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

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Abstract

This paper provides new evidence on how firms and workers adjust to a restriction on low-hour jobs. I exploit a unique reform introducing a minimum workweek of 24 hours in France in 2014, affecting 15% of jobs. Drawing on linked employer-employee data and an event study design, I find a firm-level reduction in the number of jobs and an increase in average hours per worker. Overall, total hours worked in the firm decreased significantly, showing imperfect substitutability between workers and hours. The effects differ by gender: part-time female workers were replaced by full-time male workers. Importantly, reduced-form evidence indicates the reallocation of workers from firms highly exposed to the policy to firms less exposed. To quantify the aggregate impact taking into account these effects, I build and estimate a search and matching model with heterogeneous workers and firms. I find that the minimum workweek destroyed 1% of jobs but had no effect on total hours, due to positive general equilibrium effects. Finally, the gender gap in welfare increased by 3% because women were more affected by the direct negative employment effects and benefited less from reallocation effects.

JEL Codes: J08, J23, J41

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1 Introduction

Part-time jobs are a sizable share of employment in many countries. On average in the OECD, 16.7% of workers worked less than 30 hours per week in 2020.[1] These jobs are becoming more and more prevalent as this share has been increasing over the past decades in most countries. Both labor supply and labor demand factors can explain the existence of part-time jobs. Some workers want to work part time because of their constraints or preferences. Firms may rely on low-hour jobs because of their production technologies. For example in the retail and service industries, hours worked must coincide with the timing of consumption. It is unclear, however, whether the employees working part time are the ones who want to work low hours. Employers may exert their market power to impose low-hour jobs. Restricting these jobs have been debated in several countries, for instance in Germany about Minijobs and in the United Kingdom about Zero Hour Contracts. Yet, very little is known about the potential effects of restricting low-hour jobs.

This paper exploits a unique reform implementing a minimum workweek in France to provide new evidence on how the labor market adjusts to a restriction of low-hour jobs. The reform consists of a minimal legal 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, my analysis provides a better understanding of (i) the labor demand determinants of hours, especially the degree of substitutability between hours and workers, (ii) labor supply behaviors, namely heterogeneous preferences in working time, and (iii) sorting and the allocation of workers between firms. My analysis proceeds in four steps.

First, I rely on French linked employer-employee data and an event study design in order 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, total hours worked in the firm decrease, indicating that the negative extensive margin effect dominates. An initial share of jobs below 24 hours higher by 1 percentage point is associated with a 0.2% decrease in hours. This result suggests that firms cannot flexibly

[1] This share was equal to 18.0% in Canada, 13.1% in France, 22.5% in Germany, 17.9% in Italy, 26.7% in Switzerland, 22.4% in the United Kingdom and 11.7% in the United States (OECD Employment Database).

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 full-time jobs is stronger for men. Hence, women are more affected by the negative effect on the extensive margin and benefit less from the positive effect on the intensive one. These results hold within industries and occupations and are driven by the hiring margin. These findings suggest that full-time men have replaced part-time women 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. Firm-level reduced-form evidence does not take into account these potential between-firm reallocation effects. To investigate indirect effects, I consider simultaneously the effects of the own 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. The reallocation of workers between firms has two important implications. First, firm-level reduced-form results are potentially biased since the Stable Unit Treatment Value Assumption (SUTVA) does not hold. Second, the aggregate impact of the minimum workweek can be very different from firm-level reduced-form estimates.[2] 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 a search and matching model with two-sided heterogeneity. The framework is a random search model with large firms and bargaining of hours and wages. Men and women differ ex-ante with respect to their distributions of 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. I compare the equilibrium with no minimum workweek and the one with the restriction.

The model predicts firm-level and general equilibrium effects of the minimum workweek. First, the firm-level effects in partial equilibrium are in line with reduced-form results: employment decreases, especially for women, while average hours increase. Second, these direct negative employment effects induce indirect positive feedback effects in general equilibrium. Since there are more unemployed workers, for whom the value of the outside option decreases, it becomes more profitable to open vacant jobs. While the direct partial equilibrium effects are more important in firms highly exposed to the minimum workweek, the indirect positive effects might dominate in firms with low exposure. Since women are more affected by the direct effects, they contribute more to these general equilibrium effects, which will also benefit men.

Fourth, I estimate the structural parameters of the model over the period before the introduction

[2] While it is possible to show evidence of some reallocation in reduced-form, they cannot all be quantified.

of the minimum workweek and then simulate the policy shock. I develop an estimation strategy allowing me to separately identify labor supply and labor demand parameters, in independent steps. I combine data from the Labor Force Survey, informative about labor supply for men and women, with data from job ads, informative about firms' need of hours, and administrative data on actual hours worked in the economy.[3] Conditional on estimated values for the structural parameters, I estimate the parameter characterizing the policy shock using my reduced-form results. I estimate a simulated regression in the model, which is the direct counterpart of the difference-in-difference specification in the reduced-form strategy.

Taking into account both firm-level and general equilibrium adjustments, I estimate that the minimum workweek destroyed 1% of all jobs in the economy. The unemployment rate increased by 9% (a 0.85 percentage point increase), with women being more affected. Importantly, the model uncovers new results for the total number of hours worked: The aggregate change is very close to zero. While firm-level effects are negative for total hours, reallocation compensates these effects. This is due to the fact that workers reallocate to firms less affected and hence offering more hours. This result indicates that, after the policy, almost the same number of hours of work is concentrated among fewer workers. These workers are more likely to be men.

I estimate that firms offering more hours, to which workers reallocate, are also more productive. Consequently, aggregate gross market production increases with the reform. The policy however induces additional aggregate costs, mostly due to the cost of having more workers unemployed and red tape costs directly due to the regulation, so that total net output decreases by 1.15%. Finally, I find an increase in the welfare of employed workers, because the average quality of jobs is higher after the policy. However, workers are more likely to be unemployed and the welfare is lower in that state. For men, the two effects offset each other and welfare is unchanged. Welfare decreases for women since they are more affected by the increase in unemployment. The gender gap in welfare increases by 3% due to the minimum workweek.

A large literature seeks to identify the determinants of hours worked and part-time jobs (Altonji & Paxson (1988), Aaronson & French (2004), Hirsch (2005), Blundell et al. (2008), Prescott et al. (2009), Booth & Ours (2013), Devicienti et al. (2018), Devicienti et al. (2020), Kopytov et al. (2020), Borowczyk-Martins & Lalé (2019), Bick et al. (2020), Labanca & Pozzoli (2022)). These studies usually consider labor supply and labor demand factors separately. Exploiting the introduction of the French minimum workweek as a shock, combined with rich data on both workers and firms, I provide new evidence about firms' demand for part-time jobs and workers' preferences. I am able to study two channels simultaneously explaining the existence of low-hour jobs. First, some firms structurally demand jobs with low hours, as shown by the imperfect substitutability between hours and jobs. Second, some workers are not available to work long hours, as suggested by gender differences in preferences.

The literature on working time regulations has focused on reductions of the full-time workweek (Hunt (1999), Marimon & Zilibotti (2000), Crepon & Kramarz (2002), Rocheteau (2002), Chemin

[3] Jobs ads correspond to vacant jobs posted on the platform administered by the French unemployment service (*Pôle Emploi*).

& Wasmer (2009), Raposo & van Ours (2010)) or atypical types of contracts (Scarfe (2019) and Dolado et al. (2021) for zero hours contracts in the United Kingdom and Carrillo-Tudela et al. (2021) for mini-jobs in Germany). This paper studies a new type of regulation, minimum working hours, by exploiting a unique reform. I uncover two types of effects that have not been documented before in this literature: reallocation of workers between firms and gender heterogeneity. The former is not accounted for in reduced-form evaluations of working time regulations. The second reveals that the average effects of such policies can cover up sizable composition effects. These effects are relevant for other types of working time regulations.

This paper also makes methodological contributions. I add to the search and matching literature, and especially models with hours of work. I depart from 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), Cooper et al. (2017), Dossche et al. (2019) and Kudoh et al. (2019). In my framework, firms do not only differ with respect to their productivity. They also have different needs in terms of hours of work. I flexibly estimate the relationship between firm productivity and the distribution of firms' needs of hours. I develop a new empirical strategy in order to identify labor demand and labor supply parameters in a framework with large firms and two-sided heterogeneity, making use of rich data on workers and firms.

This paper documents sizable reallocation effects of a national working time regulation and contributes to the literature on general equilibrium effects (Auclert et al. (2019), Berger et al. (2021), Hagedorn et al. (2013), Nakamura & Steinsson (2014)). Reallocation effects of labor reforms have been documented in the literature on minimum wage (Dustmann et al. 2021) and short-time work (Giupponi & Landais 2022). I especially show that the aggregate impact of the minimum workweek cannot be deduced from reduced-form estimates at the microeconomic level and relate to Crépon et al. (2013) and Gautier et al. (2018). The model considers general equilibrium mechanisms similar to Cahuc et al. (2022), extended to the case of heterogeneous workers.

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 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 and results for the aggregate impact. Section 6 concludes.

2 The reform implementing the minimum workweek

2.1 Institutional context

There was no minimal legal working time in France until 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. The number of contractual hours determines whether a job is part-time or full-time. Since 2002, the regular full-time workweek has been equal to 35 hours.[4] A few firms and industries have exceptions to the 35h-rule and can implement a workweek between 35 and 39 hours. Consequently, jobs with contractual hours lower than 35h are considered as part-time jobs.

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. The rate depends on the size of the firm. For part-time workers, overtime hours are paid at the same rate as contractual hours but are subject to a limit of 1/10th of contractual hours.

Third, there is a maximum number for hours worked, decided at the EU level. Combining both contractual and overtime hours, a worker can never work more than 48 hours per week. Furthermore, the working time should not exceed 44 hours per week on average over a period of 12 weeks.

On top of rules regarding the working time, two additional regulations shape the design of labor contracts in France. First, there is a national minimum wage. The national minimum wage is supplemented by minimum wages in collective agreements that are industry and occupation-specific. This minimum wage is an hourly minimum wage, meaning that the number of hours worked is crucial in order to determine the monthly minimum wage. 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 and at a cost. 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. This floor on hours worked, was decided for several reasons.[5] First, the government was targeting low-income workers and aimed at increasing total earnings by increasing the number of hours worked. A second objective was to decrease the incidence of involuntary part-time employment. Before the implementation of this reform, a third of part-time workers declared having a part-time job while being willing to work more hours for the same hourly wage.[6] Third, this policy was seen as a way to increase hours worked by women and hence to reduce the gender gap in earnings.

Policy and the main exception. The reform introduced a minimum number of working hours for newly created jobs. Contracts created before July 2014 do not have to comply with the minimum workweek. Enforcement of the minimum workweek is done through labor court rulings. An employer can be sued by a worker claiming that she has been required to work less than 24h/wk. The judge might decide on a compensation equal to the wages the worker would have had, had she

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

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

[6]Source: Labor Force Survey, 2013.

been working 24h/wk, and an additional compensation due to the reclassification of the contract.[7] The minimum workweek reform was implemented with some exceptions. The main exception allows workers to ask for jobs with a workweek below 24h. In practice, the worker should explain in a letter the reasons why she prefers to work less than 24h/wk (e.g. family constraints or multiple jobs). The letter is then given to the employer as a proof that the worker is asking for an exception. There are also examples of situations in which the judge ruled in favor of the worker, even though the employer presented a letter from the worker asking for an exception. This suggests that the risk of being sued also exists in this case. This exception cannot be directly observed in the data.

Other 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 employer is a household, (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/wk. 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 Appendix A.1). In the data, I am able to identify firms and jobs covered by such agreements and will exclude them for most of the analysis. Industries with exceptions employ 8.1% of the workforce over the pre-reform period and account for 13.2% 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 accountant 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 regarding the policy between the announcement and the implementation. First, when the law was announced in June 2013, it was supposed to be implemented in January 2014. The minimum number of hours was supposed to be mandatory for new hires in January 2014 while firms benefited from a two-year transition period until January 2016 for jobs created before 2014. Hence, the law initially targeted all jobs. The reform was first implemented between January 1^{st}, 2014 and January 22^{nd}, 2014. On January 22^{nd}, 2014, the government decided to interrupt 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 were not subject to the minimum workweek. Hence jobs already created finally did not have to comply. This complicated timing has two implications for the analysis. First, there is some uncertainty about the first post-reform date. In

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

the analysis, I consider annual outcomes. As a result, 2014 will be the first post-reform year, even though the reform was only partially implemented in that year. Second, it is very unlikely that firms anticipated the implementation of the law and hired more workers with fewer than 24h/wk since the reform was supposed to be extended to all jobs at the end of the transition period. Between the announcement and the implementation, employers thought that jobs created over that period would also have to comply with the minimum workweek. As a result, there are very limited incentives to use this period to circumvent the regulation. In the empirical analysis, I am able to check for the absence of anticipation effects.

Additional reforms. Finally, 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 1/10th of contractual hours. The law removed this limit, increased the wage rate for hours below 1/10th of contractual hours by 10% and the wage rate for hours above this cutoff by 25%. By simultaneously removing the cap and increasing the cost of overtime hours for part-time jobs, the policy could have made these jobs more or less attractive to firms. However, 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). This suggests that this regulatory change for overtime hours should not have had an important effect. Moreover, 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 hours worked, as well as details about the legislative process in Appendix A.2.

3 Data and descriptive evidence

3.1 Data

In order to investigate the effects of the minimum workweek, I combine rich data at the firm and worker levels. First, I rely on administrative linked employer-employee data in order to compute job- and firm-level outcomes. Second, I use survey data and information from job ads to recover workers' preferences and firms' need of working hours.

3.1.1 Administrative data on jobs and firms

The main job-level and firm-level outcomes are measured from the French linked employer-employee data, the *déclarations de données sociales* (DADS). 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 dates of beginning and end of the employment spell. These data cover all wage earners in France since 2009. 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 industry agreement applying for each job. It is hence possible to identify the exceptions to the minimum workweek due to these agreements.

For each year and each firm, I compute the average workweek of all job spells using the total number of hours worked, the starting date and the end date of the job spell. Total hours are divided by the number of weeks worked in the firm in order to obtain the working time. This has two implications. First, the total number of hours that is observed for each job is the number of hours worked, 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. I can follow firms over time using a unique identifier.

The data provide demographic characteristics including age and gender. They also include the type of contract (open-ended or fixed term), industry and occupation codes. Table 1 presents descriptive statistics on jobs with workweek below and above 24h before the implementation of the minimum workweek. Employees working fewer than 24h/wk in 2013 are more likely to be women (58% against 39% for jobs above 24h/ wk) 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/wk are in accommodation and food while this industry represents 9% of jobs above 24h/wk). Jobs below 24h/wk are more likely to be minimum-wage jobs and fixed-term contracts, consistent with the fact that these occupations are low-skilled. The large differences in the share of jobs below 24h/wk between industries and occupations suggest structural differences in firms' needs for these jobs. Appendix Table B.1 presents similar information after implementation of the policy.

I also rely on the panel version of the DADS (Panel DADS), to investigate individual trajectories and multiple-job holding. This panel is a random sample of 1/12th of the standard DADS, composed of workers born in October of each year, which includes a worker identifier.

Finally, I combine the linked employer-employee data with balance sheet data (Ficus-Fare). These data provide information on value added, the stock of capital, total wage bill. They are built by the French Institute of Statistics from firms' fiscal declarations.

3.1.2 Additional data on workers and firms

I complement the job-level information with data on firms' and workers' preferences. These data will be used in order to present descriptive evidence on the mechanisms as well as for identification of structural parameters on workers and firms.

On the firm side, I use data on job vacancies. The French Public Employment Service (*Pôle Emploi*) administers a job search platform. This platform offers employers the possibility to include job ads with a standard application procedure. I use data provided by *Pôle Emploi* containing information about all job ads posted on this website. Since 2012, the number of hours of work required for the job has been observed for 70% of job ads because this information started to be collected by the Employment Service at that date. Half of the vacancies contain information on both the number of hours and the hourly wage.

Information on the worker side is obtained from the Labor Force Survey. Each year, the survey is administered to a representative sample of about 75,000 households. Interestingly, it provides information about workers' preferences regarding hours of work. Unemployed workers are asked about their preferred workweek while employed workers are asked about their preferred workweek with the current hourly wage. The Labor Force Survey is also useful to observe additional demographic characteristics not observed in the linked employer-employee data, in particular about the household composition. Appendix Table B.2 shows the share of workers married and with kids depending on their workweek, before the reform. While men working less than 24h/wk are less often married (38%) than the ones working more than 24h/wk (49%), it is the contrary for women: 52% of women with a workweek below 24h are married, while 47% are among the ones working more than 24h/wk. Finally, women with low-hour jobs are not more likely to have kids, but conditional on being a parent, they have on average more kids.

3.2 Aggregate descriptive evidence

I now consider aggregate evolution of working hours to document the bite of the minimum workweek. First, in Figure 1, I plot the evolution of the share of new hires for jobs with a workweek below 24h/wk, in order to consider the bite and compliance regarding the 24h rule. I separately consider all industries and the ones not affected by exceptions. From 2002 to 2013, there was an upward trend in the share of new jobs with fewer than 24h/wk. In 2013, the year before the implementation of the minimum workweek, 30% of new hires were for jobs with less than 24h/wk (industries with exceptions excluded). Starting in 2014, the share progressively declined to 15% in 2017. The remaining 15% are very likely to be due to the fact that the worker can ask for an exception to the 24h rule. The absence of a sharp decline immediately following the implementation of a minimum workweek could be due to the fact that workers and employers were not all aware of the policy at the time it was implemented. Appendix Figure B.1 shows that the evolution of the share of jobs with less than 24h/wk in the stock of jobs followed a similar evolution, even if the share in the stock is initially lower (15% when exceptions are excluded) than for new hires. In Figure 2, I decompose new hires below 24h/wk between men and women. The share is much higher for women: 40% of new hires against 25% for men. Following the reform, the share decreased for both, reaching 20% for women and 11% for men in 2017. Figures B.2 and B.3 decompose 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. To isolate the labor demand component, in Figure 3, I plot the share of vacant jobs with a workweek below 24h/wk over time. Before the implementation of the policy, this share was 22% in 2013. It decreased to 18% in 2014 and is equal to 14% in 2017. This graph suggests that firms took into account the potential cost associated with a worker going to a labor court 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. First, in Figure 4, I plot the distribution of hours worked in the stock of jobs before the implementation of the minimum workweek. The spike observed at 35h corresponds to full-time jobs. The cumulative sum for all jobs below 24h/wk corresponds to 15% of employment. Second, Figure 5 shows the before/after change in the distribution, following the implementation of the reform. The decrease in the share of jobs below 24h/wk comes from all types of workweeks below that cutoff. There is a small increase in the number of jobs with exactly 24h/wk but this increase is very small compared to the bunching that could be expected with this type of policy. In contrast, there was an important increase in the number of full-time jobs. Figure B.4 presents the before- and after-distributions on the same graph. Figure 6 shows similar patterns for men and women, with greater magnitudes of variations for the latter. These figures provide suggestive evidence that some substitution took place with full-time jobs instead of part-time jobs with more than 24h/wk. The next sections provide results that have a causal interpretation for each type of jobs.

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 hours and jobs. I then decompose the effects between male and female workers. Second, I investigate additional margins of adjustments and provide a flow-analysis.

4.1 Reduced-form strategy

The previous section shows that jobs with workweeks below 24h/wk were over-represented in some industries and some occupations. This suggests a structural need for low-hour jobs in some types of economic activity. The idea of the main reduced-form strategy is to leverage between-firm differences in the need for jobs with less than 24h/wk. For example, restaurants are heavy users of these part-time jobs and this is likely due to the timing of the demand addressed to these firms by consumers (see Table 1). 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/wk. I denote $Share24_i$ this variable, which is equal to the pre-reform share of workers working less than 24h/wk on average in the firm. I compute this exposure variable on average over 2009-2013, in order to have a measure that is not volatile and sensitive to temporary shocks. Computing an average over five years will also make the strategy less likely to be affected by mean reversion. 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

$$y_{it} = \sum_{\substack{k=-4 \\ k \neq 0}}^{k=4} \beta_k \times Share24_i \times \mathbb{1}_{t=2013+k} + \mu_i + \eta_t + \epsilon_{it}, \quad (1)$$

where y_{it} is the outcome variable in firm i in year t, for instance the logarithm of the number of jobs.[8] μ_i are firm fixed effects and control for firms' characteristics that are constant over time. η_t are year fixed effects controlling for time-varying shocks common to all firms. ϵ_{it} is the error term. Standard errors are clustered at the firm level. 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 will 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 minimum wage and Saez et al. (2019) about payroll tax cut). The identification assumption is that firms with different exposures to the reform would have had similar evolution, had the reform not been implemented. Estimates of the parameters over the pre-reform period allow me to test this parallel trend assumption before implementation of the policy. Section 4.4 presents additional evidence that this assumption is satisfied and that the results are robust are not driven by mean reversion.

I estimate this regression over a balanced panel of firms. The sample is composed of firms active at least between 2009 and 2013, and with 5 workers or more before implementation of the minimum workweek. I show in Section 4.4 that the result are robust to alternative samples. Firms covered by collective industry agreements with exceptions to the minimum workweek are excluded from the sample because we do not know exactly what is the treatment for these firms. The balanced panel is composed of 186,556 firms in retail, manufacturing, services (accommodation and food and other services) and construction. Table 2 presents summary statistics on the estimation sample. Average firm size in the sample is 46.93 workers and average exposure to the reform is 12% (respectively 8% for the median). Figure 7 shows the distribution of $Share24$, the pre-reform exposure to the minimum workweek.

Table 2 shows that there is a lot of heterogeneity in average exposure to the policy between industries: $Share24$ is on average equal to 22% in accommodation and food services and 15% in other services while it is equal to 7% in manufacturing. This suggests that a substantial share of variation used to identify the effects of the policy is between-industry. 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 firm characteristics, by industry, in order to understand the drivers of within-industry variations. Table 3 presents the R^2 of OLS regressions from which one set of regressors at a time is removed. The distribution of occupations in the firm, within industry,

[8] For outcome variables that can be equal to 0, 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.

is one of the main drivers of exposure to the policy. Variables such as firm size and location have little explanatory power.

4.2 Results for all workers

4.2.1 Extensive margin, intensive margin and total hours worked

A natural first step is to consider the effect of the floor on hours worked on jobs targeted by the reform. In Figure 8, I plot estimates of the β_k parameters in Equation 1 when the outcome variable is the log number of jobs below 24h/wk. First, over the pre-reform period (2009-2013), estimated parameters are very close to 0, even if significant.[9] From 2014, the first post-reform year, there is a decrease in the number of jobs below 24h/wk. This decrease becomes even larger over time, consistent with the facts that the policy applied to new hires only and the first year is only partially treated. In Section 4.2.2, 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/wk before the reform implies a decrease in the number of jobs below 24h/wk in the firm by 1.2% in 2016.

Due to the decrease in low-hour jobs, the total number of jobs decreases, as depicted by Figure 9. This figure shows estimates when the outcome variable is the number of workers in the firm. I find a negative impact of the minimum workweek on the extensive margin: when exposure to the policy is higher by 1 percentage point, the number of jobs in the firm is lower by 0.3% in 2016.[10] Appendix Table C.1 shows the corresponding changes in level, deduced from the joint distribution of outcomes in 2013 and $Share24$. The negative effects on the extensive margin correspond to an average decrease in jobs below 24h/wk by 3.6 jobs by firm and a decrease in all jobs by 2.2. Since the magnitude of the decrease in the total number of jobs is lower than the one for the decrease in jobs directly affected, this suggests the reallocation of some jobs with less than 24h/wk to jobs above that cutoff. As a result, I also investigate the effects on the intensive margin to identify potential substitution.

The estimates for average hours per worker in the firm are presented in Figure 10. There is a positive effect on the intensive margin: an exposure to the policy higher by 1 percentage point is associated with an increase in average hours per worker in the firm by 0.2% in 2016. Then, Figures 11 and 12 decompose this positive effect between all jobs with more than 24h/wk and full-time jobs only.[11] I find that all of the increase in the number of jobs above 24/wk is due to an increase in the number of full-time jobs. There is no evidence of an increase in the number of jobs with workweeks between 24 and 34 hours. This increase in full-time employment was suggested by the aggregate change in the distribution of hours worked after the reform (Figure 5). In terms of magnitudes, a 1

[9] 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 4.4 alternative confidence intervals accounting for potential differential pre-trends using the procedure by Rambachan & Roch (2022) and find similar results, less precisely estimated.

[10] In other words, the number of jobs declined by 3% more in firms where 100% of pre-reform jobs where below 24h/wk relative to firms with no such job.

[11] Here full-time jobs are all jobs with at least 35h/wk, to also include also full-time jobs with overtime hours.

percentage point higher exposure is associated with an increase in the number of full-time jobs in the firm by 0.4% in 2016. In terms of levels, it corresponds to an average increase of 1.1 full-time job by firm, as presented in Appendix Table C.1.

So far, I have found evidence of a negative effect of the minimum workweek on the extensive margin (number of jobs in the firm) but a positive impact on the intensive margin (hours per job). I now consider the effect on the total number of hours worked in the firm to estimate the overall effect on employment, that depends on these two margins. Figure 13 shows estimates of β_k for the total number of hours worked in the firm in the year. I find that a 1 percentage point higher share of jobs below 24h decreased total hours worked by 0.2% in 2016. This suggests that the negative effect on the extensive margin dominates the positive effect on the intensive margin. Firms are shrinking because of the policy. This implies that hours of work and workers cannot be flexibly substituted within firms.

Finally, I find that the decrease in firm-level employment translates into a decrease in output. Appendix Figure C.1 shows estimates for total sales in the firm. I find a negative and significant effect of the policy on total sales. 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 in order to compensate for the decrease in the number of workers in the firm.

4.2.2 Other adjustment margins

In the previous section, I presented the results for the stock of jobs, as it is the policy-relevant variable of interest. Employment in the firm depends on labor flows. In this section, I analyze firms' adjustments of hires and separations to the reform and the mechanisms at play.

Before analyzing the effects of the minimum workweek on workers' flows, I consider firms' adjustments of other inputs than the number of workers. Results are presented in Appendix C.2. The minimum workweek had a negative effect on the stock of capital in the firm, as depicted by Figure C.2. Firms more affected by the reform experienced a lower growth of capital compared to less exposed firms. I find no effect on the capital-to-labor ratio, as shown in Figure C.3, because the negative effect on the stock of capital is close in magnitude to the effect on employment. Then, in order to know whether affected firms adjust by outsourcing some tasks instead of hiring workers, I consider the total amount of purchased services over the year. This variable includes, but is not limited to, expenses due to outsourced activities. Figure C.4 shows the result. I find a decrease in purchased services, indicating that employment in the firm is not substituted with tasks done outside the firm.

Second, I consider the effects of the minimum workweek on labor flows in order to disentangle through which margins employment has been affected. Table 4 shows the difference-in-differences results for 2016. I first present the results for all workers, and the decomposition by gender will be discussed in the next section. The first five columns are the results for new hires, decomposed by workweek duration. I find a negative effect on hires for jobs with fewer than 24h/wk, on total hires and total hours worked by new hires. The effect is positive for hires of full-time workers. These results are consistent with the effects on the stock of jobs and are quantitatively large and significant. The hiring margin drives the employment results. This is consistent with the fact that the minimum workweek specifically targeted new hires. Moreover, as shown by the last column of Table 4, the effect on the separation rate is very small in magnitude and non-significant.

On top of the effects on new jobs, which are directly targeted by the policy, I investigate the effects for existing jobs. Jobs created before July 2014 do not have to comply with the minimum workweek. As a result, firms may have had incentives to keep workers already employed less than 24/wk when the reform was implemented. 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 less than 24h/wk before the policy with the ones working more. I estimate the following

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

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 less than 24h/wk in the firm in 2009. I take 2009 as the baseline year since it is the first year of my balanced sample. I estimate the regression on the panel of jobs that exist in the first year of my main sample, 2009. μ_j and η_t are job and year fixed effects, respectively. I estimate this regression over the balanced panel of jobs with workweeks between 19 and 29 hours in 2009. These jobs are in firms from the main balanced panel of firms. Figure 14 presents estimates of the α_k parameters for each year between 2010 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 2009. Even if the magnitude of the effect is small, this is significant evidence of a small hoarding effect of jobs with less than 24h/wk created before the policy. This might explain the negative effect found on the separation rate, even if this is not significant.

I consider the effect of the minimum workweek on the multiple-job holding rate to check that the negative employment effects are not driven by workers having one job with more hours instead of several with low hours. First, the share of workers with more than one job at the same time is very low, even before the policy: this share is 3.5% of part-time workers, suggesting that this margin is not very important quantitatively. After implementation of the minimum workweek, the multiple job holding rate for part-time workers decreased to 3.3%. Using a market-level analysis, in Appendix C.3, I show that this decrease in the multiple job holding rate seems to be due to the policy. However, considering both the initial low share and the very small impact, this seems to be a direct consequence of the fact that there are fewer part-time jobs in the economy and cannot drive the employment results.

Finally, I study the heterogeneity of the impact between firms to provide a better understanding of the adjustments explaining the employment effects of the minimum workweek. Figure 15 presents estimates of β_{2016} from Equation (1) when outcome variables are the number of jobs and total hours worked, for different subsamples of firms. First, the effect on the number of jobs is negative and significant for all subsamples, indicating a negative extensive margin effect for all types of firms. There is more heterogeneity when the outcome is the total number of hours, suggesting that it is easier for some firms to substitute between hours and workers than for others. The negative impact on total hours worked is actually driven by small firms (below 20 workers) while there is no significant decrease for larger firms. A potential explanation is that larger firms are more likely to have the resources needed to reorganize production and do not need to shrink despite a decrease in the number of jobs. The negative effect on total hours is larger for firms relying more on open-ended contracts. Firms using fixed-term contracts can more easily change the duration of contracts and adapt to the minimum workweek.

The fact that the floor on hours worked induced firms to hire full-time workers instead of part-time workers working at least 24h/wk could be surprising. This suggests that the workers who are now hired on full-time jobs might not be the same as the ones who would have been hired with a small number of hours without the policy. Before the reform, women were over-represented among hires for jobs with a small number of hours. The next section decomposes the firm-level employment effects of the policy between men and women.

4.3 The minimum workweek and gender inequality

As in many countries, women more often work part time than men in France. In 2013, women represented 58% of workers with a workweek below 24h against 39% for jobs with more than 24h/wk. Hence the minimum workweek is likely to have affected men and women differently. I now consider firm-level outcomes separately for men and women. I estimate Equation (1) where the outcome is now 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. For each outcome of interest, I estimate two separate regressions, by gender.

Figure 16 plots estimates of β_k when the outcomes considered are annual hours worked in the firm by women (respectively men). An increase of 1 percentage point in exposure to the policy is associated with a decrease in total hours worked in 2016 of 0.1% for men and 0.5% for women. For all years from 2014 and 2017, estimates are much larger in magnitude for women as compared to men. Several margins might explain this stronger effect for women. First, women might be more affected by the negative impact on the extensive margin. Second, the effect on the intensive margin could also be different between men and women.

Estimates for the extensive margin, the number of jobs, are plotted on Figure 17. Here again, the negative effects are much stronger for women as compared to men. In 2016 for instance, the semi-elasticity is -0.2 for men and -0.4 for women. The stronger decrease in the number of female jobs is first due to the fact that women were over represented among jobs below 24h/wk, many of which were destroyed. This is also due to the fact that the increase in the number of full-time jobs is stronger for men, as depicted by Figure 18. A 1 percentage point higher exposure increases the number of full-time jobs in 2016 by 0.4% for men and 0.2% for women.

That is, women have been more affected by the effects of the minimum workweek on the extensive margin: the number of female jobs has decreased more than the number of male jobs. Women also did not benefit as much as men from the positive impact of the policy on the intensive margin: the increase in the number of full-time jobs is much stronger for men. Appendix Table C.2 confirms that these findings also hold when outcomes are in levels. In the end, the total number of hours worked by men only decreased slightly while most of the aggregate decrease is driven by female employment. 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. Panels B and C of Table 4 show that these different effects between men and women are due to the hiring margin. There is a stronger decrease in hires for women than for men. Full-time hires also increased more for men, leading to a stronger decrease in total hours worked by female hires as compare to male hires. These results indicate that some part-time female employment was replaced by male full-time employment, at least at the aggregate level. A next step is to understand whether the different effects of the reform between men and women are driven by composition effects. The observed different effects between men and women could be due to the fact that female and male workers hold different occupations or work in different industries. This will also be informative about whether the aggregate substitution between men and women are for the same jobs.

To provide evidence on this, I first estimate Equation (1) with outcome variables that are occupation and gender specific:

$$y_{iogt} = \sum_{\substack{k=-4 \\ k\neq 0}}^{k=4} \beta_k \times Share24_i \times \mathbb{1}_{t=2013+k} + \mu_i + \eta_t + \epsilon_{it}. \tag{3}$$

The right hand side of Equation (3) is the same as in the main firm-level specification, described in Section 4.1. y_{iogt} is the outcome variable of firm i for occupation o and gender g in year t. This is for example the log number of male low-skilled white collars in firm i in year 2016.

Figure 19 shows estimates of β_{2016} when outcomes are the number of jobs (Panel (a)) and total hours (Panel (b)), by occupation. When the outcome is the number of jobs (Panel (a)), 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 different from women's estimates. This result indicates that the effect is also heterogeneous by gender for similar occupations. The different aggregate estimates between men and women are not driven by the fact that they work in different occupations. The substitutions of full-time men for part-time women are also observed at the occupation level, for several occupations, both high skilled and low-skilled. Panel (b) confirms these results using the number of hours worked instead of the number of jobs. These finding also hold within subsamples of firms based on their characteristics.[12] Different effects of the floor on hours worked between men and women are not driven by composition effects: men and women are affected differently for given occupations and industries.

A potential explanation for the higher decrease in employment for women could be that the policy led to a mismatch between firms' labor demand and workers' labor supply. Following the policy, firms reduced their demand for low-hour jobs, as shown by the decrease in the number of vacant jobs with less than 24h/wk (Figure 3). Creating jobs with less than 24h/wk after 2014 might entail large costs for firms, due to the risk of being sued. Posted vacancies advertise larger numbers of hours of work. If men and women have different labor supply behavior, they might have different preferences over the vacant jobs posted before and after the policy. Using the Labor Force Survey, I show that declared preferences strongly differ between men and women. Figure 20 plots the distributions of preferred workweeks separately for men and women, before the reform.[13] The share of men with a preferred workweek below 24h is very close to zero. On the other hand, there is a substantial share of women declaring they would prefer to work less than 24h/wk. These differences in preferences might explain, at least in part, the differential impact of the reform between men and women. After implementation of the minimum workweek, women, who might not be available to work more than 24h/wk, are less likely to find jobs with low hours. Hence, the combination of the change in labor demand induced by the policy and initial differences in labor supply between men and women seem a plausible explanation for the differential impact of the minimum workweek by gender. It is, however, not necessarily the only explanation. In particular, I cannot exclude potential discrimination by some employers.

4.4 Robustness analysis

In this section, I discuss the validity of the parallel trend identification assumption and examine the robustness of the firm-level results to the definition of exposure to the policy, to mean reversion and to changes in the sample. Results are presented in C.5. The Stable Unit Treatment Value Assumption (SUTVA) is discussed in the next section relative to the aggregation of the effects.

Parallel trend assumption. Identification of the impact of the minimum workweek relies on the assumption that, had the policy not been implemented, outcomes of firms with different

[12] Appendix Figure C.6 studies the heterogeneity of the effects between men and women based on firm characteristics. In particular, I consider firm size, industry and the distribution of occupations. For both the number of jobs and the total number of hours worked, estimates differ strongly between men and women, in all types of firms. The negative employment effects are repeatedly larger for female workers. This is further evidence that the different effects of the minimum workweek between men and women is not driven by the fact that they work in different types of firms. Even within a subsample of firms, for instance an industry, the negative impact is stronger for women. Finally, Appendix Figure C.7 shows that the higher the pre-reform share of men in an industry, the stronger the negative effect of the policy on the share of women in firms of the industry. This is consistent since firms are more likely to replace women working part-time by men working full-time if there are more men with the skills required.

[13] It is not possible to compare these distributions before and after since the scope of the corresponding variable as well as the question asked changed considerably the year the policy was implemented.

shares of affected jobs would have had the same evolution. Even if it is impossible to test this assumption over the treatment period, I can test for it over the pre-reform period. 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. Figure C.8 plots the non-parametric relationship between $Share24$, the exposure variable, and outcome variables at different dates. It shows outcomes as a function of exposure for all years from 2009 and 2013 and the average over 2015-2017. For both outcomes, 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 compare to the pre-reform period. Second, I apply the procedure proposed by Rambachan & Roch (2022) to check the robustness of the results to potential differential pre-trends before the policy. Even if estimates for the placebo dates are very small, they are not equal to zero. It allows me to compute alternative standard errors that include two things: (i) the fact that firms with different exposure to the policy might experience differential trends and (ii) the fact that these trends are unknown and estimated. I compute alternative confidence intervals for the 2015 estimates. The new 95% confidence intervals are shown in Figure C.9. For both the number of jobs and total hours worked in the firm, the negative estimated effects of the minimum workweek are still significant.

Mean reversion. Mean reversion is unlikely to drive the results. First, the share of affected jobs is computed on average over a period of five years (2009-2013) so that identification of the effects relies on a source of variation not too volatile and sensitive to temporary shocks. Moreover, I exclude small firms from the sample (smaller than 5). 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. Figure C.10 shows the estimated parameters for the number of jobs and total hours worked. Each estimate is computed in a different regression. For example, the estimate in 2010 comes from a difference-in difference regression estimated on 2009 and 2010, with $Share24$ computed in 2009. 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. As a result, the potential bias due to mean reversion would be very small relative to the estimated impact of the policy. This method is more likely to be affected by mean reversion than my main strategy since exposure to the reform is computed over one year (contrary to five in the baseline specification). Even in this more restrictive case, I find that mean reversion cannot drive the results found.

Definition of exposure to the reform. I show that $Share24$ is a good proxy to firms' exposure to the policy and find similar results with an alternative measure of exposure. First, to check the relevance of the $Share24$ variable, I consider the correlation of the share of jobs below

24h/wk in the firm in 2010 and hires for these jobs in 2011-2012. Figure C.11 shows this correlation. The share of jobs with less than 24h/wk in year t is a very good predictor of hires of these jobs in $t+1$, and hence of good measure of the firm's future need for these jobs. This suggests that the $Share24$ variable is a relevant measure of exposure to the policy. Second, 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/wk. The GAP is computed on average over 2009-2013. Table 2 shows the average GAP in each industry in 2013. Figure C.12 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: the effect on the extensive margin is negative and total hours worked in the firm decrease.

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. By definition, I cannot compute exposure to the policy for firms that did not exist before implementation of the policy. Using an analysis at the industry level, I find that the policy did not affect firm entry nor exit. I compute exposure to the policy at the industry level in 2009-2013 and estimate Equation (1) at industry instead of firm level, where the outcome is the entry or exit rate of the industry for each year. Figure C.13 shows that, for both outcomes, there is no effect. Since the policy did not affect firm survival nor entry, this is unlikely to affect the main firm-level results. Hence, the adjustment margin is employment within firms. Second, I show that the results are robust to the inclusion of firms not observed every year in the pre-reform period. Since exposure to the policy is computed over several years before the reform, the balanced panel is composed of firms that exist at least for some years. The very young firms are excluded from the sample. 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. The only drawback is that I cannot compute as many placebos as before during the pre-reform period. Figure C.14 shows estimates for all samples, for the number of jobs and total hours. Estimates for β_k are very close to the ones previously estimated. If anything, including younger firms in the sample seems to increase slightly the magnitude of estimates.

5 Aggregate effects

In this section, I investigate the aggregate effects of the minimum workweek. First, I analyze indirect between-firm effects due to the reallocation of workers between firms. 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, welfare and aggregate output.

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 are all unemployed or if they reallocate to firms less exposed to the policy. Since some firms are shrinking in response to the minimum workweek, more unemployed workers are searching for a job. For firms, it makes it easier to fill vacancies and potentially more profitable to open vacant jobs. Hence, there could be indirect general equilibrium effects positively affecting employment. In this case, the Stable Unit Treatment Value Assumption (SUTVA) would not hold: control firms would be indirectly affected by the policy. This would have two important implications. First, it would lead to a potential bias for the main reduced-form results. Second, it would also imply that 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 there seems to be such indirect between-firm 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

$$y_{izt} = \sum_{\substack{k=-4 \\ k\neq 0}}^{k=4} (\lambda_k \times Share24_i + \gamma_k \times Share24_{z(-i)}) \times \mathbb{1}_{t=2013+k} + \mu_i + \eta_t + \delta_z + \epsilon_{izt}. \quad (4)$$

where y_{izt} is the number of jobs in firm i, operating in market z in year t. A market z is a commuting zone $\times$ industry (aggregated at 2-digits). As previously, $Share24_i$ is the average share of affected jobs in firm i, computed over 2009-2013. $Share24_{z(-i)}$ is the leave-one-out average share of affected jobs in market z, computed over the same period. μ_i, η_t and δ_z 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.

Figure 21 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, the direct effect of the policy is still negative and significant. Estimates of λ_k are negative for both male and female workers after 2014. The negative direct impact on female employment is stronger than the one on male employment. This is consistent with previous findings at the firm level. Second, I find different effects of market exposure for men and women. I estimate a positive and significant effect for men, which suggests between-firm reallocation. For women, I find no indirect effect: estimates are both small and non-significant. This indicates that women, who are more affected by the direct negative impact of the policy, do not benefit as much as men from positive indirect effects. These gender differences are consistent with the differences in labor supply described in Section 4.3. If the women affected by the negative employment effects of the policy are not available to work more than 24h/wk, they are unlikely to reallocate to jobs with more hours in other firms.

Hence, there is reduced-form evidence of indirect reallocation effects within markets. Importantly, SUTVA does not hold. As a result, we cannot deduce the aggregate impact of the minimum workweek from firm-level results. Considering the positive indirect effects, employment might even increase because of the policy in firms with very low exposure to the 24h-reform.

A structural model can take into account both the firm-level effects and the general equilibrium adjustments. Moreover, it can provide evidence on additional outcomes such as the unemployment rate, aggregate output and welfare.

5.2 Structural model pre-reform

In order 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 will be 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 large 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. Similarly, 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. It accounts for both firm destruction and job destruction conditional on firm survival. 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 firm-specific and constant over time. Second, conditional on the productivity, a firm requires tasks with heterogeneous duration. A task is characterized by a maximum number of productive hours, z. Hence, z represents the number of hours necessary to perform a given job. After z hours of work, marginal production drops to 0. The distribution of tasks duration is firm-specific. For each job, z is drawn when the a matched 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. This distribution determines the firm's exposure to the minimum workweek in the model. In standard models, firms usually differ only with respect to their productivity. In that case, the ex-ante number of hours in a firm is determined directly by productivity and more productive firms offer contracts with more hours. However, the data suggest that it is not only the average level of hours that correlates with productivity, it is also the dispersion in hours, as shown by Appendix Figures D.1 and D.2. In the data, firms with low productivity do not have all workers working low-hour: they have both workers with high and low hours. The dispersion in hours worked in the firm is strongly negatively correlated with firm productivity. Hence, the distribution of z in the model allows a correlation between productivity and first and second order moments for needs in hours. Denoting h the number of hours worked in a job, the production of the job is

$$\begin{cases} yh^{\alpha} & \text{if } h < z \\ yz^{\alpha} & \text{otherwise.} \end{cases} \quad (5)$$

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 in order to draw a firm productivity, y. y is drawn in the cumulative distribution function $F(.)$.

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

Population. Workers are ex-ante heterogeneous. More precisely, there are two types of workers in the economy. Each type is in large number. The two types differ with respect to the way they value leisure. The type of a worker is denoted by i, with $i = M, F$, for male and female workers. 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 in Figure 20. I assume that the disutility associated with h hours of work is equal to $\Phi(h, \epsilon)$ where ϵ is a parameter characterizing labor disutility. For each worker, the value of ϵ is drawn when there is a match with a vacant job. Type-M and type-F workers draw ϵ in two different distributions, which is why the two types are ex-ante heterogeneous. A type-i worker draws ϵ in the cumulative distribution function $G^i(.)$. I do not make any assumption on how $G^M(.)$ compares to $H^F(.)$ and will estimate these distributions.

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 type of worker and z, the maximum number of productive hours. The labor disutility parameter ϵ is also realized. 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 workers unemployed. Contracts are unchanged for workers hired during previous periods.[14] (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. (6) A share δ of firms exit the market. (7) New firms enter the market. (8) 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, conditional on contracts. Then, I describe how contracts are determined.

5.2.2 Value of filled jobs

A worker enjoys instantaneous utility $c - \Phi(h, \epsilon)$ where c is equal to consumption and h to hours of work. The consumption is equal to total income, which is denoted by b for an unemployed worker and which corresponds to earnings for an employed worker. 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 $\Phi_h(h, \epsilon) \geq 0$).

A contract is a number of hours of work and an hourly wage, (h, w). As shown in the next section, contracts are bargained conditional on y, the productivity of the firm, ϵ, the disutility parameter and z, the maximum number of productive hours. As a result, the value of a job for a type-i worker is:

$$W^i(y, \epsilon, z) = wh - \Phi(h, \epsilon) + \beta(1 - \sigma)W^i(y, \epsilon, z) + \beta\sigma W^i_u, \tag{6}$$

where W^i_u is the value of unemployment for a worker of type i. Conditional on the job surviving, the continuation value is the same car there is no other shock that the job destruction.

For a type-y firm, the value of a job with hours h, maximum productive hours z and worker of type i with disutility parameter ϵ is denoted by $J^i(y, \epsilon, z)$ and is equal to

$$J^i(y, \epsilon, z) = y \min(h^\alpha, z^\alpha) - wh + \beta(1 - \sigma)J^i(y, \epsilon, z). \tag{7}$$

If the job is destroyed or if the firm exits, the value of this job for the firm is equal to 0. Since everything is deterministic, conditional on the job not being destroyed, the value of the job next period is the same as the value in current period. Hence, renegotiation of contracts does not matter.

The value of a vacant job for the firm is denoted $V(y)$. The firm will determine the number of vacancies exhausting all profitable opportunities. As a result, in equilibrium, $V(y) = 0$ for all y. We can define the surplus of a job when all characteristics are observed as follows:

$$S^i(y, \epsilon, z) = W^i(y, \epsilon, z) + J^i(y, \epsilon, z) - W^i_u. \tag{8}$$

[14] There is not shock for surviving jobs, which implies no renegotiation.

The surplus of a job is computed in Appendix D.1.2. 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. The sign of the surplus depends on the productivity of the firm, y, the maximum number of productive hours, z, the worker type, i and the disutility parameter, ϵ. z and ϵ are drawn independently. Hence, we can define a threshold value z conditional on the values of ϵ and y, below which the job is not created. Conversely, we could also define a threshold for ϵ conditional on z and y, leading to the same results. A job is not created if the maximum number of productive hours drawn is below

$$\underline{z}^i(y,\epsilon) = \left\{ z | S^i(y,\epsilon,z) = 0 \right\}. \tag{9}$$

Hence, the job creation threshold is different for types M and F because of different values of outside options, W_u^i, for $i = M, F$

5.2.3 Determination of contracts

When a match is formed, the worker and the employer bargain jointly over the hourly wage and the number of hours. This is an individual bargaining process. 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

$$\max_{h,\ w} (W^i(y,\epsilon,z) - W_u^i)^\gamma (J^i(y,\epsilon,z))^{1-\gamma}. \tag{10}$$

This problem yields two first order conditions. As shown in Appendix D.1.3, as in standard Nash bargaining, 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 and the firm a share $1-\gamma$:

$$\gamma S^i(y,\epsilon,z) = W^i(y,\epsilon,z) - W_u^i. \tag{11}$$

The bargained number of hours is presented in equation 32 in Appendix D.1.3. It is optimal since the condition for hours yields equality between marginal disutility of work and marginal product. It is never optimal to work more than z hours since it would generate additional labor disutility without additional production. It can be lower than z if hours equalizing marginal production with marginal disutility are below z. 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 low hours (z is small). This first type would correspond to jobs for which there is no work left to do once the task has been accomplished. In this first case, the job has low hours for labor demand motives. Second, other jobs can have low hours because the number of hours equalizing marginal disutility of labor with marginal production is low. In this case, z is not binding: if hours were to increase, the marginal production would not be equal to 0. These jobs can have low hours for two reasons: the workers wants a part time job (ϵ is high) or the firm is not very productive (y low). For this second type of jobs, both labor supply and demand can drive the small number of hours.

Mismatch in hours. Even if the number of hours is optimal, there are potential mismatches in hours in the model. The fact that the number of hours is surplus maximizing does not mean that it corresponds to the firm's or the worker's optimal number. Taking as given the hour wage resulting from the bargaining, the number of hours that is optimal for the firm corresponds to the number maximizing the instantaneous profit, as shown in Appendix D.1.4. This number does not necessarily coincide with the bargained one. Similarly for the worker, when the hourly wage is considered as given, the number of hours optimal for the worker is the one maximizing instantaneous utility, as shown in Appendix D.1.4. It is such that marginal disutility of work is equal to marginal income (the hourly wage). When this number is above the bargained number of hours, it corresponds to a situation of involuntary part-time employment. 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.[15] Hence, even in this framework with optimal hours, there are some workers willing to work more hours, which was one of the motivations for the implementation of the minimum workweek.

5.2.4 Job creation

In this section, I compute the labor supply and labor demand equations. These equations will be crucial to determine the labor market equilibrium. The labor supply equations, for the two types of workers, determine the expected values of unemployment, W_u^i, for $i = M, F$. The labor demand equation gives the number of vacant jobs posted by each type of firm. First, we can define the expected surplus of a job in a type-y firm and for a type-i worker

$$S^i(y) = \int_\epsilon \left[\int_{\underline{z}^i(y,\epsilon)} S^i(y,h,z) \mathrm{d}H_y(z) \right] \mathrm{d}G^i(\epsilon) \tag{12}$$

$S^i(y)$ is the surplus when the type of the worker and the type of the firm are known, before observing the value of the disutility parameter, ϵ, and the maximum number of productive hours, z. Since jobs are created only when they yield a positive surplus, the surplus of a job is computed conditional on the $\underline{z}^i(y,\epsilon)$ threshold.

Unemployed workers and vacant jobs are matched through a matching technology described by the matching function $m(.)$. For an unemployed worker, the probability to meet a firm is equal to $\theta m(\theta)$. For firms, vacancies are matched at rate $m(\theta)$. I denote N_f the number of firms operating in the economy. N_f is an endogenous variable determined below. The labor supply equation is given by the value of unemployment, computed in Appendix D.1.5. There are two labor supply equations, for the two types of workers. Using the solution of the bargaining from Equation (11), we have

$$W_u^i(1-\beta) = b + \beta\theta m(\theta) N_f \int_y \gamma S^i(y) \frac{v(y)}{v} \mathrm{d}F(y). \tag{13}$$

[15] In the Labor Force Survey for instance, the question is: "For proportional increase in income, are you willing to work more hours?"

The ratio $\frac{v(y)}{v}$ is the share of vacancies posted by a type-y firm in the economy. If a worker is matched with a type-y firm, which happens at rate $\theta m(\theta) N_f \frac{v(y)}{v} \mathrm{d}F(y)$, he 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 number of unemployed worked of type i. $\frac{u^i}{u^M+u^F}$ is the share of type-i workers in the unemployment pool. The value of a marginal vacant job for a firm with productivity y, $V(y)$, is computed in Appendix D.1.5. In equilibrium, $V(y) = 0$. Using the surplus sharing rule from Equation (11), we obtain the labor demand equation

$$C'(v(y)) = \beta m(\theta) \sum_{i=M,F} \frac{u^i}{u^M + u^F} (1-\gamma) S^i(y). \tag{14}$$

In equilibrium, the marginal cost of posting an additional vacancy is equal to its marginal profit. The latter equals the share of the surplus going to the firm if the job is filled next period. This equation pins down the firm size since the cost to open vacant jobs is convex in the number of vacancies. We can then deduce the number of vacant jobs posted by each type of firm, conditional on the market tightness, on W_u^i for $i = M, F$ and on the distribution of types among unemployed workers.

5.2.5 Firm entry

There is a large pool of potential entrepreneurs that may decide, at each period, to pay a cost k in order to draw a productivity y to create a firm. I denote by $\Pi(y)$ the expected value of a type-y firm. $\Pi(y)$ is computed in Appendix D.1.6. Entrepreneurs exhaust all profitable opportunities. Hence, the expected value of the firm is equal to the entry cost. The entry condition will determine the number of firms operating in the economy, N_f as follows:

$$\int \Pi(y) \, \mathrm{d}F(y) = k. \tag{15}$$

I show in Appendix D.1.6 that $\Pi(y)$ depends directly on the expected surplus to create new jobs for a type-y firm, $\sum_{i=M,F} \frac{u^i}{u^M+u^F} S^i(y)$.

5.2.6 Equilibrium

I first define the partial equilibrium of the pre-reform model and then turn to the general equilibrium. In partial equilibrium, firms decide on vacancy posting taking as given the distribution of types among unemployed workers and the expected value of unemployment. The number of firms is also fixed. In general equilibrium, these variables adjust.

Partial equilibrium. In partial equilibrium, the expected utility of unemployment for type-M workers, the distribution of types among unemployed workers, characterized by $\frac{u^M}{u^M+u^F}$ and the number of firms, N_f are considered as fixed and given. Conditional on these variables, three endogenous variables solve the partial equilibrium of the model: the value of unemployment for type-F, W_u^F, the market tightness, θ, and the distribution of the number of vacant jobs, $\{v(y)\}_y$. The partial equilibrium is solved with the two labor supply equations and the labor demand equation.

Definition 1 *The partial equilibrium of the model consists of a vector* $(W_u^F, \theta, \{v(y)\}_y)$*, which solves, for given values of* W_u^M*,* $\frac{u^M}{u^M+u^F}$ *and* N_f*:*
(i) Labor supply for type-M *workers, in Equation (13) for* $i = M$
(ii) Labor supply for type-F *workers, in Equation (13) for* $i = F$
(iii) Labor demand, in Equation (14)

Unemployment, employment, and the total number of hours worked can be deduced from the equilibrium and are provided in Appendix D.1.7.

General equilibrium. In general equilibrium, the value of unemployment for the type-M, W_u^M, as well as the distribution of types among unemployed workers, $\frac{u^M}{u^M+u^F}$, adjust and the number of firms, N_f, is endogenous. First, labor supply and labor demand equations provide a relationship between the market tightness and the distribution of types among unemployment. Second, the Beveridge curve, defined by the unemployment Equation (39) in Appendix D.1.7, gives another relationship between tightness and the distribution of types. This equation results from the equality of job creation and job destruction in equilibrium. Third, the number of firms in the economy is determined by the entry condition.

Definition 2 *The general equilibrium of the model consists of a vector* $(\theta, \{v(y)\}_y, \frac{u^M}{u^M+u^F}, W_u^M, W_u^F, N_f)$ *which solves:*
(i) Labor supply for type-M *workers, in Equation 13 for* $i = M$
(ii) Labor supply for type-F *workers, in Equation 13 for* $i = F$
(iii) Labor demand, in Equation (14)
(iv) Free entry from Equation (15)
(v) $\frac{u^M}{u^M+u^F}\frac{v}{\theta} = u^M$ *where the left hand side is determined from labor supply and demand and the right hand side is given by the Beveridge curve (Equation (39) in Appendix D.1.7) for* $i = M$
(vi) $[1 - \frac{u^M}{u^M+u^F}]\frac{v}{\theta} = u^F$ *where the left hand side is determined from labor supply and demand and the right hand side is given by the Beveridge curve (Equation (39) in Appendix D.1.7) for* $i = F$

Conditional on the general equilibrium of the model, employment, total hours worked, unemployment and the distribution of hours can be computed.

5.3 Reform in the model

The strategy relies on the comparison of the equilibrium of the model with no minimum workweek and the equilibrium with the floor of 24h/wk on hours worked.

In the model, the policy is introduced as a cost to create jobs with workweeks below 24h. This cost is supported by firms and is a red tape cost.[16] The choice to introduce to reform as a cost relates to the fact that the way the 24h-rule is enforced is through the risk of being sued. Trials in labor courts are long lasting and imply several types of costs for firms. Hence, in the model, compliance with the policy is endogenous: firms will decide whether to create a job with less than 24h/wk and pay the cost or create a job above 24h/wk or to not create the job. This implies that there will be some jobs with less than 24h/wk after the reform in the model, as in the data. I denote as $\mathcal{C}(\max(24-h,0))$ the cost associated with jobs with a workweek below 24h, with $\mathcal{C}'(.) > 0$. I assume that this cost is paid by firms at each period during which the job exists. Since separations are exogenous and there are no shocks except job destruction, it is equivalent to a cost paid once when the job is created. After implementation of the minimum workweek, the new instantaneous profit of a job is

$$\pi(y,\epsilon,z) = y\min(h^\alpha, z^\alpha) - wh - \mathcal{C}(\max(24-h,0)). \tag{16}$$

The policy decreases the expected profit of jobs and hence their expected value. The post-reform surplus of jobs and bargained number of hours are presented in Appendix D.2. With the minimum workweek, the bargained number of hours can be above z. If the maximum number of productive hours is below 24, it can be optimal to create a job with more than z hours.

As shown by the new expected surplus of jobs in Appendix D.2, there are two first-stage effects of the policy. First, the 24h-rule decreases the expected surplus to create new jobs and hence affects job creation. Second, it also has an effect on the decision to create a job, conditional on a match between a firm and a worker. In particular, it increases the job creation threshold: for a given match, the probability of positive surplus is lower with the reform. Hence, the job is less likely to be created.

I first describe the partial equilibrium direct impact of the policy predicted by the model. In partial equilibrium, I consider firm-level adjustments, taking as given the expected utility of unemployment. Then, I present the predictions of the model in general equilibrium, when all endogenous variables adjust. For now, I assume that without the reform, the bargained number of hours is more often below 24h/wk for women (this will be estimated in the next section).

Direct effects. I first consider the firm-level effects of the policy. Introducing the minimum workweek reduces the expected surplus to create new jobs. As a result, firms decrease the number of vacancies posted, according to labor demand Equation (14). Moreover, conditional on being matched with a worker, the probability that the job is created decreases. The job creation threshold, defined in Equation (9), increases. This is also due to the decrease in the expected surplus. Since hires are reduced and separations 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 men and women, 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 women: the bite of the minimum workweek is stronger for them. As a result, the decrease in female employment in the firm is larger than the decrease in male employment. For jobs created

[16] A transfer would be neutral since wages are flexibly bargained.

after implementation of the policy, average hours worked increase. The number of hours worked increases even beyond 24h/wk. Actually, with the reform, a vacant job matched to a worker with whom the bargained number of hours would have been below 24 might not be created, leading to the job remaining vacant and potentially matched in following periods. In that case, the job might be then created later with a worker with whom the optimal number of hours is much above 24.

The theoretical predictions of the model for the direct partial equilibrium effects of the policy at the firm level are in line with the reduced-form results. The model also allows for indirect general equilibrium effects that are not taken into account in reduced form.

Indirect effects. First, workers are less likely to find a job because of the direct effects (decrease in the number of vacancies and decrease in the probability that a match is converted into a job). It decreases the expected value of unemployment, as shown by the labor supply equation 13. The decrease in W_u^M and W_u^F has a positive effect on the surplus of jobs, according to surplus definition 8. Hence, there is an increase in the expected surplus to create new jobs. It has a positive feedback effect on the number of vacancies posted, according to the labor demand equation 14. Also, 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 posting vacant jobs. All these indirect effects, due to general equilibrium adjustments, have positive employment effects. They will affect firms heterogeneously. We can expect the direct negative impact of the minimum workweek to dominate for firms with a high exposure to the policy. On the contrary, for firms with a low exposure, the indirect positive effect will probably dominate and employment might increase in these firms. Hence, the policy can reallocate workers from firms with a high share of affected jobs to firms with a low share of affected jobs. Depending on the quality of jobs (productivity) in the latter, the expected utility of unemployment could increase in the end if firms with a higher productivity open more vacancies. Similarly, the effect on total hours worked in the economy depends on the type of hours bargained in the firms in which jobs are reallocated.

Finally, since women are more impacted by the direct negative employment effect of the minimum workweek, the decrease in W_u^F should be stronger than the decrease in W_u^M. Women contribute more to these general equilibrium effects, that will benefit to all workers. As a result, men might benefit from the fact that there are stronger positive indirect effects because the policy has a stronger negative impact on women.

In the end, the aggregate effect of the policy will be determined by both the direct effects and the general equilibrium adjustments. In order to quantify the magnitude of the between-firm reallocation, I first estimate the structural parameters of the model in order to then simulate the policy shock.

5.4 Empirical strategy

Parameters of the model are estimated on average over 2011-2012 (before the announcement and the implementation of the 24h rule). I first estimate the model with no minimum workweek and then simulate the policy shock conditional on the estimated structural parameters.

5.4.1 Assumptions

Regulation of full-time jobs. In France, the full-time workweek is equal to 35h for most firms. Hence, there is a large spike in the distribution of hours at 35, as depicted in Figure 4. In order to be able to reproduce the data for the distribution of hours worked, I need to introduce a model counterpart for this regulation of the full-time workweek. I represent this institution as a cost for firms to create jobs with more than 35h/wk, denoted τ. This cost is proportional to the gap to 35 hours, consistent with the overtime premium. 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. As a result, I consider that the instantaneous profit of a job for the firm is

$$\pi(y, \epsilon, z) = y \min(h^\alpha, z^\alpha) - wh - \tau \max(h - 35, 0). \tag{17}$$

τ will be estimated together with the firm technology parameters.

Functional forms and distributions. For the cost function to open vacant jobs, I assume $C(v) = c_0 v^{c_1}$. 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 $\epsilon > 0$ can be above or below 1. There are two distributions for ϵ, one for men and one for women. I assume that each distribution is a discrete distribution, with 10 possible values for ϵ but do not make any parametric assumption.

The firm productivity, y, is drawn in a Gamma distribution, with cumulative distribution function $F(.)$ characterized by two parameters, y_{scale} and y_{shape}, for the scale and shape parameters, respectively.

Finally, the firm-specific distribution of maximum number of productive hours, z, is a continuous uniform distribution. For a type-y firm, I assume that 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, that characterize the relationship between productivity and needs in hours, will be estimated. The upper bound of the uniform distribution, z_{max}, is the same for all firms.

5.4.2 Estimation of structural parameters

The structural estimation is composed of three main steps and makes use of different types of data. Table 5 presents the structural parameters of the model 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 Appendix D.3. First, I estimate the distributions of the disutility parameters leveraging information about workers' preferences from the Labor Force Survey. Second, I rely on information from job ads in order to quantify the technology parameters on the firm side. Using information from the Labor Force Survey and from job ads allows me to identify separately the labor supply and the labor demand components determining hours worked, which is crucial for the analysis. Finally, remaining parameters are estimated using the distribution of hours worked in the economy.

Step 0: Calibrated and externally chosen parameter values. The discount factor, β, is set using the average interest rate for the period 2011-2012, with $\beta = \frac{1}{1+r}$, where r is the interest rate. μ is calibrated in order to match the job separation rate in the French linked employer-employee data. δ matches the firm exit rate. The elasticity of the matching function, m_1, is set to 0.5. γ, workers' bargaining power is set to 0.5 as well. Finally, N_f is the number of firms in the main sample from the linked employer-employee data and $\frac{u^M}{u^M+u^F}$ is the share of men among unemployed workers in 2011-2012. Values for these parameters are presented in Appendix D.3.1.

Step 1: Estimation of disutility parameters using workers' preferences. The distributions of ϵ, for men and women, are estimated from the Labor Force Survey over 2011-2012. I use the sample of employed workers for whom the hourly wage, the preferred number of hours and the gender are observed. In the data, I observe the preferred workweek for given hourly wage. In the model, the optimal number of hours for a given wage is defined in Equation (34) in Appendix D.1.4. First, I residualize the number of hours and hourly wage in the data, in order to remove sources of heterogeneity not accounted for in the model, such as education. Second, using the method of moments, I estimate the two separate discrete distributions of ϵ, for men and women. Details of the procedure are presented in Appendix D.3.2.

Estimated distributions of ϵ, for men and women, are presented in Table 6. The average ϵ for men and women are very close, even if the two distributions differ substantially. These results indicate that intensive margin elasticities are nontrivial.[17]

Step 2: Estimation of technology parameters using job ads. 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/wk, 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 $(h_{f,j}, w_j)$.[18] In the model, for a given hourly wage, the optimal number of hours for the firm is computed in Appendix D.3.3. I pick the vector of parameters $\Theta = (\alpha, u_1, u_2, \tau, y_{shape}, y_{scale}, z_{max})$ maximizing the likelihood of observing the job ads (hours and

[17]This is consistent with Kline & Tartari (2016) who show that intensive margin responses for women are sizable in the US.

[18]Both the hourly wage and the number of hours are observed for half of the job ads in the sample.

wages) from the sample

$$\max_{\Theta} \mathcal{L}((h_f, w)|\Theta) = \prod_{j=1}^{n} l((h_{f,j}, w_j)|\Theta). \tag{18}$$

The moments used for the estimation of Θ are the distribution of optimal hours and wages for firms. In the model, for each firm ex-ante, there is a given relationship between the hourly wage and optimal hours. Hence, in order to identify the parameters, I assume that this relationship is constant in the data as well and that a vacant job randomly selected for a firm is representative of this relationship. Details of the procedure are described in Appendix D.3.3.

Panel (A) of Table 7 shows the estimated parameters. α is very close to 1, indicating that returns to scale are almost constant. This is consistent with the firm-level result showing decline in total production: the hourly productivity of full-time workers is not higher than the one of part-time workers and does not compensate for the decline in employment. Both z_1 and z_2 are positive: more productive firms need more hours. Also, the dispersion in the maximum number of productive hours is higher in low-productivity firms.

Step 3: Estimation of remaining parameters from the distribution of hours worked. Conditional on parameters estimated in steps 1 and 2, I estimate four remaining parameters: b, m_0, c_1 and W_u^M. These parameters are estimated using the distribution of hours worked in the economy, for all workers. More precisely, c_1 and W_u^M minimize the distance between the theoretical and empirical distributions for hours worked and b and m_0 solve the labor market equilibrium. Details are provided in Appendix D.3.4. First, c_1 and W_u^M are estimated using the Generalized Method of Moments (GMM) and solve

$$\underset{(c_1, W_u^M)}{min} \left[\mathbf{p} - \mathbf{p}\left(c_1, W_u^M\right)\right]' \Lambda^{-1} \left[\mathbf{p} - \mathbf{p}\left(c_1, W_u^M\right)\right], \tag{19}$$

where Λ^{-1} is a symmetric and positive definite weighting matrix.[19]

Second, b and m_0 are such that two additional constraints are satisfied: (1) the unemployment rate in the model coincides with the one in the economy and (2) unemployment computed from the ratio between vacant jobs and tightness equals unemployment computed from a flow-balance equation.[20] These equations are in Appendix D.3.4.

Estimated parameters are presented in Panel (B) of Table 7. Figure 22 shows the distribution of hours worked in the data and in the model for estimated parameters. The model reproduces the spike at 35h/wk observed in the data. Also, the share of jobs with a workweek below 24h/wk before implementation of the minimum workweek is very close in the model to the one in the data. However, the model does not reproduce well the jobs with very low hours (less than 10h/wk) observed in the administrative data. A potential explanation is that the existence of jobs with very low hours cannot be explained from workers' preferences in the Labor Force Survey nor from job ads posted

[19] In practice, I use a standard two-step GMM where (i) I minimize the problem 19 with the identify matrix for Λ^{-1} and obtain a first estimator $(\hat{c_1}^1, \hat{W_u}^{M,1})$ and then (ii) I compute the efficient matrix $\Lambda = \mathbf{p}(\hat{c_1}^1, \hat{W_u}^{M,1})\mathbf{p}(\hat{c_1}^1, \hat{W_u}^{M,1})'$ and minimize again to obtain the final estimates.

[20] This is to ensure that the partial equilibrium coincides with the general equilibrium in the pre-reform model.

by firms. These jobs are likely created through more informal channels.

Figure 23 decomposes the distribution of hours worked between men and women in the model, for estimated structural parameters, and in the data. While the distribution of hours worked for the population was targeted in the estimation, I did not make use of information about gender differences. Hence, these gender differences in the model allow us to assess to what extent the model reproduces observed differences in hours worked. First, the model features more part-time jobs for women as compared to men, which is consistent with what is observed in the data. However, I under-predict these differences: in the data, women are more likely to work part time than in the model. This is consistent since in the model, the only difference between men and women is the labor disutility. While in reality, other factors may explain the fact that men and women have different jobs, for instance composition effects or discrimination. Appendix Table D.1 compares other empirical and theoretical moments in order to assess the fit of the model. In particular, the fit of the model regarding firm size is good, both in terms of number of workers but also in terms of total hours worked.

5.4.3 Estimation of the policy shock

I simulate the policy shock conditional on estimated values of the structural parameters. First, I determine the policy shock to be implemented. After implementation of the minimum workweek, firms have a pay a cost for jobs with less than 24h/wk. I assume the cost to be linear in the gap to 24. This is consistent with the way the compensation is computed in labor courts. Hence, the instantaneous profit of the firm after the reform is

$$\pi(y, \epsilon, z) = y \min(h^\alpha, z^\alpha) - wh - \tau \max(h - 35, 0) - \rho \max(24 - h, 0). \tag{20}$$

ρ is the policy parameter to identify. I estimate the value of ρ reproducing the reduced-form result when the outcome variable is the number of jobs in the firm. To do so, I simulate a regression in the structural model that is the counterpart of the reduced-form specification. Hence, the regression in the model is estimated after general equilibrium adjustments and is also affected by these indirect effects, as it is the case in the data. 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

$$\frac{L_{i,after} - L_{i,before}}{L_{i,before}} = \gamma_0 + \gamma_1 Share24_i + u_i, \tag{21}$$

where the left-hand side is the employment growth rate in the firm after implementation of the minimum workweek. As before, $Share24_i$ is the share of jobs with workweeks below 24h in the firm on average before implementation of the policy. In reduced form, I have estimated the empirical counterpart $\hat{\gamma_1}^{DiD}$.

In the model, I simulate a large number of firms, conditional on estimated values of the structural parameters. For each firm, I compute employment before the policy, $L_{i,before}$, and exposure to the reform, $Share24_i$. Then, for any value of the policy parameter, ρ, I can compute the new general equilibrium and employment in the firm, $L_{i,after}$. It is then possible to deduce $\hat{\gamma_1}^{Model}$, the regression estimate from the model. Finally, I pick the value of ρ such that

$$\hat{\gamma_1}^{Model} = \hat{\gamma_1}^{DiD}. \tag{22}$$

Additional details are provided in Appendix D.3.5. The strategy relies on the comparison of two long-run equilibria. In fact, in order to pick the value of the policy parameter, I compare employment in the steady state equilibrium with no minimum workweek and in the steady state after implementation of the policy shock. Consequently, it is important to know at which rate the model is converging to the new steady state. Figure D.3 in Appendix D.4 shows the transitional dynamics of employment in the model. As it is often the case with this type of framework, the convergence to the new steady state is fast.[21] Two years after implementation of the policy shock, employment has almost reached its new level. It implies that the strategy relying on the comparison of the two steady states gives results close to the approach consisting in measuring the effects two years after the policy shock.

5.5 Policy results

Employment. Table 8 presents the employment effects of the minimum workweek, for each type of job. I distinguish between the effects in partial equilibrium and in general equilibrium to show the magnitude of the general equilibrium adjustments. First, at the aggregate level, the reform destroyed 1.02% of jobs. Women are more affected by this effect: the number of women employed decreases by 1.26% after the introduction of the policy. Taking into account direct effects only, we would estimate a decrease in the number of jobs by 1.10%. Hence there are some indirect general equilibrium effects positively affecting employment, even if the magnitude is small for this outcome. The number of jobs with workweeks below 24h/wk decreases by 46.44%, a result consistent with observed aggregate evolution. Second, there is an increase in the number of jobs with more than 24h/wk, including full-time jobs. The number of full-time jobs increases for men already in partial equilibrium, because of the within-firm substitution between men and women. Once equilibrium adjustment is accounted for, the positive effect on full-time jobs is even larger. This is due to the fact that workers are reallocated to firms in which contracts are more likely to be full time. The aggregate increase in the number of full-time jobs is more than two times larger for men as compared to women. Since women have more constraints, as shows by the larger values taken by ϵ at the right of the distribution, men benefit more from the reallocation effects. Finally, the total number of hours worked in the economy is strongly affected by the reallocation of workers. While within-firm effects on total hours are negative, confirmed by the negative effect in partial equilibrium, the aggregate general equilibrium impact is very negligible. At the aggregate level, total hours worked decrease by 0.01%. Hence, in terms of hours worked, imperfect within-firm reallocation is compensated by between-firm reallocation. There is almost the same number of hours worked in the economy after the reform, but these hours are concentrated among fewer workers. These workers are more likely

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

to be men. This last result shows that taking indirect reallocation effects into account is crucial for the aggregate impact.

Unemployment rate. Even if total hours worked are not affected at the aggregate level, there is a strong impact of the minimum workweek on unemployment. After the policy, hours worked are concentrated among fewer workers since there is a decrease in the number of jobs in the economy. The last row of Table 8 presents the partial and general equilibrium effects of the reform on the unemployment rate. Overall, the unemployment rate has increased by 9.44%, corresponding to an increase in 0.85 percentage points. This effect is stronger for women. The increase is of 12.21% for women and 7.35% for men.

Since the estimated effect on the unemployment rate is large, I compare the evolution of unemployment in France and other European countries in order to assess the plausibility of the magnitude of the estimates. I rely on the comparison of the evolution of the French unemployment rate and a synthetic control group computed from other European countries. Appendix Figure D.4 shows the results. Compared to the synthetic control group of countries, the French unemployment rate has actually been strongly increasing since the implementation of the minimum workweek. The gap is up to 20%. These results suggest that a 9.44% increase caused by the reform is a plausible order of magnitude.

Aggregate output. Due to the implementation of the minimum workweek, workers reallocate from firms relying on low-hour jobs to firms using jobs with more hours. The latter firms are also more productive. In Section 5.4, I estimated a positive relationship between firm productivity and average needs in hours. Hence, almost the same number of hours are worked after the reform, but these hours are done in more productive firms. I compute the impact of the minimum workweek on total output produced in the economy to consider the effect on the productive efficiency. Table 9 shows the changes in gross market production, total hiring expenses, expenses associated with regulations (for jobs with a workweek above 35h and after the reform with a workweek below 24h) and unemployment cost. The latter corresponds to the instantaneous utility received by unemployed workers, b, for which I have estimated a negative value. b encompasses for instance home production, job search effort and resources as well as social costs due to unemployment. After the introduction of the policy, I quantify a decrease in total output net of costs of 1.15%. This decrease can be decomposed between several margins. First, market production increases by 4.27% because of the reallocation of working hours to more productive firms. On the other hand, there are more unemployed workers after the reform, which increases total unemployment costs. Total hiring expenses decreased by 0.33% because, at the aggregate level, the decrease in the number of vacancies posted compensate for the convexity of the cost affecting more large firms. There is a slight increase in aggregate expenses due to jobs with workweeks above 35h because of the increase in the number of these jobs. Moreover, the reform entails additional costs, namely the red tape costs paid by firms for jobs with workweeks below 24h. Once these costs are accounted for, we obtain the negative effect on net output of -1.15%.

Welfare. Table 10 shows the effects of the policy on the welfare of men and women, by employment status. First, the average welfare of employed workers has increased with the minimum workweek. This is due to the fact that the low-quality jobs have been destroyed. Hence the average surplus of existing ones is higher on average. This also comes from the fact that workers are reallocated to more productive firms. Second, for unemployed workers, there are two opposite effects. On the one hand, unemployed workers are less likely to find a job, which decreases welfare. On the other hand, they anticipate that once they find a job, this is a better job in a better firm. This second effect dominates and average welfare of unemployed workers is increasing. Finally, I compute the weighted average of welfare, for men and women. I take into account both the changes in welfare for each state, but also the fact that the distribution of workers between states has been affected. In particular, workers are more likely to be unemployed. Even if welfare of unemployed workers has increased with the policy, it remains lower than the welfare of employed individuals. For men, the positive effect on welfare for each state and the increase in the share of men unemployed offset each other and welfare does not change. Women are more affected by the increase in the unemployment rate and this negative effect dominates, so that average welfare of women is decreasing by 0.2%. Finally, the gender gap in average welfare increases by 3% with the minimum workweek. It comes from the fact that women are more affected by the direct negative impact of the minimum workweek and benefit less from the reallocation.

6 Conclusion

This paper provides a comprehensive assessment of the margins along which firms and workers adjust to the introduction of a minimum workweek. I exploit the implementation of a floor of 24 hours per week in France 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 employed workers and in total hours in firms ex-ante more exposed to the reform. This result indicates 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, some men working full-time are substituted for women working less than 24h per week. At the aggregate level, I estimate that the 24h minimum workweek decreased the number of jobs by 1%. However, taking into account reallocation of workers between firms uncovers additional results: the overall impact on total hours worked is negligible because workers are reallocated to firms offering more full-time jobs. Hence, a similar number of hours is concentrated among fewer workers, more often men. While women are more affected by the direct negative impact of the policy, they benefit less from indirect reallocation. The French minimum workweek achieved the objective of improving the average quality of jobs but at the expense of an increased unemployment rate and stronger gender inequality.

Given the fact that the negative employment effects are particularly strong in small businesses, while larger firms can adjust hours more flexibly, we could expect negative employment effects of minimum working hours in countries in which firms are particularly small. Potential effects of working time regulations in other countries also depends on the industry composition since industries such as retail and services rely heavily on low-hour jobs. Regarding gender differences, the results suggest that the stronger the labor supply differences between men and women, the more likely the substitutions of men for women in firms. Hence, a minimum workweek could increase gender inequality even more in countries in which child care facilities are not very available. In the long-run, this differential impact on men and women could be even stronger if it reinforces traditional gender norms. Restricting low-hour jobs can also increase the child penalty for women since some have to stop working instead of reducing hours of work.

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 regulations such as workweek reduction, zero-hours contracts of minijobs. The structural framework and estimation strategy I propose can be used to study alternative regulations likely to have heterogeneous effects on workers with different labor supply.

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FIGURES

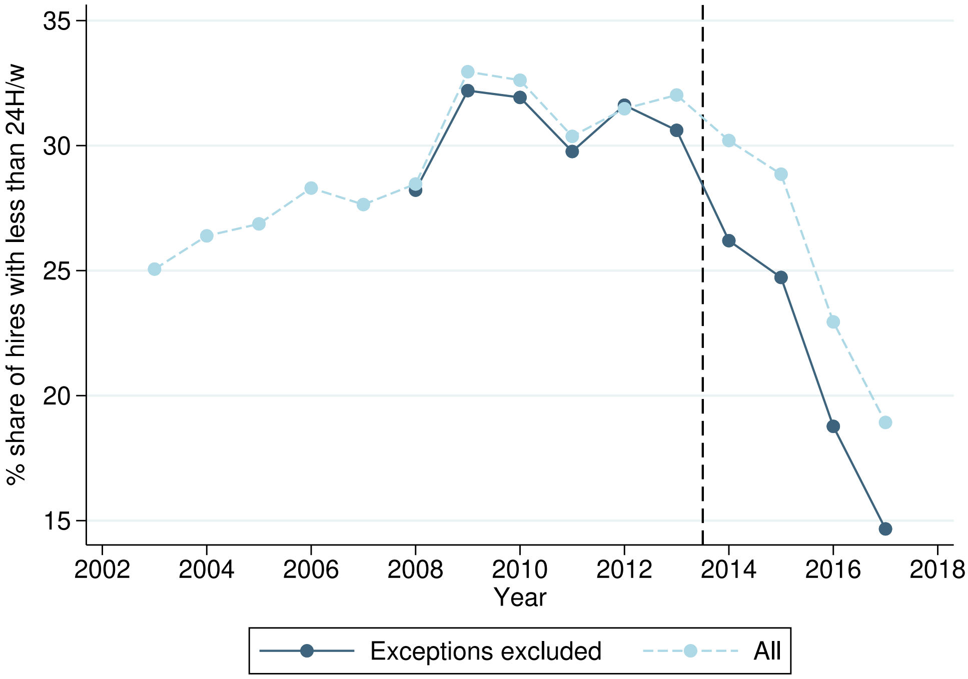


Figure 1: Evolution of share of hires for jobs below 24h/wk

Notes: This figure plots the share of new hires for jobs with an average workweek smaller than 24h/wk among all new hires, for each year. Computed from the linked employer-employee data (DADS Postes). Private sector only. Hiring of workers from 25 to 55 years old. In dark blue, the new hires covered by industry agreements with exceptions to the 24h-rule are excluded (information about industry agreements is available from 2008).

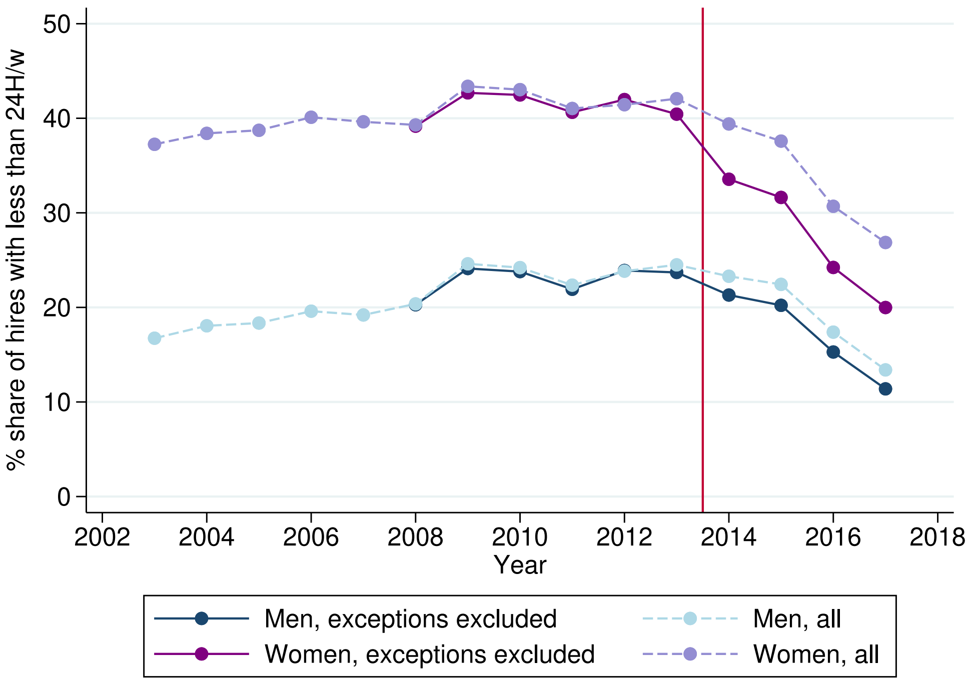


Figure 2: Evolution of share of hires for jobs below 24h/wk by gender

Notes: This figure plots the share of new hires for jobs with an average workweek smaller than 24h/wk among all new hires, separately for men and women, for each year. Computed from the linked employer-employee data (DADS Postes). Private sector only. Hiring of workers from 25 to 55 years old. Dashed lines consider all hires while industries covered by exceptions to the 24h-rule are excluded in the solid lines (information about industry agreements is available from 2008).

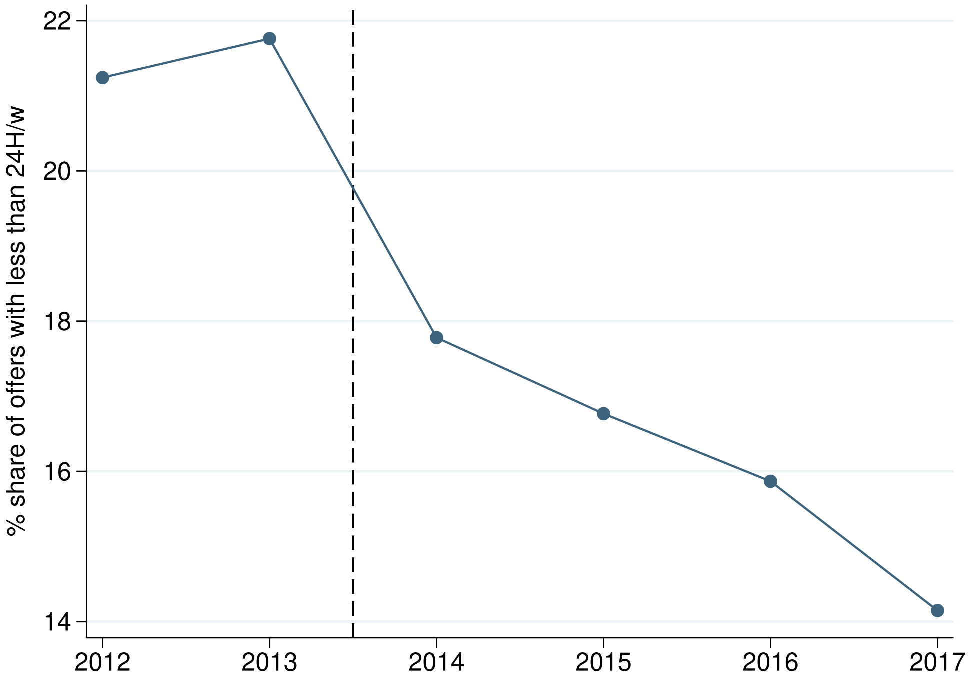


Figure 3: Evolution of share of vacancies for jobs below 24h/wk

Notes: This figure plots the share of vacant jobs for jobs with a workweek below 24h among vacant jobs for which the workweek is observed, for each year. Computed using vacant jobs posted on the website of unemployment service (*Pôle Emploi*). All vacant jobs included.

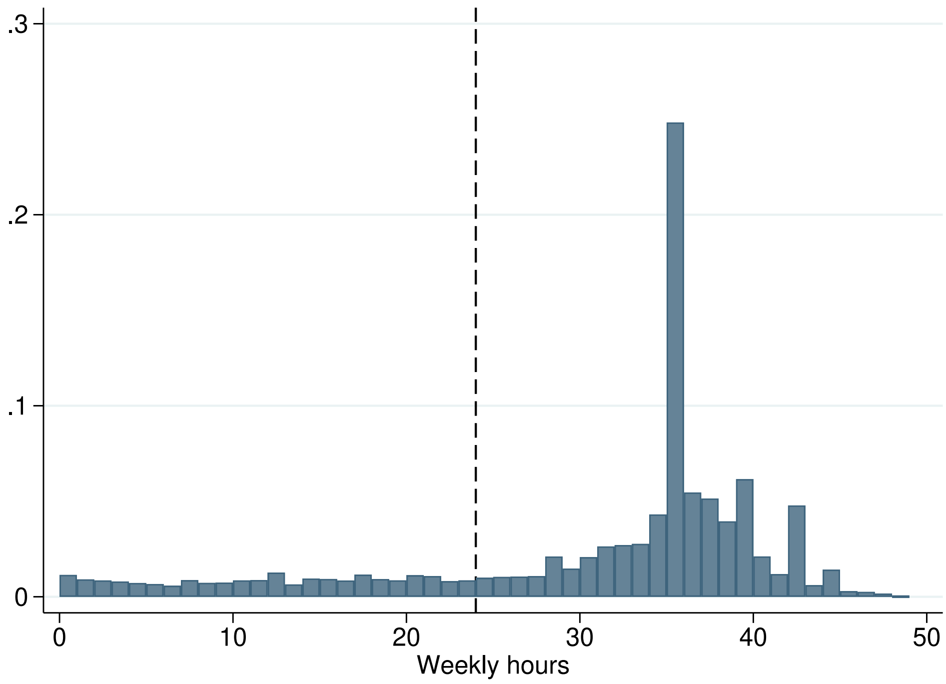


Figure 4: Distribution of hours worked in France (2012-2013)

Notes: This figure plots the distribution of weekly hours worked in the stock of jobs, on average over 2012-2013. The average workweek includes both contractual and overtime hours. Computed from the linked employer-employee data (DADS Postes). Private sector only. Workers between 25 and 55 years old. Industries covered by exceptions to the 24h-rule are excluded. Each job is weighted by the number of days of the job spell in the month. The dashed line shows the 24h cutoff. The cumulative sum for jobs below this cutoff corresponds to 15% of jobs.

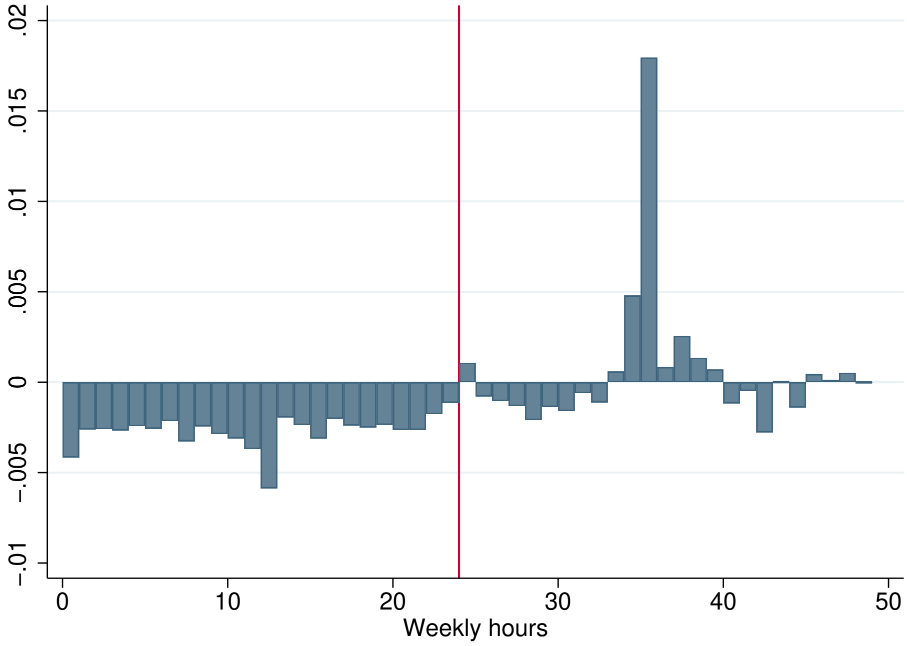


Figure 5: Change in the distribution of hours worked after the reform

Notes: This figure plots the change in the distribution of hours worked in the stock of jobs, between 2012-2013 and 2015-2016, for each bin of 1h. 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: $\frac{NbJobs(h)_{after} - NbJobs(h)_{before}}{NbJobs_{before}}$. The average workweek includes both contractual and overtime hours. Computed from the linked employer-employee data (DADS Postes). Private sector only. Workers between 25 and 55 years old. Industries covered by exceptions to the 24h-rule are excluded. Each job is weighted by the number of days of the job spell in the month. The dashed line shows the 24h cutoff. The cumulative sum at 24h is equal to -7.9% and at 50 is -3.9%.

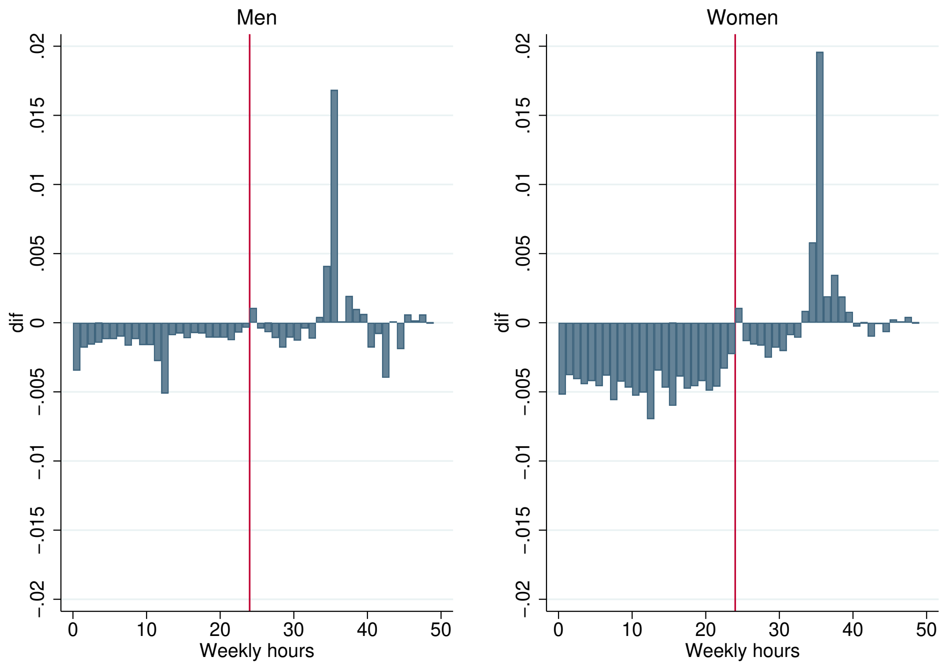


Figure 6: Change in the distribution of hours worked by gender after the reform

Notes: This figure plots the change in the distribution of hours worked in the stock of jobs, between 2012-2013 and 2015-2016, by gender, for each bin of 1h. 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: $\frac{NbJobs(h)_{after} - NbJobs(h)_{before}}{NbJobs_{before}}$. The average workweek includes both contractual and overtime hours. Computed from the linked employer-employee data (DADS Postes). Private sector only. Workers between 25 and 55 years old. Industries covered by exceptions to the 24h-rule are excluded. Each job is weighted by the number of days of the job spell in the month. The dashed line shows the 24h cutoff. For men, the cumulative sum is equal to -1.4% and for women -6.9%.

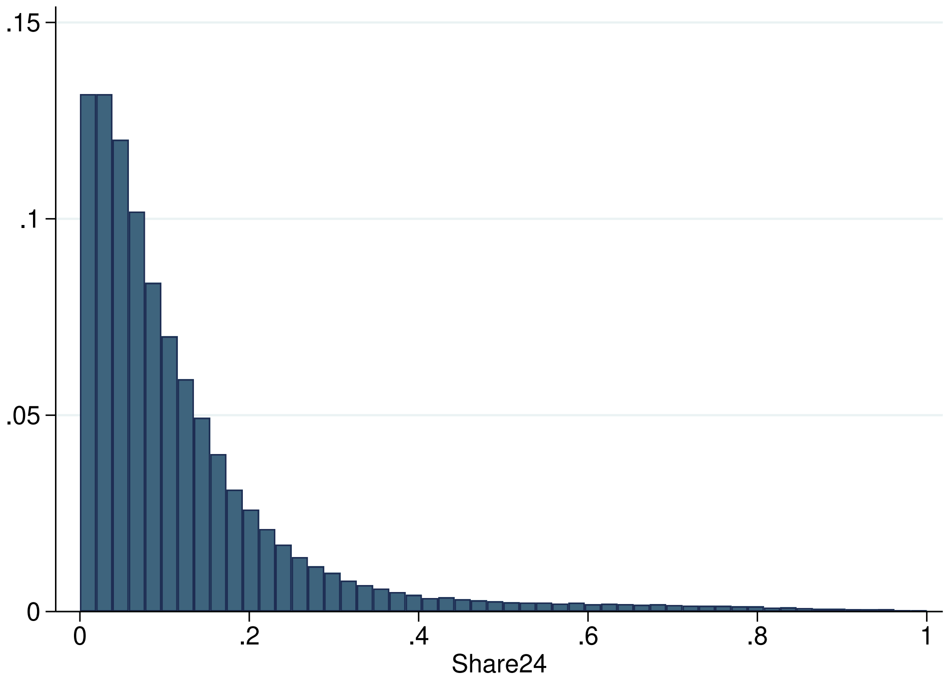


Figure 7: Distribution of exposure to the policy ($Share24$)

Notes: This figure plots the distribution of the share of jobs below 24h/wk in the firm 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.

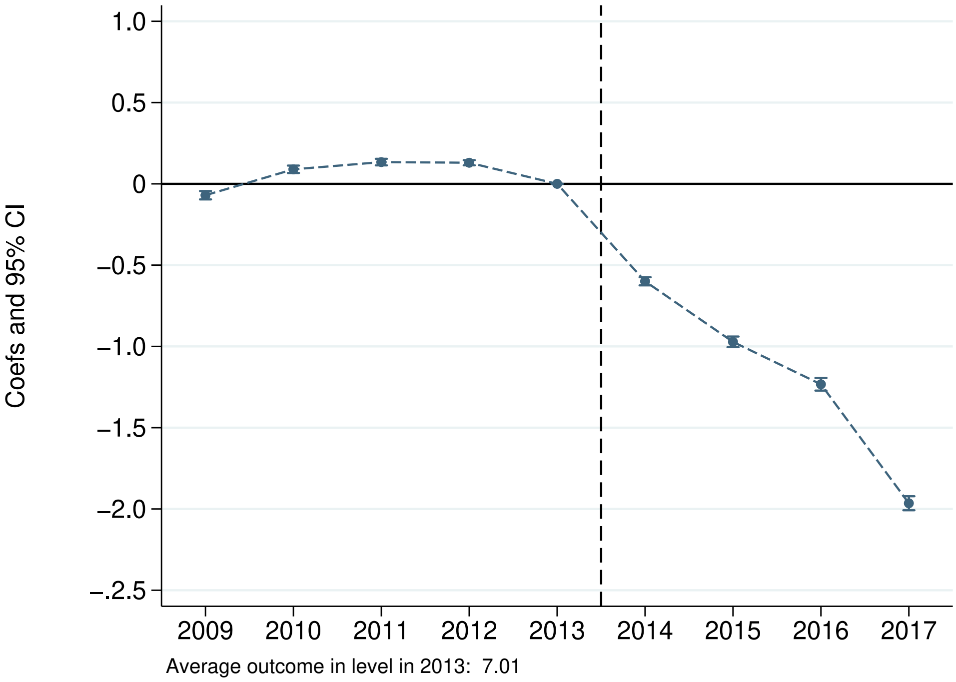


Figure 8: Number of jobs below 24h/wk

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 outcome variable is the inverse hyperbolic sine transformation of the number of jobs below 24h/wk in the firm, for each year. 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.

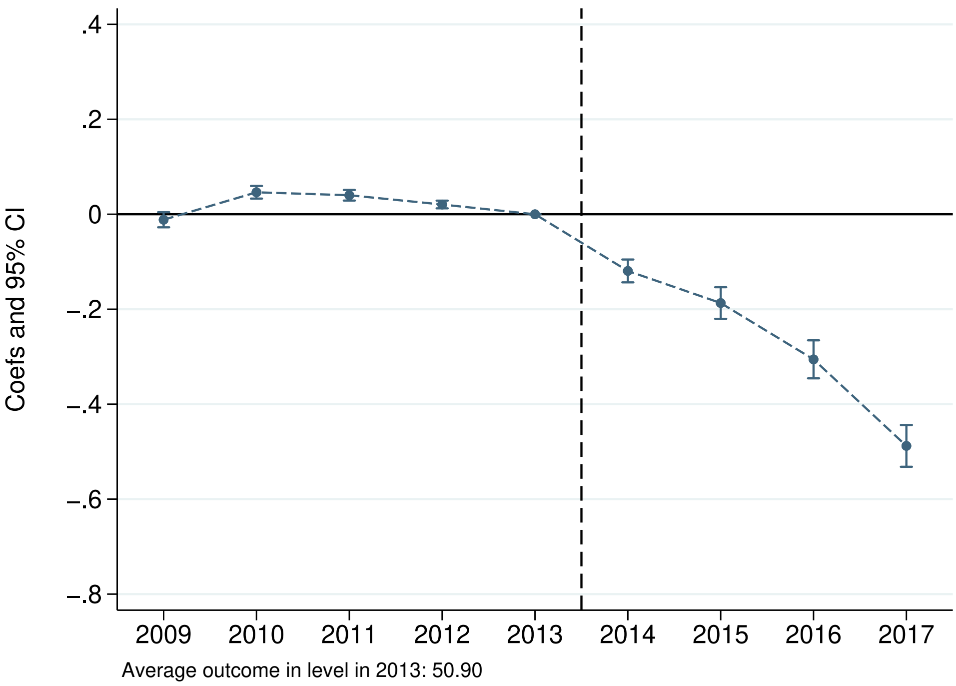


Figure 9: Number of jobs

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 outcome variable is the inverse hyperbolic sine transformation of the number of jobs in the firm, for each year. 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.

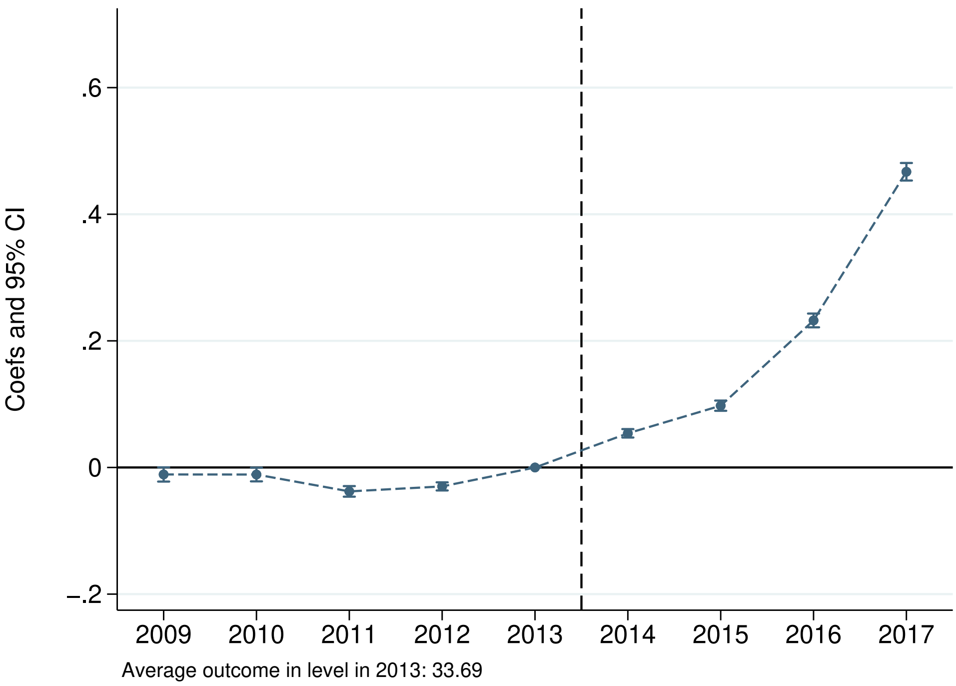


Figure 10: Average number of hours per week per worker

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 outcome variable is the log average number of hours worked per week by each worker in the firm, for each year. 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.

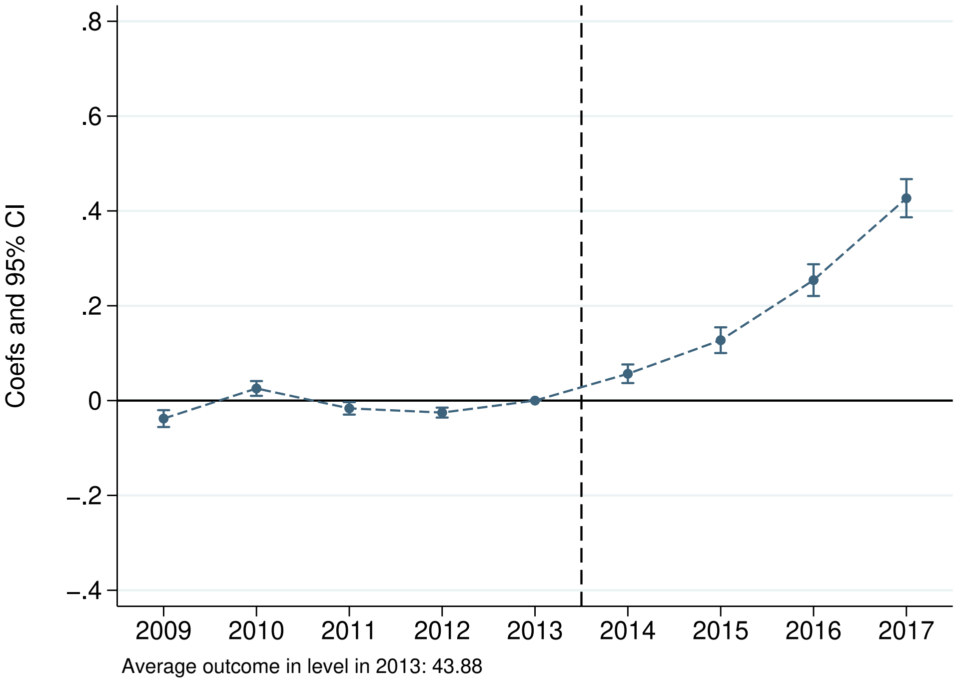


Figure 11: Number of jobs above 24h/wk

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 outcome variable is the inverse hyperbolic sine transformation of the number of jobs above 24h/wk in the firm, for each year. 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.

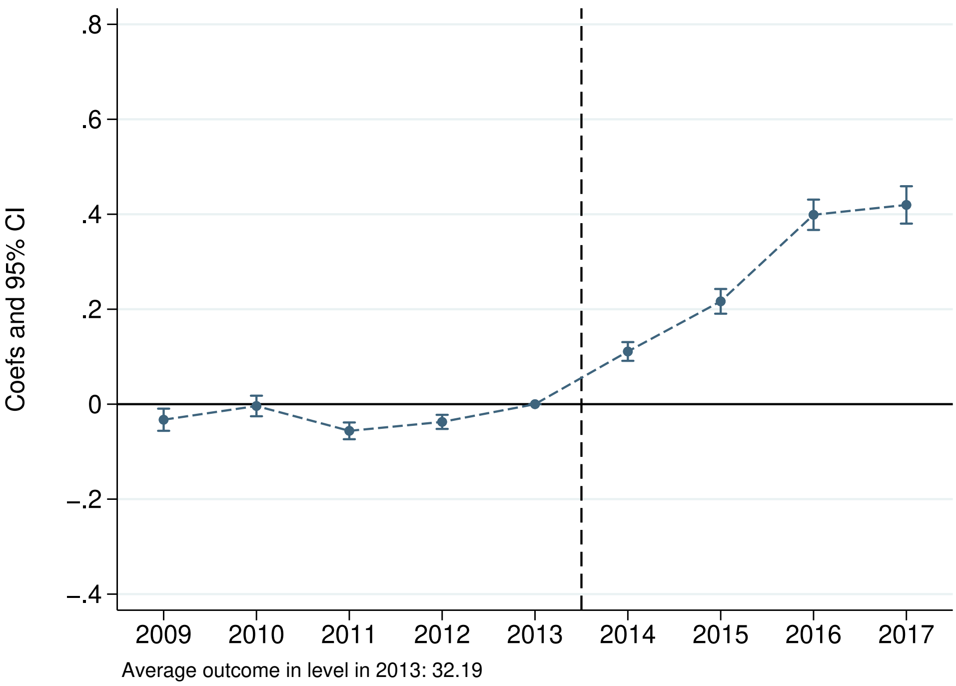


Figure 12: Number of full-time jobs

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 outcome variable is the inverse hyperbolic sine transformation of the number of full-time jobs in the firm, for each year. 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.

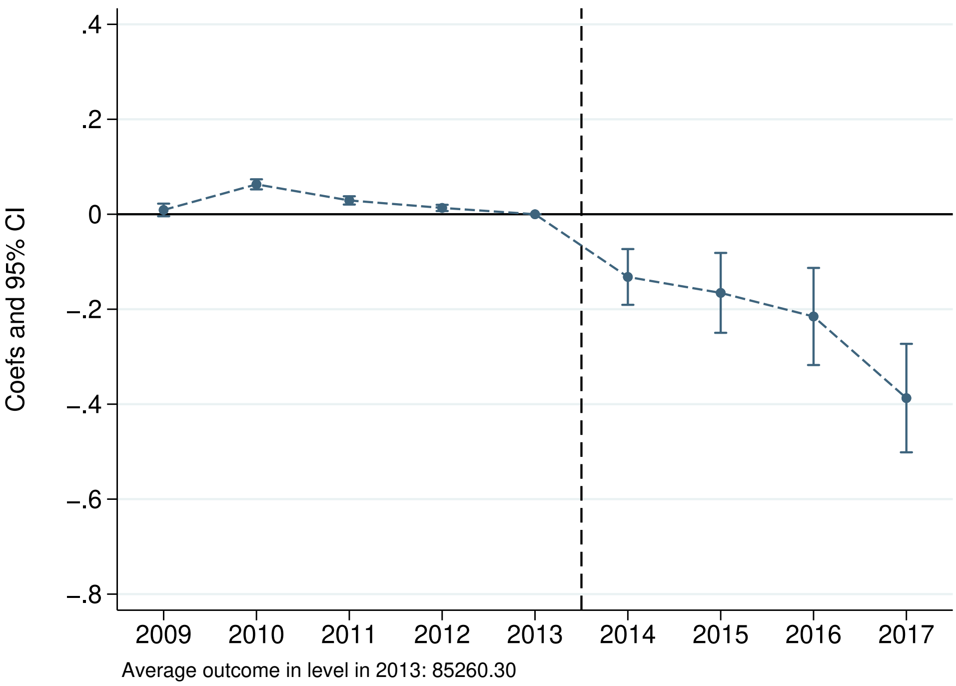
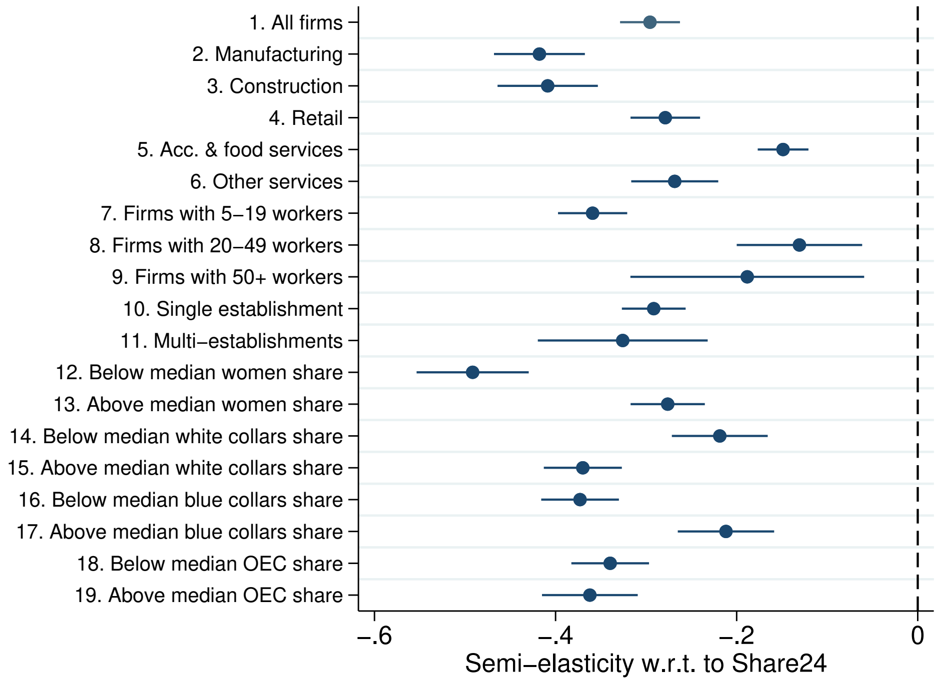


Figure 13: Total number of hours worked in the firm

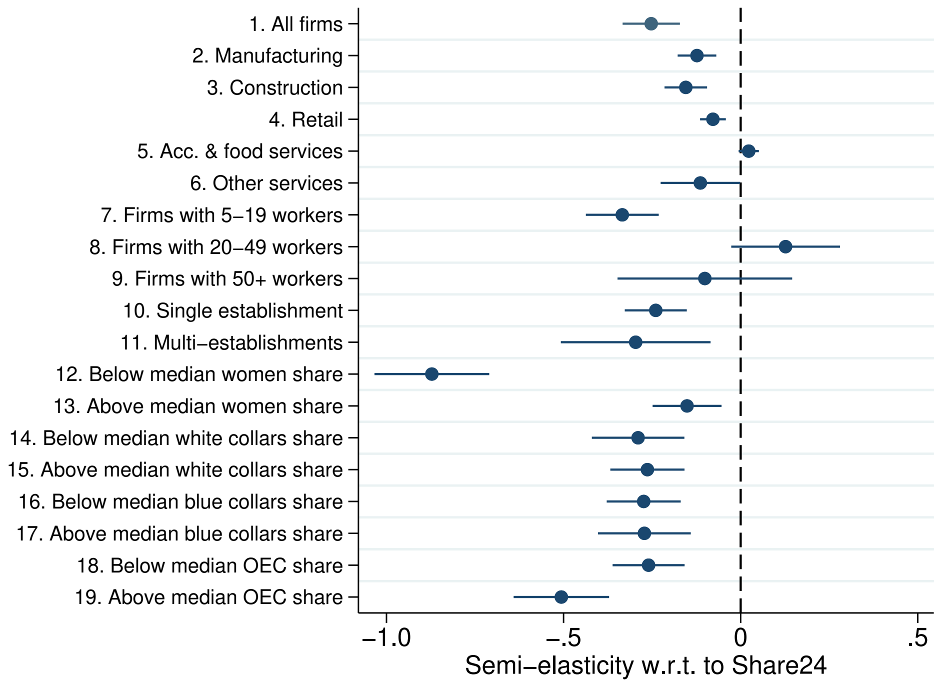
Notes: This figure plots the estimates of the β_k parameters in equation 1, for each year, as well as the 95% confidence intervals (standard errors are clustered at the firm level). The outcome variable is the inverse hyperbolic sine transformation of the total number of hours worked in the firm, for each year. 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.

Figure 14: Probability that job below 24h/wk created before the reform continues to exist

Notes: This figure plots the results of the RDD-DiD estimating the hoarding effect for jobs below 24h/wk created before implementation of the policy from equation 2. 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.



(a) Number of jobs



(b) Total hours worked

Figure 15: Firm heterogeneity

Notes: These two figures plot estimates of β_{2016} from equation 1 for different subgroups of firms. 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. The outcome considered in Figure (a) is the total number of jobs in the firm and the outcome in Figure (b) is the total number of hours worked.

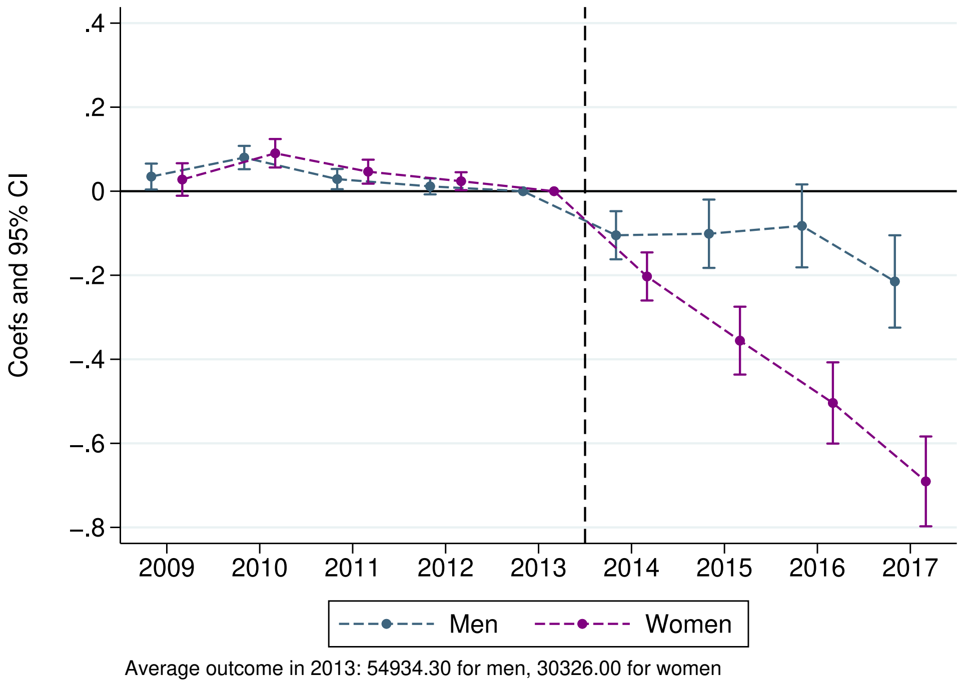


Figure 16: Total number of hours worked by men and women in the firm

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 outcome variable is the inverse hyperbolic sine transformation of the total number of hours worked in the firm by men (or by women), for each year. The regression when 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.

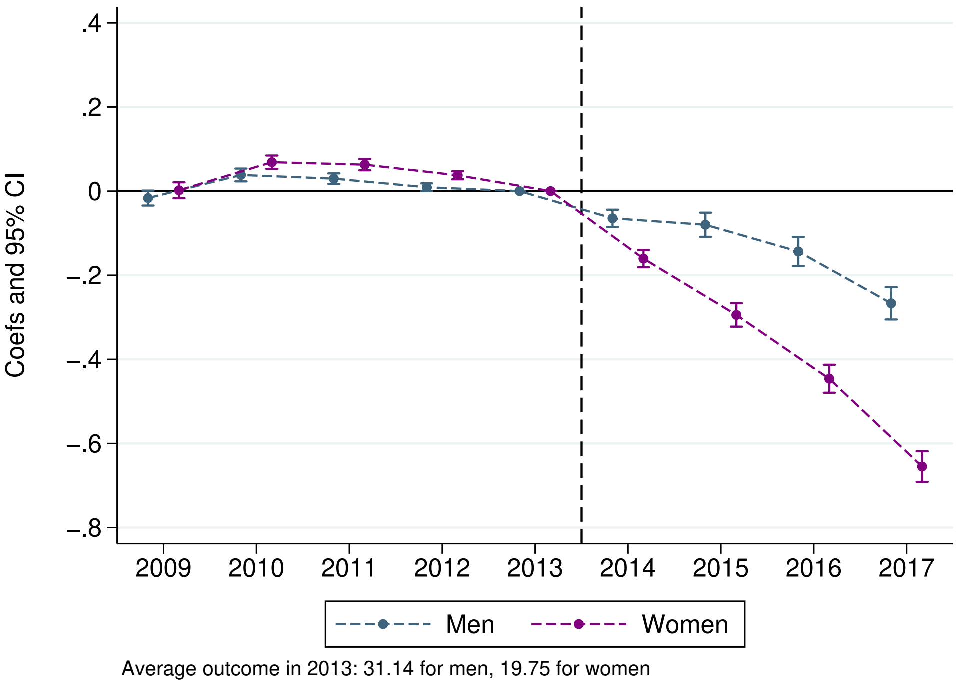


Figure 17: Number of jobs for men and women

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 outcome variable is the inverse hyperbolic sine transformation of the total number of jobs in the firm for men and women, for each year. The regression when 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.

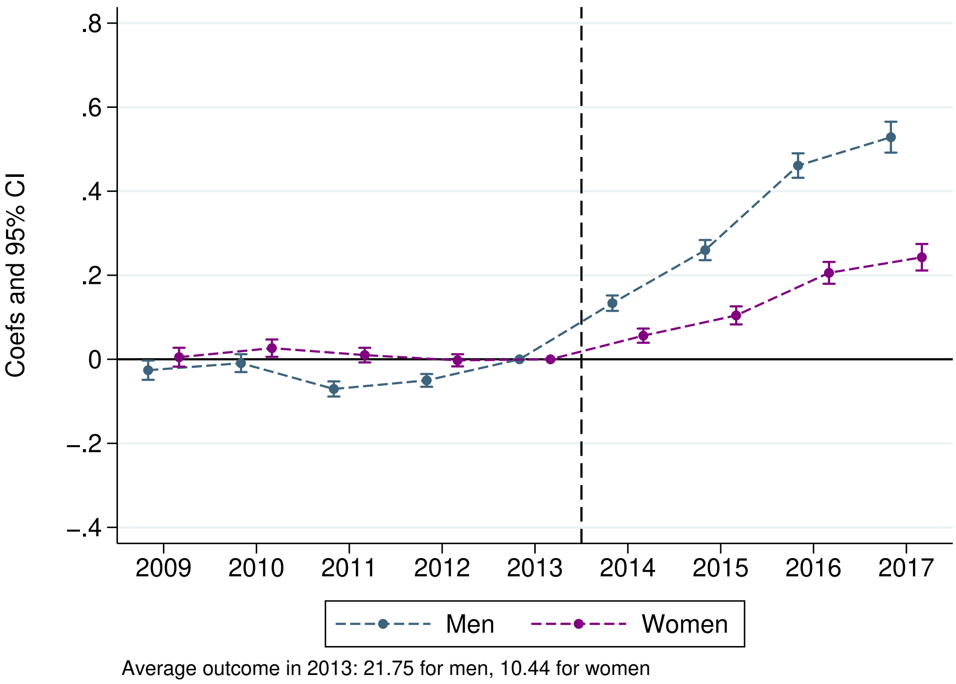
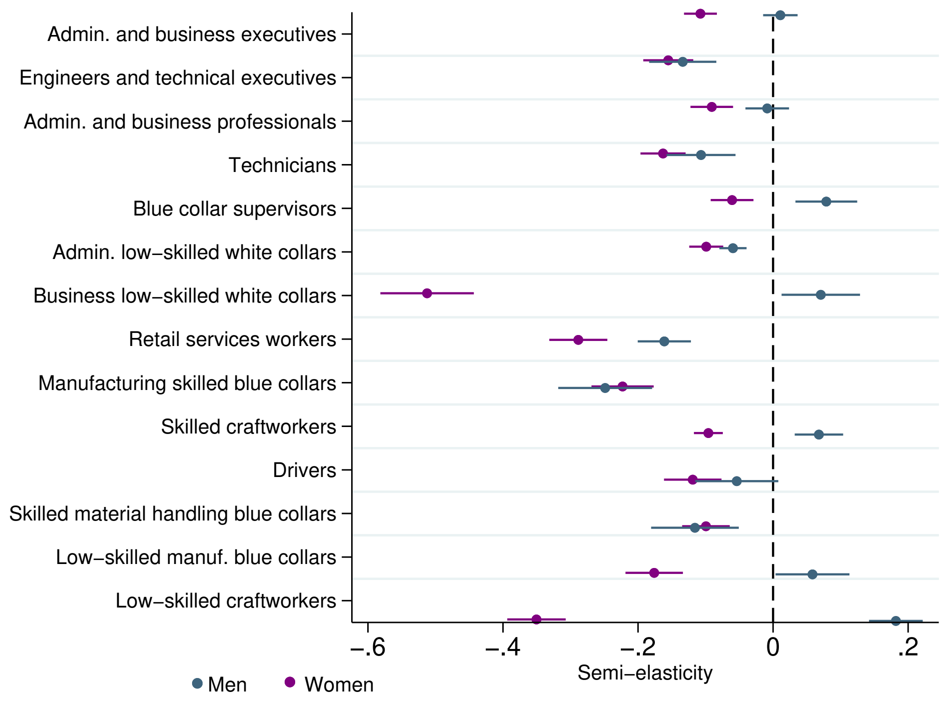
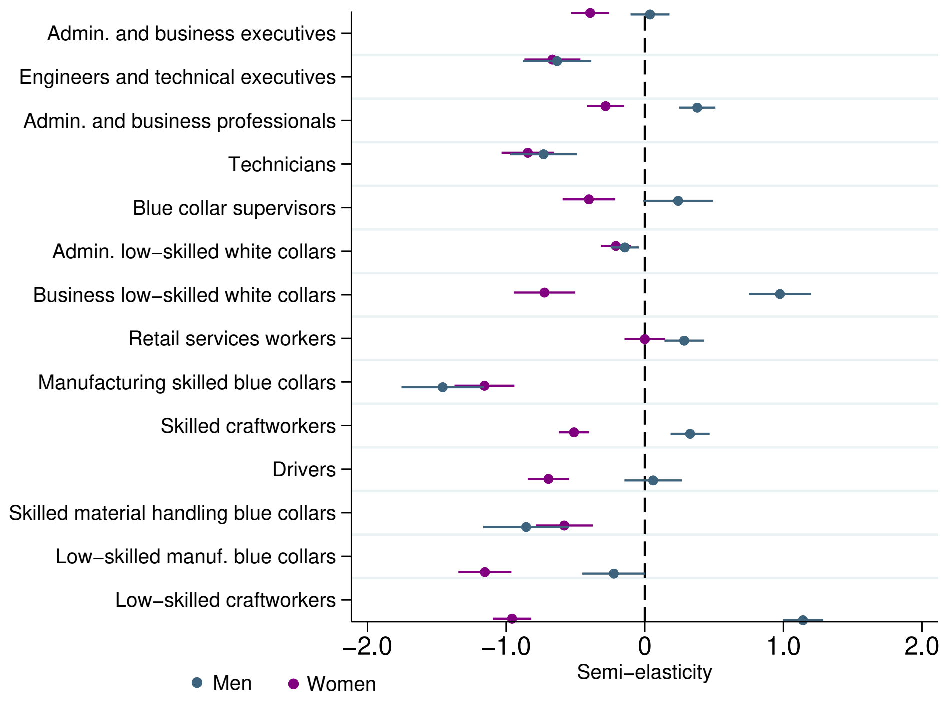


Figure 18: Number of full-time jobs for men and women

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 outcome variable is the inverse hyperbolic sine transformation of the number of full-time jobs in the firm for men and women, for each year. The regression when 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.



(a) Number of jobs for men and women



(b) Total hours worked by men and women

Figure 19: Within-occupation heterogeneity, by gender

Notes: These two figures plot estimates of β_{2016} from equation 1 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. The outcome considered in Figure (a) is the total number of jobs in the firm and the outcome in Figure (b) is the total number of hours worked.

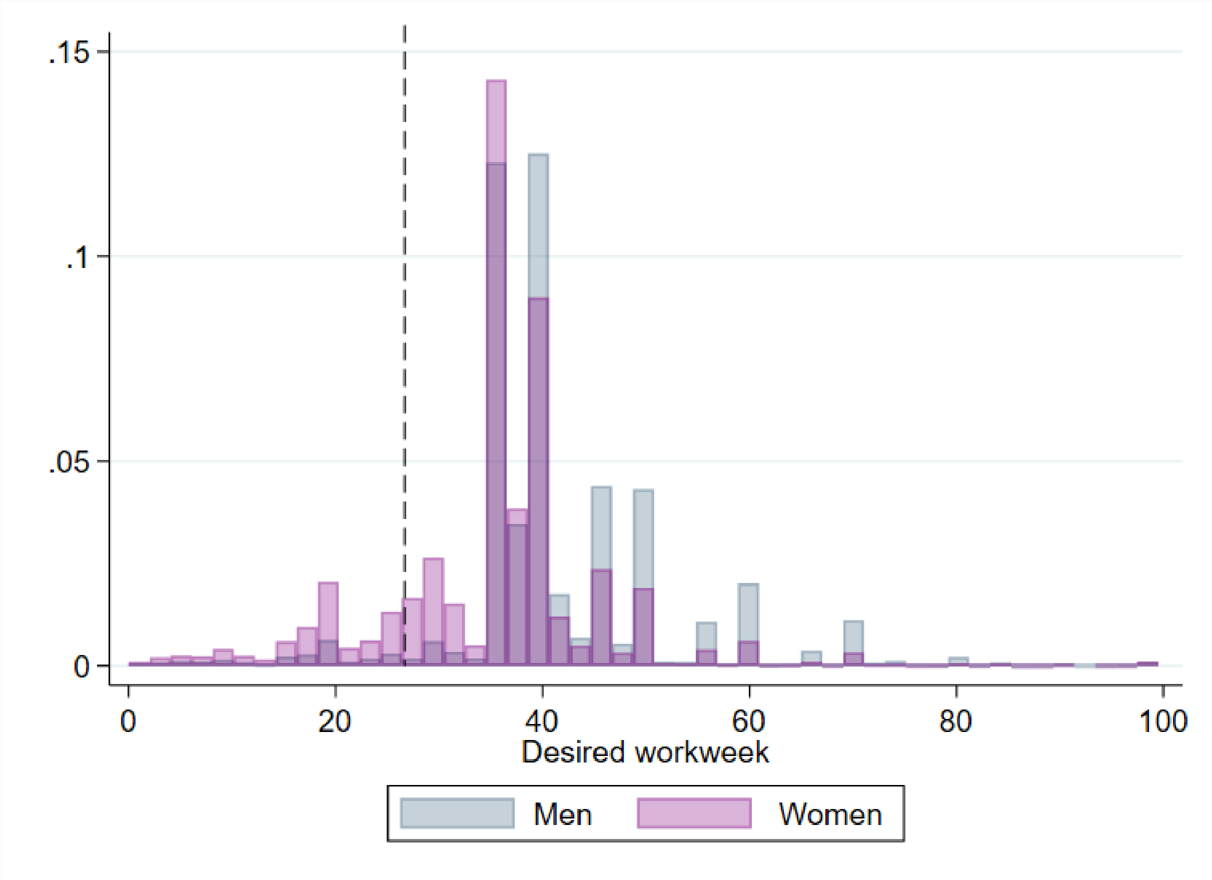


Figure 20: Preferred workweeks for men and women

Notes: This figure plots the distribution of preferred workweeks, separately for men and women, in 2012-2013. These distributions come from the Labor Force Survey, in which people are asked what is their desired number of hours of work per week.

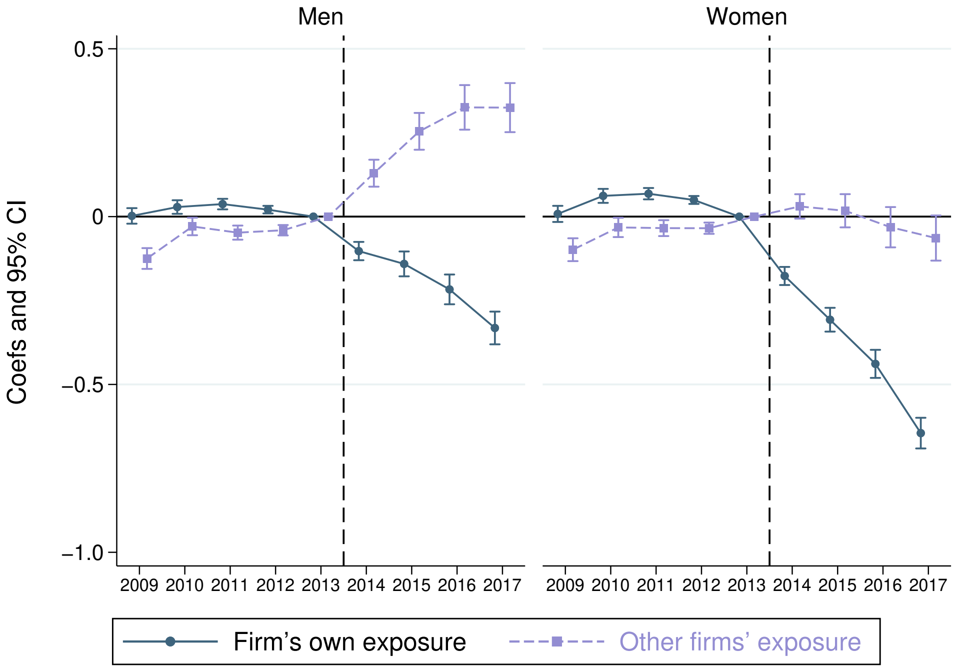


Figure 21: Direct and indirect effects on number of jobs

Notes: This figure plots estimates of β_k and γ_k in equation 4 and 95% confidence intervals. The solid blue line connects estimates for the β_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.

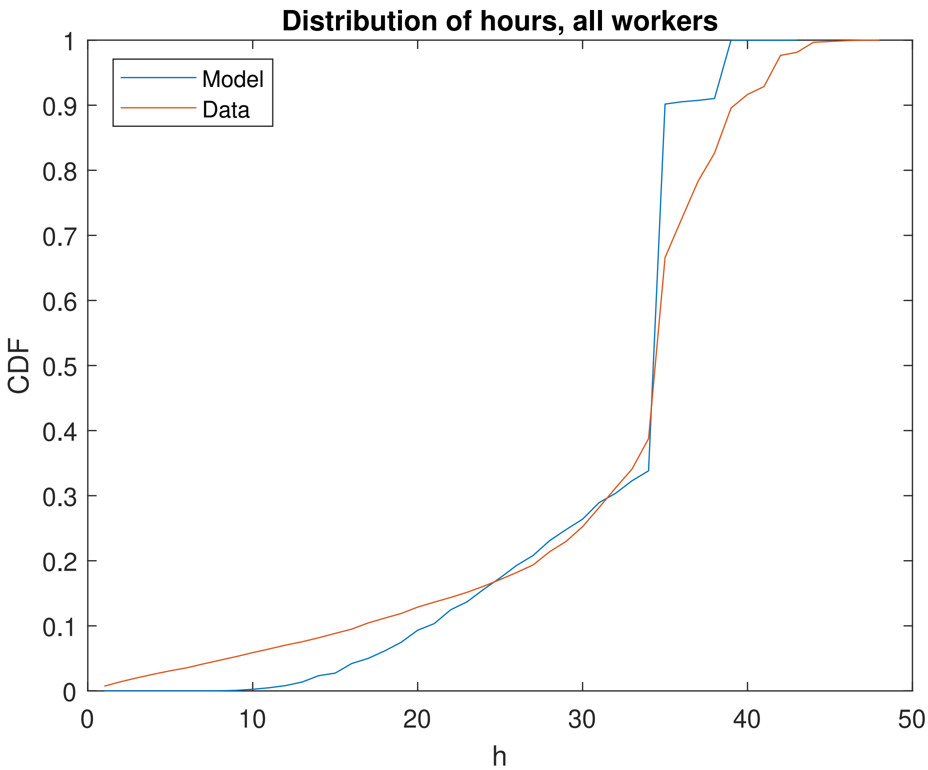


Figure 22: Distribution of hours worked in the data and in the model

Notes: This figure plots the distribution of hours worked in the economy in the data and in the model for estimated values of the structural parameters. Step 3 of the estimation procedure has objective to minimize the difference between these two distributions.

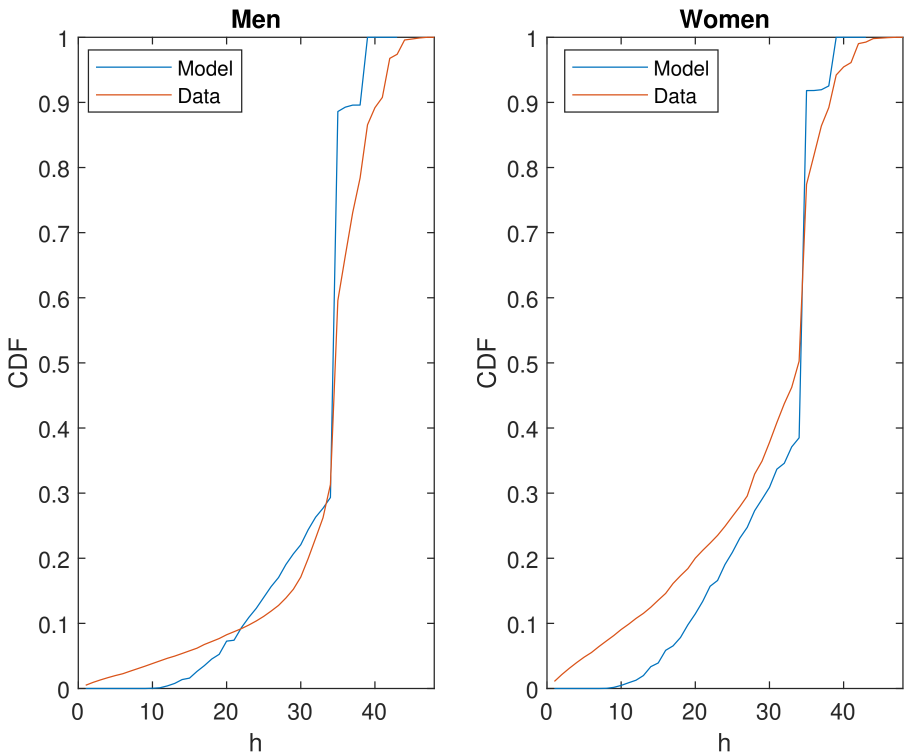


Figure 23: Distribution of hours worked in the data and in the model for men and women

Notes: This figure plots the distribution of hours worked in the economy in the data and in the model, by gender, for estimated values of the structural parameters. In the model, the gender differences are due to different distributions of the disutility parameters (estimated in Step 1).

TABLES

	$h < 24$	$h \geq 24$
1. Demographics		
Age less than 27	0.30	0.24
Age 27-49	0.46	0.55
Age more than 50	0.24	0.21
Women	0.58	0.39
2. Industry composition		
Manufacturing	0.06	0.19
Construction	0.05	0.10
Retail	0.18	0.23
Accommodation and food	0.15	0.09
Other services	0.57	0.39
3. Labor contract		
Hourly wage <1.2 x Min wage	0.39	0.24
Fixed-term contracts	0.25	0.16
4. Aggregated occupations		
Managers	0.14	0.18
Technicians and professionals	0.14	0.17
White collars (low-skilled)	0.42	0.33
Blue collars	0.31	0.32
5. Most frequent occupations with $h < 24$		
Janitors	0.15	0.02
Kitchen help	0.04	0.01
Waiters	0.03	0.01
Secretaries	0.03	0.03
Sport trainers	0.02	0.00

Table 1: Summary statistics at the job level in 2013

Notes: This stable shows how jobs below 24h/wk and jobs with at least 24h/wk are distributed along a set of characteristics. 2013 is the last year before implementation of the policy. The table shows statistics for jobs in the private sector. For example, among jobs with less than 24h/wk, 58% of the workers are women, while this share is equal to 39% for jobs with at least 24h of work.

		All	Acc & food	Construction	Manufacturing	Other services	Retail
Number of workers	Mean	46.93	25.45	26.53	70.69	53.29	43.40
Share of part time jobs	Mean	0.33	0.41	0.49	0.24	0.31	0.27
Hours per week per worker	Mean	33.72	31.78	33.43	34.94	33.43	34.12
Share of permanent jobs	Mean	0.85	0.68	0.89	0.89	0.84	0.84
GAP	Mean	2.01	4.25	1.02	0.98	2.78	1.58
Share24	Mean	0.12	0.22	0.08	0.07	0.15	0.11
	SD	0.15	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	0.01	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	0.43	0.63	0.25	0.24	0.63	0.33
Number of firms		186,566	16,859	31,335	32,622	60,624	45,126

Table 2: Summary statistics of firm-level characteristics in 2013

This table shows some summary statistics of the firms in the benchmark 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 exposure to the policy in the firm: average share of jobs below 24h/wk over 2009-2013. The GAP measures the average increase in hours per week needed to have all jobs above 24h/wk.

	All firms	Acc. & food	Construction	Manuf.	Services	Retail
All Regressors	0.3326	0.2514	0.0850	0.2088	0.4383	0.2015
Firm size	0.3325	0.2513	0.0827	0.2077	0.4382	0.2013
Firm location	0.3280	0.2207	0.0749	0.1995	0.4347	0.1913
Share of women	0.3181	0.2471	0.0849	0.1940	0.4332	0.1822
Share of OEC	0.3314	0.2437	0.0815	0.2061	0.4268	0.1998
Distri. of occupations	0.1117	0.1661	0.0425	0.1089	0.1074	0.1408
Distri. of workers' age	0.3324	0.1941	0.0775	0.1993	0.4249	0.1865

Table 3: Explanatory power of different 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.

	Hires					Separations
	Below 24h	Full-time	Part time $\geq$ 24h	All	Total hours	Sep. rate
A. All workers						
Share24 x After	-0.5052***	0.0661***	-0.0393***	-0.3365***	-0.05327***	-0.0268
	(0.0142)	(0.0113)	(0.0110)	(0.0152)	(0.0502)	(0.2319)
Mean in 2013	1.5688	2.5995	1.21650	5.3843	7531.1300	0.1309
B. Women						
Share24 x After	-0.3636***	0.0078	-0.0182**	-0.3096***	-0.8700***	-0.0069*
	(0.0127)	(0.0083)	(0.0088)	(0.0133)	(0.0527)	(0.0035)
Mean in 2013	0.9276	0.9173	0.5651	2.4100	2944,0420	0.1140
C. Men						
Share24 x After	-0.3344***	0.0722***	-0.0154*	-0.2003***	-0.4215***	-0.0173***
	(0.0123)	(0.0099)	(0.0091)	(0.0137)	(0.0538)	(0.0034)
Mean in 2013	0.6411	1.6822	0.6509	2.9742	4587.0880	0.1232
N	374058	374058	374058	374058	374058	374058

Table 4: Difference-in-difference estimates for flows in 2016

Notes: This table shows estimates of β_{2016} when the outcome corresponds to the one described in the first row. Estimation on the balanced panel of firms from which firms smaller than size 5 and firms covered by industry agreements with exceptions are excluded. For the first column for example, the outcome is the inverse hyperbolic sine transformation of the number of hires below 24h in the firm. Panel A presents the results for all flows in the firm. Panels B and C decompose between women and men, respectively.

Parameter	Definition	Strategy
β	discount rate	Calibrated
μ	job destruction rate	Calibrated
δ	firms exit rate	Calibrated
m_1	elasticity of matching function	Externally chosen
c_0	scale parameter of vacancy cost function	Normalized
γ	worker's bargaining power	Externally chosen
N_f	number of firms	Calibrated
$\frac{u^1}{u^1+u^2}$	share of type-1 among unemployment	Calibrated
parameters of $G^i(.)$	distribution of disutility parameters, for $i = 1, 2$	Estimated in step 1
y_{shape} and y_{scale}	distribution of y, firms productivity	Estimated in step 2
z_{max}, z_1 and z_2	distribution of z, number of productive hours	Estimated in step 2
τ	cost for hours above 35	Estimated in step 2
α	elasticity of production function	Estimated in step 2
W_u^1	value of unemployment, type-1	Estimated in step 3
c_1	elasticity of the vacancy cost function	Estimated in step 3
m_0	scale parameter of matching function	Estimated in step 3
b	consumption as unemployed	Estimated in step 3

Table 5: Definition of parameters and estimation strategy

This table presents all parameters of the structural model in the pre-reform. The last column indicates whether the parameter is externally chosen, calibrated or estimated and at which step is the estimation. I assume that $z \sim \mathcal{U}[z_1 y + z_2 y^2; z_{max}]$. y is drawn in a Gamma distribution.

Men		Women	
ϵ	probability	ϵ	probability
1.4785	0.0666	1.4924	0.0679
1.4998	0.0979	1.5186	0.1117
1.5211	0.1154	1.5441	0.1624
1.5417	0.1544	1.5696	0.1754
1.5624	0.1559	1.5950	0.1779
1.5840	0.1479	1.6205	0.1336
1.6044	0.1158	1.6457	0.0793
1.6253	0.0735	1.6735	0.0434
1.6460	0.0453	1.6986	0.0313
1.6671	0.0272	1.7240	0.0171

Table 6: Estimated discrete distributions of ϵ for men and women

Notes: This table presents the results for the estimation of two discrete distributions of ϵ, the disutility parameter, for men and women. These are the results of the Step 1 estimation process. Estimation by the method of moments. Average value of ϵ for women is equal to 1.58 and for men it is 1.56.

Parameter	Definition	Estimation
A. Technology parameters (estimated in Step 2)		
α	elasticity of production function	0.9883
z_1	distribution of z	3.4131
z_2	distribution of z	0.0474
y_{shape}	productivity distribution	13.9216
y_{scale}	productivity distribution	1.0379
τ	cost for hours above 35	7.4206
z_{max}	distribution of z	39
B. Remaining parameters (estimated in Step 3)		
c_1	elasticity of cost function	16.7615
W_u^1	expected value of unemployment, $i = 1$	150.5524
m_0	scale of matching function	0.3412
b	instantaneous utility of unemployed	-50.0500

Table 7: Parameters estimated from job ads and the distribution of hours worked

Notes: Panel (A) of this table presents the estimated structural parameters on the firm side (technology parameters and productivity). Estimated by maximum likelihood in the Step 2 of the estimation process. z_1 and z_2 are parameters determining the relationship between the productivity of the firm and the distribution of the maximum number of productive hours, z. I assume that $z \sim \mathcal{U}[z_1 y + z_2 y^2; z_{max}]$. Panel (B) presents the estimated structural parameters that determine the firm size distribution in the economy. Estimated by Generalized Method of Moments in the Step 3 of the estimation process. These parameters are estimated conditional on parameters estimated in Step 1 and Step 2.

	Partial equilibrium			General equilibrium		
	Men	Women	All	Men	Women	All
Number of jobs	-0.87	-1.35	-1.10	-0.80	-1.26	-1.02
Number of jobs < 24h/wk	-48.89	-44.70	-46.38	-48.90	-44.79	-46.44
Number of part time above 24h/wk	26.61	29.35	28.17	26.72	29.32	28.20
Number of full-time jobs	0.09	-0.09	0.01	0.16	0.07	0.12
Total hours worked	-0.10	-0.10	-0.10	-0.03	0.00	-0.01
Unemployment rate	7.99	13.28	10.20	7.35	12.21	9.44

Table 8: Employment effects in partial and general equilibrium (% changes)

Notes: This table presents the % variations in aggregate endogenous variables in the model after implementation of the policy shock. 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, 1.02% of all jobs are destroyed in the long run compared to the pre-reform steady state.

	% Δ	% Δ(Production - c_j)	% Δ (Production - $\sum_{i=1}^{j} c_i$)
Production	4.2671	-	-
Aggregate costs c_j:			
Hiring costs	-0.3353	4.3661	4.3661
Cost due to full-time regulation	0.0782	4.6732	4.7916
Unemployment cost	9.5276	3.1174	3.5973
Cost due to the 24h-rule	-	0.8915	-1.1490
Total net output	**-1.1490**	-	-

Table 9: 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 line in first column. The last columns shows variations in total production net of all costs indicated in all lines up to current line in the first column. As an example, the total red tape costs associated with jobs with workweeks above 35h have increase by 0.08%, the market production net of these costs has increased by 4.67% and the market production net of these costs and hiring costs has increased by 4.79%.

	Men	Women	Gender gap
Unemployed	0.59	0.62	-0.19
Employed	0.53	0.76	-3.78
Weighted average	0.01	-0.19	3.05

Table 10: Welfare effects of the reform (% changes)

Notes: This table presents the % variations in average welfare for employed and unemployed workers. The first two columns present the results for men and women, respectively. The third column shows % changes in the gender gap in welfare between men and women. For example, the average welfare of employed men has increased by 0.53% and the gender gap in welfare has increased by 3.05%.

Appendices

A Details about the 24h-reform

A.1 Exceptions to the minimum workweek in collective industry agreements

From 2014 to 2017, 40 industries signed collective agreements with different minimum workweeks than 24h/wk. 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 in order to create this new law. As a result, 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 results, reforms related to 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. 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.

B Additional descriptive statistics

	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	0.55	0.45	0.54
Age more than 50	0.24	0.21	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	0.22
Accommodation and food	0.15	0.09	0.16	0.09
Other services	0.57	0.39	0.57	0.41
3. Labor contract				
Hourly wage $<$1.2 x Min wage	0.39	0.24	0.41	0.23
Fixed-term contracts	0.25	0.16	0.39	0.21
4. Occupations				
Managers	0.14	0.18	0.11	0.20
Technicians and professionals	0.14	0.17	0.15	0.17
White collars (low-skilled)	0.42	0.33	0.43	0.33
Blue collars	0.31	0.32	0.31	0.29
5. Most frequent occupations with $h < 24$				
Janitors	0.15	0.02	0.17	0.02
Kitchen help	0.04	0.01	0.04	0.01
Waiters	0.03	0.01	0.03	0.01
Secretaries	0.03	0.03	0.03	0.02
Sport trainers	0.02	0.00	0.03	0.00

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

Notes: This stable shows how jobs below 24h/wk and jobs with at least 24h/wk 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	0.48	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	0.53	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	0.21

Table B.2: Family situation of workers employed more of less than 24h/wk

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 B decompose between men and women. Variables 'Maried', 'Have kids' and 'Have kids younger than 6' are average shares. These statistics are computed from the Labor Force Sruvey. Observations are weighted thanks to the weights provided by INSEE.

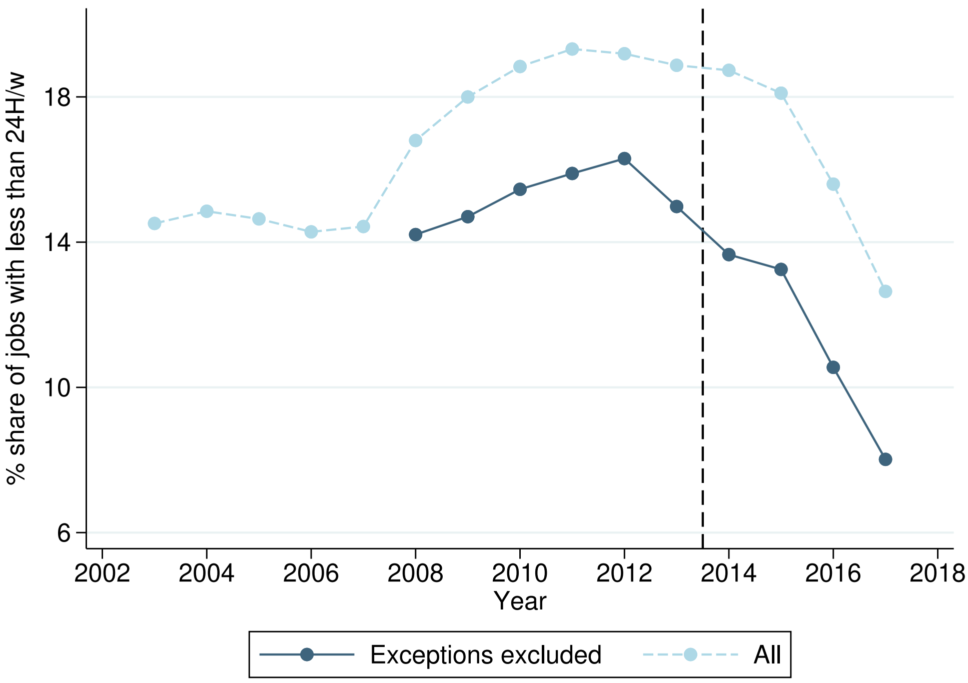


Figure B.1: Evolution of share of jobs below 24h/wk

Notes: This figure plots, for each year, the share of jobs (in the stock) with an average workweek smaller than 24h/wk among all jobs. Computed from the linked employer-employee data (DADS Postes). Private sector only. Jobs for workers from 25 to 55 years old. In dark blue, jobs covered by industry agreements with exceptions to the 24h-rule are excluded. Each job is weighted by the number of days of the job spell in the year.

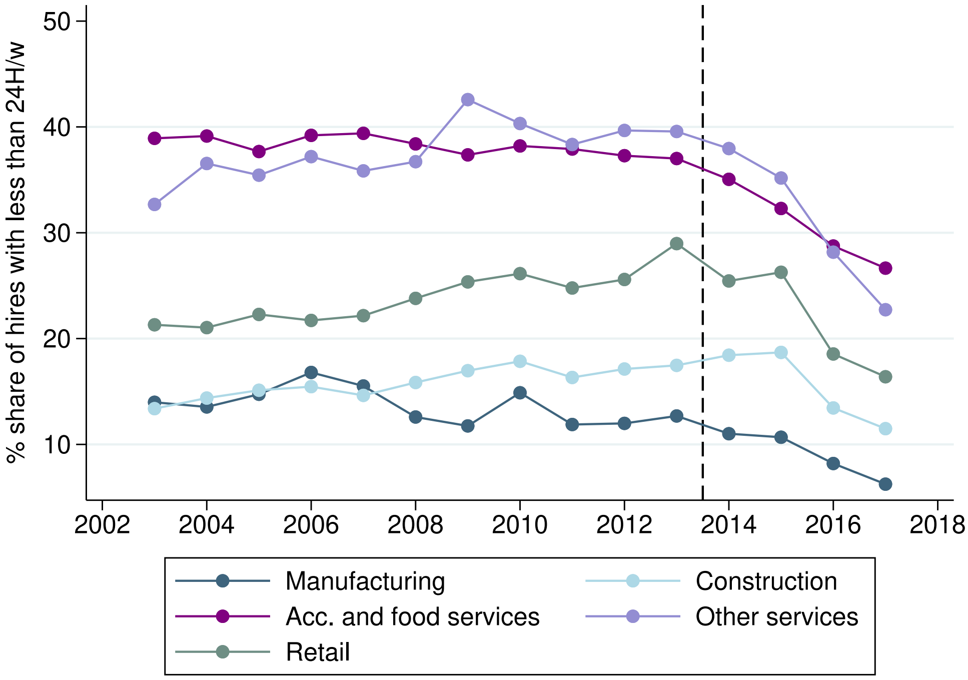


Figure B.2: Evolution of share of hires for jobs below 24h/wk by industry

Notes: This figure plots, for each year, the share of new hires for jobs with an average workweek smaller than 24h/wk among all new hires in the industry. Computed from the linked employer-employee data (DADS Postes). Private sector only. Hiring of workers from 25 to 55 years old.

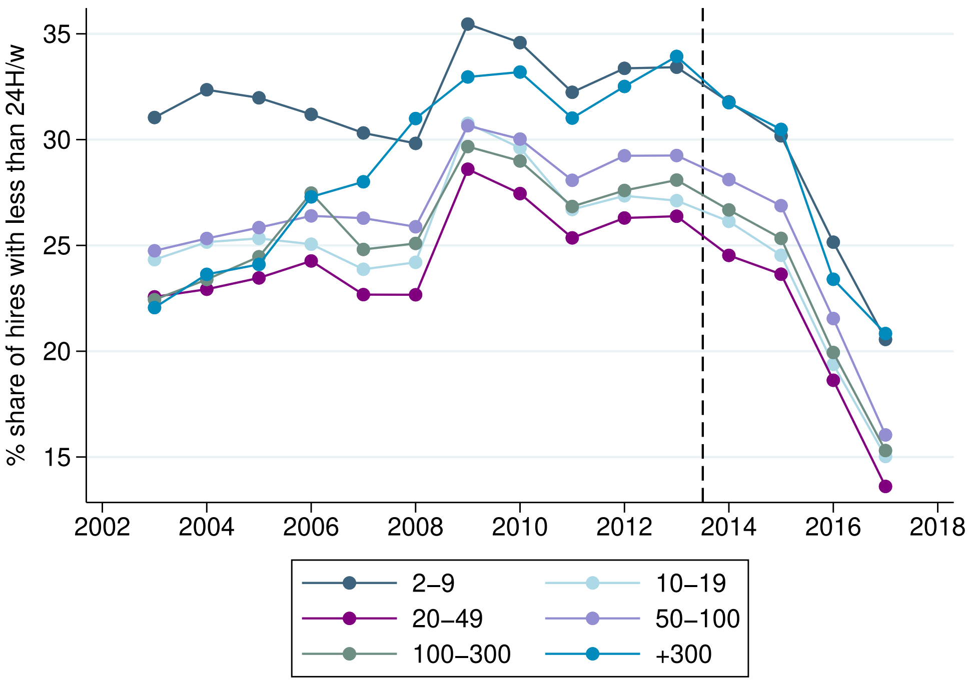


Figure B.3: Evolution of share of hires for jobs below 24h/wk by firm size

Notes: This figure plots, for each year, the share of new hires for jobs with an average workweek smaller than 24h/wk among all new hires in the firm size group. Computed from the linked-employer-employee data (DADS Postes). Private sector only. Hiring of workers from 25 to 55 years old.

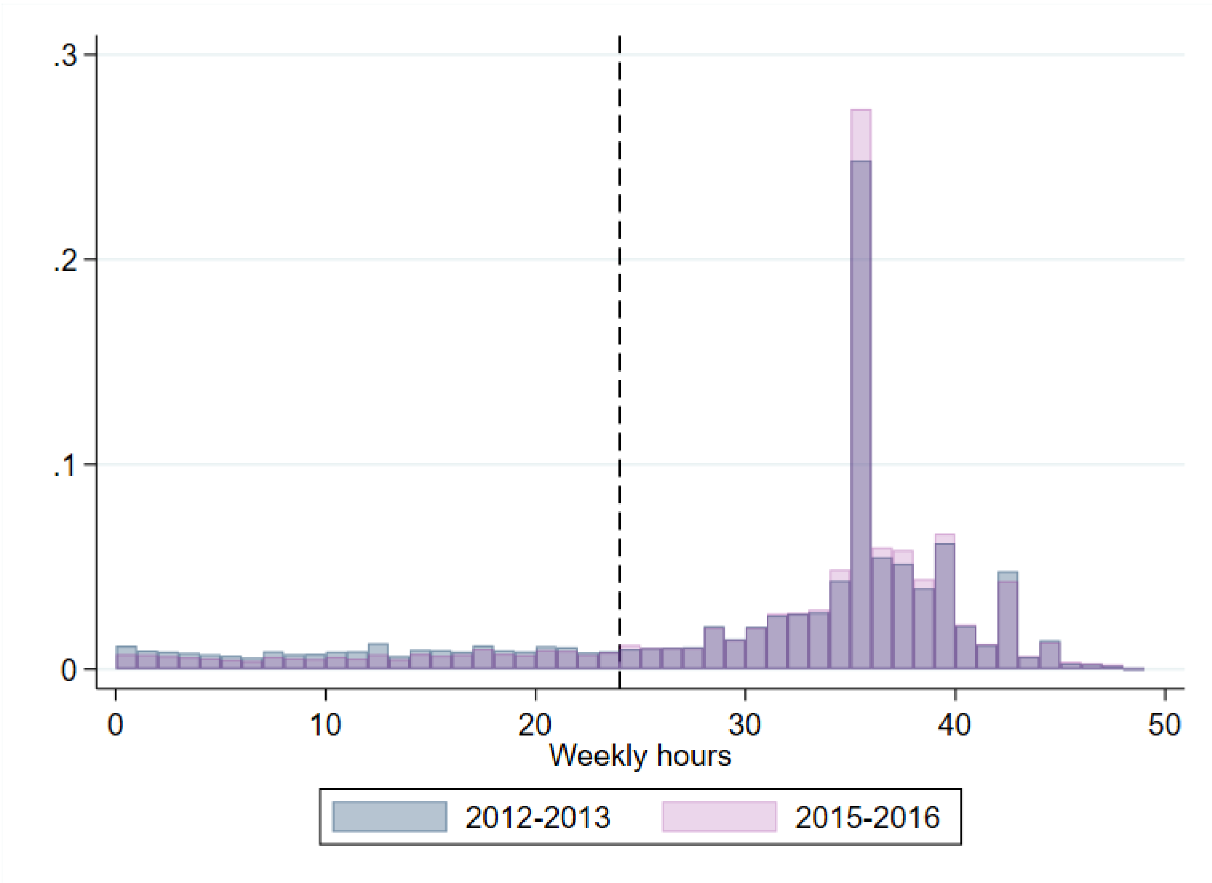


Figure B.4: Distribution of hours worked in France (2012-2013) and (2015-2016)

Notes: This figure plots the distribution of weekly hours worked in the stock of jobs, on average over 2012-2013 and on average over 2015-2016. The average workweek includes both contractual and overtime hours. Computed from the linked-employer-employee data (DADS Postes). Private sector only. Workers between 25 and 55 years old. Industries covered by exceptions to the 24h-rule are excluded. Each job is weighted by the number of days of the job spell in the month. The dashed line shows the 24h cutoff.

C Firm-level effects

C.1 Magnitudes of the effects

	Average change in level	N	Total in level	Total in %
Jobs $<$ 24h	-3.6	186,566	-671,637.6	-51.36
Full-time jobs	1.1	186,566	205,222.6	3.42
Number of jobs	-2.2	186,566	-410,445.2	-4.32
Total hours	-1,935.4	186,566	-361,079,836.4	-2.27

Table C.1: Aggregate variations due to the reform in 2016

Notes: This table presents the back-of-the-envelope results for the effects of the policy in level at the firm level, in the economy, and in % in the economy. 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.

	Women		Men	
	Average change in level	Total in %	Average change in level	Total in %
Jobs below 24h/w	-1.77	-45.50	-1.00	-39.06
Full-time jobs	0.22	2.17	0.75	3.52
Total number of jobs	-1.64	-8.63	-0.49	-1.63
Total number of hours	-2430.50	-8.25	-402.10	-0.75

Table C.2: Aggregate variations due to the reform in 2016 by gender

Notes: This table presents the back-of-the-envelope results for the effects of the policy in level at the firm level and in % in the economy, separately for men and women. 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.

C.2 Additional outcomes

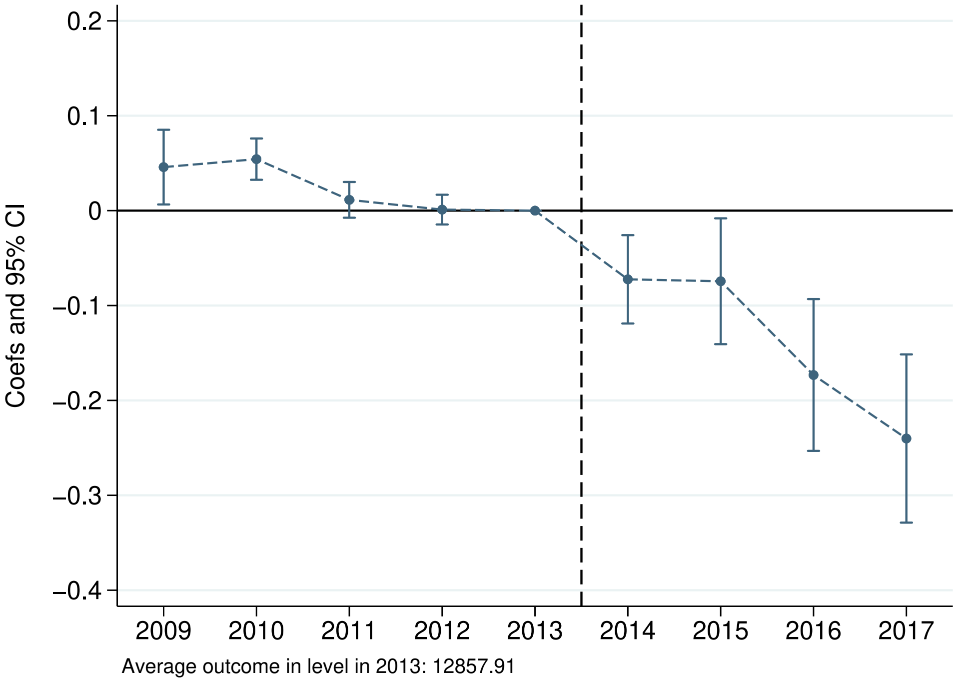


Figure C.1: Total sales in the firm

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 clustered at the firm level). The outcome variable is the inverse hyperbolic sine transformation of total sales in the firm, for each year. 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.

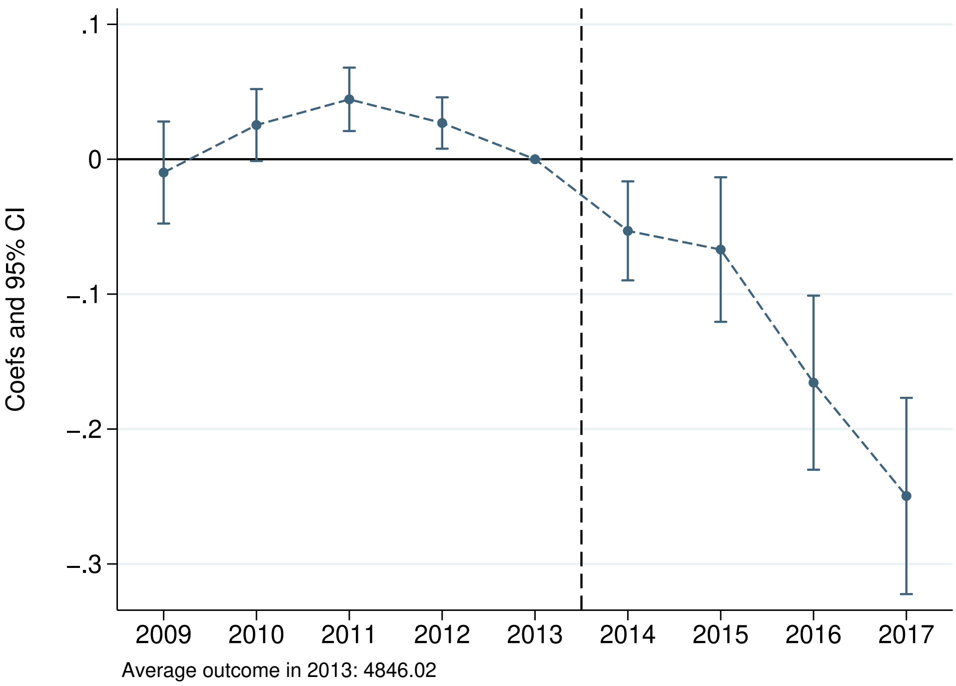


Figure C.2: Capital stock in the firm

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 clustered at the firm level). The outcome variable is the inverse hyperbolic sine transformation of the stock of capital in the firm, for each year. 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.

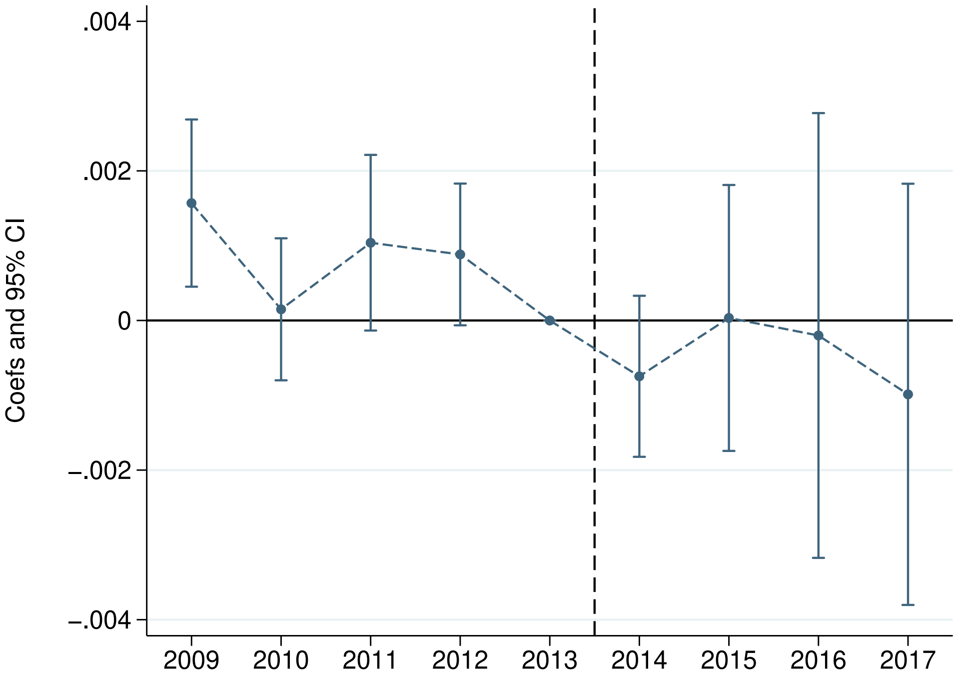


Figure C.3: Capital to labor ratio

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 clustered at the firm level). The outcome variable is the capital to labor stock ratio in the firm, for each year. 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.

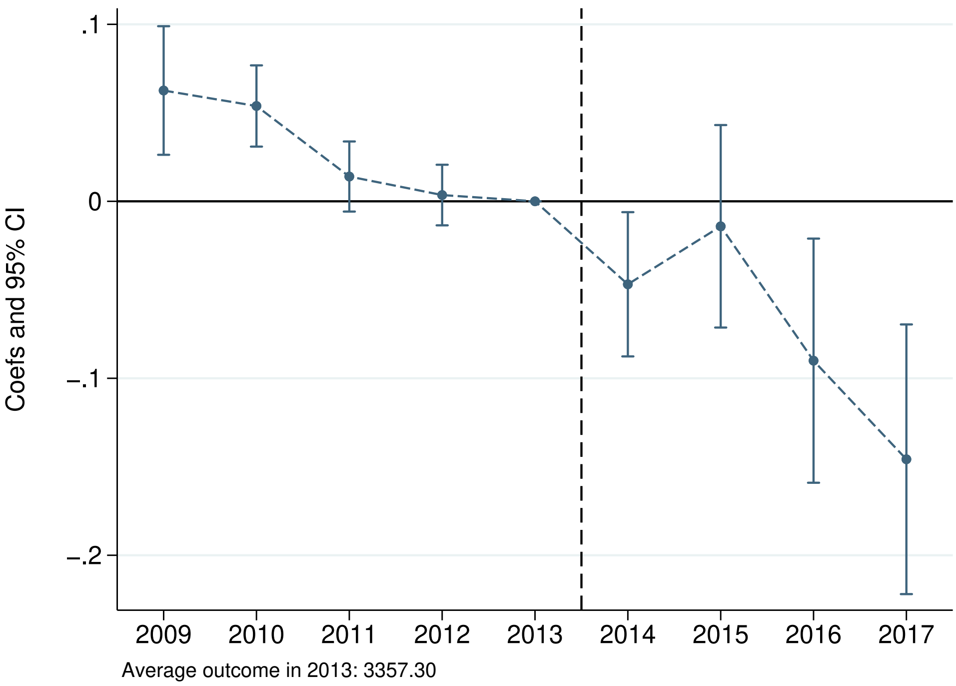


Figure C.4: Purchased services

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 clustered at the firm level). The outcome variable is the inverse hyperbolic sine transformation of purchased services in the firm, for each year. Purchased services include, but are not limited to, outsourced tasks. 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.

C.3 Multiple job holding

Does the policy allow workers previously having several part-time jobs to get access to a unique job with more hours? In order 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 identifies 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 main specification is

$$MJH_{zt} = \alpha_0 + \sum_{\substack{k=-4 \\ k\neq 0}}^{k=4} \beta_k \times Share24_z \times \mathbb{1}_{t=2013+k} + \mu_z + \eta_t + \epsilon_{zt} \tag{23}$$

where MJH_{zt} is the multiple job holding rate in market z in year t. A market z is a commuting zone-industry cell, where industry is at 2-digits. $Share24_z$ is the average share of jobs with less than 24h/wk in market z over 2009-2013. μ_z and η_t are market and year fixed effects, respectively. Figure C.5 presents the estimated parameters. First, the pre-trend 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, as compare 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.

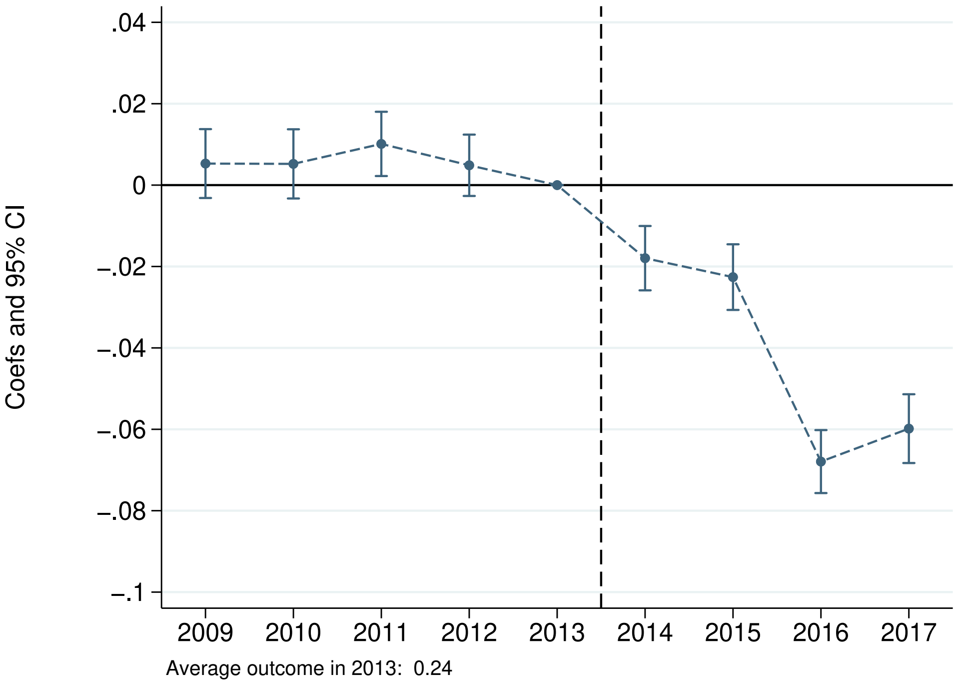
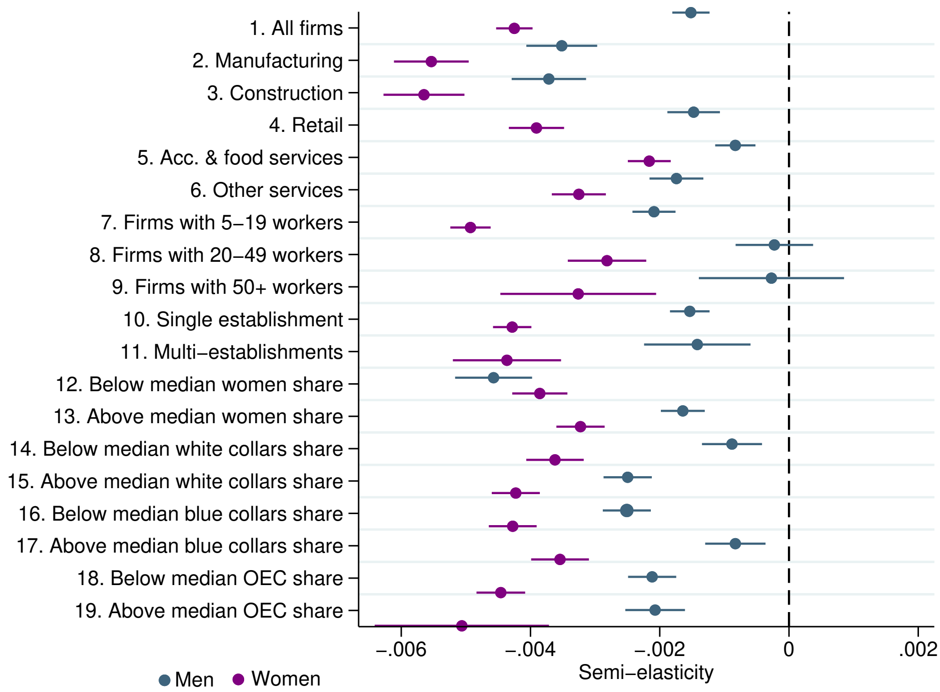


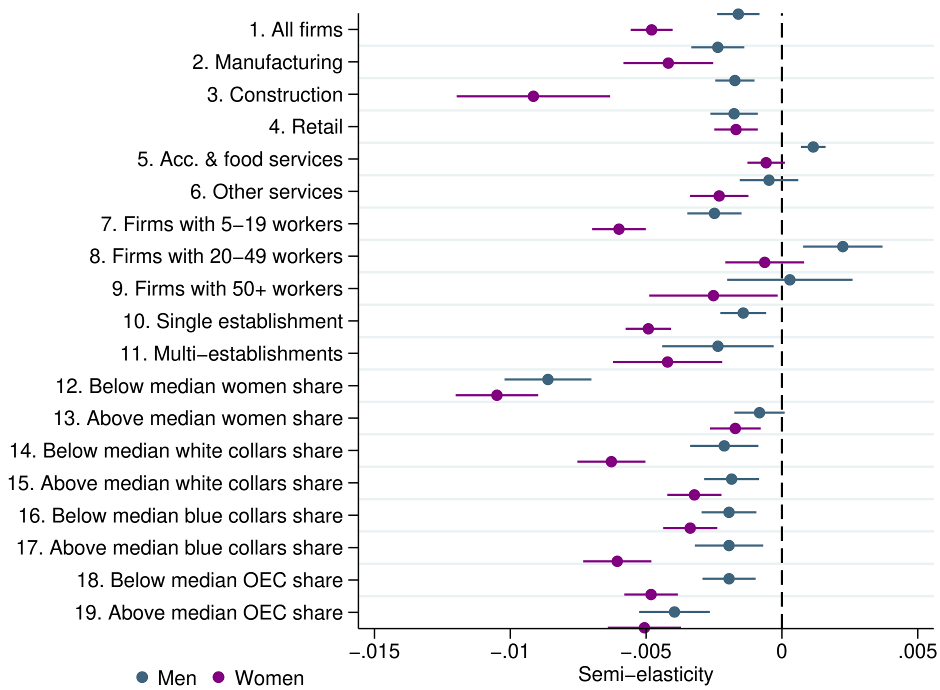
Figure C.5: Multiple job holding rate

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). The outcome is between 0 and 100. Exposure to the policy ($Share24$) is computed at the market level as well. 95% confidence intervals shown.

C.4 Substitutions between men and women



(a) Number of jobs for men and women



(b) Total hours worked by men and women

Figure C.6: Within-firm type heterogeneity, by gender

Notes: These two figures plot estimates of β_{2016} from equation 1 as well as 95% confidence intervals for different subgroups of firms. Each regression has been estimated separately in the corresponding subsample of firms, for men and women. 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. The outcome considered in Figure (a) is the total number of jobs in the firm and the outcome in Figure (b) is the total number of hours worked.

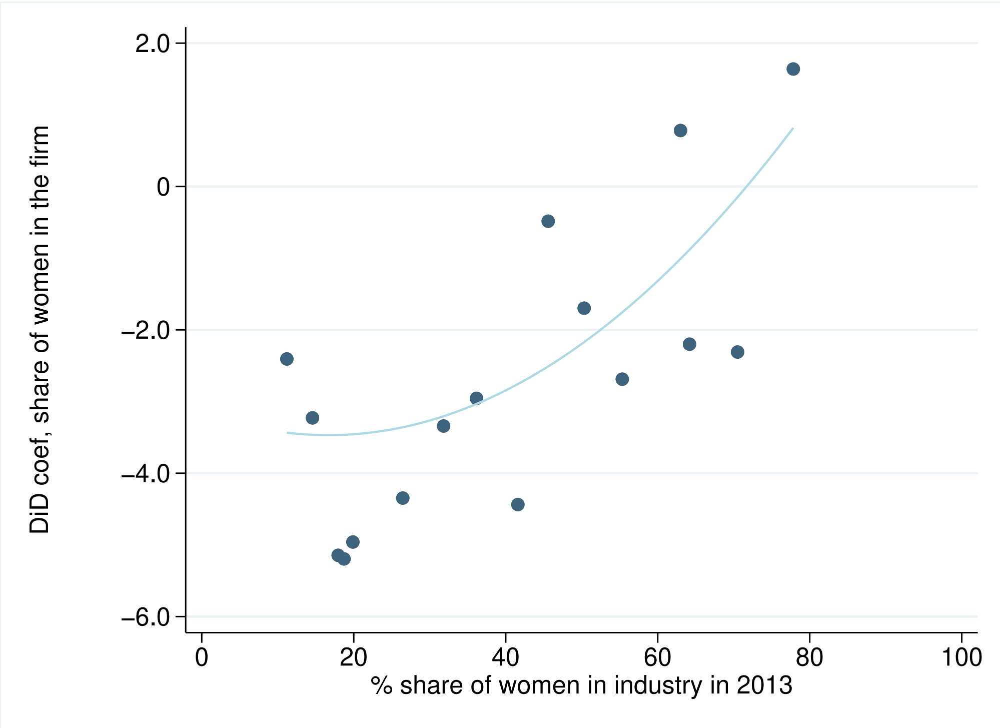
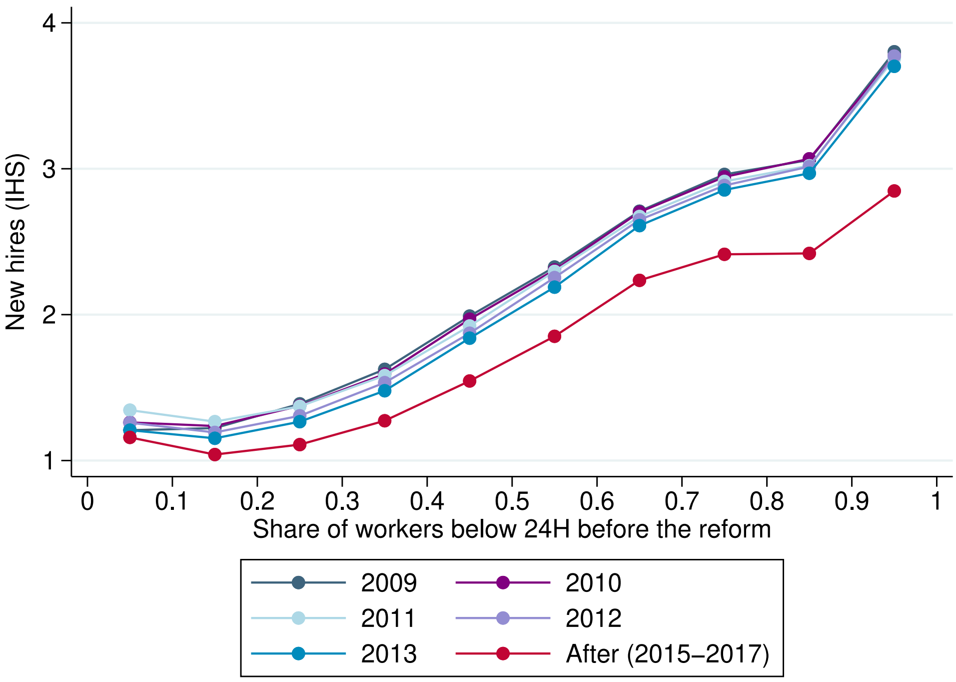


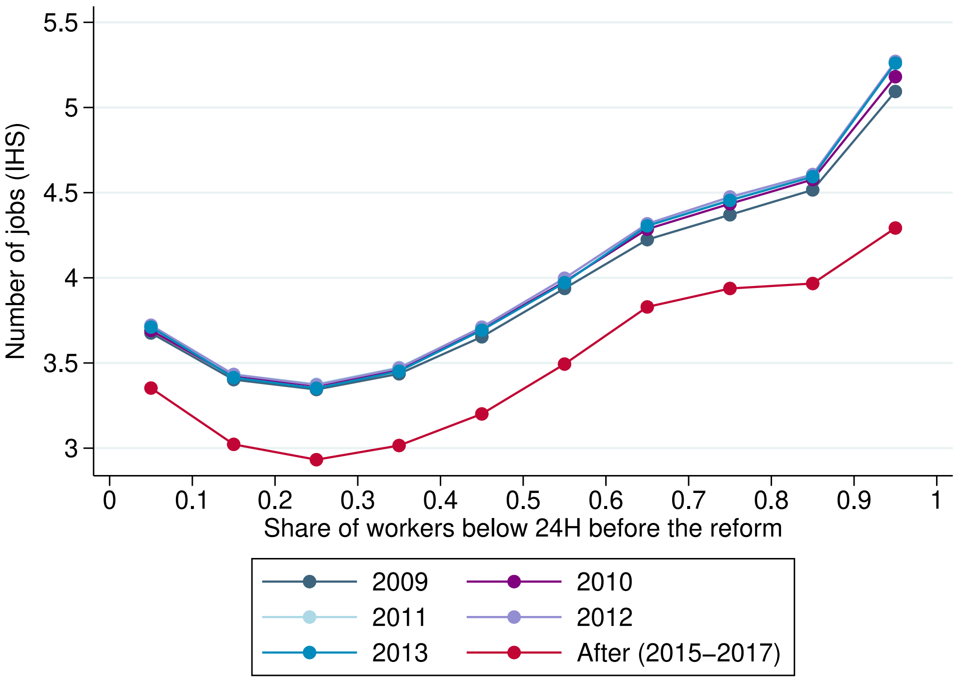
Figure C.7: Correlation between effect on the share of women in the firm and initial share in the industry

Notes: This binscatter plots, for each industry, the difference-in-difference estimate of the effect of the policy when the outcome is the share of women in the firm and the initial share of women in the industry of the firm in 2013. Each regression has been estimated separately by industry. Included firms are the ones from the baseline balanced panel.

C.5 Robustness



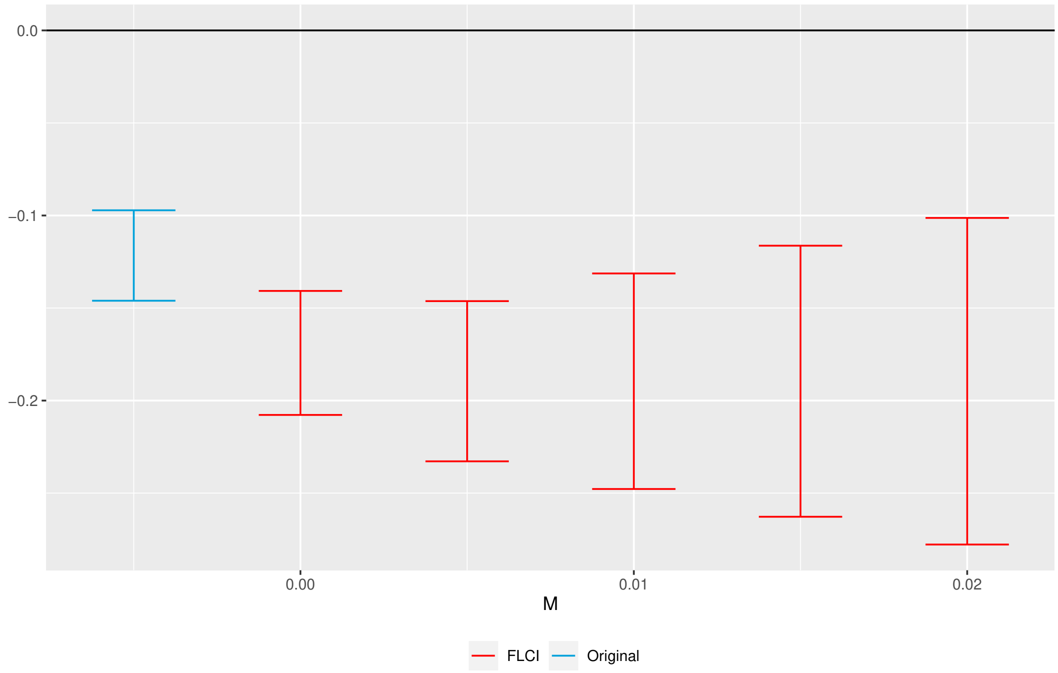
(a) Hires



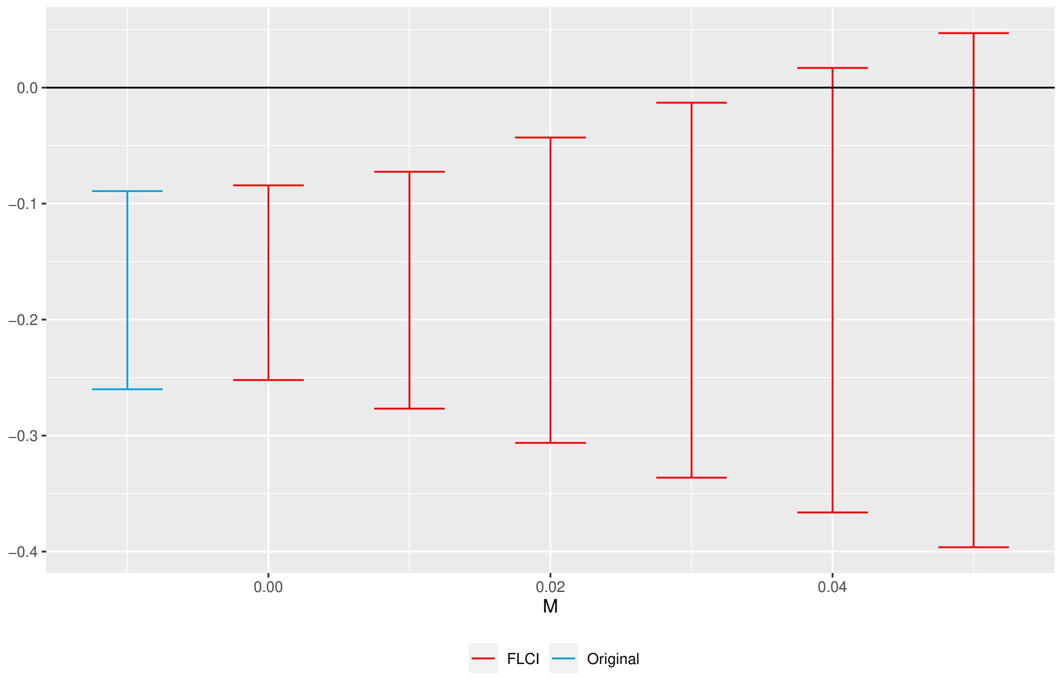
(b) Number of jobs

Figure C.8: Relationship between $Share24$ and outcomes at different dates

Notes: These two figures plot the relationship between exposure to the policy at the firm level ($Share24$) and inverse hyperbolic sine transformations of outcomes. These are computed for all years before the policy (2009 to 2013) and then all years after are averaged together.



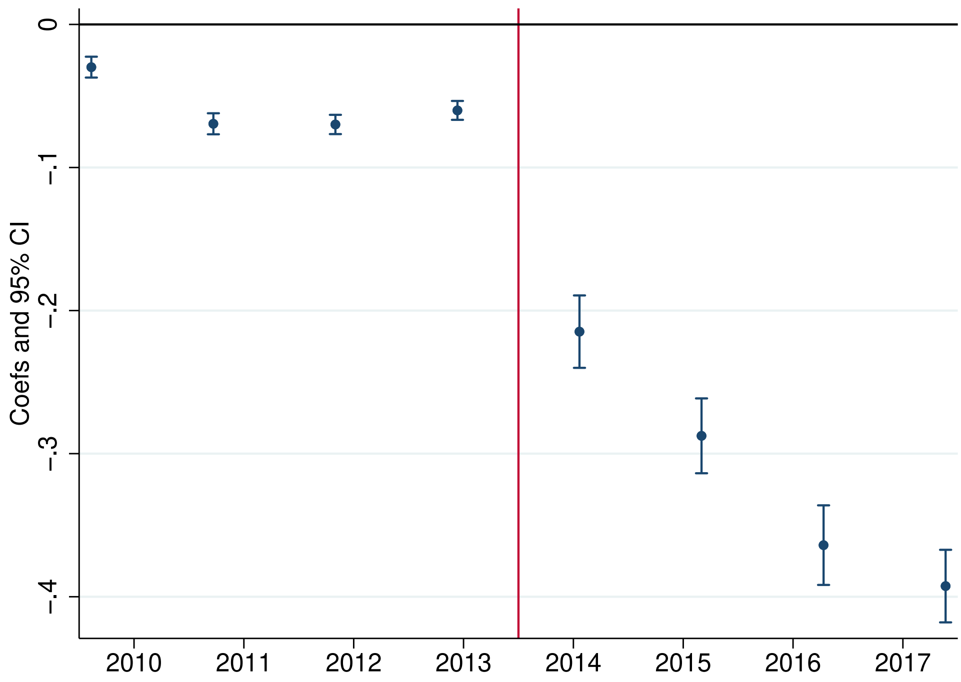
(a) Number of jobs



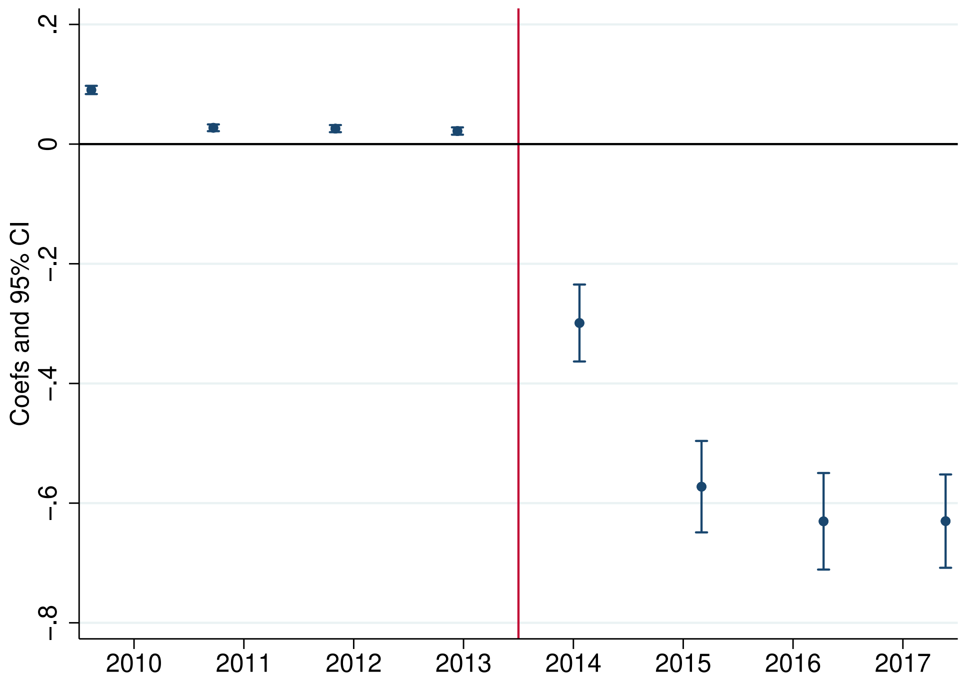
(b) Total hours worked

Figure C.9: Honest pre-trends following (Rambachan & Roch 2022)

Notes: These two figures plot the coefficient β_k from equation 1 for year 2015 (a year after implementation of the reform). It plots alternative confidence intervals that allow for deviations from parallel trend in the pre-reform period, following the procedure in (Rambachan & Roch 2022). 95% confidence intervals are shown.



(a) Number of jobs



(b) Total hours worked

Figure C.10: Difference-in-difference estimates over two-year rolling periods

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.

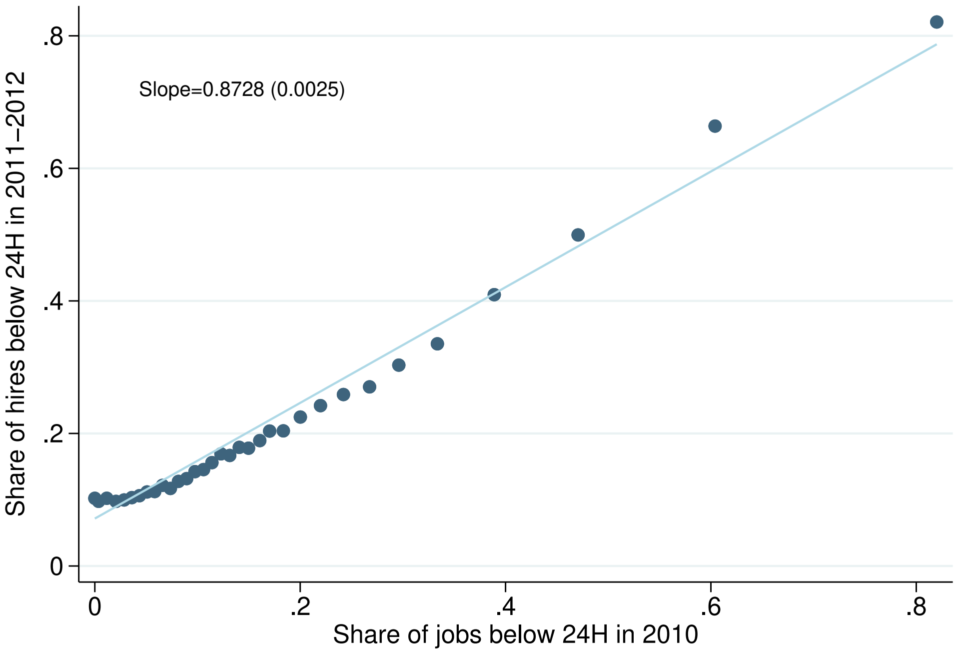
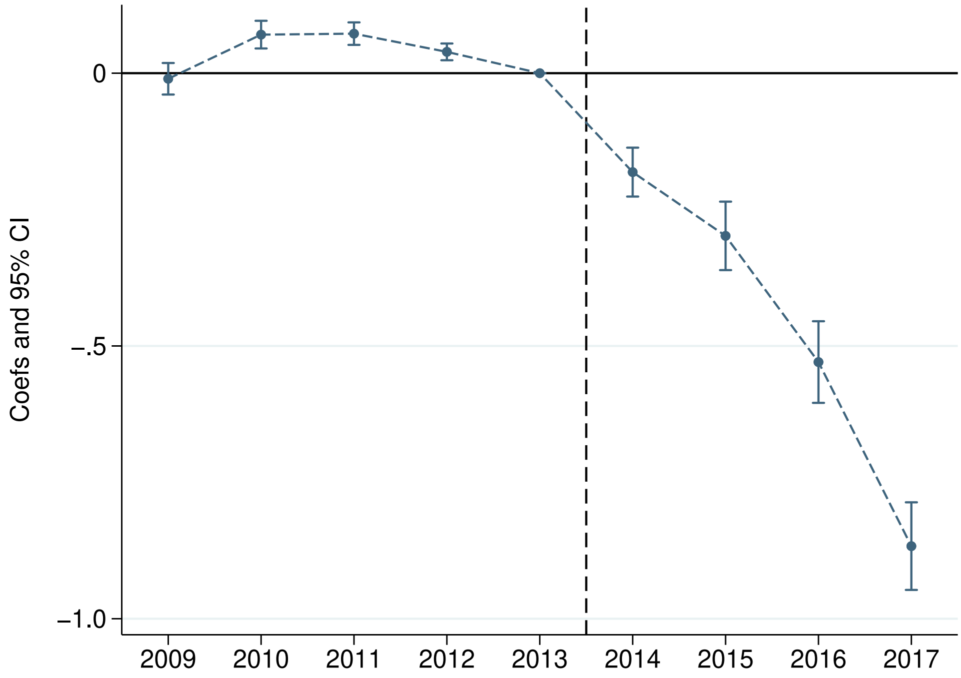
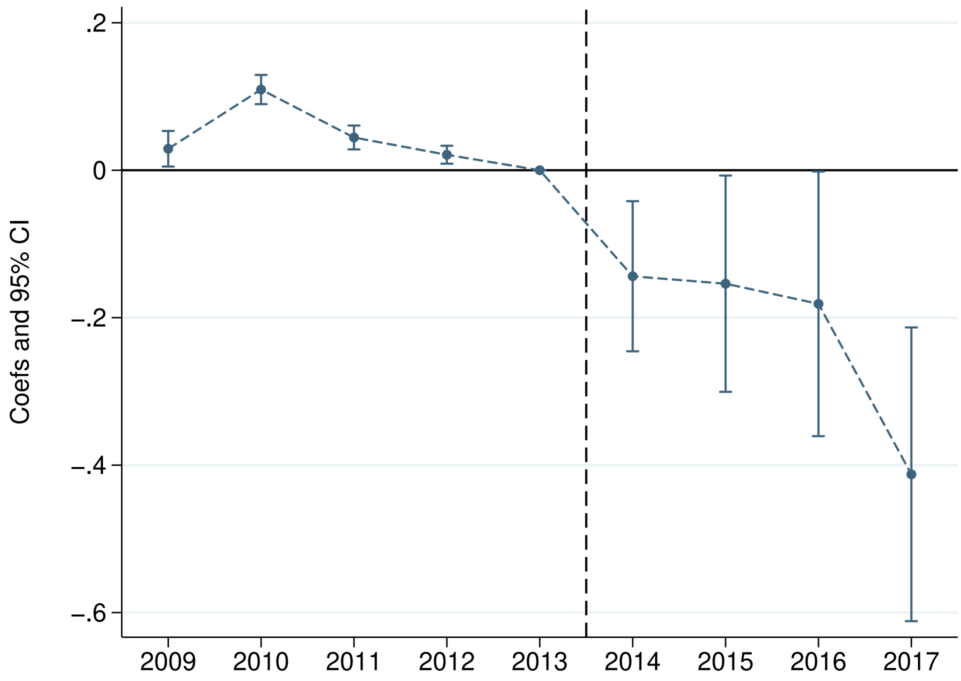


Figure C.11: Correlation between previous share of jobs below 24h/wk and future hires of these jobs

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



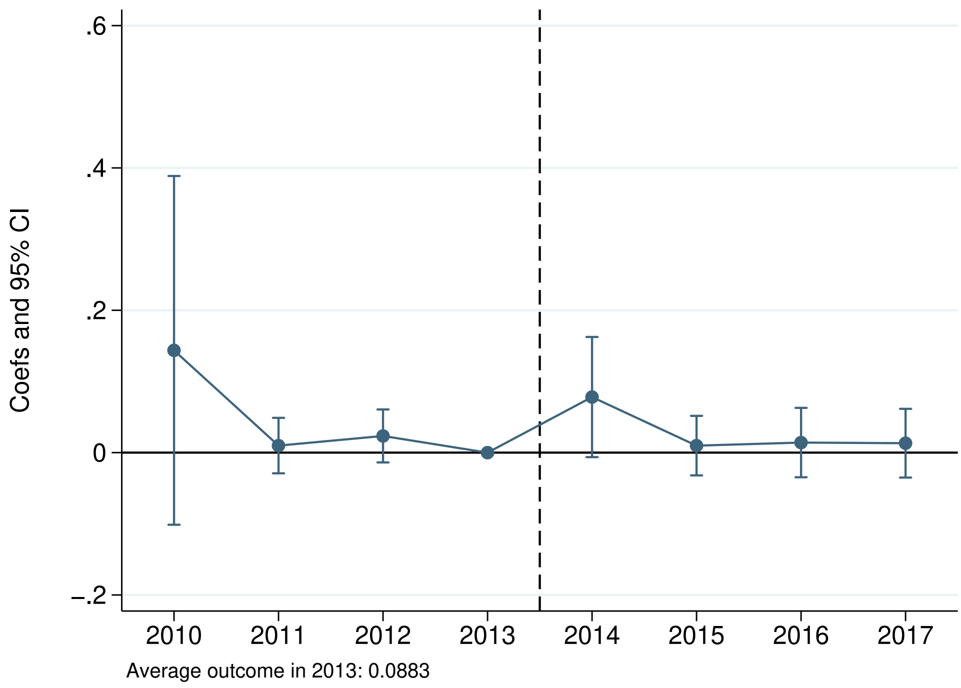
(a) Number of jobs



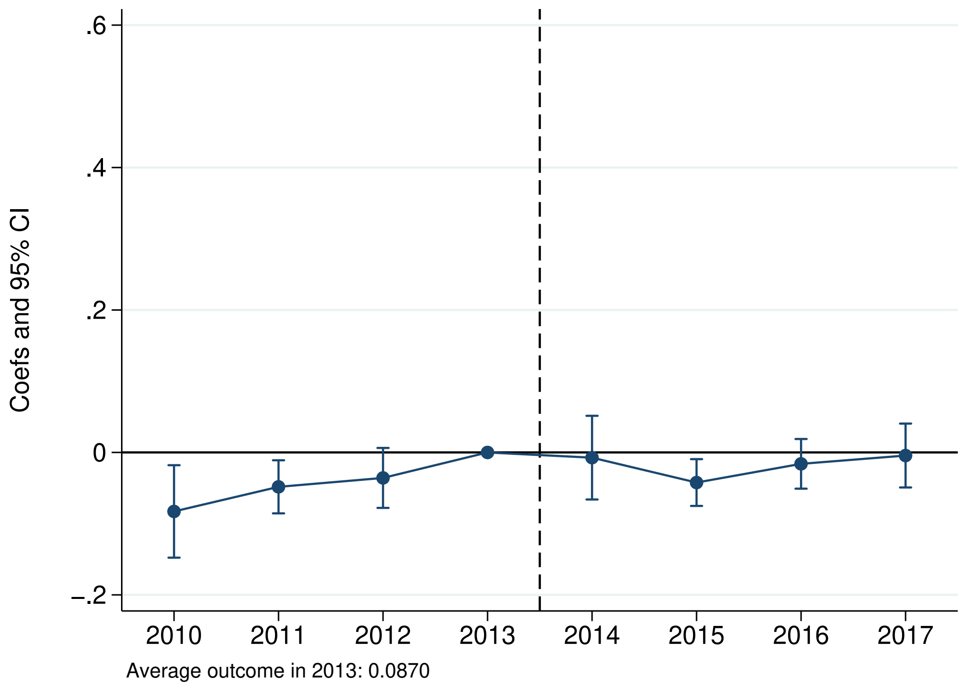
(b) Total hours worked

Figure C.12: Results with GAP-design

Notes: These two figures plot 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 in order to have all jobs with at least 24h/wk, over 2009-2013. Estimated on the baseline balanced panel of firms.



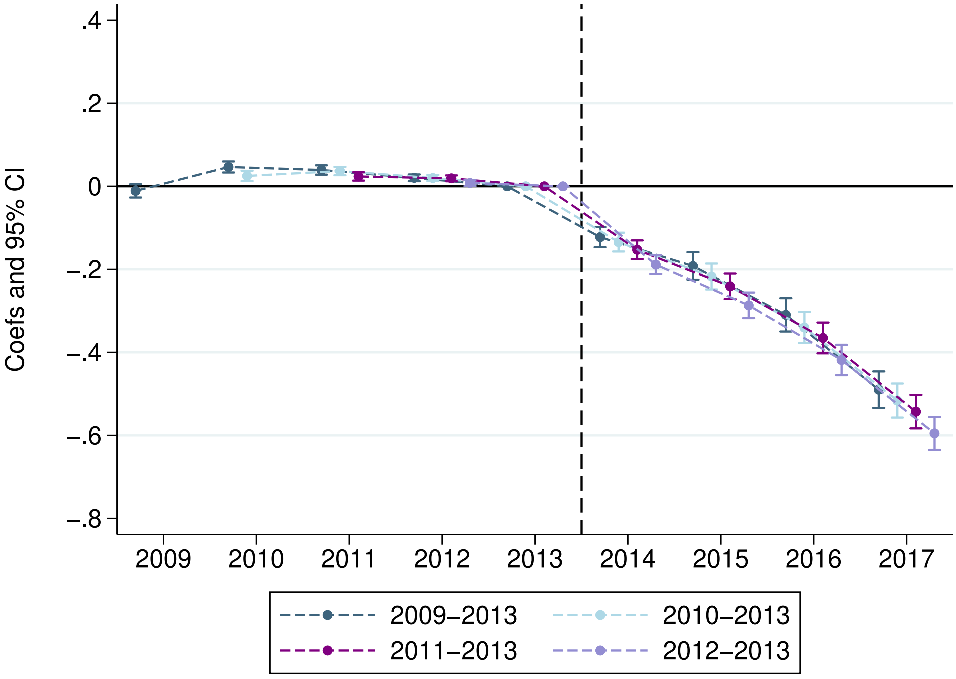
(a) Entry rate



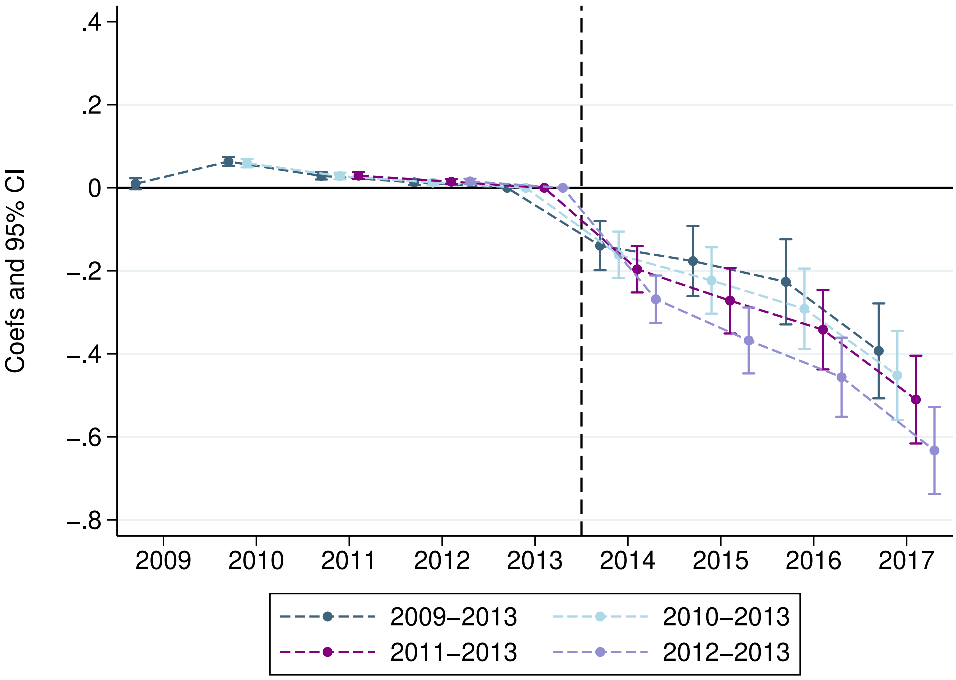
(b) Exit rate

Figure C.13: Firm entry and exit rates at industry level

Notes: These two figures plot 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/wk in the industry over 2009-2013. Outcomes are the entry and exit rates in the corresponding industry. Industries are defined at the 4-digits level.



(a) Number of jobs



(b) Total hours worked

Figure C.14: Results including younger firms in the sample

Notes: These two figures plot estimates of β_k in equation 1 and 95% confidence intervals. Each line in the figure connects estimates on different samples. 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 estimated from 2010 to 2017 also include firms that were created in 2010.

D Aggregate effects

D.1 Pre-reform structural model

D.1.1 Hours and productivity

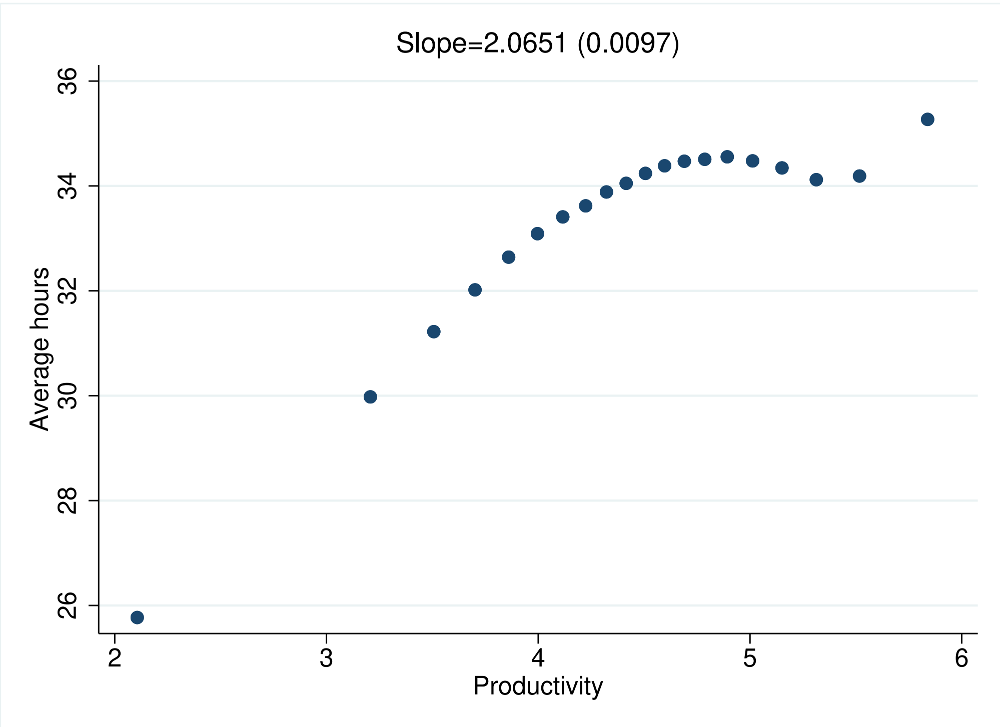


Figure D.1: Correlation between average hours and productivity at the firm level

Notes: This figure plots a firm-level binscatter. On the y-axis is the average workweek per worker in the firm in 2012. The x-axis corresponds to the logarithm of the total value added divided by the total number of hours in 2012. Firms smaller than 5 workers are excluded. The slope corresponds to the OLS estimate when average hours are regressed on productivity. The standard error is in parentheses.

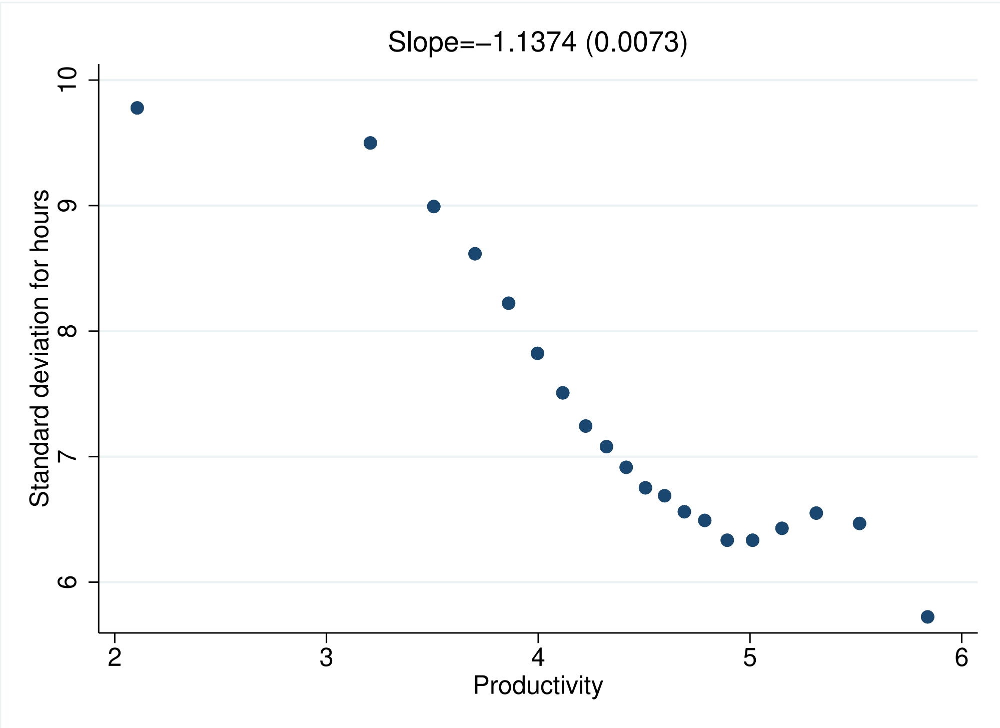


Figure D.2: Correlation between dispersion in hours and productivity at the firm level

Notes: This figure plots a firm-level binscatter. On the y-axis is the standard deviation of the workweek per worker in the firm in 2012. The x-axis corresponds to the logarithm of the total value added divided by the total number of hours in 2012. Firms smaller than 5 workers are excluded. The slope corresponds to the OLS estimate when the standard deviation of hours is regressed on productivity. The standard error is in parentheses.

D.1.2 Surplus of a job

Combining equations 6 and 7, we can deduce the surplus of a job for which i, y ϵ and z are observed.

$$S^i(y,\epsilon,z) = \frac{1}{1-\beta(1-\sigma)}[y\min(h^\alpha, z^\alpha) - \Phi(h,\epsilon) - (1-\beta)W_u^i] \tag{24}$$

D.1.3 Nash bargaining

Problem 10 can be rewritten using equations 6 and 7

$$\max_{h,\ w} \left(\frac{wh - \Phi(h,\epsilon) - (1-\beta)W_u^i}{1-\beta(1-\sigma)}\right)^\gamma \left(\frac{y\min(h^\alpha, z^\alpha) - wh}{1-\beta(1-\sigma)}\right)^{1-\gamma} \tag{25}$$

Taking the log, we have

$$\max_{h,\ w}\ \gamma\ log\left(\frac{wh - \Phi(h,\epsilon) - (1-\beta)W_u^i}{1-\beta(1-\sigma)}\right) + (1-\gamma)\ log\left(\frac{y\min(h^\alpha, z^\alpha) - wh}{1-\beta(1-\sigma)}\right) \tag{26}$$

The first order condition with respect to w gives

$$\frac{\gamma h}{wh - \Phi(h,\epsilon) - (1-\beta)W_u^i} - \frac{(1-\gamma)h}{y\min(h^\alpha, z^\alpha) - wh} = 0 \tag{27}$$

Using the definition of 6 and 7

$$\frac{\gamma h}{W^i(y,\epsilon,z) - W_u^i} - \frac{(1-\gamma)h}{J^i(y,\epsilon,z)} = 0 \tag{28}$$

Rearranging, we obtain

$$W^i(y,\epsilon,z) - W_u^i = \gamma S^i(y,\epsilon,z) \quad \text{and} \quad J^i(y,\epsilon,z) = (1-\gamma)S^i(y,\epsilon,z) \tag{29}$$

The first order condition for h is

$$\frac{\gamma(w - \Phi_h(h,\epsilon))}{wh - \Phi(h,\epsilon) - (1-\beta)W_u^i} - \frac{(1-\gamma)(w - y\alpha h^{\alpha-1}\mathbb{1}_{h<z})}{y\min(h^\alpha, z^\alpha) - wh} = 0 \tag{30}$$

Using the first order condition on the wage, in 29, we have

$$\Phi_h(h,\epsilon) = y\alpha h^{\alpha-1}\mathbb{1}_{h<z} \tag{31}$$

This condition coincides with the derivative of the surplus, from equation 24, 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

$$h^b = \begin{cases} \Phi_h^{-1}(y\alpha h^{\alpha-1}) & \text{if } \Phi_h^{-1}(y\alpha h^{\alpha-1}) < z \\ z & \text{otherwise.} \end{cases} \tag{32}$$

Hence, $h^b = \min(z, \Phi_h^{-1}(y\alpha h^{\alpha-1}))$. 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.

D.1.4 Individual optimal hours

For 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

$$h_f = \arg\max_h \min(z^\alpha, h^\alpha) - w^b h \tag{33}$$

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

$$\Phi_h(h_w, \epsilon) = w^b \tag{34}$$

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.

D.1.5 Value functions

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

$$W_u^i = b + \beta\theta m(\theta) N_f \int\int \left[\int \left[\text{max}(W^i(y,\epsilon,z), W_u^i)\text{d}H_y(z)\right] \text{d}G^i(\epsilon)\right] \frac{v(y)}{v}\text{d}F(y) + \beta(1-\theta m(\theta))W_u^i \tag{35}$$

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.

The value of opening a marginal vacant job in a firm with productivity y is denoted $V(y)$ and is

$$V(y) = -C'(v(y)) + \beta m(\theta) \sum_{i=M,F} \left[\frac{u^i}{u^M + u^F} \int \left[\int \text{max}(J^i(y,\epsilon,z), V(y))\text{d}H_y(z)\right] \text{d}G^i(\epsilon)\right] + \beta(1-m(\theta))V(y) \tag{36}$$

D.1.6 Firm entry

The expected value of a firm with productivity y is denoted $\Pi(y)$ and equal to

$$\begin{aligned}\Pi(y) = \sum_{t=1}^{\infty} \beta^t (1-\delta)^{t-1} m(\theta) v(y) \Bigg[\frac{u^1}{u^1+u^2} \int\int_{\underline{z}^i(y,\epsilon)} J^1(y,\epsilon,z)\text{d}H_y(z)\text{d}G^1(\epsilon) \\ + \frac{u^2}{u^1+u^2} \int\int_{\underline{z}^i(y)} J^2(y,\epsilon,z)\text{d}H_y(z)\text{d}G^2(\epsilon)\Bigg] \sum_{j=0}^{t} (1-\mu)^j - \sum_{t=0}^{\infty} C(v(y))\beta^t(1-\delta)^t\end{aligned} \tag{37}$$

where μ is the probability that a job is exogenously destroyed and δ the exogenous probability that the firm exits the market. It can be shown that

$$\Pi(y) = \frac{\beta v(y) m(\theta) \sum_{i=1,2} \left[\frac{u^i}{u^1+u^2} \int \int_{\underline{z}^i(y,\epsilon)} J^i(y,h,z) \mathrm{d}H_y(z) \mathrm{d}G^i(\epsilon) \right] - [1-\beta(1-\delta)(1-\mu)] C(v(y))}{[1-\beta(1-\delta)][1-\beta(1-\delta)(1-\mu)](1-\delta)} \tag{38}$$

D.1.7 Labor market outcomes

Unemployment. 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 $u^i \theta m(\theta) N_f (1 - \delta) \int \left[\int [1 - H_y(\underline{z}^i(z,\epsilon))] \mathrm{d}G^i(\epsilon) \right] \frac{v(z)}{v} \mathrm{d}F(y)$. 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

$$u^i = \frac{n^i \sigma}{\sigma + \theta m(\theta) N_f (1-\delta) \int \left[\int [1 - H_y(\underline{z}^i(y,\epsilon))] \mathrm{d}G^i(\epsilon) \right] \frac{v(y)}{v} \mathrm{d}F(y)} \tag{39}$$

where $\int [1 - H_y(\underline{z}^i(y,\epsilon))] \mathrm{d}G^i(\epsilon)$ is the probability that a match is converted into a job offer for a type-y firm and a type-i worker. It is the probability that the surplus of the job is positive. Hence, the unemployment rate is equal to the ratio of the job destruction rate and the sum of the destruction and creation rates.

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 type-y firms, 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

$$\ell^{\tau,i}(y) = v(y) m(\theta) \frac{u^i}{u^M + u^F} \left[\int [1 - H_y(\underline{z}^i(y,\epsilon))] \mathrm{d}G^i(\epsilon) \right] \frac{1 - (1-\mu)^\tau}{\mu} \tag{40}$$

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

$$\ell^i(y) = v(y) m(\theta) \frac{u^i}{u^M + u^F} \left[\int [1 - H_y(\underline{z}^i(y,\epsilon))] \mathrm{d}G^i(\epsilon) \right] \frac{(1-\delta)}{[1 - (1-\mu)(1-\delta)]} \tag{41}$$

Aggregating over all types of firms, we can deduce total employment per type of workers in the economy

$$\ell^i = N_f \int \ell^i(y) \mathrm{d}F(y) \tag{42}$$

And total employment is

$$\ell = \ell^M + \ell^F \tag{43}$$

We can notice that in equilibrium, when $\theta = \frac{v}{u}$, this equation coincides with $N^M + N^F - u^M - u^F$, where u^i is computed in equation 39.

Total hours worked. In a type-y firm, the total number of hours worked by worker type i is the product of average hours per worker and the number of worker of type i in the firm

$$\ell^i(y) \times \int \int_{\underline{z}^i(y,\epsilon)} \frac{h^b(y,z)}{1 - H_y(\underline{z}^i(y,\epsilon))} \mathrm{d}H_y(z)\mathrm{d}G^i(\epsilon) \tag{44}$$

And the total number of hours worked in the economy is

$$N_f \int \sum_{i=M,F} \left[\ell^i(y) \times \int \int_{\underline{z}^i(y)} \frac{h^b(y,z)}{1 - H_y(\underline{z}^i(y,\epsilon))} \mathrm{d}H_y(z)\mathrm{d}G^i(\epsilon)\right] \mathrm{d}F(y) \tag{45}$$

D.2 Post-reform structural model

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

$$S^i_{24}(y,\epsilon,z) = \frac{1}{1 - \beta(1-\sigma)} [y \min(h^\alpha, z^\alpha) - \mathcal{C}(\max(24 - h, 0)) - \Phi(h,\epsilon) - (1-\beta)W^i_u] \tag{46}$$

The surplus sharing rule in equation 11 is unchanged. The bargained number of hours is now

$$h^b_{24} = \arg\max_h \; y \min(h^\alpha, z^\alpha) - \mathcal{C}(\max(24 - h, 0)) - \Phi(h,\epsilon) \tag{47}$$

D.3 Structural estimation

D.3.1 Step 0: calibrated parameters

The number of firms, N_f, the job destruction rate, μ and the firm exit rate, δ, are set to their value in the baseline sample, described in Section 3. The number of firms is equal to 186,566, the job annual separation rate is equal to 0.06 and the firm annual exit rate is 0.17. These flow rates are converted in weekly rates by dividing them by 52.

D.3.2 Step 1: distribution of disutility parameters

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 optimal one. For the others, I take the preferred workweek. The preferred number of hours of work and the hourly wage are first residualized. 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 optimal number of hours. In the model, the optimal number of hours for given hourly wage is defined by

$$\Phi_h(h_w, \epsilon) = w^b \tag{48}$$

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

$$\epsilon h_w^{\epsilon-1} = w^b \tag{49}$$

Hence, for each observation (h˙w,i, w^b˙i), we can numerically deduce $epsilon_i$ using the method of moments. Finally, I compute the distribution in the range between the 1rst and 99th percentile of the obtained ϵ. I discretize the distributions by first creating bins with regular range and then compute the average ϵ for each bin. This process is done separately for men and women.

D.3.3 Step 2: technology parameters

For 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

$$h_f(y, z) = \left\{ h | \max_h y \min(h^\alpha, z^\alpha) - wh - \tau \max(0, h - 35) \right\} \tag{50}$$

It corresponds to

$$h_f(y, z) = \min \left[z, \max(\min[(\frac{y\alpha}{w})^{\frac{1}{1-\alpha}}, 35], (\frac{y\alpha}{w+\tau})^{\frac{1}{1-\alpha}}) \right] \tag{51}$$

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

$$h_f(y) = \tilde{h}(y)[z_{max}(y) - \tilde{h}(y)] + \frac{1}{2}[\tilde{h}(y) - z_{min}(y)]^2 \tag{52}$$

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 $z_{min}(y) = z_1 y + z_2 y^2$.
The distribution of $h_f(y)$ hence depends on the distribution of y.

In order to maximize the likelihood in 18, I proceed as follows numerically:

1. z_{max} is calibrated by taking the maximum number of hours in vacant jobs.
2. For $\Theta_1 = (\alpha, z_1, z_2, \tau)$, I compute the value of y associated with the observed $(h_{f,j}, w_j)$:
   - If $h_{f,j} \neq$35 this value of y is unique
   - If $h_{f,j} = 35$, I determined the range $[\underline{y}_{35}; \bar{y}_{35}]$
3. For $\Theta_2 = (y_{shape}, y_{scale})$, I compute the probability associated with y or with $[\underline{y}_{35}; \bar{y}_{35}]$.
4. I iterate on (2) and (3) in order to maximize the likelihood.

D.3.4 Step 3: estimation of b, m_0, c_1 and W_u^1

In a first step, I estimate c_1 and W_u^1 using the distribution of hours worked. For a type i worker, the distribution of hours is given by

$$P^i(h \leq x) = \frac{\int\int P(h^{b,i}(y,\epsilon) \leq x|y,\epsilon)[1 - H_y(\underline{z}^i(y,\epsilon)]\mathrm{d}G^i(\epsilon)v(y)\mathrm{d}F(y)}{\int\int[1 - H_y(\underline{z}^i(y,\epsilon)]\mathrm{d}G^i(\epsilon)v(y)\mathrm{d}F(y)} \tag{53}$$

In a second step, I pick b and m_0 such that

$$\frac{v}{N \times \theta} = 0.09 \tag{54}$$

and

$$\frac{v}{\theta} = \frac{N \times (\mu(1-\delta)+\delta)}{\mu(1-\delta)+\delta+\theta m(\theta)nf(1-\delta)\int\left[\frac{u^1}{u^1+u^2}\int[1-H_y(\underline{z}^1(y,\epsilon))]\mathrm{d}G^1(\epsilon)+\frac{u^2}{u^1+u^2}\int[1-H_y(\underline{z}^2(y,\epsilon))]\mathrm{d}G^2(\epsilon)\right]\frac{v(y)}{v}\mathrm{d}F(y)} \tag{55}$$

D.3.5 Estimation of the policy parameter

The reduced-form estimation of equation 21 on the baseline sample of firms described in Table 2 gives $\hat{\gamma_1}^{DiD} = 0.23$.
In the structural model, the value of ρ such that $\hat{\gamma_1}^{Model} = 0.23$ is 1.15. It means that having a job with a workweek below 24h/wk generates a cost of 1.15€ per hour difference to 24 for each period. A job with 23h/wk costs 1.15 additional euros per period and another job with 15h/wk costs 10.35 additional euros per period.

D.4 Model robustness

Moment	Model	Data
Share of jobs below 24h for women	0.20	0.25
Share of jobs below 24h for men	0.13	0.10
Share of full-time jobs for women	0.60	0.50
Share of full-time jobs for men	0.69	0.70
Average hours worked by women	30.70	29.30
Average hours worked by men	32.17	33.84
Average number of jobs by firm	45.75	46.93
Average total hours worked by firm	1439	1582

Table D.1: Model fit pre-reform

Notes: This table presents a set of empirical moments computed from the data and theoretical moments computed in the model for estimated values of the structural parameters. These moments have not been targeted for the structural estimation and allow to check the fit of the model before the reform.

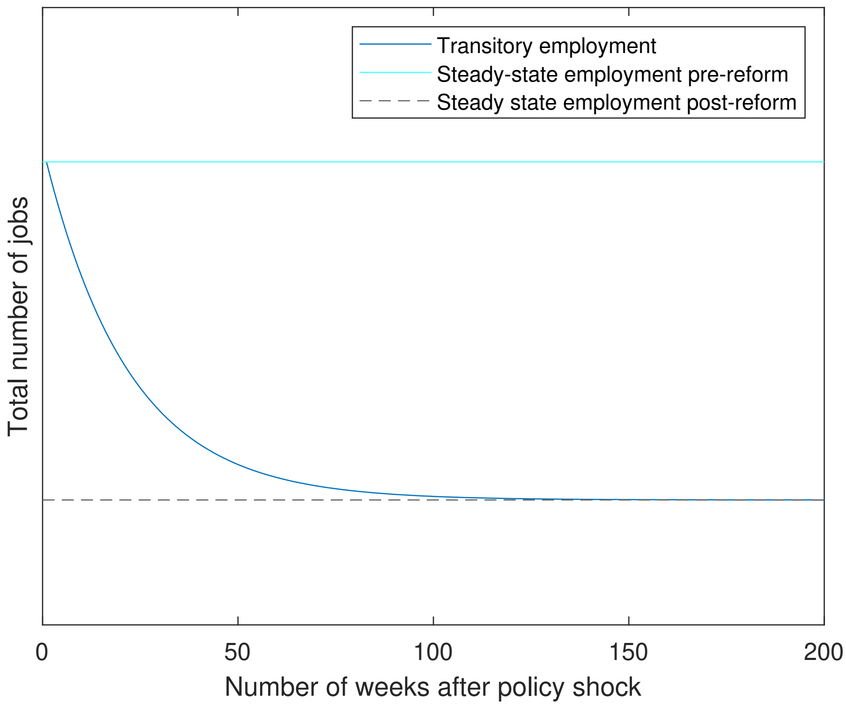


Figure D.3: Transitional dynamics to the new steady-state

Notes: This figure plots the employment level in the model for each period after implementation of the policy. A period is a week. The solid horizontal line shows the employment level before the policy. The horizontal dashed line shows the post-reform employment level.

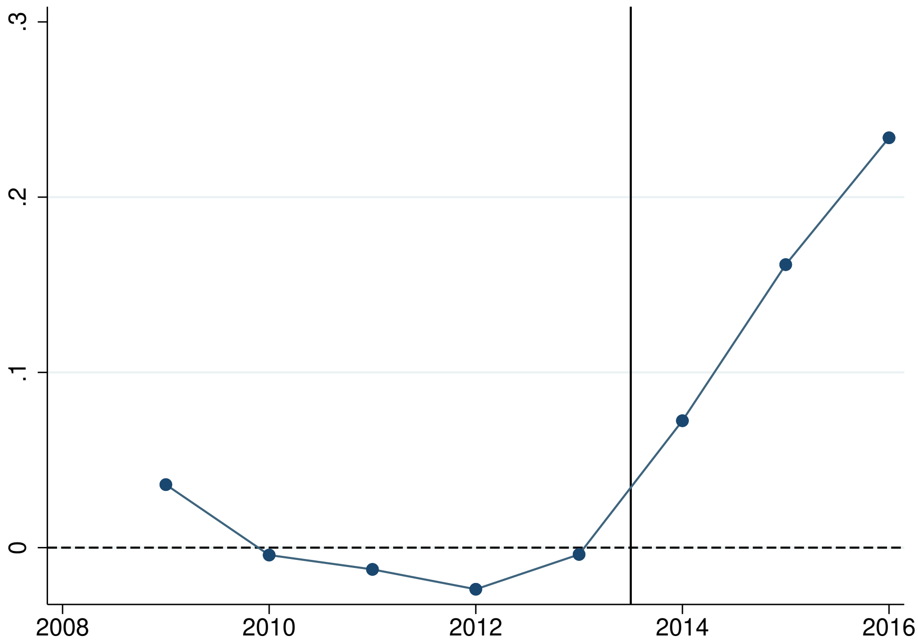


Figure D.4: Synthetic control method - unemployment rate

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). Controls in the synthetic control group are Austria, Belgium, Denmark, Germany, Hungary, Italy, Luxembourg, Poland, Portugal, Spain, Sweden, United Kingdom.