

# Do women want to work more or more regularly? Evidence from a natural experiment\*

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## Abstract

We provide causal evidence that children limit women's chances of working regularly, and that this contributes to the persistence of the gender wage gap. Historically, French children have had no school on Wednesday. In 2013, a reform reallocated some classes to Wednesday morning. Exploiting variation in the implementation of this reform over time and across the age of the youngest child, we demonstrate that, once institutional constraints are relaxed, mothers are more likely to work on Wednesday, and full-time. Longer and regular hours help mothers close 6 percent of the gender wage gap. High-skilled women drive hours and wage effects.

**JEL codes:** H52, J13, J16, J22.

**Keywords:** school schedule; temporal flexibility; female labor supply; child penalty.

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Since the introduction of compulsory primary education in 1882, French children have always had a full day off in the middle of the week. This was first allocated to Thursday and from 1972 onwards to Wednesday. While other aspects of the school calendar have changed over the last decades, the break on Wednesday has always been maintained. In the meantime, women’s labor force participation in France has attained one of the highest levels across OECD countries ([OECD 2016b](#)). Yet, as displayed in [Figure 1](#), while women with children in the UK, Germany, and Spain distribute their working time uniformly over the week, French mothers work significantly less time on Wednesdays than on the other working days of the week. In contrast, French fathers and women without children have a regular working schedule.

An increasing number of studies suggest that women value temporal flexibility at work more than men do ([Filer 1985](#), [Goldin and Katz 2011](#), [Flabbi and Moro 2012](#), [Wiswall and Zafar 2017](#), [Mas and Pallais 2017](#)). At the same time, many papers document the existence of a part-time pay penalty, and its relationship to occupational segregation ([Manning and Petrongolo 2008](#), [Fernández-Kranz and Rodríguez-Planas 2011](#)). Besides, [Goldin \(2014\)](#), [Goldin and Katz \(2016\)](#), and [Cortes and Pan \(2016\)](#) further argue that women’s quest for flexibility can contribute to explain the persistence of the gender wage gap even within occupations, especially in those professions where continuous presence at work and availability to work long hours are particularly rewarded.

In this paper we take advantage of a recent reform of the school schedule in France to show that children limit women’s chances of working regularly. Next, we provide evidence that treated mothers are rewarded for adopting a long and regular working schedule. Finally, we show that high-skilled mothers are particularly responsive to the opportunity of working regularly.

From 2008-2012, French children in kindergarten and primary school had 24 hours of classes per week, spread over four days. In January 2013, the French government reduced the length of the instruction time per day, and added an extra half day of classes on Wednesday morning, in order to lighten the daily workload of children without changing the total number of weekly teaching hours. Moreover, to compensate for the shortening of each school day, the government introduced three optional hours of extracurricular activities, at almost no additional cost for families.

We use the reorganization of the teaching time and, in particular, the introduction of

classes on Wednesday morning, to study how mothers' demand for temporal flexibility at work evolves when institutional constraints are relaxed. Next, we exploit the introduction of extracurricular activities to analyze women's response to this implicit wage subsidy. Finally, we assess whether mothers are rewarded when they increase their availability to work long and regular hours.

To conduct this analysis, we focus on mothers whose youngest child is of primary school age and compare them, with a difference-in-difference strategy, to mothers whose youngest child is twelve to fourteen years old. The data come from the quarterly version of the French Labor Force Survey and span the period 2009-2016. Note that we exclude from the estimation sample all respondents working in schools, from teachers to administrative staff, to ensure that our results do not capture the mechanical impact of the reform on this group of workers.<sup>1</sup>

Our analysis provides the following findings. First, treated mothers take advantage of the 2013 reform to adopt a regular working schedule. In the pre-reform period, more than 40 percent of women with children of primary school age stayed at home on Wednesday, compared to only 35 percent of those with older children.<sup>2</sup> With the introduction of the reform, their probability of working on Wednesday rises by three percentage points with respect to mothers in the control group. In other words, the reform allows treated mothers to close 40 percent of the pre-reform Wednesday-gap with mothers of older children, with their response getting larger over time. This result speaks to the studies on gender differences in preferences for flexibility by showing that this taste for flexibility is tightly linked to the presence of children. In this respect, this paper adds to the event-study type of evidence provided by [Angelov, Johansson and Lindahl \(2016\)](#), [Kleven, Landaís and Sogaard \(2018\)](#), [Chung et al. \(2017\)](#) and [Kuziemko et al. \(2018\)](#) on the presence of a "child penalty" for, respectively, Swedish, Danish and American mothers.<sup>3</sup> Moreover, it is worth noting that the increased presence at work on Wednesday is in part explained by a substitution of Wednesday work for Saturday work. This second piece of evidence seems to support the experimental evidence provided by [Mas and Pallais \(2017\)](#) on workers' willingness to pay to avoid working during the weekend, and more

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<sup>1</sup>Nevertheless, our results are practically the same when we include the entire school personnel, or when only excluding teachers.

<sup>2</sup>Note that the probability of working on any other day of the week does not differ between treated and control mothers in the pre-reform period.

<sup>3</sup>In addition, this paper is also closely related to the recent study by [Blundell, Pistaferri and Saporta-Eksten \(2017\)](#) highlighting the importance of children in shaping couples' preferences over consumption and leisure.

generally to the growing evidence on the importance of leisure complementarities in explaining individuals' labor supply choices (Georges-Kot, Goux and Maurin 2017, Goux, Maurin and Petrongolo 2014).

Secondly, the reorganization of teaching time, coupled with the introduction of three hours of extracurricular activities, allows treated mothers, and especially the highly educated, to progressively shift from part-time to full-time contracts and to catch up with the control group in terms of hours worked per week. This result stands in contrast to the evidence suggesting that women's own wage elasticity is lower in contexts of high female labor force participation (Cascio 2009, Fitzpatrick 2010, Gelbach 2002, Goldin 2006, Havnes and Mogstad 2011).

Perhaps even more importantly, our results show that women get rewarded for a longer and more regular presence at work. Thanks to the reform, treated mothers, compared to control ones, experience a 1.5 percent increase in their hourly wages, relative to the pre-reform level. Back-of-the-envelope calculations imply that this effect corresponds to a 6 percent decrease in the pre-reform gender wage gap, in less than three years.<sup>4</sup> Note also that, at least in the short run, this wage effect does not seem to arise from an increased likelihood of changing position in the firm or finding better-paid job opportunities, but rather from a re-definition of the same contract.

Remarkably, high-skilled mothers seem especially responsive to the opportunity of working longer and continuous hours. While mothers take advantage of the reform to work on Wednesday irrespective of their skills or occupation, the drop in part-time work and consequent increase in hourly wages are driven by high-skilled mothers.<sup>5</sup> These results do not exclude that in the long-run low-skilled women could also become more likely to work full-time, thanks to this reform. Yet, they suggest that switching from part-time to full-time work, while maintaining the same job, may be easier in certain types of positions and firms. Moreover, in line with Goldin's theory on the cost of flexibility in highly-paid professions, high-skilled mothers may react quicker to the reform precisely because they perceive that a longer and

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<sup>4</sup>To obtain this estimate we proceeded as follows. The reform triggers a 1.5 percent increase in the hourly wages of treated mothers, relative to their pre-reform level, or 0.18 euros per hour. We also calculate that the pre-reform gender gap in real net hourly wages between men and women whose youngest child is of primary school age amounts to 3 euros. Therefore, the impact of the reform corresponds to 6 percent of such a gap.

<sup>5</sup>Although the effect on hourly wages is not statistically different between high- and low-skilled mothers, the point estimates are insignificant and practically zero for the latter.

more regular presence at work may be particularly rewarding for their career ([Cortes and Pan 2016](#), [Goldin 2014](#)).

Finally, to complete our analysis, we also study fathers' labor supply decisions in this context. The LFS data confirm that in the pre-reform period, fathers' probability of working on Wednesdays did not differ from that of the other days of the week. We find no evidence that the 2013 reform affects their labor supply decisions, which suggests that, even in a country where female labor force participation is high, a traditional division of gender roles persists in the household ([Bertrand, Kamenica and Pan 2015](#), [Bursztyn, Fujiwara and Pallais 2017](#), [Fernandez, Fogli and Olivetti 2004](#), [Fernandez 2011](#), [Folke, Rickne et al. 2016](#)).

We believe that these results make important contributions to several strands of the literature on gender and family economics. In particular, by linking women's demand for flexibility to the presence of children, we complement the recent studies reporting gender differences in preferences for flexibility ([Filer 1985](#), [Goldin and Katz 2011](#), [Flabbi and Moro 2012](#), [Wiswall and Zafar 2017](#), [Mas and Pallais 2017](#)) and those providing event-study type of evidence on the existence of a child penalty ([Angelov, Johansson and Lindahl 2016](#), [Chung et al. 2017](#), [Kleven, Landais and Sogaard 2018](#), [Kuziemko et al. 2018](#)). Secondly, by showing that mothers tend to substitute weekend shifts for Wednesday work, when given the possibility to do so, we contribute to the scarce but growing evidence on the importance of leisure complementarities in explaining individuals' labor supply choices ([Georges-Kot, Goux and Maurin 2017](#), [Goux, Maurin and Petrongolo 2014](#), [Mas and Pallais 2017](#)). Finally, our findings that high-skilled women are especially responsive to the opportunity of working regularly offer new insights to the literature documenting the existence of a part-time penalty and its relationship to occupational segregation ([Manning and Petrongolo 2008](#), [Fernández-Kranz and Rodríguez-Planas 2011](#)). Besides, they are also consistent with the growing evidence that women's quest for flexibility may be especially costly in those occupations where workers have no close substitutes and a regular interaction with clients and colleagues is particularly valuable to the firm ([Cortes and Pan 2016](#), [Goldin 2014](#)).

The paper proceeds as follows. [Section 1](#) gives a detailed description of the French primary school system and how it has been affected by the 2013 reform. [Section 2](#) contains three subsections. Part [2.1](#) describes the data used to conduct this analysis. Part [2.2](#) presents a descriptive analysis of the pre-reform period. Part [2.3](#) focuses on the impact of the reform

and discusses the identification strategy, the main results, and robustness checks. Section 3 concludes.

## 1 The French primary school system

The French educational system is divided into three stages: elementary education, for children aged six to eleven; secondary education – which, in turn, is divided into middle school (*collège*) and high school (*lycée*) – and tertiary education. Education is compulsory from the age of six to sixteen. However, parents can already send their children to free public pre-kindergarten (*école pre-maternelle*) when they are two, or to kindergarten (*école maternelle*) at the age of three. Today, 23 percent of two-year-old children and 95 percent of children aged three to five attend this pre-school stage (Goux and Maurin 2010).

Public primary schools are financed by municipalities. The private sector comprises mainly religious schools and receives fourteen percent of all primary school pupils.

With respect to the structure of the school calendar in primary school, France has always been one of the countries with the longest holidays, highest number of hours per year, and longest school day.

Importantly, since the introduction of compulsory primary education in 1882 (*Loi Ferry*), French children have always had a full day off in the middle of the week. Until the end of the 1960s, children spent five full days at school, with a break on Thursdays and Sundays, for a total of 30 hours per week. In 1969, Saturday afternoon school was abolished, and three years later, in 1972, the break in the middle of the week was advanced from Thursday to Wednesday, and two hours of physical activities were added to the school week. Finally, in 2008, all classes on Saturday were abolished and a 4-day school schedule, with six hours per day - plus a 2-hour lunch break in the middle - was adopted.<sup>6</sup>

In the meantime, since the development of chronobiology in the 1980s, an intense debate

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<sup>6</sup>It would clearly be interesting to evaluate the impact of this reform on parents' labor supply decisions, as well. However, there are at least two reasons why we choose not to do so. First, according to the 1998-99 wave of the Multinomial Time Use Survey, all respondents, irrespective of their gender or presence of children, work an average of less than 2 hours on Saturday. This suggests that the abolition of Saturday classes for children of primary school age is unlikely to affect their parents' working schedule. Secondly, as stressed below, the question on which days of the week a respondent works was only introduced into the Labor Force Survey in 2013. Thus, the absence of this information would strongly limit our ability to understand how the 2008 reform affects parents' labor supply decisions.

on the optimal structure of the school schedule has developed. Experts of this discipline point out that primary school children need more frequent holidays and a shorter day at school. And this was precisely the rationale for the 2013 reform. In detail, this reform shortened the school day by an average of 45 minutes and, to maintain the total number of weekly hours, it added half a day, usually on Wednesday mornings, and exceptionally on Saturdays. Moreover, to compensate for the reduction in daily teaching time, the government urged municipalities to provide free extra-curricular activities for children, for a total of three weekly hours. Importantly, precisely because of this organizational burden, the government also gave municipalities the possibility to implement the new schedule in either 2013-14 or 2014-15. Twenty percent of them chose to do it in 2013; the rest only adopted the new system in 2014.<sup>7</sup>

Finally, it is important to note that the 2013 reform affects only kindergarten and primary school children. In middle and secondary school, pupils have at least 24 hours of classes per week, spread over five days, and this schedule has not been modified for a long time.<sup>8</sup>

## 2 Empirical analysis

### 2.1 Data description

To study this setting and the consequences of the 2013 reform, we make use of two main databases. First, we use the 2009-2016 waves of the French Labor Force Survey (*Enquête Emploi en Continu*). This data set collects information on work-related statistics with quarterly interviews of a representative sample of the French population. From the Labor Force Survey we extract data on respondents' age, level of education, marital status, labor market status, income, and the structure of the household in which they reside. Crucially, we exploit the

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<sup>7</sup>Each municipality can also choose how to allocate the extracurricular activities, whether to concentrate them on two days a week or spread them over the week. Unfortunately, disaggregated data by municipality on the allocation of extracurricular activities are not available.

<sup>8</sup>It is also worth mentioning that private schools had the freedom to choose whether to implement the 2013 reform or not, and, by the end of the academic year 2014-2015, only fifteen percent of them, comprising 13.5 percent of French pupils attending a private school, had adopted the new schedule. Although in our data we cannot tell whether families send their children to public or private schools, we check that the aggregate proportions of students enrolled in public and private schools every year remains stable over the years of implementation of the reform. In other words, it does not seem that parents are moving their children from one type of school to the other because of the reform. If anything, this implies that our estimates might be slightly downward-biased, as around twelve percent of the families in our sample are not affected by the reform (corresponding to 87 percent of the 14 percent of children attending private schools.)

information on the municipality of residence, the number of children respondents have, and their age.

Secondly, to identify the timing of the implementation of the 2013 reform across municipalities, we exploit the Enryesco database. This is an administrative data set that was created by the French Ministry of Education and provides a precise description of the weekly teaching schedule for each school, in each municipality.

In the main analysis, we focus on the sample of mothers aged 18 to 55 whose youngest child is between 6 and 14, for a total of 175,528 observations.<sup>9</sup> In a series of robustness checks, we also include mothers whose youngest child is 2 years old up to those whose youngest child is 17. Analogously, to study fathers' labor supply decisions, we consider men aged 18 to 55 whose youngest child is between 6 and 14, for a total of 149,794 observations. Importantly, we exclude from the main estimation sample all respondents working in schools, such as teachers, school heads, school psychologists, but also the administrative staff, for a total of around 10 percent of employed workers. This restriction allows us to ensure that any result we find is not simply driven by the mechanical effect of the reform on this group of workers.<sup>10</sup>

As for the main outcomes of interest, we construct them as follows. To measure labor force participation, we use a dummy equal to one if the woman belongs to the active population; we measure part-time work using a dummy equal to one if the woman declares to work part-time in her main job; next, we use a continuous variable indicating the number of hours worked on average per week; and we construct a series of dummies that take the value one if the woman works on each specific day of the week. Importantly, in the French Labor Force Survey, the decision to work on each day of the week is only measured from 2013 onward. For this reason, we complement the analysis on these outcomes by also considering another variable, available for the entire sample period, and measuring the number of days worked per week. Finally, to measure earnings, we consider log real net hourly wages. To construct this last variable, we take the log of the ratio between real net monthly wages, which is directly available in the Labor Force Survey, and hours worked per month, computed as four times the hours worked per week. Importantly, respondents report their monthly wages only once out of the five times

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<sup>9</sup>Note that we do not consider younger mothers as less than 1 percent of women aged 15 to 17 have children in France.

<sup>10</sup>However, our main findings remain practically unchanged when including the school personnel. These results are available upon request.

they are interviewed. Thus, the sample size consistently falls when analyzing the impact of the reform on this outcome. Final remark, all outcomes that concern employed women, such as hours or day worked, daily labor supply, or part-time work, are set to missing for non-employed women. Accordingly, when analyzing the impact of the reform at the intensive margin, we restrict the sample to employed women.

## 2.2 Pre-reform period

[Table 1](#) describes the characteristics of French mothers aged between 18 and 55 and interviewed in the Labor Force Survey before the introduction of the 2013 reform. We regroup them according to the age of their youngest child living in the household.

A few preliminary considerations are worth mentioning. Firstly, mothers of younger children tend to be not only younger but also more likely to hold a college degree, which is consistent with the well-documented increasing trend in female education attainment common to many OECD countries ([OECD 2016a](#)). This suggests that looking at incentives, constraints, and choices of highly educated women is particularly relevant for predicting the behavior of future generations. Secondly, mothers' labor force participation is strongly correlated with their children's age and, in particular, we can see that it increases discontinuously as soon as their youngest child starts attending primary school. Thirdly, conditional on participation, we can see that the probability of working part-time decreases as the youngest child grows older and the average number of hours and days increases accordingly.

However, what appears especially striking in this table is the large gap in the proportion of mothers who work on Wednesdays as the youngest child moves from primary to middle school. More than 40 percent of working mothers whose youngest child is in kindergarten or primary school do not work on Wednesdays, and this proportion decreases by almost ten percentage points as soon as the youngest child enrolls in middle school. Besides, such a pattern does not emerge at all when looking at the probability of working on any another day of the week, such as Thursdays. These figures are consistent with the evidence obtained from the Multinomial Time Use Survey that mothers are the main providers of childcare on Wednesdays. As shown in [Figure A.1](#) in the appendix, they are also in line with the results of a survey on childcare arrangements for Wednesdays aimed at families with children aged 0-6. There, up to 70 percent of respondents declare that parents themselves take care of their

children when they do not have school on Wednesday.<sup>11</sup>

What these figures clearly show is that the institutional constraint imposed by children’s school schedule appears to bind for a large fraction of women. Or, in other words, that a large proportion of working mothers adopted a flexible working schedule in the pre-reform period.

To get more insight on who actually makes such choice, from now on we mainly focus on mothers whose youngest child is in primary school, as it appears uncontroversial to compare their behavior to that of mothers with slightly older children. Indeed, [Table 1](#) tells us that, except for the allocation of their working time over the week, their behavior in terms of education, marriage, and employment decisions closely resembles that of mothers whose youngest child is in middle school.<sup>12</sup>

When we break down the previous figures by mothers’ characteristics, we notice that women seem to cope in different ways with the institutional constraint imposed by children’s school schedule, depending on their level of education, their occupation, sector, employer’s characteristics and position in the household. In particular, in [Figure 2](#), we can see that, before the reform, highly-educated mothers tended to work significantly more hours per week than low-educated ones, although in both groups more than 40 percent of mothers did not work on Wednesdays.<sup>13</sup> In other words, highly-educated mothers seem to compensate for their

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<sup>11</sup>Note that a large fraction of mothers choose to stay at home on Wednesdays, despite the fact that other forms of childcare, both public and private, are available for that day. This is consistent with the growing evidence that parents, and particularly highly educated ones, are increasingly spending more time with their children ([Bertrand, Goldin and Katz 2010](#), [Ramey and Ramey 2010](#)).

<sup>12</sup>Concerning mothers with children of kindergarten age instead, [Table 1](#) clearly shows that their participation rate in the labor market, as well as several observable characteristics, differ substantially from those of mothers with older children. This suggests that the incentives driving their decisions might differ as well. For instance, mothers with children between two and three in France are entitled to receive specific childcare subsidies that are withdrawn as children enter primary school. In addition, kindergarten is not compulsory and only 30 percent of families whose youngest child is two years old actually make use of this service ([Goux and Maurin 2010](#)). For all these reasons, we prefer to exclude mothers with children aged two to five from our analysis. For these same reasons, we decide to exclude them as well from the regression analysis studying the impact of the 2013 reform. However, our findings do not change substantially when we include them in the treatment group. These results are available upon request.

<sup>13</sup>Remarkably, in [Figure A.2](#) in the appendix, we also show that, among the highly-educated, mothers of primary-school age children who have the same or a lower level of education than their partner are significantly more likely to stay at home on Wednesdays than other highly-educated mothers. In other words, the probability that a highly educated mother works on Wednesdays is higher when she is more likely to be the breadwinner in the household - as her level of education is higher than that of her husband. This pattern is consistent with the evidence provided by [Bertrand, Goldin and Katz \(2010\)](#), who show that, among female MBA graduates, those with richer husbands are the ones who tend to have the longest job interruptions when they have a child. As they point out for their context, also in France it seems that richer husbands purchase more costly child-care time of their highly educated wives, rather than more nannies. Interestingly, in couples where the woman has at most a high school degree, mothers’ probability of working on Wednesdays does not seem to vary with her role in the household.

absence in the middle of the week by working more hours on other days. This may be a sign that bargaining power plays a role in the ability of workers to negotiate a flexible working schedule with their employer - which is consistent with the evidence provided by [Katz and Krueger \(2016\)](#) that the recent growth in freelance and contract work largely excludes the low-wage sector. Alternatively, differential sorting into family-friendly firms by level of education, or the structure of occupations might explain these pre-reform differences in participation on Wednesday.<sup>14</sup> In this respect, note that mothers working in managerial positions whose youngest children are in primary school are even significantly less likely than those working in other occupations to work on Wednesdays ([Figure 3](#)). However, these figures also suggest that highly-educated mothers - and especially those having no substitute at work - perceive to bear a higher cost, in terms of productivity losses and wage penalizations, than low-educated ones for their quest for flexibility.<sup>15</sup>

Overall, this descriptive analysis of the pre-reform period suggests that children limit women's chances of working regularly. However, it also shows that the possibility of adopting a flexible schedule relates to the interplay of different factors, among which women's bargaining power at work, the structure of jobs and the career cost of flexibility may play an important role.<sup>16</sup>

## 2.3 The impact of the 2013 reform

To study how the 2013 reform affects mothers' employment decisions, we adopt a difference-in-difference strategy. We define a woman as being treated if her youngest child is affected by this reform. Next, as in the descriptive analysis, we choose to compare mothers whose youngest child is between six and eleven with those whose youngest child is between twelve and

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<sup>14</sup>In some service occupations, such as shops, or restaurants, productive work can only be done when customers are present ([Manning and Petrongolo 2008](#)), implying that workers in these occupations might not be able to work outside of peak time even if they want to.

<sup>15</sup>Consistent with this, [Figure A.3](#) and [A.4](#) - reported in the appendix - constructed using pre-reform data extracted from the French match-employer-employee data set, add two elements to this picture. Firstly, [Figure A.3](#) shows that, in France as in the United States ([Goldin 2014](#), [Wasserman 2015](#)), women tend to be less represented in occupations where men work more hours. Secondly, as depicted in [Figure A.4](#), the gender wage gap widens along both the male wage and the hours distribution. Overall, these pieces of descriptive analysis seem to suggest that women's quest for flexibility may be particularly hurtful in highly-paid occupations. Importantly, note that we do not use this data set to analyze the impact of the reform, as it is only available until 2013.

<sup>16</sup>All the figures presented in this paragraph, together with those broken down by occupation, sector, and employer's characteristics are also reported in [Table A.1](#) and [Table A.2](#) in the appendix.

fourteen – corresponding to the age-interval of middle-school pupils. The graphical analysis of pre-treatment trends in the labor supply measures we have chosen, displayed in [Figure 4](#),<sup>17</sup> supports this choice, as the employment decisions of the treatment and control group exhibit a comparable evolution.<sup>18</sup>

Next, in the main regressions, we consider both mothers living in municipalities that implemented the reform in 2013 and those living in municipalities that postponed its introduction to 2014.<sup>19</sup>

Finally, we exclude from the estimation sample all mothers working in schools, as teachers, school heads, school psychologists or administrative staff.

On the basis of these choices, we run the following specification on mothers aged 18 to 55, interviewed between 2009 and 2016, and whose youngest child is between six and fourteen years old:

$$\begin{aligned} Y_{icmt} = & \gamma_m + \delta_t + \pi * X_{icmt} + \alpha * Yst\_Child\_btw\_6\_11_c \\ & + \beta * Yst\_Child\_btw\_6\_11 * Post\_Sep\_2013_{ct} + u_{icmt} \end{aligned} \quad (1)$$

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<sup>17</sup>This figure shows trends in selected outcomes, notably the probability of working on Wednesdays, the number of days worked per week, the number of hours worked per week and log real net hourly wages. [Figure A.5](#) in the appendix reports the evolution of the other outcomes we study, that is, labor force participation and the decision to work part-time.

<sup>18</sup>Note that, although the evolution of several labor supply measures is similar among mothers with children in kindergarten and those with older children, we choose to exclude the former from the treatment group for the same reasons explained in the previous paragraph. Their baseline characteristics are indeed too different from those of our control group to assume that, absent the reform, they would respond to the same type of incentives.

<sup>19</sup>In principle, to identify the effect of the reform, we could exploit the variation over time and across municipalities in the implementation of the reform. In this way, we would compare mothers whose youngest child is in the affected age-range and live in municipalities that introduced the reform in 2013, with the same group of mothers who live in municipalities that postponed the implementation of the reform to 2014. However, we prefer not to adopt this strategy for two reasons. First and most importantly, a comparison of the pre-trends in labor supply measures for these two groups of mothers – the graphs are available upon request – reveals that their dynamics seem to diverge before the implementation of the reform. Therefore, it is hard to claim that, absent the reform, the evolution of labor supply would have been the same across these groups. This concern is also confirmed by a formal test on the parallel trend assumption. In a regression model that compares the evolution of labor supply for these two groups of mothers, we include a battery of dummies taking the value one for mothers "treated in 2013", in the three waves before September 2013. A test on their joint significance leads us to reject the null for all the outcomes considered. Secondly, by adopting this strategy we would only be able to study the impact of the reform in its first year of implementation, given that, from 2014 onward, all municipalities adopted the new schedule. As it might take some time for its effect to manifest itself, we think that considering only its short-run impact would considerably limit the objectives of our analysis.

Here  $i$  stands for each interviewed woman,  $c$  for the age of the youngest child,  $m$  for the municipality of residence and  $t$  for the wave in which the woman is interviewed.  $Y_{icmt}$  represents the outcome considered. This is either labor force participation, the decision to work part-time or full-time, hours worked per week, days worked per week, the decision to work on each specific day of the week, or the logarithm of real net hourly wages. The vector  $X_{icmt}$  includes all the individual variables that can affect women’s labor supply decisions. These comprise age, age squared, level of education, number of children, marital status, and presence of other members in the household;  $\alpha$  measures the impact of having a youngest child of primary school age.  $\text{Post\_Sep\_2013}_{ct}$  is a dummy equal to one starting from September 2013 for those mothers living in municipalities that introduced the reform in 2013, and from September 2014 for mothers living in municipalities that postponed the implementation to 2014. The main coefficient of interest is  $\beta$ , which should capture any deviation from a parallel evolution in the outcome of interest between the treatment and the control group due to the implementation of the new schedule in primary schools. In all regressions we also include municipality of residence,  $\gamma_m$ , and wave of interview fixed effects,  $\delta_t$ . Finally, in all specifications, standard errors are clustered at the municipality level to account for any correlation of the outcomes for women residing in the same municipality.<sup>20</sup>

The main results of our analysis are summarized in [Table 2](#), [3](#), and [4](#). First, the reform does not trigger any response at the extensive margin – [Table 2](#), column 1 – which should not be surprising given that 86 percent of treated mothers are already active.<sup>21</sup>

However, the reorganization of the teaching time, coupled with the introduction of three hours of extracurricular activities, leads treated mothers to adopt a longer and more regular working schedule. In particular, column 2 of [Table 2](#) shows that, following the implementation of the reform, the probability of working part-time significantly decreases by 2 percentage points for treated mothers compared to the control group, or by 5 percent with respect to the pre-reform mean. Accordingly, the point estimate on hours worked per week in column 3 is also positive, though the coefficient fails to be significant. Next, columns 4 to 6 of [Table 2](#) tell us how mothers re-organize their overall weekly working schedule, following the 2013 reform.

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<sup>20</sup>Following the suggestion of an anonymous referee, we also estimated specifications with standard errors clustered at the level of age-youngest-child- $\times$ -quarter-of-interview. All our results, available upon request, are robust to this alternative choice.

<sup>21</sup>We also checked that this result does not vary by level of education, and found no evidence of heterogeneous effects on this margin.

Besides increasing the amount of hours worked per week, treated mothers also significantly increase the number of days they work, by halving the pre-reform gap with the control group on this margin. Crucially, in column 5, we can see that this increase in the number of days worked per week corresponds to a three-percentage-point rise in the probability that treated mothers work on Wednesdays, significant at the one percent significance-level. Interestingly, as shown in column 6, this effect is in part accompanied by a reduction of weekend work. In other words, some mothers who, prior to the reform, worked on Saturdays - probably to compensate for their absence on Wednesdays - take advantage of the reorganization of the school schedule to allocate their Saturday hours to Wednesday. This result points towards a distaste for weekend work, which is line with the recent evidence proposed by [Mas and Pallais \(2017\)](#) on workers' positive willingness to pay to avoid working on the weekend.

Importantly, the last column of [Table 2](#) tells us that, thanks to the reform, treated mothers also experience an increase of more than 1 percent in their (log) hourly wages.<sup>22</sup> To dig into the mechanisms behind these main results we proceed as follows.

First, in [Table 3](#), we show how the reform affects the decision of treated mothers to work on the other days of the week. With the exception of Saturday, their likelihood of working on any other day of the week does not change with respect to the pre-reform period, in comparison with control mothers. This clearly suggests that the main constraint mothers face when deciding how to allocate their weekly labor supply comes from their children's schedule.

Next, in [Table 4](#) we break down our results by level of education. The rationale for performing this exercise is to understand whether the observed increase in hourly wages represents a reward for a longer and more regular presence at work. If this was the case, we would expect high-skilled mothers to be more responsive to the opportunity of working regularly, as they are probably less substitutable and more likely to play a key role for their firm. In other words, highly educated mothers should be those facing the highest cost of flexibility.

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<sup>22</sup>Note that the sample size changes from the first to the other columns in [Table 2](#). In the first column, we consider all mothers aged 18-55 whose youngest child is between 6 and 14, with the exception of those working in schools. In the other columns, we restrict the sample to employed mothers. Besides, the sample further falls in columns 5 and 6, as in the French Labor Force Survey the decision to work on each day of the week is only measured from 2013 onward. However, note that the fact that the reform also has a significant impact on the number of days worked per week shows that the effect on the probability of working on Wednesdays does not merely depend on the span of time over which this outcome is observed. Finally, as respondents report their monthly wages only once out of the five times they are interviewed, the sample size further falls in the last column, where we analyze the impact of the reform on log real net hourly wages. For completeness, we checked that the other results do not change when estimated on this restricted sample, and this table is available upon request.

The results reported in [Table 4](#) strongly support this hypothesis.<sup>23</sup> Firstly, following the 2013 reform, highly-skilled mothers significantly increase the number of hours worked per week by an average of almost 1 hour - with their coefficient being significant at 5 percent and statistically different from the one on low-skilled mothers. Secondly, highly-educated mothers see their (log) hourly wages increasing by more than 3 percent, with this coefficient being significant at 10 percent. This effect corresponds to a 10 percent decrease in the pre-reform gender wage gap.<sup>24</sup> On the contrary, the point estimate for low-skilled women is practically zero and not significant - though not statistically different from that on high-skilled mothers. In other words, the positive effects on full-time work and hourly wages for the entire sample seem to be completely driven by the impact on highly-educated mothers.

In addition, this same result holds for mothers who work in managerial and professional occupations, although in this case the point estimates for the log hourly wages are not significant - nor statistically different from the estimates on mothers working in other occupations.<sup>25</sup>

Overall, these results provide causal evidence that the availability to work long and regular hours appears to be rewarding and significantly contributes to reduce the gender wage gap.<sup>26</sup> In [Appendix A.1](#), we show that a very simple theoretical framework can rationalize these findings, using few assumptions from the empirical literature in personnel economics.

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<sup>23</sup>To ease the reading of this table, we also report a graphical representation of its results in [Figure 5](#).

<sup>24</sup>To obtain this estimate we proceeded as follows. The reform triggers a 3 percent increase in the hourly wages of high-skilled mothers, relative to their pre-reform level, or 0.44 euros per hour. We also calculate that the pre-reform gender gap in real net hourly wages between high-skilled men and women whose youngest child is of primary school age amounts to slightly less than 5 euros. Therefore, the impact of the reform corresponds to  $\beta * \overline{\text{wage}}_W / (\overline{\text{wage}}_M - \overline{\text{wage}}_W) = 0.03 * 14.87 / (19.48 - 14.87) = 0.0968$ .

<sup>25</sup>In a series of regressions not reported here but available upon request, we also find that, at least in the short run, this wage effect does not seem to arise from an increased likelihood of finding better-paid job opportunities, but rather from a re-definition of the same contract. In particular, we test whether, following the introduction of the reform, treated mothers are more likely to work in high-skilled occupations or in managerial positions, and find no evidence for these changes. Interestingly, we do see that high-skilled women are significantly more likely to participate in on-the-job training, and this may help explain the increase in hourly wages.

<sup>26</sup>Importantly, we analyzed other dimensions of heterogeneity as well, but no striking difference emerged along them. In particular, we studied whether the response to the reform differs between mothers working in the private sector and those employed in the public sector, by firm size, number of children, role of mothers in the household or by ranking occupations on the basis on men's average hours worked, or men's returns to working long hours. All these results are available upon request. We also considered the possibility that the response differs depending on the distance to the employer's premises, and found that this is not the case. However, we have to acknowledge that our measure of distance is not too accurate, as we can only calculate it for respondents residing and working in two different municipalities. For instance, we cannot compute it for mothers residing and working in big cities like Paris, where commuting time might be an important factor affecting the planning of the working schedule. Hence, these results should be considered with caution.

## 2.4 Robustness checks

To validate our results we run the following robustness checks. Firstly, we verify that the parallel-trend assumption holds in our context. In other words, we check that, without the reform, the evolution of mothers' labor supply would have been the same for the treated and control groups. Secondly, we show that our findings are robust to variations in the definition of the control group.

To support the validity of the parallel-trend assumption, besides visually inspecting the pre-treatment trends in labor supply measures, we first analyze the dynamic impact of the reform, and then we estimate the impact of a battery of placebo reforms on the main outcomes of interest. [Figure 6](#) provides a graphical analysis of the treatment dynamics. In particular, it shows the coefficients of the leads and lags in the treatment, estimated with this regression:

$$\begin{aligned} Y_{icmt} = & \gamma_m + \delta_t + \pi * X_{icmt} + \alpha * Yst\_Child\_btw\_6\_11_c \\ & + \sum_k \beta_k * Yst\_Child\_btw\_6\_11 * Leads\_Lags_{ck} + u_{icmt} \end{aligned} \quad (2)$$

where  $k$  goes from  $-2$  when the outcome is the decision to work on Wednesdays, and from  $-4$  for all the other outcomes. The first thing to note is that the coefficients on the leads are always insignificant. This strongly suggests that we are truly identifying the impact of the reform, rather than picking the effect of other elements that were already affecting the treatment and control groups differently before the introduction of this intervention. In addition, this analysis rules out significant anticipation effects. Moreover, note that these regressions allow us to implicitly perform a placebo test. In the first year of implementation of the reform, this should have no impact on mothers living in municipalities that postponed its introduction to 2014. As these represent 80 percent of our sample, when we look at the impact of the reform on both groups of municipalities at the same time, this is exactly what we observe. None of the coefficients capturing the impact from September 2013 to August 2014 is significant in the two regressions, while, in a previous version of this paper, we showed that the reform did have an impact on mothers living in municipalities implementing the reform in 2013.<sup>27</sup>

In [Figure 7](#), we graphically report the estimates of the impact of several placebo reforms,

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<sup>27</sup>These results are available upon request.

obtained by pretending that the government intervention took place before its actual introduction, and excluding the actual treatment period from the estimation sample. Reassuringly, with the exception of a fake March 2011 reform on the number of days worked per week, none of these placebo reforms appears to have a significant effect on the outcomes of interest, suggesting that in our main regression we are not simply capturing the impact of factors that systematically affect treated and control mothers differently.<sup>28</sup>

Finally, in [Figure 8](#) we document the evolution of the estimates of the impact of the reform on each outcome of interest, when changing the size of the control group. As we can see, restricting or expanding the control group does not affect either the magnitude or the significance of the reform coefficients. These graphs clearly show that our results are not sensitive to the definition of the control group we adopt in the main specification.

Overall, this battery of robustness checks strongly supports the validity of our identification strategy.

## 2.5 Impact on fathers

In principle, the institutional constraints imposed by children’s school schedule in France might affect the employment decisions of both parents. Yet, as suggested already by the Multinational Time Use Survey data, the Labor Force Survey confirms that, before the reform, fathers worked on Wednesdays as much as on the other days of the week. In particular, 76 percent of fathers worked on Wednesdays, exactly as on the other days of the week, whereas only 56 percent of mothers did so. As a consequence, it should not be surprising to see that the reform does not have any impact on fathers’ employment decisions, as shown in [Table 5](#) and [6](#). These results show that even in a country in which a high proportion of women participate in the labor market, a strict division of roles persists within households with children, and that institutional constraints bind only for women. Therefore, removing barriers to work for women might play the double role of enhancing the attachment to the labor market and of helping to change gender norms.

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<sup>28</sup>Note that we cannot run these robustness checks on the outcome measuring the decision to work on Wednesdays, given that the question concerning labor supply at daily frequency is not available in the Labor Force Survey before 2013.

### 3 Discussion and conclusion

This paper studies women’s employment decisions in a context where institutions limit their chances of having a regular working schedule. From 1972, French children in kindergarten and primary school have had no school on Wednesday. In 2013, a reform reallocated some classes to Wednesday morning. This setting allows us to study which factors influence women’s demand for temporal flexibility, and whether this quest for flexibility can help explain the persistence of the gender wage gap.

To conduct this analysis we use a difference-in-difference strategy and compare mothers whose youngest child is of primary school age to mothers whose youngest child is twelve to fourteen years old.

We find that the presence of children, combined with institutional constraints, strongly limit mothers’ chances of working regularly. Once institutional constraints are removed, mothers tend to adopt a long and regular working schedule. In particular, they are less likely to work part-time and more likely to work on Wednesdays.

Moreover, we show that high-skilled mothers are particularly responsive to the opportunity of adopting a long and regular working schedule. On the one hand, this might be because low-skilled women are trapped into occupations where full-time work is scarce ([Manning and Petrongolo 2008](#)). On the other hand, this may suggest that high-skilled mothers perceive that a regular presence at work is particularly rewarding for them ([Cortes and Pan 2016](#), [Goldin 2014](#)).

Overall, our findings have a clear policy implication. While both traditional gender norms and the structure of jobs and pay evolve slowly,<sup>29</sup> governments should continue to reduce institutional constraints on women’s regular work, even in countries with high rates of female labor force participation. This consideration is particularly important in light of the growing debate about the possibility of having a four-day school week that has recently spread in many countries such as the United States and the United Kingdom ([Brookings Institute 2017](#), [The Guardian 2015](#)).<sup>30</sup> Our findings clearly show that these initiatives might hurt mothers’ labor market prospects, and this could be especially so for the high-skilled.

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<sup>29</sup>See, in this respect, the work by [Wasserman \(2015\)](#), showing that imposing a cap on workweek for certain medical specialities makes women more likely to choose such specialities.

<sup>30</sup>In the United States, the four-day school week is actually already a reality in some school districts, mostly rural ones.

To conclude, two considerations are worth mentioning. Firstly, so far we do not find evidence that the reform increases mothers' likelihood of working in high-skilled occupations, or in managerial positions, where a regular presence at work might be particularly rewarded. Nor do we find that the reform boosts women's fertility, which could happen if women perceived that this reform lowers the career cost of children ([Adda, Dustmann and Stevens 2017](#)). However, these effects might take some time to materialize. Clearly, we will continue to monitor these potential long-term effects of the reform. Secondly, so far we are only considering how institutional constraints affect mothers' labor supply. However, the sudden availability of a larger pool of female employees willing to adopt a regular working schedule might also affect their co-workers and firms' decisions regarding the overall organization of the work environment. Upon the release of the appropriate data, it will certainly be important to study all these responses.

## Tables and figures

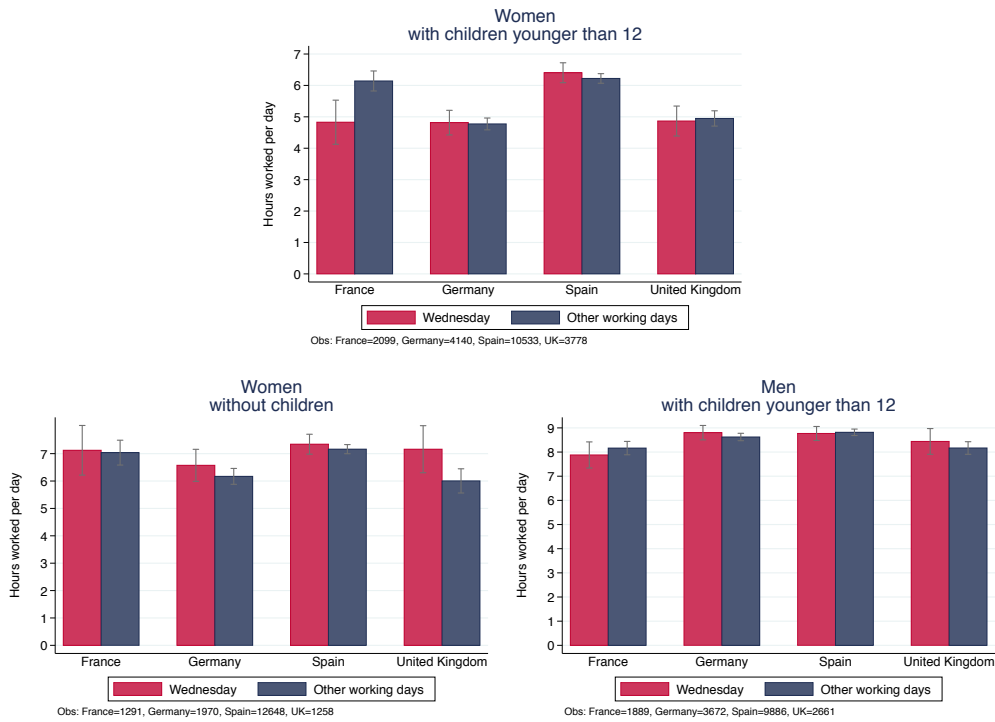


FIGURE 1. WORKING TIME ACROSS EUROPEAN COUNTRIES

*Notes:* the figures report bar graphs representing the average number of hours spent at work by, respectively, mothers with children younger than 12 years old, women without children, and fathers of children younger than 12, in France, Germany, Spain, and the United Kingdom. Working time includes paid work, paid work at home, second job, and travel to/from work. To highlight the peculiarity of the French case, we show the working time declared for Wednesday separately from that reported for the other days of the week. The graph is constructed using the 1991-2010 averages of the Multinational Time Use Survey. Finally, we report 95 percent-confidence intervals obtained from the estimation of a regression of the outcome of interest on the treated category, with standard errors clustered at the country level.

*Source:* Multinomial Time Use Study, 1991-2010 averages.

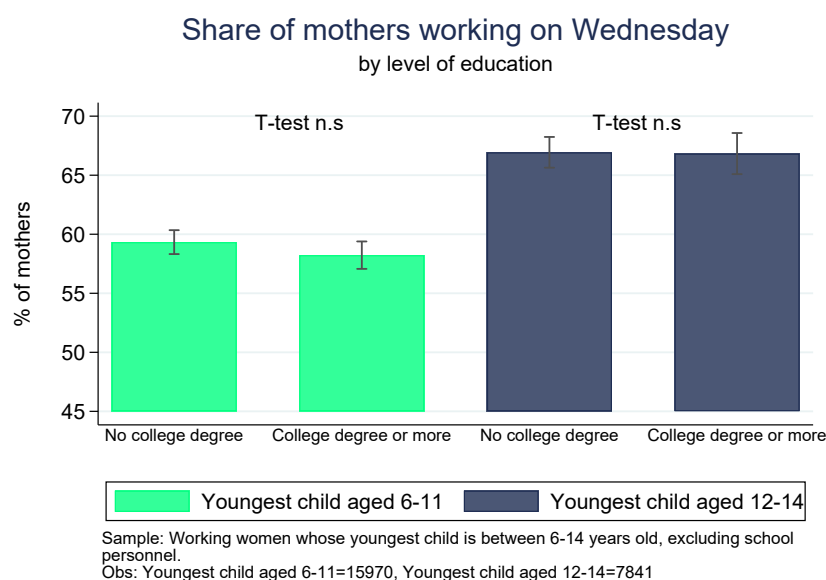
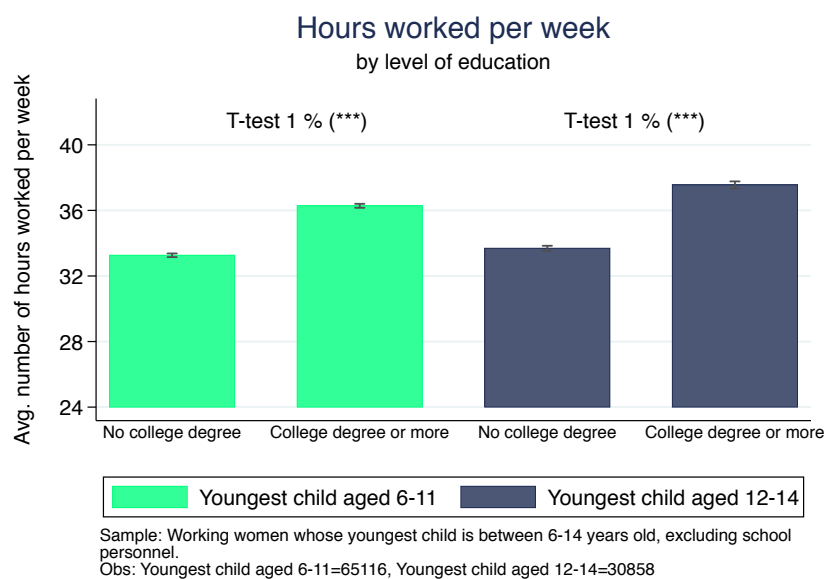


FIGURE 2. MOTHERS' LABOR SUPPLY BY LEVEL OF EDUCATION - PRE-REFORM PERIOD

*Notes:* the figures report bar graphs representing labor supply measures for mothers whose youngest child is between six and eleven, in green, and mothers whose youngest child is between twelve and fourteen, in blue. In the top graph, we report average hours worked per week, while at the bottom, we represent the proportion of mothers working on Wednesday. In each graph, we compare mothers who have at most a high-school degree with those who have at least college education. All figures refer to the pre-reform period, and we exclude the school personnel when computing them. On each bar, we also report 95 percent-confidence intervals. Finally, for each age interval of the youngest child, we indicate the results of T-tests for the difference in means between the two subgroups.

*Source:* French Labor force Survey 2009-2013.

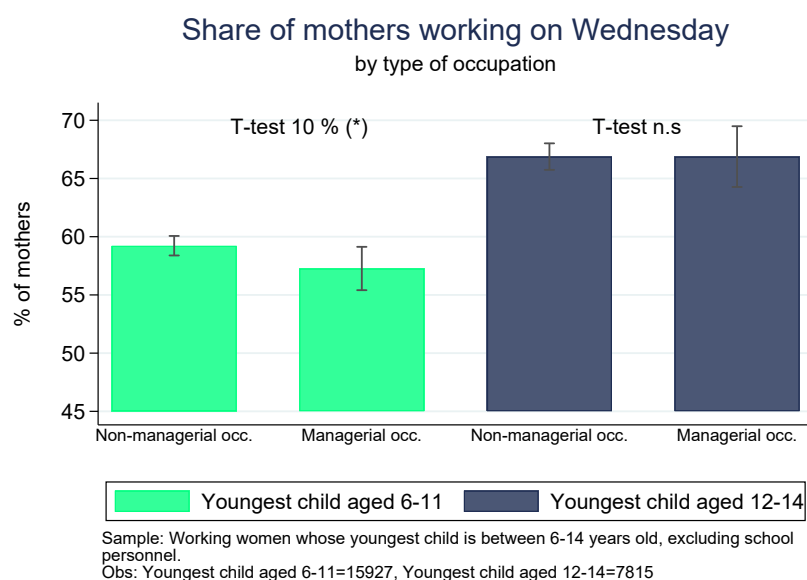
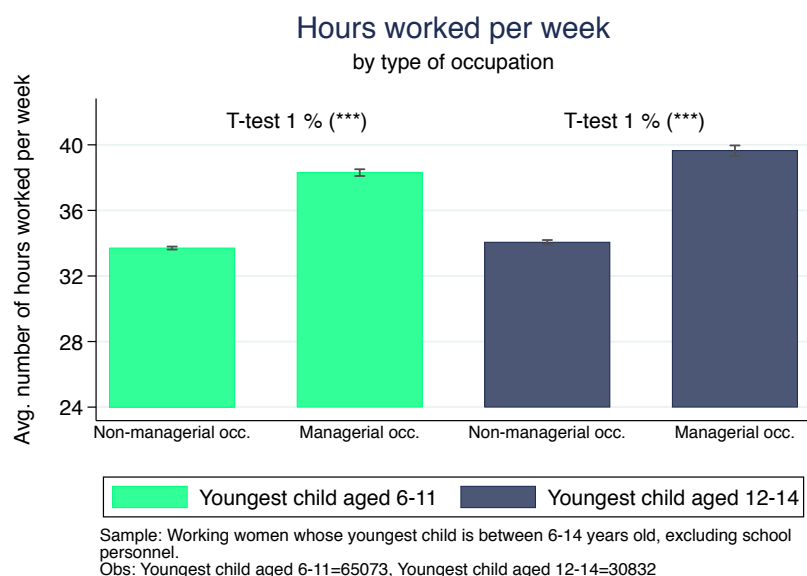


FIGURE 3. MOTHERS' LABOR SUPPLY BY TYPE OF OCCUPATION - PRE-REFORM PERIOD -

*Notes:* these figures report bar graphs representing labor supply measures for mothers whose youngest child is between six and eleven, in green, and mothers whose youngest child is between twelve and fourteen, in blue. In the top graph, we report average hours worked per week, while at the bottom, we represent the proportion of mothers working on Wednesday. In each graph, we compare mothers working in managerial occupations with those employed in other professions. All figures refer to the pre-reform period, and we exclude the school personnel when computing them. On each bar, we also report 95 percent-confidence intervals. Finally, for each age interval of the youngest child, we indicate the results of T-tests for the difference in means between the two subgroups.

*Source:* French Labor force Survey 2009-2013.

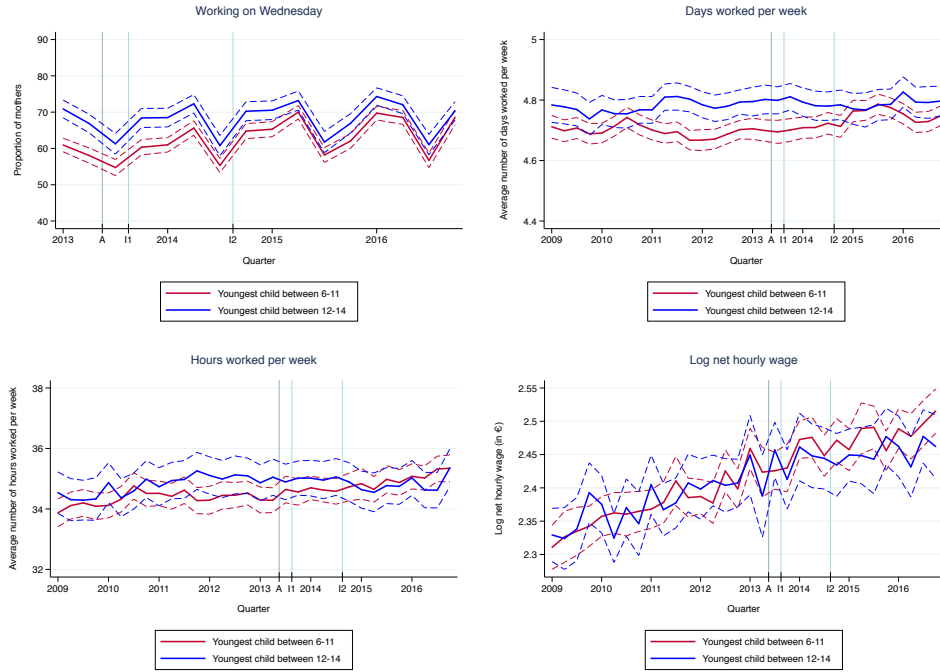


FIGURE 4. TRENDS IN MOTHERS' LABOR SUPPLY MEASURES BY AGE OF THE YOUNGEST CHILD

*Notes:* the graphs show the evolution of different labor supply measures over the period 2009-2016. The sample includes all mothers aged 18-55 whose youngest child is between the age of six and fourteen, with the exception of those working in schools. We represent in red treated mothers, that is, those whose youngest child is between six and eleven years old. Mothers whose youngest child is of middle-school age, or control mothers, are represented in blue. The vertical bar named "A" corresponds to April 2013, when municipalities announce in which year they will introduce the reform. The bar called "I1" corresponds to September 2013, when 20 percent of municipalities implement the reform. The bar labelled "I2" corresponds to September 2014, when the rest of municipalities implement the reform. Finally, 95-percent confidence intervals are also reported.

*Source:* French Labor Force Survey 2009-2016.

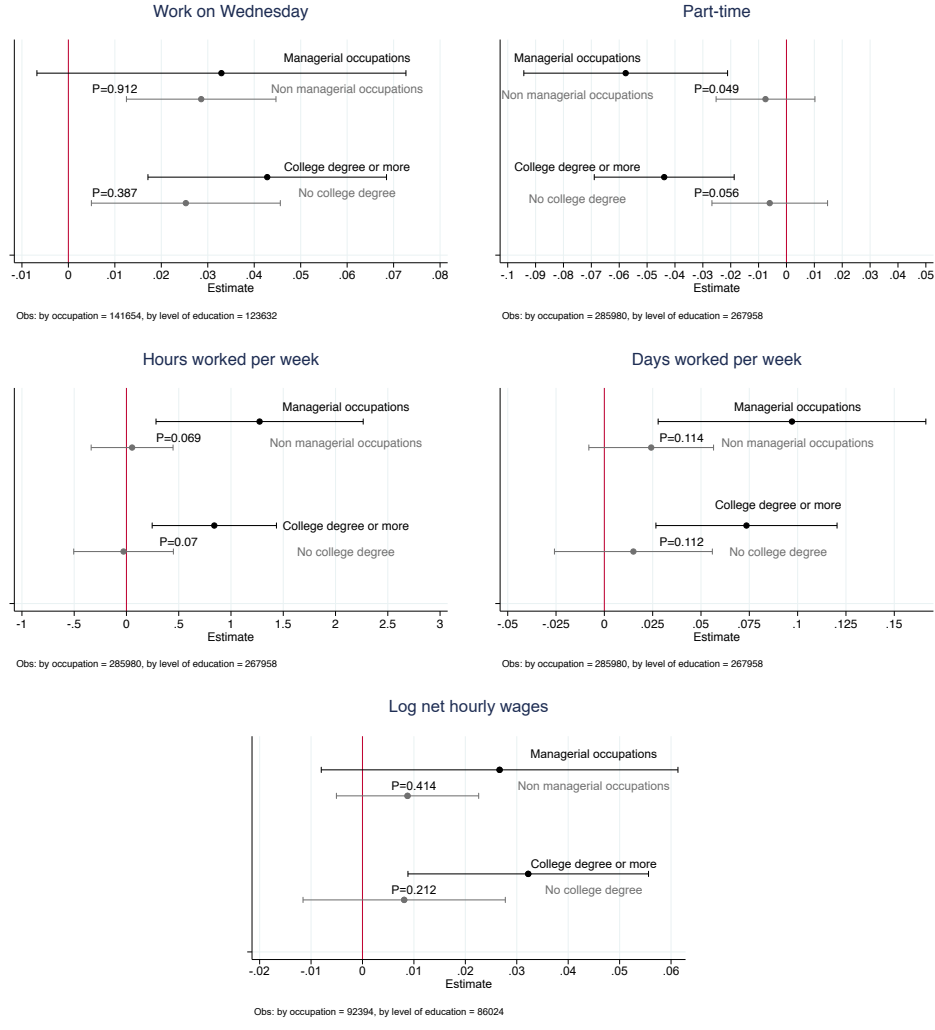


FIGURE 5. LABOR SUPPLY RESPONSE - SUBGROUP ANALYSIS

*Notes:* the graphs show the estimated impact of the reform on labor supply decisions of different subgroups. We report these estimates for the following outcomes: the decision to work on Wednesday, the decision to work part-time, hours worked per week, days worked per week and the log of real net hourly wages. To conduct this subgroup analysis, we estimate a regression on the entire sample, and interact all regressors with the subgroups considered, except for municipality fixed effects. Otherwise, all regressions include the standard covariates, namely age and age square, marital status, number of children, a dummy for immigration status, municipality and wave fixed effects, dummies for the level of education, and a dummy for the presence of other members in the household. For each subgroup, we present the coefficient of the treatment interacted with the subgroup considered. We also report 90-percent confidence intervals, as well as the p-value of the test on the equality of the impact of the reform across the two subgroups. The estimation sample includes all mothers, aged 18 to 55, whose youngest child is between six and fourteen, with the exception of those working in schools.

*Source:* French Labor Force Survey 2009-2016.

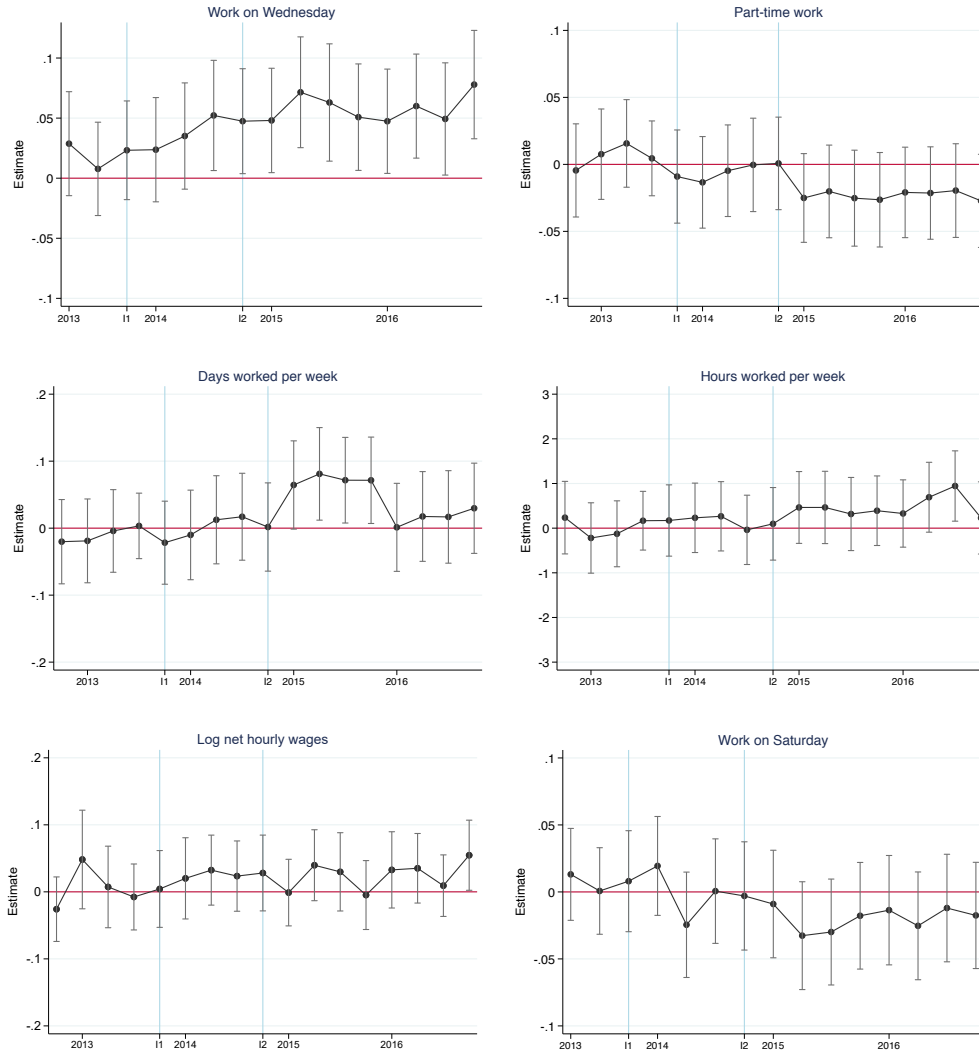


FIGURE 6. DYNAMIC RESPONSE TO THE REFORM

*Notes:* in this graph, we report the dynamic response to the reform concerning the decision to work on Wednesday, the decision to work part-time, days worked per week, hours worked per week, log real net hourly wages, and the decision to work on Saturday. The coefficients are obtained from the estimation of regression 2 on the years 2012-2016. We also report 95-percent confidence intervals. The estimation sample includes all mothers, aged 18 to 55, whose youngest child is between six and fourteen, with the exception of those working in schools. The implementation dates "I1" and "I2" correspond to, respectively, the last quarter of 2013 and the last quarter of 2014.

*Source:* French Labor Force Survey 2009-2016.

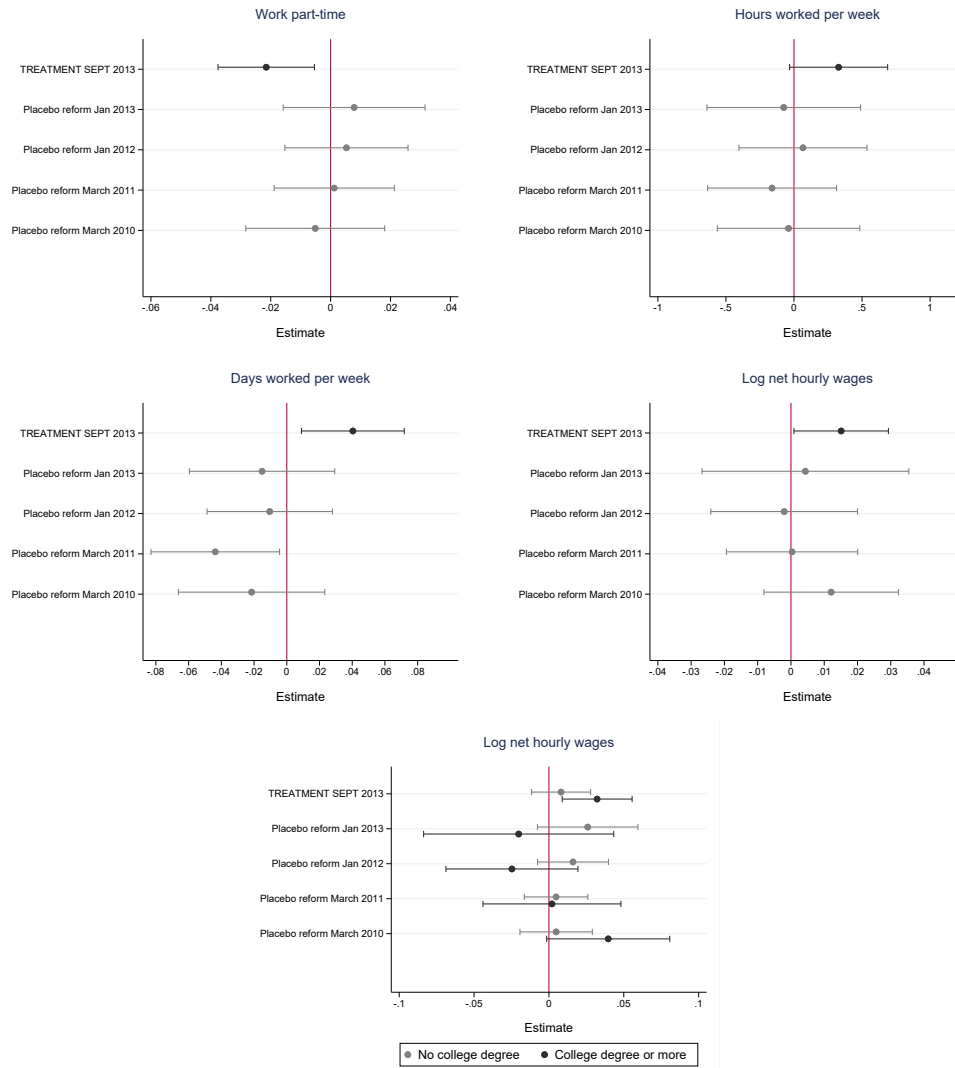


FIGURE 7. PLACEBO REFORMS

*Notes:* the figure shows the impact of a series of placebo reforms on the decision to work part-time, hours worked per week, days worked per week, and the log of real net hourly wages. In each graph, the first coefficient refers to the impact of the 2013 reform, while the other estimates refer to the impact of, respectively, a placebo reform implemented at the beginning of 2013, one taking place in January 2012, one happening in March 2011, and one in March 2010. In all but the last graph, the coefficients are obtained from the estimation of regression 1. As for the last graph concerning the impact of the placebo reforms on hourly wages by educational level, the coefficients are obtained from the estimation of regression 1 on the entire sample, and interacting all regressors with the subgroups considered, except for municipality fixed effects. For each subgroup, we present the coefficient of the treatment interacted with the subgroup considered. In all graphs, we also report 90-percent confidence intervals. The estimation sample includes all mothers, aged 18 to 55, whose youngest child is between six and fourteen, with the exception of those working in schools. When estimating the impact of the placebo reforms, we exclude the actual treatment period from the estimation sample.

*Source:* French Labor Force Survey 2009-2016.

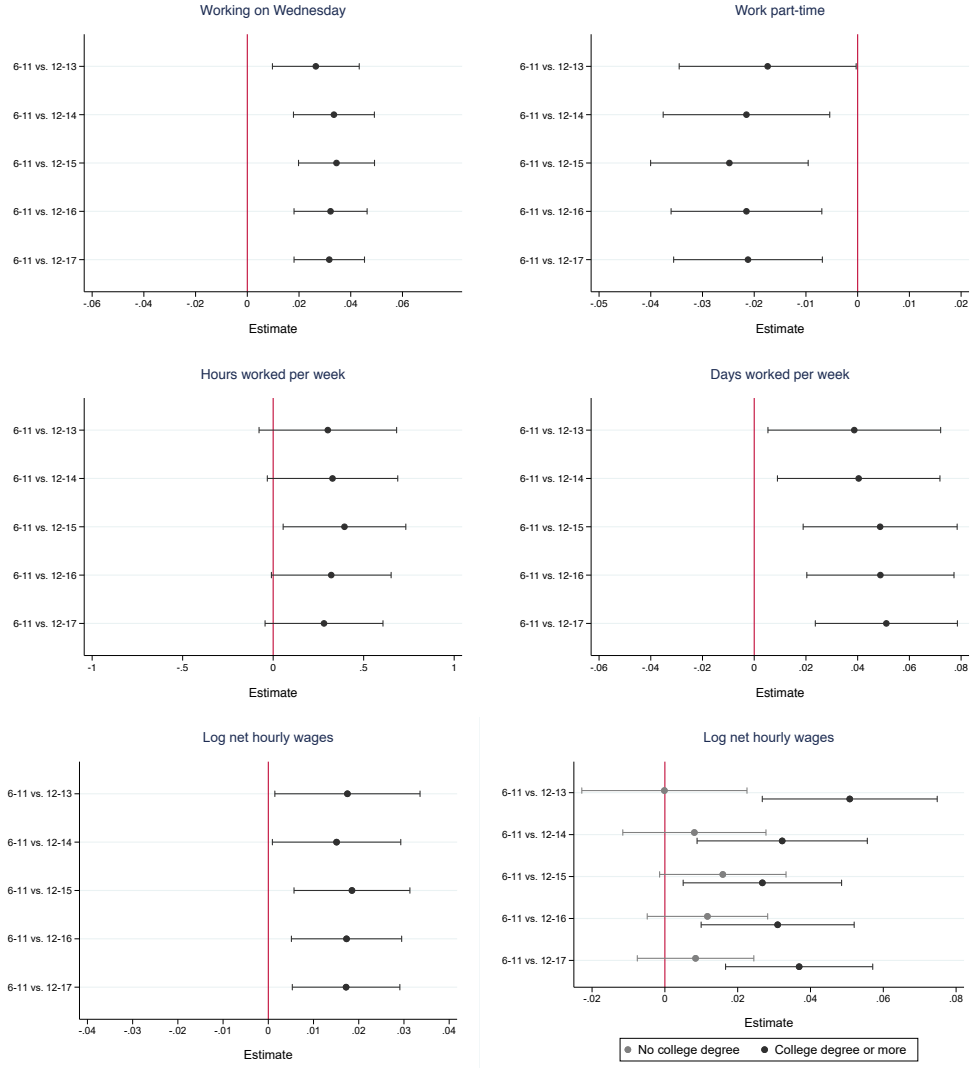


FIGURE 8. CHANGING THE DEFINITION OF THE CONTROL GROUP

*Notes:* the figure reports the coefficients capturing the effect of the reform on the main outcomes of interest. In all but the last graph, the coefficients are obtained from the estimation of regression 1, where controls include age and age square, marital status, number of children, a dummy for immigration status, municipality and wave fixed effects, dummies for the level of education, and a dummy for the presence of other members in the household. In each graph, the first coefficient is estimated on a sample that comprises only mothers whose youngest child is between six and thirteen years old. Then, we progressively enlarge the control group. Mothers working in schools are always excluded from the estimation sample. As for the last graph reporting the impact of the reform on hourly wages by educational level, the coefficients are obtained from the estimation of regression 1 on the entire sample, and interacting all regressors with the subgroups considered, except for municipality fixed effects. For each subgroup, we present the coefficient of the treatment interacted with the subgroup considered. The sample restrictions are the same as in the other graphs. Finally, in all graphs, we report 90-percent confidence intervals.

*Source:* French Labor Force Survey 2009-2016.

TABLE 1 – DESCRIPTIVE STATISTICS OF MOTHERS’ CHARACTERISTICS BY AGE OF THE YOUNGEST CHILD

	Youngest child aged between				
	0-1	2-5	6-11	12-14	15-18
Age	31.60 (4.77)	34.96 (5.17)	40.46 (5.04)	44.54 (4.40)	46.69 (4.04)
Married	0.95 (0.21)	0.89 (0.31)	0.83 (0.38)	0.80 (0.40)	0.79 (0.41)
Immigrant	0.08 (0.27)	0.09 (0.29)	0.09 (0.29)	0.09 (0.28)	0.09 (0.28)
College degree or more	0.56 (0.50)	0.48 (0.50)	0.38 (0.48)	0.30 (0.46)	0.27 (0.44)
No college degree	0.44 (0.50)	0.52 (0.50)	0.62 (0.48)	0.70 (0.46)	0.73 (0.44)
Number of children	1.69 (0.80)	1.88 (0.81)	1.89 (0.73)	1.51 (0.58)	1.10 (0.31)
Labor Force participation	0.63 (0.48)	0.79 (0.41)	0.86 (0.35)	0.87 (0.34)	0.85 (0.35)
Hours worked per week	34.31 (9.36)	33.96 (10.19)	34.38 (10.89)	34.85 (11.28)	35.05 (11.50)
Part-time work	0.35 (0.48)	0.37 (0.48)	0.36 (0.48)	0.34 (0.47)	0.32 (0.47)
Days worked per week	4.61 (0.88)	4.63 (0.89)	4.70 (0.90)	4.78 (0.87)	4.79 (0.90)
Work on Wednesday	0.51 (0.50)	0.57 (0.49)	0.59 (0.49)	0.67 (0.47)	0.69 (0.46)
Work on Thursday	0.61 (0.49)	0.72 (0.45)	0.74 (0.44)	0.76 (0.43)	0.74 (0.44)
Saturday	0.21 (0.41)	0.23 (0.42)	0.23 (0.42)	0.24 (0.42)	0.23 (0.42)
Monthly wages (in Euros)	1,609 (882)	1,566 (927)	1,579 (1,044)	1,617 (1,107)	1,612 (963)
N	27,132	51,981	65,630	31,043	24,771

*Notes:* the table presents summary statistics for mothers’ characteristics, computed for each age-interval of their youngest child living in the household. The studied sample comprises all French mothers aged between 18 and 55, and interviewed in the French Labor Force Survey before the implementation of the reform. Mothers working in schools are not included when computing these figures.

*Source:* French Labor Force Survey 2009-2013.

TABLE 2 – LABOR SUPPLY RESPONSE TO THE REFORM

	(1) Labor force participation	(2) Part-time	(3) Hours worked per week	(4) Days worked per week	(5) Work on Wednesday	(6) Work on Saturday	(7) Log net hourly wages
Treatment	0.00842 (0.00621)	-0.0215** (0.00979)	0.328 (0.219)	0.0404** (0.0191)	0.0335*** (0.00951)	-0.0201** (0.00890)	0.0151* (0.00863)
Youngest child between 6-11	-0.015*** (0.0041)	0.0336*** (0.00688)	-0.676*** (0.159)	-0.0904*** (0.0121)	-0.0687*** (0.00921)	-0.00340 (0.00832)	0.0148** (0.00583)
Observations	175,528	133,979	133,979	133,979	61,816	61,816	43,012
$R^2$	0.169	0.155	0.169	0.140	0.097	0.136	0.342
F	38.81	19.77	24.38	7.840	22.35	19.85	112.0
Pre-treatment mean	0.85	0.36	34.4	4.7	0.59	0.23	11.5

*Notes:* the table shows the coefficients capturing the effect of the reform, obtained from the estimation of regression 1. The different columns refer to the outcome considered. All regressions include age and age square, marital status, number of children, a dummy for immigration status, municipality and wave fixed effects, dummies for the level of education, and a dummy for the presence of other members in the household. The estimation sample comprises all mothers whose youngest child is between six and fourteen years old, with the exception of those working in schools. In columns 2 to 7, we only consider mothers who are employed at the time of the interview. The sample size falls in columns 5 and 6, as in the French Labor Force Survey the decision to work on each day of the week is measured only from 2013 onward. The sample size further shrinks in the last column, as respondents report their monthly wages only once out of the five times their are interviewed.

\*\*\* Significant at the 1 percent level.

\*\* Significant at the 5 percent level.

\* Significant at the 10 percent level.

*Source:* French Labor Force Survey 2009-2016.

TABLE 3 – DAILY LABOR SUPPLY RESPONSE TO THE REFORM

	(1) Monday	(2) Tuesday	(3) Wednesday	(4) Thursday	(5) Friday	(6) Saturday	(7) Sunday
Treatment	-0.00188 (0.00875)	0.00125 (0.00755)	0.0335*** (0.00951)	0.00158 (0.00782)	0.00073 (0.00782)	-0.0201** (0.00890)	-0.00533 (0.00569)
Ygst child btw 6-11	0.0008 (0.00778)	-0.0091 (0.00661)	-0.0687*** (0.00921)	-0.0111* (0.00675)	-0.00953 (0.00696)	-0.00340 (0.00832)	-0.00268 (0.00548)
Observations	61,816	61,816	61,816	61,816	61,816	61,816	61,816
$R^2$	0.085	0.087	0.097	0.088	0.083	0.136	0.112
F	20.38	35.92	22.35	30.82	28.27	19.85	5.536
Pre-treatment mean	0.70	0.77	0.59	0.75	0.75	0.23	0.09

*Notes:* the table shows the coefficients capturing the effect of the reform, obtained from the estimation of regression 1. The different columns refer to the outcome considered, corresponding to the decision to work each specific day of the week. All regressions include age and age square, marital status, number of children, a dummy for immigration status, municipality and wave fixed effects, dummies for the level of education, and a dummy for the presence of other members in the household. The estimation sample comprises all employed mothers whose youngest child is between six and fourteen years old, with the exception of those working in schools. As the French Labor Force Survey starts including questions on the allocation of working time along the week only in 2013, the sample considered here only comprises women interviewed between 2013 and 2016.

\*\*\* Significant at the 1 percent level.

\*\* Significant at the 5 percent level.

\* Significant at the 10 percent level.

*Source:* French Labor Force Survey 2009-2016.

TABLE 4 – LABOR SUPPLY RESPONSE TO THE REFORM BY SUBGROUP

	Working on Wednesday			Hours worked per week			Log net hourly wages		
	Estimate	Pre-treatment mean	Estimate	Pre-treatment mean	Estimate	Pre-treatment mean	Estimate	Pre-treatment mean	(in €)
<b>Panel A. Educational level</b>									
No college degree	0.0252** (0.0123)	0.59	-0.0277 (0.289)	33.26	0.0081 (0.0119)	10			
College degree or more	0.0427*** (0.0156)	0.58	0.840** (0.361)	36.28	0.0322* (0.0142)	15			
P-value difference	0.386		0.069		0.211				
N	61,816		133,979		43,012				
<b>Panel B. Type of occupations</b>									
Non-managerial occupations	0.0285*** (0.009)	0.59	0.054 (0.238)	33.79	0.008 (0.008)	10.45			
Managerial occupations	0.0329 (0.0241)	0.57	1.273** (0.602)	38.29	0.0266 (0.0210)	19			
P-value difference	0.999		0.070		0.41				
N	75,511		142,990		46,197				

*Notes:* the table reports the impact of the reform on labor supply decisions of different subgroups. To conduct this analysis, we choose to estimate a regression on the entire sample, and interact all regressors with the subgroups considered, except for municipality fixed effects. Otherwise, all regressions include the standard covariates, namely age and age square, marital status, number of children, a dummy for immigration status, municipality and wave fixed effects, dummies for the level of education, and a dummy for the presence of other members in the household. For each subgroup, we present the coefficient of the treatment interacted with the subgroup considered. We also report the p-value of the test on the equality of the impact of the reform across the two subgroups. The estimation sample includes all mothers, aged 18 to 55, whose youngest child is between six and fourteen, with the exception of those working in schools.

\*\*\* Significant at the 1 percent level.

\*\* Significant at the 5 percent level.

\* Significant at the 10 percent level.

*Source:* French Labor Force Survey 2009-2016.

TABLE 5 – FATHERS’ LABOR SUPPLY RESPONSE TO THE REFORM

	(1) Labor force participation	(2) Part-time	(3) Hours worked per week	(4) Days worked per week	(5) Work on Wednesday	(6) Work on Saturday
Treatment	-0.00633 (0.00395)	-0.00239 (0.00378)	0.0247 (0.224)	0.00824 (0.0135)	0.00861 (0.00655)	-0.00175 (0.00866)
Youngest child between 6-11	-0.00427 (0.00264)	0.00647*** (0.00242)	-0.498*** (0.160)	-0.0142 (0.00952)	-0.0225*** (0.00610)	0.0145* (0.00815)
Observations	149,794	135,127	135,127	135,127	66,499	66,499
$R^2$	0.101	0.111	0.175	0.140	0.085	0.112
F	11.3	4.106	16.98	2.086	34.21	6.035
Pre-treatment mean	0.96	0.03	42.81	5.09	0.82	0.22

*Notes:* the table shows the coefficients capturing the effect of the reform on fathers, obtained from the estimation of regression 1. The different columns refer to the outcome considered, being, respectively, labor force participation, column 1, the decision to work part-time, column 2, number of hours worked per week, column 3, number of days worked per week, column 4, and decision to work on Wednesday and Saturday, columns 5 and 6. All regressions include age and age square, marital status, number of children, a dummy for immigration status, municipality and wave fixed effects, dummies for the level of education, and a dummy for the presence of other members in the household. The estimation sample comprises all fathers whose youngest child is between six and fourteen years old, with the exception of those working in schools. In column 2 to 6, we restrict the sample to fathers who are employed at the time of the interview. The sample size further shrinks in columns 5 and 6, as in the French Labor Force Survey the decision to work on each day of the week is measured only from 2013 onward.

\*\*\* Significant at the 1 percent level.

\*\* Significant at the 5 percent level.

\* Significant at the 10 percent level.

*Source:* French Labor Force Survey 2009-2016.

TABLE 6 — DAILY LABOR SUPPLY RESPONSE TO THE REFORM - FATHERS

	(1) Monday	(2) Tuesday	(3) Wednesday	(4) Thursday	(5) Friday	(6) Saturday	(7) Sunday
Treatment	0.00346 (0.00728)	0.000656 (0.00637)	0.00861 (0.00655)	0.00764 (0.00677)	0.00564 (0.00691)	-0.00175 (0.00866)	0.00183 (0.00569)
Youngest child between 6-11	-0.0170*** (0.00652)	-0.0124** (0.00548)	-0.0225*** (0.00610)	-0.0195*** (0.00580)	-0.0101* (0.00593)	0.0145* (0.00815)	0.00776 (0.00556)
Observations	66,499	66,499	66,499	66,499	66,499	66,499	66,499
$R^2$	0.082	0.089	0.085	0.088	0.088	0.112	0.120
F	19.18	43.34	34.21	30.14	31.26	6.035	2.770
Pre-treatment mean	0.76	0.82	0.79	0.79	0.79	0.22	0.09

*Notes:* the table shows the coefficients capturing the effect of the reform on fathers, obtained from the estimation of regression 1. The different columns refer to the decision to work each specific day of the week. All regressions include age and age square, marital status, number of children, a dummy for immigration status, municipality and wave fixed effects, dummies for the level of education, and a dummy for the presence of other members in the household. The estimation sample comprises all fathers whose youngest child is between six and fourteen years old who are employed at the time of the interview, with the exception of those working in schools.

\*\*\* Significant at the 1 percent level.

\*\* Significant at the 5 percent level.

\* Significant at the 10 percent level.

*Source:* French Labor Force Survey 2009-2016.

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## A Appendix (For online publication)

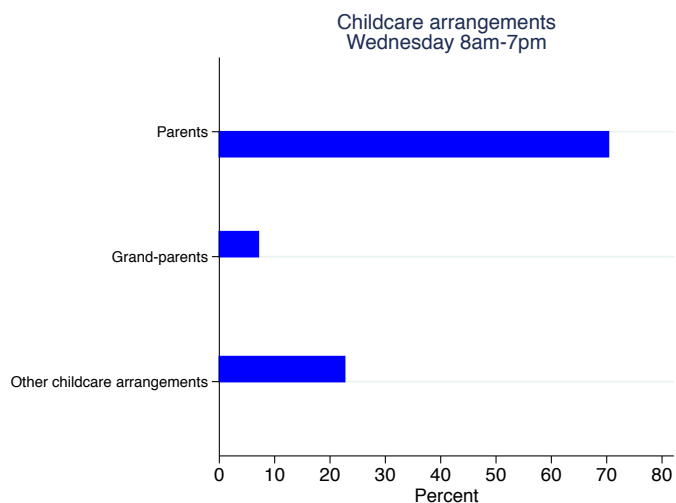


FIGURE A.1. CHILDCARE ARRANGEMENTS FOR CHILDREN BETWEEN 0 AND 6 - 2002/2013

*Notes:* the figure shows the childcare arrangements families adopt prior to the introduction of the reform, to take care of their children when these are not in school on Wednesday. The sample comprises 8461 parents with children aged 0 to 6 interviewed in 2002, 2007, and 2013 - prior to the introduction of the reform.

*Source:* CNAF survey on childcare arrangements.

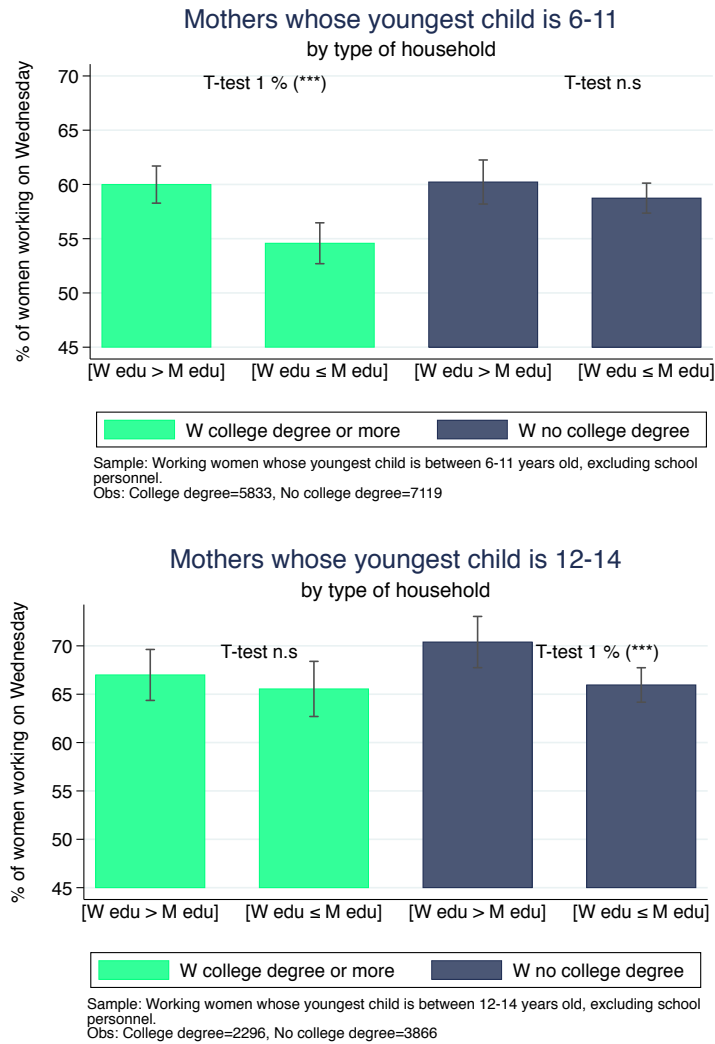


FIGURE A.2. PROPORTION OF WOMEN WORKING ON WEDNESDAY BY TYPE OF HOUSEHOLD -  
PRE-REFORM PERIOD

*Notes:* the figures report bar graphs representing the percentage of women working on Wednesday among mothers whose youngest child is between six and eleven, at the top, and mothers whose youngest child is between twelve and fourteen, at the bottom. In each graph, we consider women with at least a college degree separately from those without college degree. Within each of these two groups, we compare women whose educational level is strictly higher than their partner's, labelled "W edu > M edu", with women whose educational level is at most equal to their partner's, called "W edu ≤ M edu". All figures refer to the pre-reform period, and we exclude mothers working in schools when computing them. On each bar, we also report 95 percent-confidence intervals. Finally, for each educational level, we indicate the results of T-tests for the difference in means between the two types of household.

*Source:* French Labor force Survey 2009-2013.

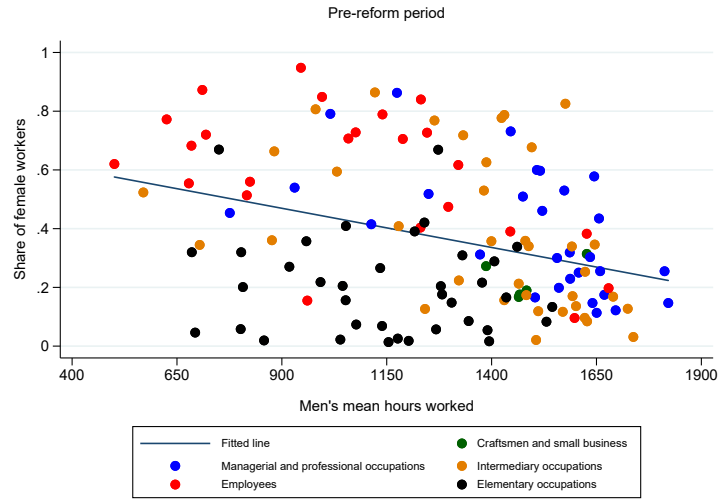


FIGURE A.3. WOMEN REPRESENTATION ALONG THE MALE HOURS DISTRIBUTION

*Notes:* the figure reports the relationship between the share of female workers and the average number of hours worked by occupation (3-digit classification). The graph is constructed using a representative sample of the French matched-employer-employee data set for the period 2009-2012.

*Source:* French matched-employer-employee database 2009-2012 (DADS).

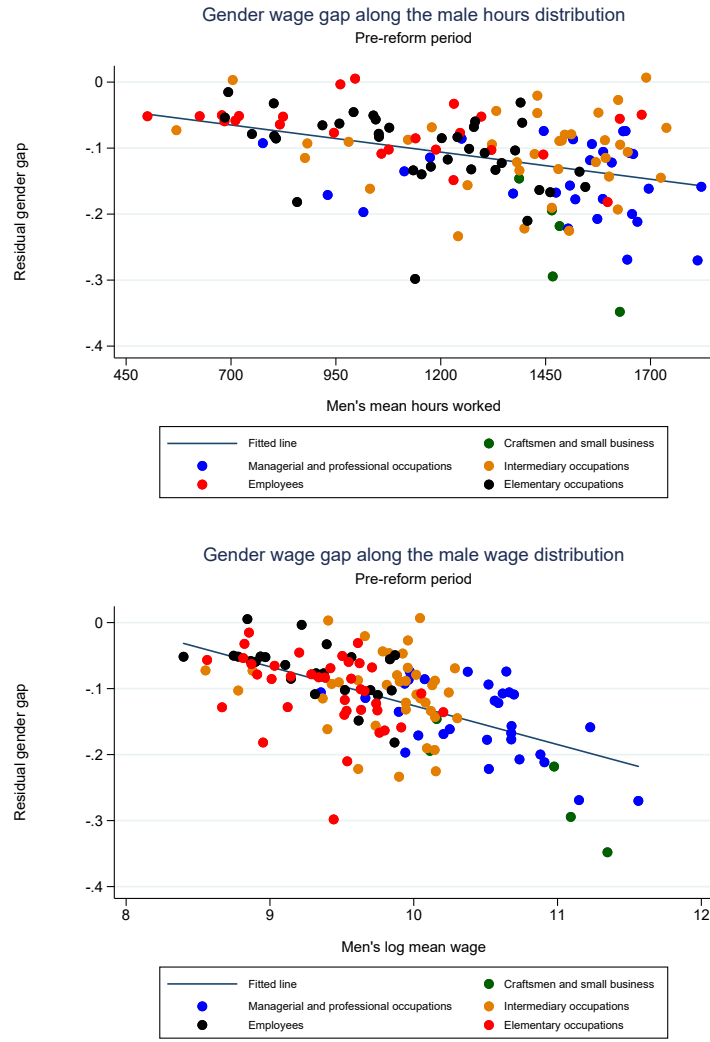


FIGURE A.4. GENDER WAGE GAP BY OCCUPATION

*Notes:* the graph depicts the gender wage gap by occupation (3-digit classification). The top graph reports the relationship between the residual gender wage gap and the average number of hours worked by occupation. The bottom graph reports the relationship between the residual gender wage gap and (log) male average annual earnings by occupation. The residual gender wage gap corresponds to the female coefficient in a regression of (log) annual earnings on (log) annual hours worked, age, age squared, level of education and a female dummy, estimated separately for each 3-digit occupation. The graph is constructed using a representative sample of the French matched-employer-employee data set for the period 2009-2012.

*Source:* French matched-employer-employee database 2009-2012 (DADS).

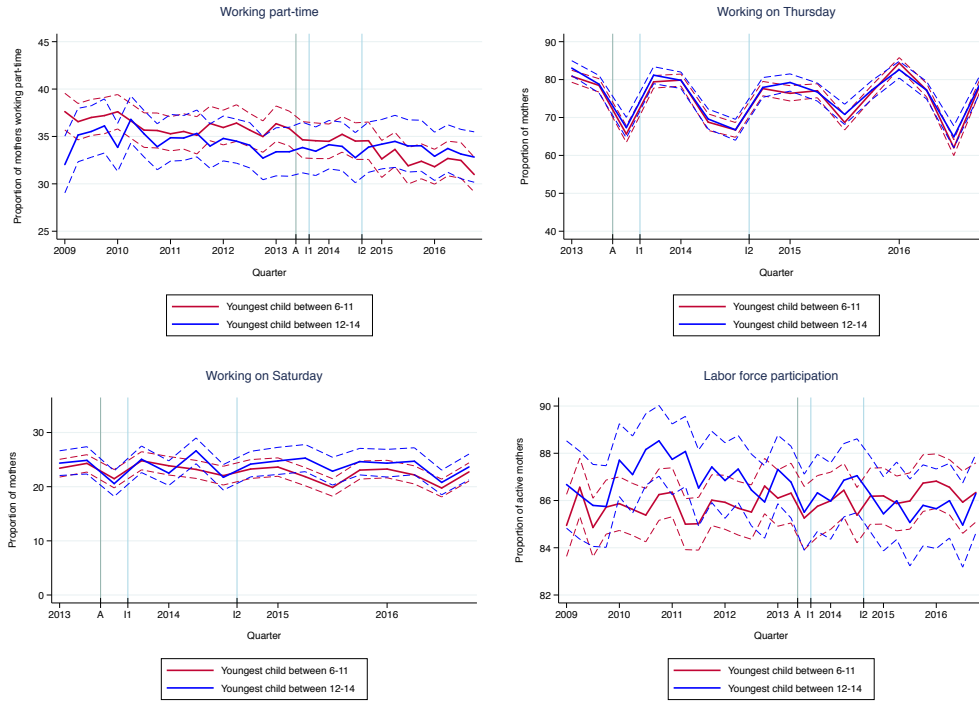


FIGURE A.5. TRENDS IN MOTHERS' LABOR SUPPLY MEASURES BY AGE OF THE YOUNGEST CHILD

*Notes:* the graphs show the evolution of different labor supply measures over the period 2009-2016. The sample includes all mothers aged 18-55 whose youngest child is between the age of six and fourteen, with the exception of those working in schools. We represent in red treated mothers, that is, those whose youngest child is between six and eleven years old. Mothers whose youngest child is of middle-school age, or control mothers, are represented in blue. The vertical bar named "A" corresponds to April 2013, when municipalities announce in which year they will introduce the reform. The bar called "I1" corresponds to September 2013, when 20 percent of municipalities implement the reform. The bar labelled "I2" corresponds to September 2014, when the rest of municipalities implement the reform. Finally, we report 95-percent confidence intervals.

*Source:* French Labor Force Survey 2009-2016.

TABLE A.1 – DESCRIPTIVE STATISTICS - YOUNGEST CHILD BETWEEN 6-11

	No college degree	<i>N</i>	College degree or more	<i>N</i>	P-value T-test
Hours worked per week	33.26	40,491	36.28	24,625	0.00
Part-time	38.52	42,936	32.07	24,625	0.00
Days worked per week	4.74	40,491	4.63	24,625	0.00
Work on Wednesday	59.33	9,043	58.23	6,927	0.16
Work on Saturday	29.05	9,043	15.99	6,927	0.00
Monthly wages	1,277	13,181	2,110	7,674	0.00
	Non-managerial occupations	<i>N</i>	Managerial occupations	<i>N</i>	P-value T-test
Hours worked per week	33.70	55,179	38.3	9,894	0.00
Days worked per week	4.7	55,179	4.66	9,894	0.24
Part-time	37.72	55,179	26.94	9,894	0.00
Work on Wednesday	59.23	13,211	57.27	2,716	0.06
Work on Saturday	26.12	13,211	10.16	2,716	0.00
Monthly wages	1,369	17,746	2,811	3,098	0.00
	Low W High M	<i>N</i>	High W Low M	<i>N</i>	P-value T-test
Hours worked per week	33.98	31,779	35.16	23,235	0.00
Part-time	40.06	31,779	33.23	23,235	0.00
Days worked per week	4.66	31,779	4.7	23,235	0.00
Work on Wednesday	56.26	7,571	60.09	5,383	0.00
Work on Saturday	24.25	7,571	22.16	5,383	0.00
Monthly wages	1,553	10,021	1,666	6,560	0.00
	Firm size $\leq 20$	<i>N</i>	Firm size $>20$	<i>N</i>	P-value T-test
Hours worked per week	34.86	12,824	34.29	52,292	0.00
Part-time	35.17	12,824	36.3	52,292	0.02
Days worked per week	4.78	12,824	4.68	52,292	0.00
Work on Wednesday	60.34	3,577	58.42	12,393	0.00
Work on Saturday	27.84	3,577	22.1	12,393	0.00
Monthly wages	1,502	3,868	1,602	16,987	0.00
	Public sector	<i>N</i>	Private sector	<i>N</i>	P-value
Hours worked per week	34.59	15,495	33.26	43,628	0.00
Part-time	36.43	15,495	37.82	43,628	0.00
Days worked per week	4.56	15,495	4.68	43,628	0.00
Work on Wednesday	53.41	3,326	59.3	10,933	0.00
Work on Saturday	15.27	3,326	21.09	10,933	0.00
Monthly wages	1,703	5,396	1,539	15,370	0.00

*Notes:* the table reports pre-reform summary statistics for mothers whose youngest child is between six and eleven. The figures are reported separately for the subgroups indicated on top of each table section. In the last column of the table, we report the p-value of the T-tests for the difference in means between the two subgroups.

*Source:* French Labor Force Survey 2009-2013.

TABLE A.2 – DESCRIPTIVE STATISTICS - YOUNGEST CHILD BETWEEN 12-14

	No college degree	<i>N</i>	College degree or more	<i>N</i>	P-value T-test
Hours worked per week	33.69	21,435	37.55	9,423	0.00
Part-time	37.43	21,435	27.29	9,423	0.00
Days worked per week	4.81	21,435	4.73	9,423	0.00
Work on Wednesday	66.94	5,026	66.83	2,815	0.92
Work on Saturday	28	5,026	15.59	2,815	0.00
Monthly wages	1,322	6,938	2,344	2,864	0.00
	Non-managerial occupations	<i>N</i>	Managerial occupations	<i>N</i>	P-value T-test
Hours worked per week	34.06	26,357	39.65	4,475	0.00
Part-time	36.44	26,357	22	4,475	0.00
Days worked per week	4.79	26,357	4.78	4,475	0.67
Work on Wednesday	66.88	6,563	66.88	1,252	0.99
Work on Saturday	25.93	6,563	11.01	1,252	0.00
Monthly wages	1,396	8,412	2,979	1,384	0.00
	Low W High M	<i>N</i>	High W Low M	<i>N</i>	P-value T-test
Hours worked per week	34.49	15,167	35.60	8,931	0.00
Part-time	38.66	15,167	32.32	8,931	0.00
Days worked per week	4.77	15,167	4.78	8,931	0.25
Work on Wednesday	65.84	3,793	68.63	2,371	0.02
Work on Saturday	24.51	3,793	22.51	2,371	0.07
Monthly wages	1,564	4,747	1,741	2,829	0.00
	Firm size $\leq 20$	<i>N</i>	Firm size $>20$	<i>N</i>	P-value T-test
Hours worked per week	35.43	6,212	34.73	24,646	0.00
Part-time	35.05	6,212	34.15	24,646	0.18
Days worked per week	4.86	6,212	4.76	24,646	0.00
Work on Wednesday	66.99	1,756	64.47	6,085	0.00
Work on Saturday	30.62	1,756	21.51	6,085	0.00
Monthly wages	1,849	2,309	1,642	7,953	0.00
	Public sector	<i>N</i>	Private sector	<i>N</i>	P-value
Hours worked per week	35.07	7,542	33.48	20,509	0.00
Part-time	31.83	7,542	37.2	20,509	0.00
Days worked per week	4.68	7,542	4.75	20,509	0.00
Work on Wednesday	58.83	1,789	68.60	5,331	0.00
Work on Saturday	16.76	1,789	21.23	5,331	0.00
Monthly wages	1,786	2,603	1,555	7,165	0.00

*Notes:* the table reports pre-reform summary statistics for mothers whose youngest child is between twelve and fourteen. The figures are reported separately for the subgroups indicated on top of each table section. In the last column of the table, we report the p-value of the T-tests for the difference in means between the two subgroups.

*Source:* French Labor Force Survey 2009-2013.

## A.1 Theoretical framework

In this section, we show that we can rationalize our empirical findings in a very simple conceptual framework that explores the link between inter-temporal labor supply decisions, free childcare provision and wage penalty associated to working few hours. We illustrate the effect of the reform in a canonical consumption/leisure two-period model. We want to see how the optimal time allocation is affected if (i) tomorrow's wage rate is a function of today's labor supply decision, (ii) women's time constraint is relaxed through the provision of free childcare.

### A.1.1 Setting

Consider an individual (mother) who derives utility from consumption  $c$  and leisure  $l$  in period 1 and 2 by supplying hours of work.<sup>31</sup>

$$\max_{\{c_1, c_2, l_1, l_2\}} u(c_1, l_1) + \beta \mathbb{E}[u(c_2, l_2)]$$

and

$$\begin{cases} c_1 & \leq h_1 w_1 \\ c_2 & \leq h_2 w_2 \end{cases}$$

with  $u(\cdot)$  increasing and strictly concave, and where  $h_1, h_2$  represent the hours spent working in period 1 and 2.<sup>32</sup> The wage rate at period 1,  $w_1$ , is determined exogenously, while the wage in period 2 depends on a probability of promotion  $p$ .<sup>33</sup>

$$w_2 = \begin{cases} w^H & \text{with probability } p \\ w^L & \text{with probability } (1 - p) \end{cases}$$

---

<sup>31</sup>We think that it is justified to focus on individual labor supply model rather than using joint labor supply models a la [Chiappori, Iyigun and Weiss \(2009\)](#) in order to be consistent with our empirical results. First, we do observe a reaction to the reform also for single mothers, second we show that fathers' labor supply is not responsive to the reform. Moreover, women's reaction to the reform is not statistically different across types of households. Therefore it is relevant and simpler to focus on the labor supply of women alone.

<sup>32</sup>For simplicity, we exclude the possibility of savings from the model.

<sup>33</sup>In terms of incentives compensation, this wage structure would correspond to a worker who received input-based pay with continuous incentives: the worker can decide over the amount of input supplied. The time-based pay assumption is relevant in settings where output and/or quality are not very observable ([Lazear 2018](#)), which is consistent with characteristics of the sample of working mothers with high level of education, or working in managerial occupations.

with  $w^H > w^L$

A key assumption here is that  $p$  is a function of hours worked in period 1, i.e promotion is more likely to occur with high level of labor supply in period 1. This assumption relies on a line of research on compensation and incentives in the workplace ([Lazear 2018](#)), in particular regarding relative scheme of performance and tournament theory. In this setting,  $h_1$  is akin to an imperfect signal of each player's performance. A greater  $h_1$  signals a greater performance and increases the probability of promotion.

Consistent with empirical evidence showing that the jump in pay for promotions at high levels is greater than that at low levels ([Eriksson 1999](#), [Belzil and Bognanno 2008](#)), the gap between  $w^H$  and  $w^L$  is likely to be higher for high levels of education  $e$ . Without loss of generality, let's assume that  $w_2^L = w_1$ , i.e if the mother is not promoted, she stays with the same wage rate, we now write

$$w_2^H - w_2^L = w_2^H - w_1 = \Delta_w > 0$$

Assumptions related to the wage dynamics write as follows:

$$\left\{ \begin{array}{l} p = f(h_1) \quad \text{with} \quad \frac{\partial f}{\partial h_1} > 0 \\ \frac{\partial \Delta_w}{\partial e} > 0 \end{array} \right.$$

For simplicity, we set:

$$f(h_1) = h_1$$

Once promotion is granted (or not), the state of the world is realized, and the mother can optimally allocate her time knowing her budget constraint (i.e the value of  $w_2$ ). We solve the program by backward induction: we first find optimal labor supply in period 2 ( $h_2^*$ ), and then incorporate indirect utility functions of period 2 within the objective function of period 1.

## Optimal labor supply in period 2

$$\max_{\{c_2, l_2\}} u(c_2, l_2) \text{ s.t } \begin{cases} w_2(1 - l_2) - c_2 & \geq 0 \\ h_2 + l_2 & \leq 1 \end{cases}$$

$$\text{with } u(c, l) = \alpha \log(c) + (1 - \alpha) \log(l)$$

Maximizing with respect to  $c_2$ ,  $l_2$  and using the budget constraint the time constraint, we find:<sup>34</sup>

$$\begin{cases} c_2^* &= \alpha w_2 \\ l_2^* &= 1 - \alpha \\ h_2^* &= \alpha \end{cases} \quad (3)$$

The condition for an interior solution is  $0 < \alpha < 1$ .

We can then derive the indirect utility functions in states of the world where promotion occurred ( $H$ ) or did not ( $L$ ).

$$\begin{cases} V_2(w_2^H, \alpha) &= \alpha \log(w_2^H) + \alpha \log(\alpha) + (1 - \alpha) \log(1 - \alpha) \\ V_2(w_2^L, \alpha) &= \alpha \log(w_2^L) + \alpha \log(\alpha) + (1 - \alpha) \log(1 - \alpha) \end{cases}$$

**Schooling constraint** Let's assume now that the mother can only choose to work as long as the child is in school.<sup>35</sup> If  $s$  is the time that the child can spend at school, the time constraint is such that  $h_2^* \leq s$ . Therefore, the condition under which the schooling constraint is not binding writes as follows:

$$h_2^* < s \iff \alpha < s \quad (4)$$

---

<sup>34</sup>Given that  $u(\cdot)$  is a standard Cobb-Douglas utility function continuously differentiable, the solutions are known to be interior and are characterized by the first-order conditions.

<sup>35</sup>Implicitly, we make the assumption here that mothers cannot buy private childcare. This is consistent with anecdotal evidence of low utilization pre-reform of childcare facilities on Wednesday, and could be explain both by the limited provision of high quality childcare or by the prevalence of social norms according to which mothers should be taking care of their children when they are not at school.

**Optimal labor supply in period 1** The representative mother incorporates future earnings in today's labor supply decision. We substitute indirect utility functions for both states  $H$  and  $L$  in period 1.

$$\max_{\{c_1, l_1\}} u(c_1, l_1) + \beta[pV_2(w_2^H, \alpha) + (1-p)V_2(w_2^L, \alpha)]$$

$$\text{s.t. } \begin{cases} c_1 & \leq (1-l_1)w_1 \\ h_1 + l_1 & \leq 1 \end{cases}$$

Substituting the constraints into the expression:

$$\alpha \log(h_1 w_1) + (1-\alpha) \log(1-h_1) + \beta[f(h_1)V_2^H + (1-f(h_1))V_2^L]$$

with  $f(h_1) = h_1$ . The solution writes:

$$h_1^* = \frac{1}{2} - \frac{1}{2\beta\alpha K} + \frac{\sqrt{\beta^2\alpha^2 K^2 + 1 + (4\alpha - 2)\beta\alpha K}}{2\beta\alpha K}$$

with  $K = \log\left(\frac{w^H}{w^L}\right)$ , where  $h_1^*$  is the unique interior solution. Proof is given in [Appendix A.1.2](#).

In contrast to period 2,  $h_1^*$  here depends on the wage rate in period 2. If  $w_1 = w^L$ , i.e no wage growth between period 1 and 2, the optimal labor supply in period 1 would be greater or equal to the one in period 2. This captures one key component of the model which is that the optimal labor supply in period 1 incorporates future gains in earnings due to promotion. The condition under which the schooling constraint is not binding is:

$$h_1^* = \frac{1}{2} - \frac{1}{2\beta\alpha K} + \frac{\sqrt{\beta^2\alpha^2 K^2 + 1 + (4\alpha - 2)\beta\alpha K}}{2\beta\alpha K} < s$$

Therefore, certain mothers will not attain their optimal labor supply in period 1 but will have to bunch at  $s$ . The following comparative statics help us characterize who are these mothers whose labor supply in period 1 is suboptimal.

**Comparative statics** We can derive the following comparative statics for  $h_1^*$ .

**Proposition:** *the optimal labor supply in period 1,  $h_1^*$ , is an increasing function of  $\alpha$ ,  $\beta$  and  $K = \log\left(\frac{w^H}{w^L}\right)$ , when the schooling constraint is not binding.*

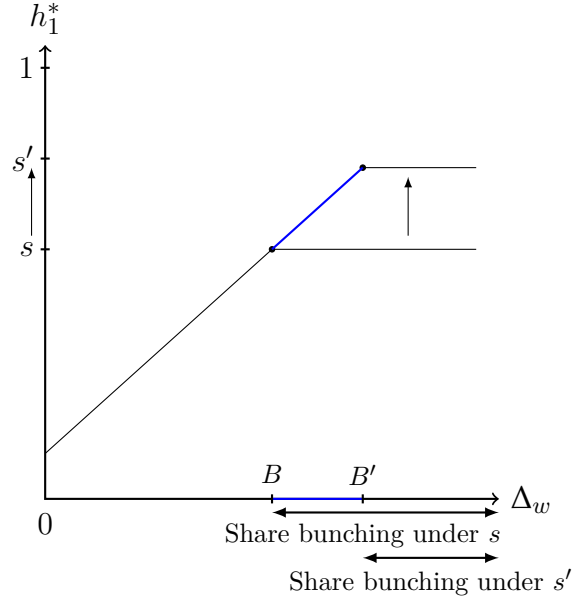
$$\left\{ \begin{array}{l} \frac{dh_1^*}{d\alpha} > 0 \quad (i) \\ \frac{dh_1^*}{d\beta} > 0 \quad (ii) \\ \frac{dh_1^*}{d\Delta_w} > 0 \quad (iii) \end{array} \right.$$

Proof is given in [Appendix A.1.2](#). Propositions (i) and (ii) are intuitive: mothers who value the future more (high  $\beta$ ) are likely to work more in period 1 to increase the probability of promotion in period 2. Mothers with high  $\alpha$  value consumption more than leisure and are likely to work more at both periods. Proposition (iii) states the following: the higher the jump in pay for promotions, the higher the hours worked in period 1. We now investigate what are the implications of these results in the context of the reform.

**Interpretation of the reform** Our reform corresponds to an increase in  $s$ , i.e a relaxation of the schooling constraint. Given the positive relation between  $h_1^*$  and  $\Delta_w$ , the following diagram illustrates the impact of the reform. The shift from  $s$  to  $s'$  reduces the share of mothers who bunch at the schooling constraint.

- The welfare of women whose optimal labor supply in period 1 was lower than  $s$ , i.e for whom the schooling constraint was not binding, is unchanged.
- The welfare of women who were bunching at  $s$  in period 1 increases: a significant share of these mothers (represented by the blue line on the diagram) is able to reach her optimal

$h_1^*$  .



**Welfare gains** Consistent with our empirical results, given the positive relation between education and  $\Delta_w$ , highly educated women are more likely to be among these bunchers. The gain in welfare can be characterized by:

$$(B' - B) \frac{dh_1^*}{d\Delta_w} [V_1(h_1^*) - V_1(s)]$$

where  $V_1(\cdot)$  is the indirect utility function in period 1.

### A.1.2 Proofs

**Optimal labor supply** Substituting the constraints into the expression:

$$\alpha \log(h_1 w_1) + (1 - \alpha) \log(1 - h_1) + \beta[f(h_1)V_2^H + (1 - f(h_1))V_2^L]$$

We differentiate with respect to  $h_1$

$$\frac{\partial}{\partial h_1} = 0 \iff \frac{\alpha}{h_1} - \frac{1 - \alpha}{1 - h_1} + \beta V_2^H - \beta V_2^L = 0$$

Rearranging this expression, we find

$$\alpha + h_1(-1 + \beta V_2^H - \beta V_2^L) + h_1^2(-\beta V_2^H + \beta V_2^L) = 0 \quad (5)$$

For simplicity, let's write

$$V_2^H - V_2^L = \alpha \log(w_2^H) - \alpha \log(w_2^L) = \alpha \log\left(\frac{w_2^H}{w_2^L}\right) = \alpha K$$

By construction,  $K$  is strictly positive. Compare to (3), the optimal labor supply in period 1,  $h_1^*$ , solves

$$h_1 = \alpha + \underbrace{\beta \alpha K h_1 - \beta \alpha K h_1^2}_{\Delta}$$

which incorporates future gains in earning due to promotion. We can rewrite (5) as a polynomial of  $h_1$  and solve it:

$$\alpha + (\beta \alpha K - 1)h_1 - \beta \alpha K h_1^2 = 0 \quad (6)$$

$$\Delta = \beta^2 \alpha^2 K^2 + 1 + (4\alpha - 2)\beta \alpha K$$

For  $1 > \alpha > 0$  and  $1 > \beta > 0$ ,  $\Delta > 0$  and the system (6) has two solutions:

$$\begin{cases} h_1'^* &= \frac{1-\beta\alpha K + \sqrt{\beta^2\alpha^2 K^2 + 1 + (4\alpha-2)\beta\alpha K}}{-2\beta\alpha K} \\ h_1''^* &= \frac{1-\beta\alpha K - \sqrt{\beta^2\alpha^2 K^2 + 1 + (4\alpha-2)\beta\alpha K}}{-2\beta\alpha K} \end{cases} \quad (7)$$

$h_1''^*$  is the only positive root. Moreover,  $\lim_{K \rightarrow +\infty} h_1''^* = 1$ , therefore  $h_1''^*$  is the interior solution to the maximization problem in period 1.

**Comparative statics** Assuming  $\beta > 0$  and  $\alpha > 0$ ,

$$h_1^* = \frac{1}{2} - \frac{1}{2\beta\alpha K} + \underbrace{\frac{\sqrt{\beta^2\alpha^2 K^2 + 1 + (4\alpha-2)\beta\alpha K}}{2\beta\alpha K}}_A$$

$$\begin{aligned}
\frac{dh_1^*}{dK} &= \frac{1}{2\beta\alpha K^2} + A' \\
A' &= \frac{\frac{2\beta\alpha K}{2\sqrt{\Delta}}[2\beta^2\alpha^2 K + (4\alpha-2)\beta\alpha] - 2\beta\alpha\sqrt{\Delta}}{(2\beta\alpha K)^2} \\
&= \frac{2\beta^2\alpha^2 K + (4\alpha-2)\beta\alpha}{4\beta\alpha K\sqrt{\Delta}} - \frac{\sqrt{\Delta}}{2\beta\alpha K^2} \\
&= \frac{2\beta\alpha K + (4\alpha-2)}{4K\sqrt{\Delta}} - \frac{\sqrt{\Delta}}{2\beta\alpha K^2} \\
&= \frac{K^2\beta^2\alpha^2 + (2\alpha-1)\beta\alpha K - \Delta}{2\beta^2\alpha^2 K\sqrt{\Delta}} \\
&= \frac{-1 - \beta\alpha K(2\alpha-1)}{2\beta^2\alpha^2 K\sqrt{\Delta}} \\
\frac{dh_1^*}{dK} &= \frac{1}{2\beta\alpha K^2} - \frac{1 + \beta\alpha K(2\alpha-1)}{2\beta^2\alpha^2 K\sqrt{\Delta}} \\
&= \frac{\sqrt{\Delta} - 1 - \beta\alpha K(2\alpha-1)}{2\beta^2\alpha^2 K\sqrt{\Delta}}
\end{aligned}$$

Given that

$$2\beta^2\alpha^2 K\sqrt{\Delta} > 0$$

for  $\beta > 0$  and  $\alpha > 0$ , then

$$\frac{dh_1^*}{dK} > 0 \Leftrightarrow g(K) = \sqrt{\Delta} - 1 - \beta\alpha K(2\alpha - 1) > 0$$

which is true for  $K > 0$ ,  $\beta > 0$  and  $\alpha > 0$ . The problem is symmetric for  $\frac{dh_1^*}{d\beta}$ .