. Contrary to the main data sources used in this paper, the panel version provides an individual identifier allowing to linked all jobs of a given worker. Combining this information with the starting and ending dates of each job spell, I compute, for each individual, the amount of time spent with at least two jobs at the same time over the year. This information can then be aggregated.

First, before implementation of the 24h-reform, the share of part-time workers with at least two jobs is equal to 3.5% in 2012-2013. This share is lower after the policy, equal to 3.3% in 2015-2016. I investigate here whether this decline is due to the impact of the reform. To do so, I compare the evolution multiple job holding rates between markets with different exposure to the policy. The specification is

$$MJH_{mt} = \alpha_0 + \sum_{\substack{k=-4 \\ k\neq 0}}^{k=4} \beta_k \times \text{Share24}_m \times \mathbb{1}_{t=2013+k} + \mu_m + \eta_t + \epsilon_{mt} \tag{17}$$

where MJH_{mt} is the multiple job holding rate in market m in year t. A market m is a commuting zone-industry cell, where industry is at 2-digits. Share24_m is the average share of jobs with working time below 24h in market m over 2009-2013. μ_m and η_t are market and year fixed effects, respectively.

Figure F .1 presents the estimated parameters. First, the parallel trends assumption seems to hold on the pre-treatment period. Second, we observe a significant drop in the multiple job holding rate after the policy for markets more exposed, relative to markets with a lower exposure. However, the magnitude of the effect is small. An increase in 1 percentage point in exposure to the policy is associated with a decrease in the share of workers with multiple jobs in the market by 0.0006 percentage points in 2016.

This result suggests that the aggregate decrease in multiple jobs holding is likely due to the reform. However, this strategy does not allow to quantify the magnitude of the aggregate effect since I only consider multiple jobs hold in the same market.

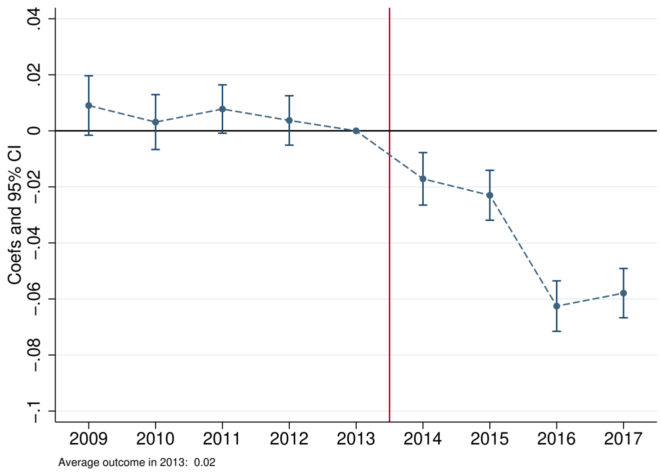
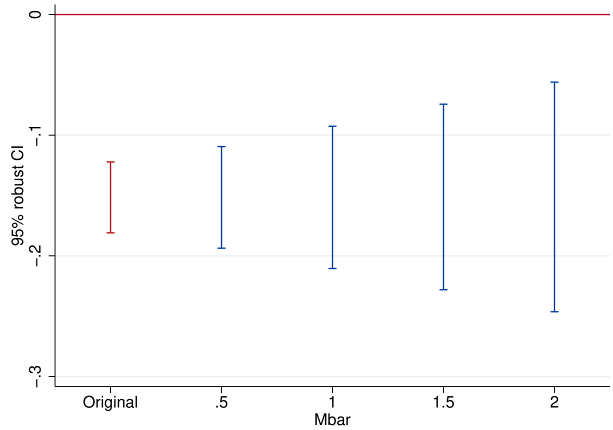


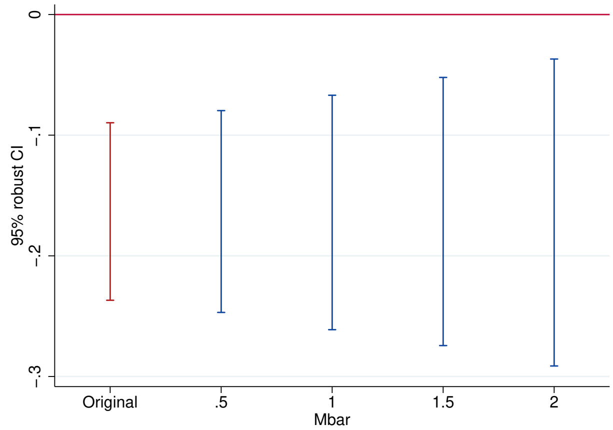
Figure F .1: Effect of the reform on the market-level multiple job holding rate

Notes: This figure plots the estimates of the event study specification estimated at the market level, where the outcome variable is the multiple job holding rate in the market, i.e. the share of workers with more than one job at a time. A market is a commuting zone and industry (at 2-digits). Exposure to the policy (Share24) is computed at the market level as well. 95% confidence intervals shown and standard errors are clustered at the market level.

G Additional robustness for the firm-level effects



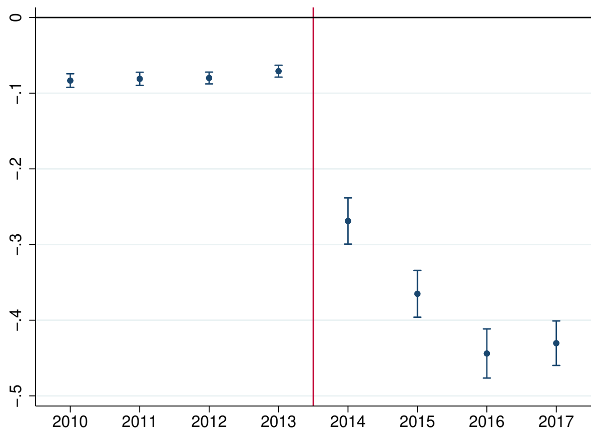
(a) Number of jobs



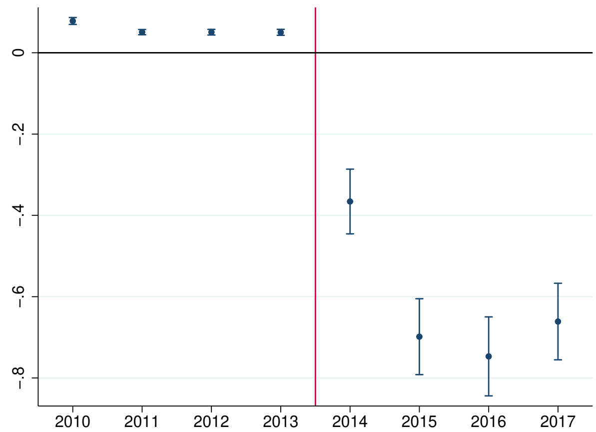
(b) Total hours

Figure G .1: Honest pre-trends following Rambachan & Roth (2023)

Notes: This Figure plots alternative estimated confidence intervals for β_{2014} (the first post-reform year) in Equation (1). These confidence intervals allow for deviations from parallel trend in the pre-reform period, following the procedure in Rambachan & Roth (2023). Each confidence interval is computed assuming that the post-treatment violation of parallel trends is at most Mbar larger than the maximum violation of parallel trends in the pre-treatment period. For instance, Mbar equals to 2 means that the post-treatment violation of parallel trends is no more than twice that in the pre-treatment period. 95% confidence intervals are shown



(a) Number of jobs



(b) Total hours

Figure G .2: Robustness check for mean reversion

Notes: These two figures plot estimates of separate difference-in-difference regressions estimated on two consecutive periods, where the second period is considered as after the policy. Each estimated parameter is from an estimation over two periods, in which exposure is computed during the first period. For example, the estimate in 2012 for the number of jobs is obtained by estimating a regression on 2011 and 2012 where 2012 is considered as the "after" period and 2011 as the "before" period. In this case, exposure to the policy is computed in 2011. Estimated on the baseline balanced panel of firms. Specification includes firm and year fixed effects, time-varying industry, area, age and size effects. 95% confidence intervals shown.

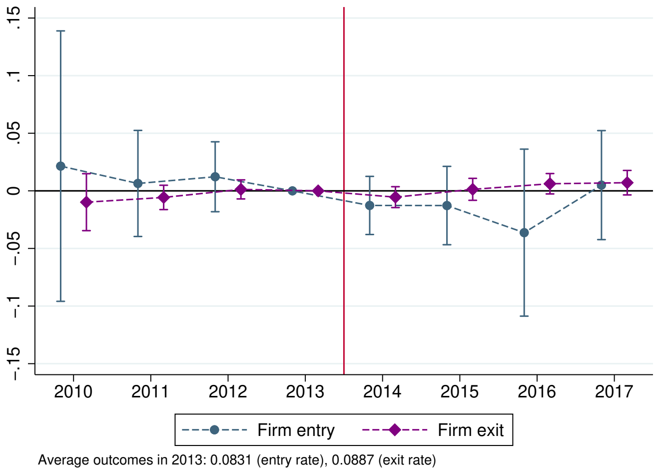
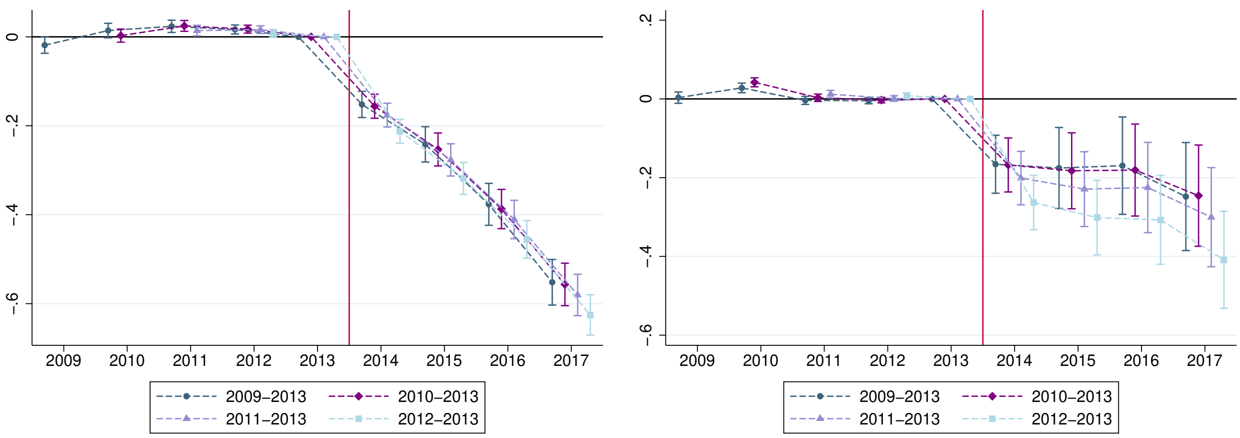


Figure G .3: Effects on firm entry and exit

Notes: This Figure plots estimates of β_k in Equation (1), where this equation is estimated at industry level instead of firm level. Share24 is the average share of jobs below 24h in the industry over 2009-2013. Outcomes are the firm entry and exit rates in the corresponding industry. Industries are defined at the 3-digit level.



(a) Number of jobs

(b) Total hours

Figure G .4: Estimates on alternative samples including younger firms

Notes: This Figure plots estimates of β_k in Equation (1) and 95% confidence intervals. Each line in the figure connects estimates obtained on a different sample. Each sample is a balanced panel of firms. The line connecting 2009 to 2017 corresponds to my baseline results for the baseline sample of firms (with firms that were created in 2009 or before). The other lines consider larger samples in which I include younger firms. For instance, the line connecting estimates from 2010 to 2017 also include firms that were created in 2010. Reported estimates are for the full model with firm and year FE, time-varying industry, area, age and size effects.

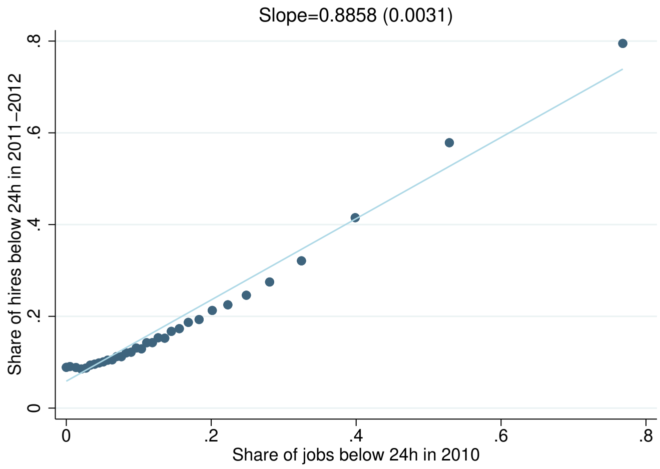
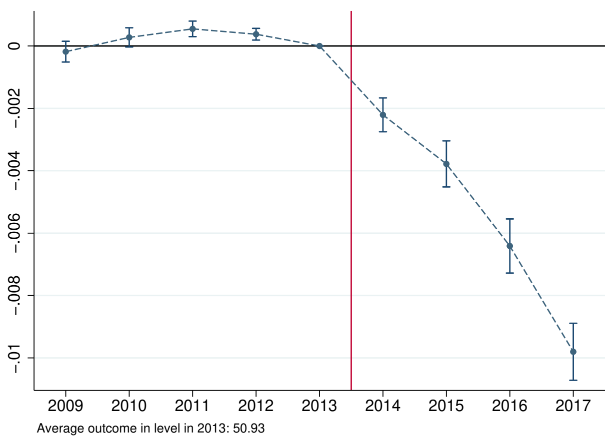
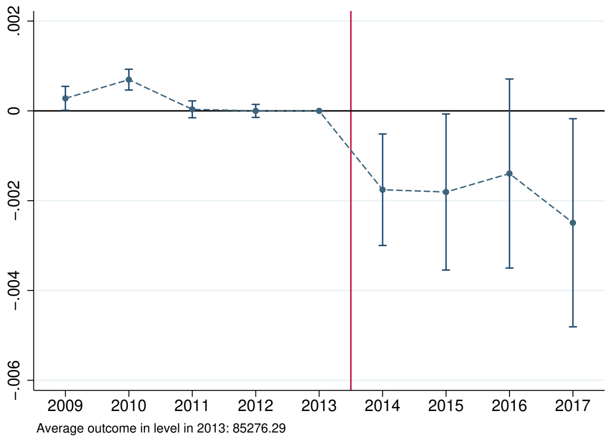


Figure G .5: Persistence of Share24 over time

Notes: This Figure is a binscatter of the relationship between the share of jobs below 24h in the firm in 2010 and hires of these jobs in 2011-2012.



(a) Number of jobs



(b) Total hours

Figure G .6: Estimates with GAP-design

Notes: This Figure plots the estimates of β_k in Equation (1), where instead of Share24, the exposure of the firm to the policy is the GAP-exposure. The GAP-exposure corresponds to the average increase in hours that would be needed in the firm to have all jobs with at least 24h per week, over 2009-2013. Estimation on the balanced panel of firms from which firms smaller than size 5 before the policy and firms covered by industry agreements with exceptions to the policy are excluded. Reported estimates are for the full model with firm and year FE, time-varying industry, area, age and size effects. 95% confidence intervals are shown.

H Robustness for the reduced-form analysis of indirect effects

	Baseline	CZ x Industry (2 digits)	CZ x Industry (1 digit)	Province x Industry (1 digit)
Share24_i × After	-0.307***	-0.346***	-0.314***	-0.330***
	(0.020)	(0.023)	(0.020)	(0.021)
$\text{Share24}_{m(-i)}$ × After		0.125***	0.107*	0.244***
		(0.035)	(0.051)	(0.056)
Average employment (2013)	51.369	51.369	51.369	51.369
N	670,784	670,784	670,784	670,784

Table H .1: Estimates of direct and indirect effects on the firm-level number of jobs

Notes: This table shows estimates of Equation (2) for several definition of the level of a market. The outcome is the log number of workers employed in the firm. The first column presents the baseline estimate when only the firm's own exposure is included in the specification. The three other columns present estimates when both the firm's own exposure (Share24) as well as the leave-one-out average market exposure ($\text{Share24}_{m(-i)}$) are included. The first raw details what is the definition of the market. For instance, in the second column, a market is a commuting zone and industry, the industry being defined at the 2-digits level. Estimates are obtained on the baseline sample of firms from which firms smaller than 5 workers and firms covered by industry agreements with exceptions are excluded. Market and year fixed effects are included. 'Average employment (2013)' is the average firm-level number of jobs in 2013. Standard errors are clustered at the firm level and shown in parentheses. Significance levels: * 0.10, ** 0.05, *** 0.01.

I Workers' preferences

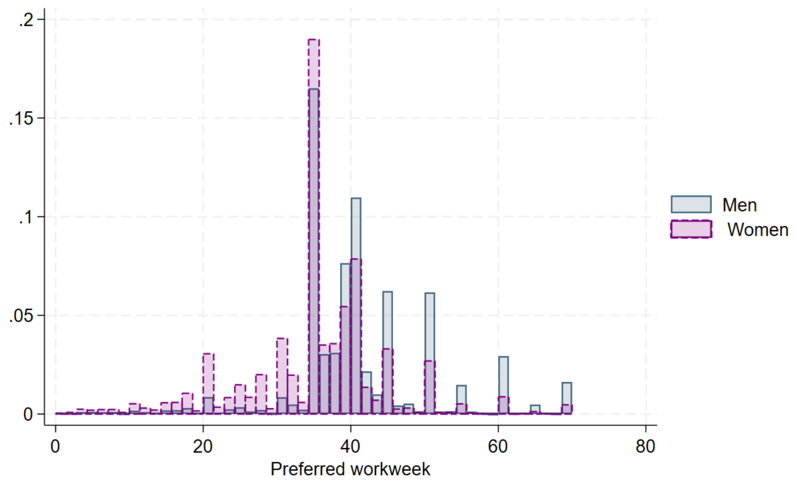
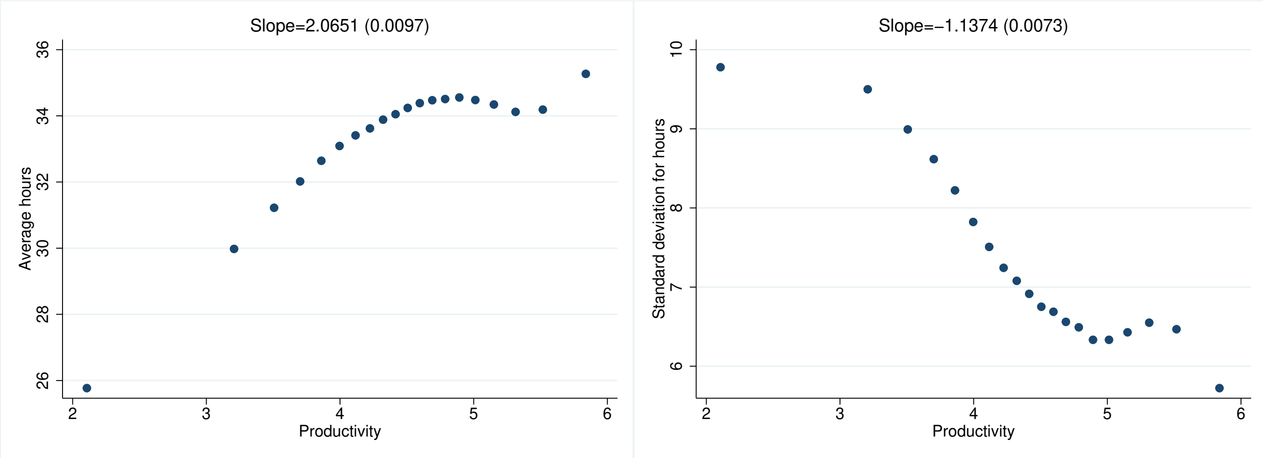


Figure I .1: Preferred working time by gender

Notes: This figure plots the distribution of preferred working time, separately for men and women, in 2013. It is computed from the French Labor Force Survey, in which people are asked how many hours they want to work per week. Workers younger than 18 and older than 65 are excluded.

J Firm-level productivity and hours



(a) Mean hours

(b) Standard deviation of hours

Figure J .1: Correlation between firm productivity and working time

Notes: This figure plots firm-level binscatters. The x-axis corresponds to the logarithm of the total value added divided by the total number of hours in 2012. The y-axis plots the average weekly hours worked in the firm (Panel (a)) and the standard deviation of weekly hours (Panel (b)). Firms smaller than 5 workers are excluded. The slope corresponds to the OLS estimate when the average hours (or standard deviation of hours) is regressed on productivity. The standard error is in parentheses.

K Structural model: technical appendix

K .1 Surplus and contract determination

Combining Equations (5) and (6), we can deduce the surplus of a job for which i, y ϵ and z are observed.

$$S^i(y, \epsilon, z) = \frac{1}{1 - \beta(1 - \sigma)}[y \min(h^\alpha, z^\alpha) - \Phi(h, \epsilon) - (1 - \beta)W_u^i]. \tag{18}$$

The firm and the worker bargain on the number of hours of work and the hourly wage. Problem (9) can be rewritten using Equations (5) and (6):

$$\max_{h,\ w} \left(\frac{wh - \Phi(h, \epsilon) - (1 - \beta)W_u^i}{1 - \beta(1 - \sigma)} \right)^\gamma \left(\frac{y \min(h^\alpha, z^\alpha) - wh}{1 - \beta(1 - \sigma)} \right)^{1-\gamma}.$$

Taking the log, we have

$$\max_{h,\ w} \ \gamma \ log \left(\frac{wh - \Phi(h, \epsilon) - (1 - \beta)W_u^i}{1 - \beta(1 - \sigma)} \right) + (1 - \gamma) \ log \left(\frac{y \min(h^\alpha, z^\alpha) - wh}{1 - \beta(1 - \sigma)} \right).$$

The first order condition with respect to w gives

$$\frac{\gamma h}{wh - \Phi(h,\epsilon) - (1-\beta)W_u^i} - \frac{(1-\gamma)h}{y\min(h^\alpha, z^\alpha) - wh} = 0.$$

Using the definition of (5) and (6),

$$\frac{\gamma h}{W^i(y,\epsilon,z) - W_u^i} - \frac{(1-\gamma)h}{J^i(y,\epsilon,z)} = 0.$$

Rearranging, we obtain

$$W^i(y,\epsilon,z) - W_u^i = \gamma S^i(y,\epsilon,z) \quad \text{and} \quad J^i(y,\epsilon,z) = (1-\gamma)S^i(y,\epsilon,z). \tag{19}$$

The first order condition for h is

$$\frac{\gamma(w - \Phi_h(h,\epsilon))}{wh - \Phi(h,\epsilon) - (1-\beta)W_u^i} - \frac{(1-\gamma)(w - y\alpha h^{\alpha-1}\mathbb{1}_{h<z})}{y\min(h^\alpha, z^\alpha) - wh} = 0.$$

Using the first order condition on the wage, in Equation (19), we have

$$\Phi_h(h,\epsilon) = y\alpha h^{\alpha-1}\mathbb{1}_{h<z}.$$

This condition coincides with the derivative of the surplus, from Equation (18), with respect to h. It implies that the bargained number of hours is surplus maximizing.
As a result, the bargained number of hours, h^b is

$$h^b = \begin{cases} h : \Phi_h(h,\epsilon) = y\alpha h^{\alpha-1} & \text{if } \Phi_h^{-1}(y\alpha h^{\alpha-1}) < z \\ z & \text{otherwise.} \end{cases} \tag{20}$$

It is never optimal to create a job with more than z hours since the worker would suffer additional labor disutility for a marginal production equal to 0.

K .2 Individual optimal hours

For a given bargained hourly wage w^b, the number of hours of work which is optimal for the firm maximizes instantaneous profit. Hence, the firm would prefer the number of hours to be equal to h_f such that

$$h_f = \arg\max_h \left[\min(z^\alpha, h^\alpha) - w^b h\right] \tag{21}$$

On the worker side, the preferred number of hours, denoted h_W maximizes instantaneous utility and is such that

$$\Phi_h(h_W,\epsilon) = w^b \tag{22}$$

A situation of involuntary part-time employment is defined such that $h_W > h^b$ and $h^b < 35$: the number of hours preferred by the worker is above the bargained number of hours and the job is a part-time job, for constant hourly wage.

K .3 Value functions

The expected value of unemployment, for a type-i worker is

$$\begin{aligned} W_u^i = b + \beta\theta m(\theta) \int \left[\int \left[\max(W^i(y,\epsilon^i,z), W_u^i) \mathrm{d}H_y(z) \right] \right] \frac{v(y)}{v} \mathrm{d}F(y) \\ + \beta(1-\theta m(\theta))W_u^i. \end{aligned} \tag{23}$$

b is the instantaneous utility of an unemployed worker. The second term is the expected value associated with meeting a firm. The last term is the value next period if no firm has been met.

Let us denote by s^i the share of type-i workers among unemployed workers. This is an endogenous variable that will be determined in equilibrium. The value of opening a marginal vacant job in a firm with productivity y is denoted $V(y)$ and is

$$\begin{aligned} V(y) = -C'(v(y)) + \beta m(\theta) \sum_{i=1,\ldots,\mathcal{N}} s^i \left[\int \max(J^i(y,\epsilon^i,z), V(y)) \mathrm{d}H_y(z) \right] \\ + \beta(1-m(\theta))V(y). \end{aligned} \tag{24}$$

K .4 Firm entry

The value of a firm that exits the market after T periods is

$$m(\theta)v(y)J(y)\beta \sum_{t=1}^{T-1} \beta^t(1-\delta)^t - C(v(y)) \sum_{t=0}^{T} \beta(1-\delta).$$

where δ is the probability that the firm is destroyed at each period. $J(y)$ is the expected value of a job, before observing the worker type and the task duration:
$J(y) = \sum_{i=1,\ldots,\mathcal{N}} s^i \int J^i(y,\epsilon^i,z)\mathrm{d}H_y(z)$. By taking the number of periods, T, to infinity, we can deduce the value of the firm. The expected value of a firm with productivity y is denoted $\Pi(y)$ and equal to

$$\Pi(y) = \frac{\beta m(\theta)v(y)J(y) - C(v(y))}{1-\beta(1-\delta)}.$$

The vacancy cost function, $C(.)$ is homogeneous of degree c^1. Combining that with the labor demand Equation (13), we have

$$\Pi(y) = \frac{\beta m(\theta)v(y)(1-\gamma)(1-\frac{1}{c^1})S(y))}{1-\beta(1-\delta)}, \tag{25}$$

which shows that the firm value depends on the expected surplus of a job in the firm, $S(y)$.[19]

K .5 Unemployment rate

I denote by N^i the size of the workforce of type i, which is exogenous. Hence, $N^i = u^i + \ell^i$, where u^i is the number of unemployed workers and ℓ^i the number of employed workers of type i. Each period, the number of entries into unemployment for the type i is equal to $(N^i - u^i)\sigma$. The number of exits out of unemployment is equal to $u^i\theta m(\theta)(1-\delta)\int\left[1-H_y(\underline{z}^i(z,\epsilon^i))\right]\frac{v(y)}{v}\text{d}F(y)$. In equilibrium, the number of entry into unemployment is equal to the number of exits. We can deduce the number of workers unemployed, for each type

$$u^i = \frac{N^i\sigma}{\sigma+\theta m(\theta)(1-\delta)\int\left[1-H_y(\underline{z}^i(y,\epsilon^i))\right]\frac{v(y)}{v}\text{d}F(y)}, \tag{26}$$

where $[1-H_y(\underline{z}^i(y,\epsilon^i))]$ is the probability that a job in a type-y firm is profitable for the type-i worker. Hence differences in unemployment rates between different types of workers are due to differential probabilities that matches are converted into jobs. As a result, the unemployment rate is equal to the ratio of the job destruction rate and the sum of the destruction and creation rates.

K .6 Additional labor market outcomes

Employment. The number of jobs in a given firm depends on the age of this firm. Actually, at the firm level, employment is not constant over time. Then, for a type-y firm, the distribution of the number of jobs is determined by the age distribution. The number of workers of type i working in a type-y firm of age τ is equal to

$$\ell^{\tau,i}(y) = v(y)m(\theta)s^i\left[1-H_y(\underline{z}^i(y,\epsilon^i))\right]\frac{1-(1-\mu)^\tau}{\mu}.$$

Since firms exit rate, δ, is constant, the age distribution of firms does not depend on y. Considering the age distribution, we can deduce the average number of workers of type i working in a type-y firm

$$\ell^i(y) = v(y)m(\theta)s^i\left[1-H_y(\underline{z}^i(y,\epsilon^i))\right]\frac{(1-\delta)}{[1-(1-\mu)(1-\delta)]}.$$

Aggregating over all types of firms, we can deduce total employment for each type of worker

$$\ell^i = n\int \ell^i(y)\text{d}F(y), \tag{27}$$

[19] With $S(y) = \sum_{i=1,\ldots,\mathcal{N}} s^i \int S^i(y,\epsilon^i,z)\text{d}H_y(z)$.

Where n is the number of firms operating in the economy. And total employment is

$$\ell = \sum_{i=1}^{\mathcal{N}} \ell^i.$$

We can notice that in equilibrium, when $\theta = \frac{v}{u}$, this coincides with $\sum_{i=1}^{\mathcal{N}} N^i - \sum_{i=1}^{\mathcal{N}} u^i$, where u^i is computed in Equation (26).

Total hours. In a type-y firm, the total number of hours worked by workers of type i is

$$v(y)m(\theta)s^i \int h^{b,i}(y, \epsilon^i, z) \mathrm{d}H_y(z) \frac{(1-\delta)}{[1-(1-\mu)(1-\delta)]},$$

where $h^{b,i}(y, \epsilon^i, z)$ is the number of hours bargained. And the total number of hours worked in the economy is

$$n \times m(\theta) \frac{(1-\delta)}{[1-(1-\mu)(1-\delta)]} \sum_{i=1}^{\mathcal{N}} s^i \left[\int v(y) \int h^{b,i}(y, \epsilon^i, z) \mathrm{d}H_y(z) \mathrm{d}F(y) \right].$$

K .7 Post-reform surplus

After implementation of the 24h-rule, the surplus of a job in a firm with productivity y, a worker of type i, disutility parameter ϵ^i and maximum number of productive hours z is

$$S_{24}^i(y, \epsilon^i, z) = \frac{1}{1-\beta(1-\sigma)} [y \min(h^\alpha, z^\alpha) - \mathcal{C}(\max(24-h, 0)) - \Phi(h, \epsilon^i) - (1-\beta) W_u^i]. \quad (28)$$

L Appendix: model estimation

L .1 Workers' disutility parameters (Step 1)

For employed workers, we observe in the Labor Force Survey the preferred number of hours of work. First, people are asked if they would prefer to change hours, for the same wage. If yes, they are then asked about their preferred workweek, for current hourly wage. For workers satisfied with current hours, I consider that the current workweek is the preferred one. For the others, I take the preferred workweek. The preferred number of hours of work and the hourly wage are first residualized to remove sources of heterogeneity not explained by the model. The variables used are the age, industry, level of education and occupation. Then, for each individual, I obtain the residual hourly wage and the residual preferred number of hours. In the model, the preferred number of hours of a worker, h_W for given hourly wage, w is defined by

$$\Phi_h(h_W, \epsilon) = w$$

Using the functional form $\Phi(h, \epsilon) = h^{\epsilon}$, we have

$$\epsilon h_W^{\epsilon-1} = w$$

Hence, for each observation $(h_{W,i},\, w_i)$, we can numerically deduce ϵ_i. I winsorize the obtained set of ϵ at 3% to remove extreme values. I discretize the distributions by first creating bins with regular range and then compute the average ϵ for each bin as well as the probability distribution of the bin. This is done separately for men and women. For each gender, I create 3 bins for ϵ.

L .2 Technology parameters (Step 2)

The maximum number of productive hours of a job is drawn uniformly in $[z_1 y + z_2 y^2; z_{max}]$. z_{max} is common to all firms and it calibrated by taking the 99th percentile of required hours posted in job ads. It is equal to 40. I then estimate parameters $\Theta = (\alpha, z_1, z_2, \tau, y_{shape}, y_{scale})$ by using the joint distribution of hourly wages and required hours posted in the job ads. I do not need to make any assumption on how the posted wage is determined. I assume that conditional on this posted wage, firms post the expected optimal number of hours. In the structural model, ex-ante, there is a relationship between the hourly wage and optimal hours in each firm. To identify the parameters, I assume that there is also such a characteristic relationship in the data as well. In the vacancy data, I randomly draw one job ad for each firm and take this job ad as representative of that relationship. I exploit information about the joint distribution of hourly wages and hours to infer the joint distribution of productivity and hours.

For a given hourly wage w, the optimal number of hours for a firm of type y with vacant jobs with maximum number of productive hours z is

$$h_f(y, z) = \left\{ h | \max_h y \min(h^{\alpha}, z^{\alpha}) - wh - \tau \max(0, h - 35) \right\}.$$

It corresponds to

$$h_f(y, z) = \min \left[z, \max(\min[(\frac{y\alpha}{w})^{\frac{1}{1-\alpha}}, 35], (\frac{y\alpha}{w+\tau})^{\frac{1}{1-\alpha}}) \right].$$

For a type-y firm, before observing z, preferred hours are

$$h_f(y) = \frac{1}{z_{max} - z_{min}(y)} \left[(z_{max} - \tilde{h}(y))\tilde{h}(y) + \frac{1}{2}(\tilde{h}^2(y) - z_{min}^2(y)) \right],$$

with $\tilde{h}(y) = \max(\min[(\frac{y\alpha}{w})^{\frac{1}{1-\alpha}}, 35], (\frac{y\alpha}{w+\tau})^{\frac{1}{1-\alpha}})$, and $z_{min}(y) = z_1 y + z_2 y^2$.

L .3 Remaining parameters (Steps 3 and 4)

c^1 is calibrated to reproduce the share of jobs with working time below 24 hours in the economy. In the model, for a type-i worker, this share is

$$P^i(h \leq 24) = \frac{\int_y P(h(y,\epsilon^i) \leq 24 \cap z \geq \underline{z}^i(y,\epsilon^i))v(y)\text{d}F(y)}{\int_y P(z \geq \underline{z}^i(y,\epsilon^i))v(y)\text{d}F(y)}.$$

This probability does not depend on m_0, which can then be calibrated in a last step. It is not possible to identify both m_0 and c_0 as they always intervene as a product in the model equations. I normalize c_0 to 1 and calibrate m_0 to match an unemployment rate of 9%.

	Data	Model
Average firm size	50.98	47.22
Average hours per man	34.718	33.12
Average hours per woman	31.31	32.73
Average hours per worker	33.72	32.93
Number of men below 24h	2.87	2.54
Number of women below 24h	4.29	2.98
Total hours worked in the year	85064	80842

Table L .1: Model fit with respect to non-targeted moments, firm-level averages

Notes: This table shows firm-level average moments in the data, computed from the DADS, and in the model. The model moments are computed in the pre-reform framework for estimated values of the structural parameters.

L .4 Policy parameter ρ

The event study estimated in reduced form is an extended version of a difference-in-difference. Taking the corresponding difference-in-difference equation in first difference, I obtain

$$log(L24_{i,after}) - log(L24_{i,before}) = \lambda_0 + \lambda_1 Share24_i + u_i, \tag{29}$$

where the left-hand side is the log change in the number of jobs below 24h in the firm after implementation of the minimum workweek. As before, Share24$_i$ is the share of jobs with workweek below 24h in the firm before implementation of the policy. In reduced form, I have estimated the empirical counterpart $\hat{\lambda_1}^{DiD}$. In the model, I simulate a large number of firms, conditional on estimated values of the structural parameters. For each firm, I compute the number of jobs below 24 and exposure, before any policy change. Then, for any value of the policy parameter ρ, I can compute the new general equilibrium and the new number of jobs below 24h in each firm. It is then possible to deduce $\hat{\lambda_1}^{Model}$, the regression estimate from the model. Finally, I pick the value of $\hat{\rho}$ such that

$$\hat{\lambda_1}^{Model} = \hat{\lambda_1}^{DiD}. \tag{30}$$

	Reduced-form estimate (data)	Model-based DiD
A. Number of jobs		
All	-0.38	-0.35
Women	-0.45	-0.38
Men	-0.26	-0.32
B. Total hours		
All	-0.17	-0.17
Women	-0.42	-0.20
Men	-0.09	-0.14

Table L .2: Comparison of difference-in-difference estimates in model and data

Notes: This Table reports estimates of Equation (1) in 2016 for several outcomes of interest (first column) and the corresponding difference-in-difference estimates obtained from the structural model (second column). The estimate for the number of jobs below 24h is used to calibrate the policy parameter and is hence excluded as it coincides perfectly. The estimates shown in this table are not targeted in the estimation procedure.

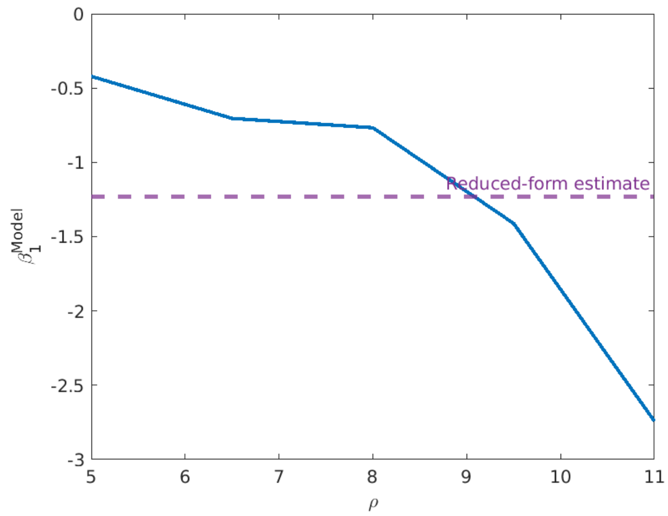


Figure L .1: Model simulations for different values of ρ

Notes: This Figure shows the difference-in-difference estimate simulated in the structural model, for several values of the policy parameter, ρ. The outcome is the log number of jobs with working time below 24h in the firm. Each estimate is obtained after computing the new general equilibrium of the model for the corresponding policy shock. The reduced-form estimate corresponds to β_{2016} in Equation (1).

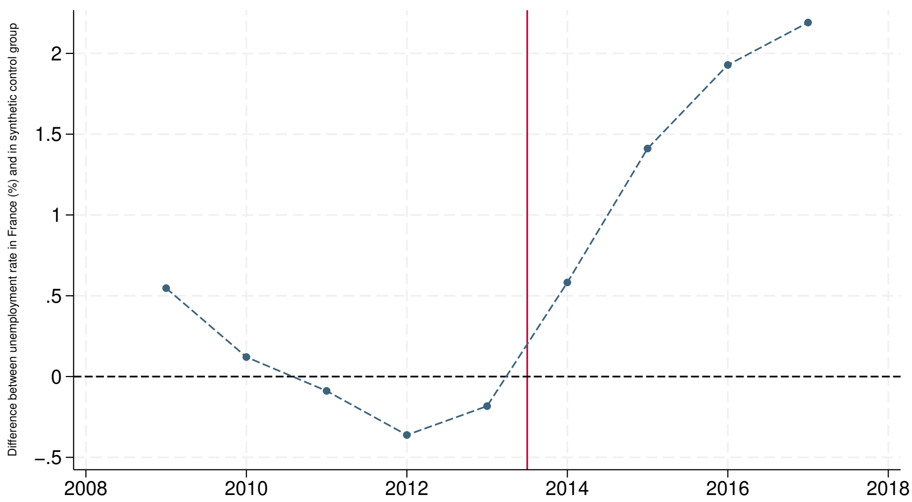


Figure L .2: Difference between French unemployment rate and synthetic unemployment rate

Notes: This figure plots the gap between the log unemployment rate in France each year and the log unemployment rate computed in the synthetic control group. The synthetic control group is determined based on Abadie et al. (2010). Countries in the synthetic control group are Austria, Belgium, Denmark, Germany, Hungary, Italy, Luxembourg, Poland, Portugal, Spain, Sweden, United Kingdom.