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ABSTRACT

Employed 40 Hours or Not-Employed 39: Lessons from the 1982 Mandatory Reduction of the Workweek*

We use longitudinal individual wage, hours and employment data to investigate the effect of the 1 February 1982 mandatory reduction of weekly working hours in France. Just after François Mitterrand's election in May 1981, the government decided to increase the minimum wage by 5%. Then, as promised in its electoral program, the socialist government reduced the workweek from 40 to 39 hours. At the same time, it mandated stable monthly earnings for minimum wage workers and recommended the stabilization of monthly earnings for other workers (recommendations followed by 90% of the firms). We show that workers directly affected by these changes – those working 40 hours in March 1981 – were more likely to lose their jobs between 1981 and 1982 than workers not affected by the changes – those working 36 to 39 hours in March 1981. Moreover, because the decree enforcing the new standard was issued faster than earlier promises, some firms had no time to complete negotiations and their workers were still working 40 hours after 1 February 1982. We show that these workers have also been strongly affected by the reduction in standard hours. Our estimates of the impact of this one-hour reduction of the workweek on employment losses vary between 2% and 4%, depending on the methodology or the data used. Furthermore, we show that minimum wage workers have been most affected by the changes. This result, consistent with our model, is due to the impossibility of adjusting their monthly wage, which results in excess job destruction and creation. These results should help us understand the possible effects of the upcoming mandatory reduction of hours in France, where the maximum weekly working hours will gradually decline from 39 to 35 hours beginning in the year 2000. Similar projects are envisaged in other European countries, which hope that reductions in hours will be an efficient policy for reducing unemployment.

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* Please note that this paper replaces Discussion Paper 2158 'Working 40 Hours or Not Working 39: Lessons from the 1981 Mandatory Reduction of Weekly Working Hours' by **Francis Kramarz** and **Bruno Crépon** (May 1999). An error in the construction of the data was discovered subsequent to the publication of the original paper. We apologize for any inconvenience this may have caused.

Submitted 3 January 2000

NON-TECHNICAL SUMMARY

The mandatory reduction of weekly hours is gaining ground in the minds of politicians and in public opinion as the unique public policy that can efficiently reduce unemployment in France. In 1998 the French government adopted a policy requiring firms to implement a 35-hour workweek by the year 2000. French firms are in the process of negotiating the workweek reduction timetable with their unions or personnel delegates, starting with the current 39-hour workweek. The outcome of these negotiations will help determine the second set of hours regulations, which are being debated now in the French Parliament. Some Italian and Spanish union leaders and politicians advocate the same set of policies as the French have adopted.

Although the media are full of discussions of the potential effects of the hours-reduction laws, there are very few empirical assessments of the effects of such regulation, leaving the debate open to views based on political prejudices (see, however, Hunt, 1999, who mostly focuses on the German case). This is ironic because France has already attempted to manipulate working hours in order to reduce unemployment. In 1982, a few months after François Mitterrand's election, the socialist government, as stated in its election platform, decided to shorten the workweek by cutting the maximum legal number of hours per week. Even though the hourly reduction was included in the socialist's platform, it was almost fully unexpected 6 months before the elections. The hourly reduction took place at the beginning of 1982, in February, a few months after the 5% increase in the French minimum wage, the SMIC, of July 1981. In addition, the February 1982 decree stipulated the mandatory rigidity of monthly earnings for minimum wage workers employed by the firm at that date.

In this article we investigate the effects of this reduction in the maximum workweek. We evaluate the effect of the workweek reduction on employment to non-employment transitions using two different approaches, based on two natural experiments associated with the 1982 hours reduction. In the first one, we compare workers who worked 36 to 39 hours before 1982 with workers who worked exactly 40 hours. In the second experiment, we take advantage of specific features of the implementation process of the reduction. As mentioned earlier, some firms were surprised by the 1 February 1982 decree. In April 1982, date at which the French Labour Force Survey took place, a sizeable share of firms had not altered their hours to the new standard. To analyse these two issues, we use panel data from the French Labour Force Survey (Enquête Emploi) for the period going from 1977 to 1987. Our results show that workers who were working 40 hours per week in March 1981 were less likely to be employed in 1982 than observationally identical workers who,

in 1981, were working 36 to 39 hours per week. This first analysis also uses differences in different techniques by comparing transitions from 1981 to 1982, after implementation of the decree with those prevailing between 1978 and 1981, before the election of François Mitterrand. Our second analysis, in which evaluation techniques are extended to account for multi-wave treatments, also demonstrates that workers still employed 40 hours in 1982 lost their jobs more often than those already employed under the new standard workweek. Indeed, all our results show that these job losses can be directly attributed to the reduction in the workweek. In our first analysis, the effects are significant and vary between 2.4% and 4% according to the technique considered. In our second analysis, the effects are also quite significant and we estimate a lower bound for the induced additional job losses at 4.1%. Furthermore, we show that minimum wage workers are much more affected than others. This is fully consistent with our theoretical model predictions, since wage rigidity has been most binding for the low-wage workers, more particularly after the 5% minimum wage increase of July 1981. Hence, this wage rigidity should have generated simultaneous job destruction and creation. In addition, our results show, also in conformity with the model, that better compensated workers were less directly affected by the reduction of the workweek.

1. Introduction

The mandatory reduction of weekly hours is gaining ground in the minds of politicians and in public opinion as the unique public policy that can efficiently reduce unemployment in France (see *Economist*, 1998a, 1998b, but see 1999b for a skeptical view of the anticipated results). In 1998 the French government adopted a policy requiring firms to implement a 35-hour workweek by the year 2000.[1] French firms are in the process of negotiating with their unions or personnel delegates the workweek reduction timetable, starting with the current 39-hour workweek. The outcome of these negotiations will help determine the second set of hours regulations, which are being debated now in the French Parliament. Some Italian and Spanish union leaders and politicians advocate the same set of policies as the French have adopted (*Economist*, 1998b and 1998c). Germany's newly elected government also appears to support mandatory hours reductions, as shown in the famous BMW's agreement (*Economist*, 1999a, 1998d).

Although the media are full of discussions of the potential effects of the hours-reduction laws, there are very few empirical assessments of the effects of such regulation, leaving the debate open to views based on political prejudices (see, however, Hunt, 1999, who mostly focuses on the German case). This is ironic because France has already attempted to manipulate working hours in order to reduce unemployment. In 1982, a few months after François Mitterrand's election, the socialist government, as stated in its election platform, decided to shorten the workweek by cutting the maximum legal number of hours per week.[2] It is fair to say that the election of François Mitterrand was not foreseen by most political analysts. At the beginning of 1981, the Paris correspondent of the *Economist* wrote: "For months French opinion polls have made President Giscard d'Estaing's reelection this spring seem a foregone conclusion." (*Economist*, 1981). Furthermore, the victory of the socialists at the parliamentary elections, which took place a few weeks after the presidential election, was an even longer shot in those

[1] 2002 for firms with 20 employees or less.

[2] The legal workweek in France is determined by the maximum number of hours, as specified in national statutes and implemented in collective bargaining agreements. The firms are permitted to employ workers for more than the national statutory maximum hours under the following conditions: (1) overtime hours up to a statutory limit at a negotiated wage premium, (2) in certain sectors, e.g. hotels and restaurants, the statutory limits are higher, (2) management and certain engineering positions (cadre) specified in the collective bargaining agreement are exempted. About 95% of the jobs in France are covered by collective bargaining agreements even though a much smaller

first months of 1981. Therefore, even though the hours reduction was included in the socialist's platform, it was almost fully unexpected 6 months before the elections. The hours reduction took place at the beginning of 1982, in February, a few months after the 5% increase in the French minimum wage, the SMIC, of July 1981. In addition, the February 1982 decree stipulated the mandatory rigidity of monthly earnings for minimum wage workers employed by the firm at that date.

In this article we investigate the effects of this reduction in the maximum workweek. We evaluate the effect of the workweek reduction on employment to non-employment transitions using two different approaches, based on two natural experiments associated with the 1982 hours reduction. In the first one, we compare workers who worked 36 to 39 hours before 1982 with workers who worked exactly 40 hours. In the second experiment, we take advantage of specific features of the implementation process of the reduction. As mentioned earlier, some firms were surprised by the February 1, 1982 decree. In April 1982, date at which the French Labor Force Survey took place, a sizeable share of firms had not altered their hours to the new standard. To analyze these two issues, we use panel data from the French Labor Force Survey (Enquête Emploi) for the period going from 1977 to 1987. Our results show that workers who were working 40 hours per week in March 1981 were less likely to be employed in 1982 than observationally identical workers who, in 1981, were working 36 to 39 hours per week. This first analysis also uses differences in differences techniques by comparing transitions from 1981 to 1982, after implementation of the decree with those prevailing between 1978 and 1981, before the election of François Mitterrand. Our second analysis, in which evaluation techniques are extended to account for multi-wave treatments, also demonstrates that workers still employed 40 hours in 1982 lost their jobs more often than those already employed under the new standard workweek. Indeed, all our results show that these job losses can be directly attributed to the reduction in the workweek. In our first analysis, the effects are significant and vary between 2.4% and 4% according to the technique considered. In our second analysis, the effects are also quite significant, and we estimate a lower bound for the induced additional job losses at 4.1%. Furthermore, we show that minimum wage workers are much more affected than others. This is fully consistent with our theoretical model predictions, since wage rigidity has been most binding for the low-wage workers, more particularly after the 5% minimum wage increase of July 1981. Hence, this wage rigidity should have generated simultaneous job

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percentage are members of unions (Card, Kramarz, and Lemieux, 1999).

destruction and creation. Given empirical relationships between employment destruction and worker flows (Abowd, Corbel, and Kramarz, 1999), excess job destruction that is observed for low-wage workers, around 8%, corresponds to roughly 2% annual employment destruction, yielding an elasticity of employment to labor costs just below minus one, in the same ballpark as other estimates for this category (Abowd, Kramarz, and Margolis, 1999a and Kramarz and Philippon, 1999). In addition, our results show, also in conformity with the model, that better compensated workers were less directly affected by the reduction of the workweek.

In the next section, we present the decree and the institutional context surrounding the 1982 reduction of the workweek. Section 3 contains a description of the data sets that are used in the analysis. In Section 4, we present our analysis of the direct natural experiment whereas the analysis of the delayed reduction of hours is examined in Section 5.[3] Finally, we conclude in section 6.

2 Institutional Context

2.1 Principles and Legal Aspects of the 1982 Reduction of the Workweek

2.1.1 Changes in Hours

The number of hours worked strongly decreased during the seventies, from 48 hours in 1974 to just above 40 hours in 1981. During all this period, indeed from 1936, the standard workweek was 40 hours. François Mitterrand's election in May 1981 induced a sudden decrease of the standard to 39 hours (January 16, 1982 ordinance). In fact, negotiations started just after May 1981, since the reduction was part of the left's electoral platform. These negotiations were planned to end before 1982. In a report to the President at the end of 1981, the Prime Minister mentions that negotiations did not make real advances but nevertheless recommends to let firms and workers unions and delegates continue until the second semester of 1982, the suggested date of application of the new standard. Against his Prime Minister's recommendations, François Mitterrand imposed, by the January 16 ordinance, the new 39 hours standard which took effect February 1, 1982. Collective agreements, specifying the terms of application of the decree, ensued, starting with the largest firms in the manufacturing industries and spreading to smaller firms and other industries (Marchand, Rault, and Turpin,

[3] Appendix 1 contains the theoretical model, Appendix 2 contains elements of our statistical models, and Appendix 3 contains an extension of the Section 5 analysis.

1983).

Therefore, the law reducing the workweek became effective February 1, 1982. It mandated a maximum legal workweek of 39 hours, whereas it was 40 hours previously, and only slightly altered the prevailing regulation on overtime: the overtime premium remained 25% for the first four hours, and 50% above, but the maximum compensated hours was reduced from 50 to 48 per week (for more details see Marchand, Rault, and Turpin, 1983).

2.1.2 The Mandatory Nominal Wage Rigidity and its Consequences

The government also recommended that monthly pay after the change in workweek remain unchanged for all workers, but no special arrangements were included in the law to enforce this recommendation except for workers paid the legal minimum wage (SMIC) and working 40 hours. For these workers, a special hourly minimum wage was prescribed in order to guarantee that their monthly earnings be unchanged after the change in hours.[4] Hence, a worker paid the SMIC and working 40 hours before February 1, 1982 received the same monthly earnings after February 1st even though the workweek was only 39 hours. However, any worker hired at the minimum wage rate after February 1, 1982 received monthly pay corresponding to his or her exact number of hours. Therefore, newly hired workers were approximately 100 Francs a month ($20 US) cheaper than their more senior counterparts because of this special provision in the hours reduction law. Furthermore, since a 5% increase in the hourly SMIC was one of the first decisions made by the newly elected government in mid-1981, the hourly cost of minimum wage workers increased by 7.5% between mid-1981 and mid-1982. Finally, for all other categories of workers, the "recommendation" to leave monthly pay unchanged seems to have been followed by firms. A survey conducted in September 1982 showed that more than 90% of all workers had their monthly pay unchanged after implementation of the law reducing the length of the workweek (Marchand, Rault, and Turpin, 1983).

This double minimum and, more generally, this nominal monthly wage rigidity for workers employed at the date of the decree has dramatic consequences on worker flows. The main result of our theoretical model (see Appendix 1) is the following: it is often optimal for firms to separate from workers constrained by the old standard, i.e. workers paid 40 hours for a 39-

[4] Remember that the minimum wage in France specifies an hourly wage.

hours workweek, and to hire new workers unconstrained by the old standard, i.e. workers who will be paid 39 hours for a 39-hours workweek. Furthermore, we show that the set of parameters for which this holds is likely to be large. Even if employment is stable, which is unlikely in our model, there will be excess hiring and firing, depending on the respective sizes of hiring costs, firing costs, and the changes in hours. At one extreme, if hiring and firing costs of minimum wage workers are zero, all such workers would be replaced. At the other extreme, if hiring and firing costs of highly-skilled workers are large, no replacement would take place.

2.2 Two Sources of Identification

The process of reduction of the standard workweek from 40 to 39 hours was sudden, unexpected but, at the same time, it took several years. In April 1982, month in which the 1982 French Labor Force Survey took place, only a fraction of the firms had signed an agreement with their workers. The structure of hours in some firms in 1982 was identical to its structure before promulgation of the decree. Indeed, Table 4 shows that the fraction of individuals employed 40 hours in the population of workers employed 40 or 39 hours was equal to 28% in 1982 and fell to approximately 20% in 1983, 1984, and 1985. Hence, the passage to the new standard continued, even after April 1982, date of the survey. In addition, negotiations resulted in new and old workweeks of equal lengths for 20% of the workforce; one hour being counted as overtime after February 1, 1982.

These two characteristics of the process constitute our two sources of identification of the effects of the hours reduction. The reduction of the workweek was unexpected. In addition, some full-time workers were already employed 39 hours or less in 1981. Hence, it can be considered as a natural experiment. We evaluate the effect of the reduction of the workweek by comparing the employment transitions of workers employed 40 hours in 1981 with those of workers employed less than 40 hours at the same date. The identifying restriction is then that workers employed between 36 and 39 hours in 1981 are not affected by the reduction.

The reduction of the workweek was also gradual, and this constitutes another source of identification. To see this, assume that, once the reduction has been negotiated with a group of workers, all such workers are employed 39 hours exactly. Hence, all those who work 40 hours

in 1982 are potentially affected by the forthcoming reduction while all workers employed 39 hours at that date are not any more. Therefore, this last group is a potentially valid control group.

3. The French Labor Force Survey

In this section, we describe the longitudinal data sets, the French Labor Force Surveys (called the Enquête Emploi), that are used in the analysis. Our analysis uses data from 1977 to 1987. Since the French Labor Force Survey (LFS, hereafter) questionnaire and survey structure changed between 1981 and 1982, we first describe the features of the survey that are common to the two sub-periods, then we describe the specifics for the years 1977 to 1981, and finally, we describe the LFS for the period 1982 to 1987.

Every year, approximately 60,000 domiciles are sampled from the stock of all houses and apartments (the sampling rate is exactly 1/300). In March of the survey year, each person in the sampled household is interviewed (in person if present at the time of the interview or by proxy if absent).[5] One third of the sample is replaced each year. Hence, all persons in the household are followed at most three times. And, we build our longitudinal data using this feature. In all years, most usual household and individual characteristics are available for all surveyed individuals. Sex, education categories (6 positions), experience defined as age minus age at the end of school directly measured, region (lives in Ile de France or not), employment contract (apprentice, short-term contract, other) and status (employed or not employed), a part-time variable, seniority, employer's industry (14 positions), employer's size (4 positions) are available in all years and will be used in most of our analyses. The employment status of the individuals is defined according to the ILO criteria.

During the first sub-period (1977 to 1981), two features are essential to note. First, there is no wage variable in the data. Second, the information is not on " usual " hours but on hours worked during the reference week. If the individual works fewer than 45 hours, a second question is asked on possible reasons. Some are labeled temporary (strike, disease,...) whereas others are labeled durable, among which are distinguished part-time work and usual duration of the workweek. Hence, we have a potential way of approximating the usual " usual hours "

[5] In 1979, 1980, and 1981, the LFS also took place in October. Each wave had the same size as those of March. Unfortunately, the October survey does not exist after 1981 and is therefore not usable for our purpose.

concept. Unfortunately, responses to this second question appear to be frequently missing and this possible measure is not usable.

Starting in 1982, monthly wages (grouped by cells of 500 French Francs, roughly $100 US) and usual weekly hours are also available. Although the usual survey date is March, because of the 1982 Census of Population, the 1982 Labor Force Survey took place in April of that year. Hence, the 1982 Labor Force Survey took place just after the legal reduction in the workweek to 39 hours took effect on February 1, 1982.

For our first analysis, we construct four three-years panel data sets in which individuals are followed from 1977 to 1979 for the first one, from 1978 to 1980 for the second one, from 1979 to 1981 for the third one, and from 1980 to 1982 for the last one. This allows us to characterize workers' situations before, at, and just after implementation of the legal change in the standard workweek.

For our second analysis, we construct also four three-years panel data sets in which individuals are followed from 1982 to 1984, from 1983 to 1985, from 1984 to 1986, and from 1985 to 1987. This allows us to understand the implementation process of the reduced workweek that took place in 1982 and just after, and contrast this period with the following one during which the shock was absorbed.

4. The Reduction of the Workweek : a Natural Experiment

4.1 Principle and Descriptive Analysis

In this analysis, we use the sudden, and above all, unexpected nature of the reduction of the standard workweek, from 40 to 39 hours. A fraction of workers were employed less than 40 hours before February 1982. This situation resembles a natural experiment. Table 1 shows the proportion of full-time workers employed 36 to 39 hour within the population of all full-time workers employed 36 to 40 hours in 1981. It also shows the employment – non-employment transition rates for both categories of workers. It readily appears that employment – non-employment transitions are more intense for workers employed 40 hours than for those employed 36 to 39 hours. 6.2% of all workers employed 40 hours in 1981 have no employment in 1982 whereas 3.2% of those employed less than 40 hours are in the same situation, a difference of 3%. Nevertheless, the size of the control group that we use to

evaluate the impact of the reduction of the workweek is small; 3.5% of the workers were employed less than 40 hours in March 1981. Therefore, we cannot expect to measure the impact of this reduction on subgroups of workers.

4.2 Selectivity Bias

4.2.1 Motivation and Statistical Model

We now discuss the identification conditions under which we can isolate a causal effect of the workweek reduction on employment. Two hypotheses are necessary for our analysis. First, workers employed 36 to 39 hours should not have been affected by the reduction of the workweek. Second, the employment – non-employment transitions of these workers should help us identify what the transitions of workers employed 40 hours would have been in absence of a reduction of the workweek.

Therefore, we classify individuals in two categories, those affected (1) and those not-affected (0) by the reduction. We consider the two corresponding labor market situations *NE*(0), *NE*(1) equal to 1 if the individual is not-employed and equal to zero otherwise. The effective situation of any individual is:

$$NE_i = NE_i(0) + D_i\left[NE_i(1) - NE_i(0)\right]$$

where *D* is equal to 1 if the individual is employed 40 hours a week in 1981. The employment loss probability is $E(NE_i)$ (where *E(.)* denotes the expectation of the random variable between parentheses). We focus on the quantity $NE_i(1)-NE_i(0)$. Such quantities measure, for each individual, the difference between the labor market situation when affected by the reduction of the workweek to 39 hours with what would have been their situation if they had not been affected by this reduction. In this, we follow Rubin (Rubin, 1974) in his definition of a causal effect. These quantities, different for different individuals, are unobservable since any given individual is in one and exactly one state among the two possible ones. Only some parameters of the distribution of $NE_i(1)-NE_i(0)$ can be identified, under some hypotheses. For instance, one can identify the expectation of the effect, conditional on changing hours from 40 to 39 (average treatment on the treated in Heckman, Lalonde, and Smith, 1999' terminology), defined as $E\left(NE_i(1) - NE_i(0) \middle| D_i = 1\right)$. To measure this last quantity, we assume (H_{0A}) that, conditionally on observables, the potential situation – in which workers are not affected by the

reduction - $NE_i(0)$, is independent of being <u>in reality</u> affected by the reduction to 39 hours (independence conditional on observables, Rubin, 1977). The corresponding equation is:

$$H_{0A} : E(NE_i(0)|x_i, D_i = 1) = E(NE_i(0)|x_i, D_i = 0)$$

Therefore, the following relation holds:

$$\begin{aligned} E(NE_i|x_i, D_i) &= E(NE_i(0)|x_i) + D_i E[NE_i(1) - NE_i(0)|x_i, D_i = 1] \\ &= g_0(x_i) + D_i e_D(x_i) \end{aligned}$$

Function $e_D(x_i)$ represents the average effect of the workweek reduction when applied to individuals with characteristics x_i.

To estimate the effect of the workweek reduction, there exists various methodologies that are compatible with the above hypotheses. A simple and transparent method is based on the differences in the employment – non-employment transition rates between workers affected and not affected by the change of the standard workweek, controlling for all their observable characteristics. To analyze the 1982 employment losses of individuals employed in 1981 with observable characteristics x_{81}, we estimate a regression using a linear probability model based on the following relation:

$$E[NE_{82}|x_{81}, D_{81}] = x_{81}\beta + \alpha_{81} \, \mathrm{I}(D_{81} = 40) \qquad (1)$$

where the *i* index has been omitted for simplicity and where NE_{82} corresponds to the non-employment situation in 1982. The impact of the workweek reduction on employment – non-employment transitions is given by coefficient α_{81}. Note that other techniques, such as matching methods (Heckman, Ichimura, and Todd, 1998) could have been used. We selected a linear probability model for simplicity and transparency reasons. We present the resulting estimates of this first analysis in the next paragraphs.

4.2.2 Results

The results presented in this subsection are based on the 1980-1982 panel. Since our analysis

uses workers employed 36 to 39 hours as a control group, we first check if their observed characteristics are similar to those of workers employed exactly 40 hours. Table 2 presents the estimates of two logistic regressions where the dependent variable is "employed 40 hours", in years 1980 and 1981. First, it appears that very few individual characteristics matter. More specifically, differences in education, experience or seniority are not associated with strong differences in hours. Most differences stem from the employing firm. Short hours are not only found in the service sectors but also in some manufacturing industries, such as those producing intermediary or consumption goods. Hence, violations of our hypothesis H_{0A} are more likely to come from unobserved firm heterogeneity, that we cannot control for, than from unobserved individual heterogeneity.

The first Column of Table 3 presents the estimates of equation (1). The independent variables that we use are the following. In panel A, we use sex, region, diploma (4 categories), labor market experience (4 categories), seniority (4 categories), and the two-digit industry of the employing firm. In panel B, we add information on hours worked in the entry year of the panel, i.e. 1980. The inclusion of variables on the past of the individual may render the independence assumption more plausible (Heckman, Ichimura et Todd, 1998). Finally, as mentioned above, estimates are based on a linear probability model.

Resulting estimates confirm figures from Table 1: workers employed 40 hours in 1981 lose their job more often. Point estimates vary between 2.4% (panel A, significant at the level of 10%) and 2.8% (panel B, significant at the level of 5%), such coefficients are of the same magnitude as those obtained without any controls. Therefore, introducing many individual controls as well as information on the employing firm do not modify the estimated impact of the reduction of the standard workweek as seen from the raw results of Table 1.

4.2.4 Working 39 or 40 Hours Before the Reduction

Of course, independently of the reduction of the workweek, it is highly possible that workers employed 40 hours lose more (resp. less) often their job than other workers, even after controlling for observable individual characteristics. In such a case, our preceding estimates would be biased.

Table 3 shows that the job loss probability of workers employed 36 to 39 hours fluctuates from year to year, unlike workers employed exactly 40 hours.[6] This probability is, in general,

[6] Whereas the share of the population employed 36 to 39 hours within the population of

lower than the one observed for workers employed 40 hours (1979, 1980 et 1982), but it may also be greater (1981). The biggest difference is observed in 1982, 3% whereas the difference is equal to 1.4% in 1979, 2.3% in 1979, and –1.8% in 1981.

To account for observable characteristics of the workers, we estimate the following double difference equation using all four panels:

$$E\left[NE_t \middle| x_t, D_t, t\right] = x_t\beta_t + \alpha \ \mathrm{I}(D_t = 40) + \tilde{\alpha}_{81}\,\mathrm{I}(D_{81} = 40), t = 78,79,80,81 \qquad (2)$$

The impact of the reduction of the workweek is now given by the coefficient $\tilde{\alpha}_{81}$.[7] The resulting estimates (Table 3, pooled Column) from this double difference approach are larger, around 4%, than those obtained with a simple difference method.

However, the double difference analysis may lead to overestimating the impact of the workweek reduction. Indeed, as described in the Data Section, hours are measured from the number of hours worked in the week that precedes the interview. There is no satisfactory information on usual hours. Hence, we may capture the prevailing economic conditions. For instance, in 1981 conditions were bad, and workers employed 36 to 39 hours may well be those working in adversely affected firms. Therefore, such workers may lose their job more often than other types of workers. This type of measurement error results in an upward bias of the estimated impact of the reduction of the workweek, if assessed with a double difference approach.

4.2.3 Discussion

This first analysis presents several limits. First, the size of the control group is small: less than 5% of the observed population. This is obviously the main reason for the lack of precision of our estimates.[8] Furthermore, even though it is small, this control group could also be

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workers employed 36 to 40 hours is also very stable, between 3.5% and 4.0%, for the same period.

[7] The statistical analog of the estimated equation starts from the following relation:

$$E\left(NE_i \middle| x_i, D_i\right) = E\left(NE_i(0) \middle| x_i, D_i\right) + D_i E\left[NE_i(1) - NE_i(0) \middle| x_i, D_i = 1\right]$$

To measure function $E\left(NE_i(0) \middle| x_i, D_i\right)$, one can use information on employment non-employment transitions observed prior to implementation of the law. The identifying assumption is weakened:

$$E(NE_{82} \mid x_i, D_i = 1) - E(NE_{82} \mid x_i, D_i = 0) = E(NE_{81} \mid x_i, D_i = 1) - E(NE_{81} \mid x_i, D_i = 0)$$

[8] Nevertheless, the diffusion of the reduction of hours to workers employed 39 or less in 1981 leads to underestimating the effect of interest. In the extreme case of a complete diffusion of the reduction of the workweek to all workers employed less than 40 hours a week, we should

heterogeneous. To test the robustness of our results, we estimated the same equations as those presented in Table 3 but with a control group comprising either workers employed 35 to 39 hours or workers employed 37 to 39 hours. All estimated results are similar to those already discussed.

It is well possible that unobserved differences in transition rates between workers employed 36 to 39 hours and those employed 40 hours, even after controlling for all observed characteristics, still exist. In particular, pay is desperately lacking. The minimum wage strongly increased in July 1981 and may have generated job losses. If workers employed 40 hours were more affected by the SMIC increase than those working 39 or less, we may put the blame on hours reduction whereas job losses would come from the SMIC increase. However, it is likely that this source of estimation bias be small. Indeed, wages are strongly correlated to skills, education, diploma, experience, or seniority.[9] As mentioned previously, the introduction of all these characteristics in our regressions did not modify the estimated effects. The residual component of wages should not cause a bias.

We tried to examine the possible heterogeneity of the impact of the reduction of the workweek in the population. In particular, we estimated effects by skill-levels, by experience or seniority groups, and by employment status (apprentice or not). As expected, we could not isolate any significant effect. This does not mean that the reduction affects all groups similarly but, simply, that the size of the control group is too small to measure such effects.

Such limits – size of the control groups or absence of some important variables (wage or usual hours, as opposed to hours in the week preceding the interview) – incite us to examine more carefully the situation that prevails from 1982 and on, since these two data limitations do not exist any more from that date on. But such limits do not invalidate the result of this first analysis: the reduction of the workweek from 40 to 39 hours is directly responsible for the increased employment – non-employment transition rates of affected workers.

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find no effect of the hours worked in 1981 on employment losses in our regressions.

[9] More strongly in France than in the United States, see Abowd, Kramarz, and Margolis (1999).

5. Late Changes to the New Standard Workweek

5.1 Motivation

A first examination of the proportion of workers employed 40 hours between 1982 and 1987, after the decree mandating the workweek reduction, confirms that the passage to 39 hours was progressive (Table 4). The fraction of workers employed exactly 40 hours became stable only in 1983, at around 20% of workers employed either 39 or 40 hours. This progressive transition to 39 hours is another potential source of identification of the effect of the workweek reduction. Examination of Table 4 also shows that differences in job loss probabilities between workers employed 39 and workers employed 40 hours exist. In 1982, this difference amounts to 1.6 points for year-to-year job losses and to 3.9 points for cumulated losses over two years. These differential losses are much greater in 1982 than in any of the following years.

The persistence of a large fraction of workers employed 40 hours (usual hours) after 1982, 20%, demonstrates that negotiations have led many firms to maintain hours as they were before 1982. This generates problems when evaluating the impact of the reduction. A fraction of the workers declaring usual hours equal to 40 in 1982 may well belong to firms that implemented the new standard before April 1982, the date of the survey, one hour being paid as overtime. The proportion of workers employed exactly 40 hours in a firm that had implemented the 39-hours workweek before April 1982 is not known, but can be estimated under various hypotheses using the proportion of workers employed 40 hours at various dates.

Using as a parallel our first analysis in which the control group comprised workers employed between 36 and 39 hours in 1981, it seems that, based on the above discussion, a potential control group for this second analysis could well be all workers employed 39 hours in April 1982, i.e. workers for whom the new standard was applied immediately after the publication of the February 1st decree and who were still employed two months after this date. The associated potential treated group comprises all workers employed 40 hours in April 1982, i.e. workers who were also employed after February 1st in firms that had completed negotiations and kept the old standard as well as in firms that had not yet completed negotiations. We discuss in the following section, the hypotheses that are sufficient for this potential control group to be a valid control group in order to detect and to measure the impact of the workweek reduction on employment.

5.2 Statistical Model

The statistical model that we use to evaluate the effect of the reduction of the workweek is an extension to multi-wave treatments of the model used in our first analysis. Let us consider three potential states in 1983 and 1984: not affected by the reduction to 39 hours (0), affected before April 1982 (1), and affected after April 1982 (2). Let us denote T_{0i}, T_{1i}, T_{2i} the respective events and $NE_{it}(0), NE_{it}(1), NE_{it}(2)$ is equal to 1 if individual *i* was ever unemployed between 1982 and *t*, for *t=1982*, *1983*, *1984*. Therefore, *NE* summarizes the employment history of each individual in the years following the workweek reduction. Denote also NE_i the resulting vector of labor market history at the various dates of interest. This analysis framework is borrowed from the evaluation with multiple treatments framework as it was recently developed in Imbens (1999), Lechner (1999), and Brodaty, Crépon, and Fougère (1999).

Notice that the three potential states are mutually exclusive, hence $T_{0i} + T_{1i} + T_{2i} = 1$. In addition, all workers are eventually affected by the reduction of the workweek, we have $T_{0i} = 0$. Therefore, the relation between the effective and the potential labor market status is:

$$\begin{aligned} NE_i &= T_{0i} NE_i(0) + T_{1i} NE_i(1) + T_{2i} NE_i(2) \\ &= NE_i(1) + T_{2i}\left[NE_i(2) - NE_i(1)\right] \end{aligned}$$

Identifying hypotheses are necessary, as they were in our first analysis, in order to give an evaluation of the reduction of the workweek. The formal details are presented in Appendix 2. We summarize their economic content and the resulting equations in the next paragraphs.
The first hypothesis (H_A) is the following:

$$H_A : E\left(NE_i(1) \middle| x_i, D_{82i} = 40, NE_{82i}(1) = 0, T_{2i} = 1\right) = E\left(NE_i(1) \middle| x_i, D_{82i} = 40, NE_{82i}(1) = 0, T_{1i} = 1\right)$$

(H_A) implies that, for workers employed 40 hours in 1982, and conditionally on observables, the labor market state associated to being affected before April 1982, $NE_i(1)$, is independent of the date at which the new standard was implemented, T_{1i}. This is the analog of hypothesis H_{0A} of our previous model. However, since the equality is expressed conditionally on being employed in 1982 when negotiating before April 1982, i.e. $NE_{82i}(1)=0$, hypothesis (H_A) is

weaker than:

$$\tilde{H}_A : E\left(NE_i(1)\middle|x_i, D_{82i}=40, T_{2i}=1\right)= E\left(NE_i(1)\middle|x_i, D_{82i}=40, T_{1i}=1\right)$$

in which the whole potential labor market history, *NE(1)*, is independent of the date of implementation of the new standard, T_{1i} . Indeed, $\tilde{H}_A \Rightarrow H_A$.[10] Thus, (H_A) is weaker than what is generally assumed. The empirical plausibility of this hypothesis is discussed in the final subsection of this section.

In addition, we assume - hypothesis (H_B) – that the effect of the reduction of the workweek is independent of the outcome, 39 or 40 hours, of the negotiation surrounding implementation of the new standard workweek. This last hypothesis is not very demanding since it amounts to neglecting the additional cost induced by one overtime hour when the outcome is 40 (overtime adds 25% to a normal hour).

Under these two hypotheses, one shows that the conditional expectation of NE_i rewrites as :

$$E\left(NE_i\middle|x_i, D_{82i}, NE_{82i}=0\right)= E\left(NE_i(1)\middle|x_i, D_{82i}=39, NE_{82i}(1)=0, T_{1i}=1\right)+$$
$$\left[E\left(NE_i(2)\middle|x_i, D_{82i}=40, NE_{82i}(2)=0, T_{2i}=1\right)- E\left(NE_i(1)\middle|x_i, D_{82i}=40, NE_{82i}(1)=0, T_{2i}=1\right)\right] \quad (3)$$
$$P(T_{2i}=1\middle|x_i, D_{82i}=40, NE_{82i}=0)1(D_{82i}=40)$$

The following proposition shows that under these hypotheses, the potential control group, i.e. workers employed 39 hours in 1982, is a valid control group for <u>detecting</u> an impact of the workweek reduction on employment:

Proposition 1 : *Under hypotheses H_A and H_B, when the reduction of the workweek has no effect on the labor market state:*

$$NE_{it}(0)= NE_{it}(1)= NE_{it}(2), \forall i, \text{ and } \forall t,\ t=1982, 1983, 1984$$

then the following testable restriction holds:

$$E(NE_i\middle|x_i, D_{82i}, NE_{82i}=0) = E(NE_i\middle|x_i, NE_{82i}=0)$$

Proof *:* see Appendix 2.

[10] The proof being straightforward is not given here but is available from the authors.

Therefore, the above equation (3) would not include $1(D_{82i} = 40)$ as soon as the reduction of the workweek has no employment effect, i.e. $NE_i(0) = NE_i(1) = NE_i(2)$. Even if the interpretation of the resulting estimates of such an equation may be hard, a significant coefficient on the variable $1(D_{82i} = 40)$ would demonstrate that the reduction had an impact on employment.

Of course, we are not only trying to detect the existence of an effect, we want to measure this effect. Then, we first note that equation (3) includes, on one hand, one parameter of the distribution of potential outcomes:

$$E\left(NE_i(2)\middle| x_i, D_{82i} = 40, NE_{82i}(2) = 0, T_{2i} = 1\right) - E\left(NE_i(1)\middle| x_i, D_{82i} = 40, NE_{82i}(1) = 0, T_{2i} = 1\right)$$

which measures the difference between the effect of the reduction when implemented after April 1982 – state (2) – and what would have been this effect had the reduction been implemented before April 1982 – state (1) – and had workers not lost employment between 1981 and 1982, evaluated on individuals for whom the reduction indeed took place after April 1982.[11] Equation (3) includes, on the other hand, a nuisance parameter $P\left(T_2 = 1\middle| x_i, D_{82} = 40\right)$.

To go from the above parameters to our parameters of interest, i.e. to identify the employment – non-employment transitions of which the reduction of the workweek is directly responsible, we assume that these effects only last a limited number of periods, two years in our empirical application (hypothesis (H_E)). For instance, in 1984, only workers employed in firms having completed negotiations after April 1982 are susceptible of losing their job because of the reduction. Together with hypotheses (H_C), that neglects second-order terms, and (H_D) that specifies the inter-temporal relations between the past potential employment status ($NE_t(1)$, $NE_t(2)$) and the future employment status if no workweek reduction had happened ($NE_{t+1}(0)$), (all these hypotheses are presented in Appendix 2) , we are able to recover the parameters of interest of our analysis:

$$\pi_1(x_i) = E\left(NE_{83i}(2) - NE_{83i}(0)\middle| x_i, D_{82i} = 40, NE_{82i}(2) = 0, T_{2i} = 1\right)$$
$$\pi_2(x_i) = E\left(NE_{84i}(2) - NE_{84i}(0)\middle| x_i, D_{82i} = 40, NE_{83i}(2) = 0, T_{2i} = 1\right)$$

[11] Whereas the first analysis provided us with an evaluation for workers moving to the new standard before April 1982, this analysis provides an evaluation for workers moving to the new standard after that date.

We discuss the empirical plausibility of (H_D) in the last subsection of this section.

The following proposition shows that under these hypotheses, the potential control group, i.e. workers employed 39 hours in 1982, is a valid control group for measuring the impact of the workweek reduction on employment:

Proposition 2: *Under hypotheses H_A to H_E, employment – non-employment transitions between 1982 and 1983, and between 1982 and 1984 follow :*

$$E\left(NE_{83i}(2)\middle|x_i, NE_{82i}(2)=0, T_{2i}=1\right)-E\left(NE_{83i}(1)\middle|x_i, NE_{82i}(1)=0, T_{2i}=1\right)=\pi_1(x_i)-\pi_2(x_i)$$

$$E\left(NE_{84i}(2)\middle|x_i, NE_{82i}(2)=0, T_{2i}=1\right)-E\left(NE_{84i}(1)\middle|x_i, NE_{82i}(1)=0, T_{2i}=1\right)=\pi_1(x_i)$$

Therefore,

$$E\left(NE_{83i}\middle|x_i, D_{82i}\right)=g_{83}(x_i)+P(T_{2i}=1\middle|x_i, D_{82i}=40)(\pi_1(x_i)-\pi_2(x_i))1(D_{82i}=40)$$

$$E\left(NE_{84i}\middle|x_i, D_{82i}\right)=g_{84}(x_i)+P(T_{2i}=1\middle|x_i, D_{82i}=40)\,\pi_1(x_i)\,1(D_{82i}=40)$$

where $\pi_k(x_i)$ denotes the change in employment loss probability that can be directly imputed to the reduction of the workweek for individuals with characteristics x_i in the k^{th} period following negotiations, and where g(.) denotes any function (NE_{84} is equal to 1 for a worker not employed in 1983 or in 1984 since we only consider workers employed in 1982). The total effect is $\pi_1+\pi_2$.

Proof : see Appendix 2.

Remark: If the impact lasts one year instead of two, we have $\pi_2=0$, a testable restriction.

As a consequence, we can estimate the following regressions:

$$E\left(NE_{83}\middle|D_{82}, x_i\right)=x_i c+x_i\lambda 1(D_{82}=40)$$
$$E\left(NE_{84}\middle|D_{82}, x_i\right)=x_i d+x_i\mu 1(D_{82}=40)$$

which will yield parameters $\pi_1(x_i)$ - $\pi_2(x_i)=x_i\lambda$ and $\pi_1(x_i)=x_i\mu$ for any given value of the nuisance parameter. Once again, we estimate all models in this section using linear probability models for simplicity and transparency reasons. We will examine the case of an homogeneous effect within the population, we will also estimate a specific effect for low-wage workers.

As in Section 4, we must also check that the effects that are found, if any, are specific to year 1982. One cannot discard the possibility that, starting after 1982, workers employed 40 hours lose their job more often than those employed 39. Indeed, a common reason – specific to these jobs but unobserved to the econometrician - may well explain both 40 hours being the outcome of the negotiation and the destruction of these jobs, a destruction that would have taken place even without any mandatory hours reduction. Therefore, we also estimate the following equations:[12]

$$E\left(NE_{t+1}\middle|D_t, x_i\right) = \delta_1 1(t=82) + x_i c + x_i \tilde{\lambda} 1(D_t = 40) + x_i \lambda 1(D_t = 40 \& t = 1982)$$
$$E\left(NE_{t+2}\middle|D_t, x_i, z_i\right) = \delta_2 1(t=82) + x_i d + x_i \tilde{\mu} 1(D_t = 40) + x_i \mu 1(D_t = 40 \& t = 1982)$$

We turn now to the identification of the nuisance parameter $P\left(T_{2i}=1\middle|x_i, D_{82i}=40\right)$ which will eventually yield identification of the parameter of interest.

A first solution to the identification problem is to assume that the nuisance parameter is equal to 1 for all individuals. This corresponds to the following hypothesis: all workers employed in firms having implemented the workweek reduction before April 1982 indeed work 39 hours after the reduction. Hence, all firms in which prevailed a 40-hours workweek, one hour being compensated as overtime (based on the French LFS of 1983 to 1987, such firms comprise 20% of total employment), implemented the reduction to 39 hours after April 1982. Since the nuisance parameter lies between 0 and 1, this hypothesis provides us with a lower bound of the parameter of interest.

Other solutions to the identification problem are all based on the share of workers employed 40 hours in 1982, 1983, … We examine two restrictions that provide identification. We consider (a) an hypothesis of independence between the date of implementation and its outcome (40 hours with one hour overtime or 39 hours) and (b) an hypothesis where all firms in which the negotiation surrounding implementation of the new standard maintained a 40 hours workweek completed that negotiation before April 1982. This last case provides us with a lower bound of the nuisance parameter, and therefore, an upper bound for our parameter of interest (see Appendix 2). In case (a) the nuisance parameter is equal to 0.36, whereas in case

[12] We also estimate the year-by-year regressions: $E\left(NE_{t+1}\middle|D_t, x_i, z_i\right) = x_i c_t + z_i \lambda_t 1(D_t = 40)$
$E\left(NE_{t+2}\middle|D_t, x_i, z_i\right) = x_i d_t + z_i \mu_t 1(D_t = 40)$

(b) the nuisance parameter is slightly lower: 0.26.

5.3 Results

This analysis is based on four panel data sets spanning three years each, 1982-1984, 1983-1985, 1984-1986, and 1985-1987. All regressions that are presented in the next tables try to explain non-employment at date *t+1*, NE_{t+1}, given employment at date *t*, or non-employment at date *t+1* or at date *t+2*, NE_{t+2}, given employment at date *t*, as functions of the number of hours in year *t*. We will only consider full-time employees working either 39 or 40 hours. Our additional explanatory variables are the industries (2-digit classification), size of the employing firm, region (Ile de France or not), sex, diploma (6 positions), labor market experience (4 positions), seniority (4 positions), wage level (5 positions defined with respect to the minimum wage, the SMIC; a low-wage corresponding to wages between 0.95 and 1.10 times the SMIC), and labor market status (apprentice, on short-term contract, on long-term contract).

Table 5 presents estimation results in which the indicator function for 'usual hours=40' is directly included (Column 1). In Columns 2 and 3 are shown estimation results when this indicator function and its interaction with a 'low wage' indicator are both included. Column 4 gives the fraction of individuals employed exactly 40 hours within the population of interest. Results for the 1982-1983 panel demonstrate that those workers employed 40 hours in 1982 are more likely to lose their jobs. After one year, the effect amounts to 1.3%. Based on proposition 2, this number measures the difference between the first year and the second year employment loss probabilities. Since the coefficient is significantly different from zero (at a 10% level) indicates that the effect attenuates through time. The two-year effect, 2.7%, is significantly different from zero. It is roughly twice the one-year effect, demonstrating that the effect is still present after one year. The total effect over the two years is equal to 4.1% (= 2*2.7-1.3, see proposition 2).

To each value of the nuisance parameters (1, 0.36, 0.26, respectively), we can associate an evaluation of the reduction of the workweek. Results respectively go from 4.1% to 16.5%. More importantly, despite the huge variability in the evaluations due to the possible values of the nuisance parameter, we always reject the null of no impact of the reduction of the workweek on the employment – non-employment transition rates.

Table 5 also shows that, if estimated panel by panel, the coefficient affecting the 'hours=40' indicator fluctuates across years. It is negative and close to 0 for the 1983 and 1985 panels, it is positive and close to significance for the 1984 panel. Given the standard-errors, such values are not mutually incompatible. Still, they leave open the possibility that workers employed 40 hours lose their job more often than those working 39 for other reasons than the reduction of the workweek. Table 6 presents estimation results for the pooled regressions. The coefficient affecting the 'hours=40' variable interacted with the 1982 year indicator is equal to 1.3 for the one-year effect and to 2.3 for the two-years effect. Here again, this coefficient is significantly different from zero. Hence, we once more reject the null of no effect of the reduction of the standard workweek on employment. These latter estimates lead to slightly lower effects of the reduction of hours on employment losses than before. The total effect is equal to 3.3% (=2*2.3-1.3) in this case. From this last estimate, we find an effect of the reduction around 10% if we use the intermediate value of *P*, and, of course, the effect is equal to 3.3% for *P* equal to 1.

All these results are confirmed if a possible individual heterogeneity of the nuisance parameter is taken into account (all results are presented in Appendix 3).

5.4 Low-Wage Workers

In this second analysis, the size of the sample and the availability of the wage variable allows us to focus on the effects of the reduction of the workweek on various subgroups. We focused on the low-wage population, trying to isolate a specific effect of the reduction on this group. Results based on the panel 1982-1984 show a specific effect on the low-wage group employed 40 hours (Table 6). This effect is present in 1982 but not in 1983 nor in 1984. However, this effect also shows up for 1985 (transitions from 1985 to 1987). If all panels are pooled, we observe a significant effect for the low-wage group that is specific to year 1982 on top of the common effect. The estimated effect is equal to 7.7% after one year (and to 6.8%, not significantly different from zero, after two years).[13] From these results, we infer that the reduction first affects low-wage workers but that the rest of the population seems to be also affected after two years. Once more, the methodology where the same indicator is pre-multiplied by a person-specific estimator of the probability of having negotiated after April 1982, yield similar results (see Appendix 3). These very large transition intensities for

[13] Notice that if we use our second polar case with *P*=0.36, the resulting effect would be close

minimum wage workers, even if P=1, appear to indicate that firms have replaced their low-wage workers with workers from the pool of applicants, consistently with results of the theoretical model of Appendix 1, in the year following the decree. This excess destruction and excess creation is entirely due to the mandatory rigidity of monthly wages and not to the July 1981 increase in the SMIC. Indeed, the minimum wage continued to increase by 4% in 1982, 1983, and 1984. But, the effects that are discussed in Tables 5 and 6 are only present in 1982, date at which the constraint on monthly wage stability was most binding.

As appears from our previous discussion, low-wage workers are most affected and this effect seems to be present in the first year, 1983, but not in the second year, 1984. To examine more formally the possibility that the effects persist more for high-wage workers than for low-wage workers, we tested several combinations of restrictions based on the estimation results presented in Table 6. All such tests are shown in Table 7. The first line shows the unrestricted results. Each line corresponds to a set of constraints. The test statistics for the validity of the set of constraints are given in the last three columns. After examination of the various constraints test statistics, the results given in the penultimate line -- in which the second year effect, π_2, for the low-wage workers is constrained to be equal to zero, hence the one-year and the two-year effects are equal for this category, whereas the coefficients for the high-wage workers are unrestricted -- appear to well-represent the structure of our results. Notice first that the chi-square statistics (p-value, respectively) is lowest (largest, respectively) among all tested restrictions. More importantly, the estimated effect for low-wage workers is large, 8.4%, and significant. On the other hand, the estimated effect for high-wage workers is only marginally significant. Finally, the last line presents estimates of the total effect of the reduction of the standard workweek, separately for low-wage and for high-wage workers, based on the previous restrictions. Effects of the reduction of the workweek on employment losses are very strong for low-wage workers whereas effects for better compensated workers are only marginally significant.

5.5 Back to the Control Group

All the above results rely on one important assumption, derived from apparently reasonable hypotheses, workers employed 39 hours in 1982 constitute a valid control group for, first, detecting and, second, measuring the impact of the reduction of the workweek. We discuss

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to 25%, too large to be credible.

now the potential problems of this approach.

Obviously, the biggest concern comes from the assumptions of independence, conditional on observables, between employment at various dates if affected before April 1982, $NE_i(1)$, and the date at which the reduction was implemented after, sometimes, negotiations with the personnel delegates or the unions, T_{1i} (hypothesis (H_A)). Indeed, if all firms or sectors in good economic conditions implemented the new standard just before or at the date of publication of the decree whereas firms that implemented the new agreement later on were in worse health, the independence assumption would be violated and our estimates of the effects would all be upward biased. We believe that this situation is very unlikely. First, it is crucial to remember that all our estimates include firm-level variables, in particular the industry or the size of the firm. Furthermore, we attempted to use more detailed industry classification (3-digits) with no change in the results. So, if any such problem arises, it comes from variation within the sector. In fact, the survey conducted in September and October 1982 by Insee, the French statistical institute (see Marchand, Rault, and Turpin, 1983) tells us exactly how the implementation of the new standard took place. We describe this process in the following paragraph.

First, Marchand et al. show that the new standard had not taken effect before February 1st since only 8.4% of workers had hours strictly below 40 hours in January 1982 (see their Table 1). Then, their survey shows the timing and the diffusion of the new workweek. "The diffusion of the agreements (on the reduction of the workweek) originated from the industries more accustomed to contractual negotiations and from the large nationalized companies to large industries such as the metal or the construction industries to the less concentrated industries in the trade or service sectors… Most of the sector-level agreements were extended to all firms in the sector by a decision of the Minister of Labor" (Marchand et al., page 4, our translation). Furthermore, more than 70% of firms with more than 500 employees declared that the reduction was implemented within a sector-level agreement, whereas the proportion is 50% for manufacturing firms with less than 100 employees, the proportion falling to 1/3 in the service or the trade sectors.

These elements show that the process of implementation of the new workweek left almost no room for within-sector or within-size variations. In those years, the industry was the level at which many institutional decisions were taken. The reduction of the workweek was no exception. Hence, the evidence do support our independence hypothesis conditional on observables that include the industry and the size of the employing firm (hypothesis (H_A)).

One may also view such evidence as supporting hypothesis (H_D) since the state vis-à-vis the reduction, affected before April (1) or affected after April (2), appears to be mostly determined at the sector-level with little scope for firm-specific decisions. Therefore, the effect of the potential employment status in state (1), for workers employed 40 hours in 1982, should not be different from the effect of the same variable in state (2) on the hypothetical (in situation (0) of no workweek reduction) employment status at future dates.

6. Conclusion

The election of François Mitterrand in 1981 ushered in a 5% increase in the French minimum wage in July 1981 and, on February 1, 1982, a mandatory reduction of workweek hours, from 40 to 39, mandatory stability of monthly wages for minimum wage workers, and recommendations – largely followed by firms – of stability of monthly wages for all other workers.

Our two evaluation methods demonstrate that the effects of the reduction of the standard workweek are large. The one-year effect lies between 2.4% (simple difference) and 4% (difference in difference) in our first analysis while our second analysis yields two lower bounds, 2.3% and 7%, depending on *P*. As claimed above, our two methodologies give similar results even though the data and the assumptions are totally different. However, this effect may seem very large for a one hour decrease and an associated increase in costs of 2.5% ($\frac{40-39}{40}$). It is even larger, 8.4%, if one focuses on low-wage workers for whom the reduction in hours was associated to monthly pay rigidity. However, at this point, the reader must note that we measure employment losses of individuals and not net job destruction. Our model has shown the mechanism that induces firms to both hire and fire. Empirical evaluations of this phenomenon are rare. For France, Abowd, Corbel, and Kramarz (1999) have shown that establishments that decrease employment by one in any given year do this by hiring three persons and separating from four (including all within year entry and exit). Hence, by applying this ratio of 1/4 to our estimated effects, the associated net job destruction amounts to approximately 2% yielding an elasticity of employment to labor costs just below minus 1, a number consistent with recent French evaluations (see Kramarz and Philippon, 1999).

These changes in the legal framework led to large employment losses, contrary to the initial goals of these policies. Gains in hourly productivity associated with the reduction of hours appear to have been insufficient to compensate firms for the increase in hourly pay. Of course, we provide no direct evidence of potential substitution effects, where affected workers would be replaced by more efficient ones. We only examine job losses whereas our theoretical model tells us that the reduction in the standard workweek, when associated with monthly pay rigidity, induces both job destruction and creation. In addition, we do not provide direct evidence on the possible substitution of part-time workers for full-time workers. However, there is no evidence of an increase in the fraction of part-time workers around these dates. But, even if employment had remained stable, given the structure of French unemployment where the fraction of long-term unemployed is very large, the employment losses that have their origin in these institutional changes must have had large negative consequences on the affected workers' incomes. In particular, the workers most affected were minimum wage workers that all such policies are trying to protect. Because of the mandatory stability of their monthly compensation, the burden fell almost entirely on minimum wage workers employed exactly 40 hours in 1982. Given this mandatory stability, the decrease in hours, and the increase in the minimum wage, the most effective cost minimization strategy was to fire some of these workers and hire new ones. Such replacements could still be paid the minimum wage rate but had monthly earnings that were based on actual hours worked. Our results show that firms did, indeed, follow this strategy.

The reader may legitimately wonder whether these conclusions apply to today's French, or more generally European, situation. Recall that French firms and unions are currently negotiating the detailed formulas for the upcoming mandatory reduction of hours, from 39 to 35. Current law mandates this negotiation. Pending legislation, considered at this exact moment, will depend upon the outcome of these negotiations as well other political considerations. Indeed, the length and method of transition from 39 to 35 hours per week will determine how firms accommodate current employees who are affected by the law. Although the 1981 changes were totally unexpected, the current transition is fully anticipated. Nevertheless, low-wage workers, more precisely minimum wage workers are most likely to be adversely affected by the forthcoming changes, as their predecessors were, since it appears that their monthly wage rates will not be allowed to decrease, thus, inducing a hike in their effective real hourly wage rate of 11%. The extension of differential payroll tax subsidies for

low-wage workers may well counteract the potentially major disemployment effects of this law. Thus, once again, the new law may also counteract the beneficial effects on the low-wage labor demand of recent changes, as described in Kramarz and Philippon (1999), that provided more employment incentives by allowing an 18% decrease in employer-paid social contributions for workers paid the SMIC.[14]

[14] In 1996, employer-paid contributions - health insurance, pensions,... - decreased from roughly 40 % of the wage to 20% of the wage.

Table 1: Work Hours Before the Reduction of the Workweek

	panel 1980-1982 year 1981	
	from 36 to 39 hours	40 hours
proportion	3.5	96.5
Employment losses in 1982	3.2	6.2
Number of observations	4,448	
GDP growth	In 1981 : 1.2	In 1982 : 2.5

Source : Enquête emploi 1980 à 1982. OECD for the GDP growth.

Table 2: Logistic Regression of " Hours = 40 "

Year	80	81
Sex (Male=1)	0.47 (0.05)	0.55 (0.05)
Low-skill	*0.01* *(0.07)*	0.17 (0.07)
Mid-skill	-	-
High-skill	0.87 (0.11)	0.51 (0.10)
Lives in Ile de France	*-0.03* *(0.06)*	*-0.05* *(0.06)*
No Diploma	-	-
Low-level Diploma	*0.08* *(0.05)*	*0.07* *(0.05)*
Mid-level Diploma	*-0.00* *(0.09)*	*0.15* *(0.09)*
High-level Diploma	*0.07* *(0.11)*	0.34 (0.11)
Experience $\in [0,5[$	-	-
Experience $\in [5,15[$	*-0.16* *(0.10)*	*-0.14* *(0.10)*
Experience $\in [15,25[$	*-0.06* *(0.10*	*-0.09* *(0.10)*
Experience ≥ 25	*-0.05* *(0.10)*	*0.07* *(0.10)*
Seniority ≤ 1	-	-
Seniority $\in]1,5[$	*-0.07* *(0.08)*	*0.02* *(0.08)*
Seniority $\in [5,10[$	*-0.13* *(0.08)*	*-0.08* *(0.08)*
Seniority ≥ 10	*-0.04* *(0.08)*	-0.16 (0.08)
Apprentice	*-0.03* *(0.22)*	*-0.40* *(0.22)*
Food Industries	0.62 (0.13)	0.23 (0.13)
Intermediary Goods	-	-
Equipment Goods	0.41 (0.09)	*0.09* *(0.08)*
Consumption Goods	*-0.04* *(0.10)*	0.19 (0.09)
Construction	0.62 (0.09)	0.52 (0.09)
Retail and Wholesale Trade	0.63 (0.09)	0.34 (0.09)

Table 2: Logistic Regression of " Hours = 40 "
(continued)

Transport	0.63 (0.10)	0.36 (0.10)
Service Industries	0.41 (0.09)	0.23 (0.09)
Rental Services	*-0.21* *(0.32)*	*-0.04* *(0.32)*
Insurance	*-0.32* *(0.26)*	0.60 (0.22)
Banking	-0.70 (0.17)	-0.30 (0.15)
Constant	-0.56 (0.12)	-0.69 (0.12)

Notes: Logistic regression for year 1980 and 1981 (first and second panel, respectively) of the indicator function for "hours=40" in the population of all full-time workers with hours between 36 and 40. Number of Observations: 4,066 and 4,448 respectively.

Table 3: Job Losses in 1979, 1980, 1981, and 1982 as a Function of Hours Worked

Panel *t* to *t+2*:	80-82	77-79	78-80	79-81	Pooled
Job Losses of Workers Employed 36 to 39 Hours	3.2	3.9	2.7	7.3	-
Job Losses of Workers Employed 40 Hours	6.2	4.3	5.0	5.5	-
	"hours=40" indicator	"hours=40" indicator	"hours=40" indicator	"hours=40" indicator	"hours=40" indicator
Non-Employment in *t+2* (A)	2.38 (1.46)	-0.36 (1.57)	1.49 (1.40)	-2.71 (2.06)	3.98 (1.84)
Non-Employment in *t+2* (B)	2.79 (1.44)	-1.76 (1.90)	1.18 (1.51)	-4.02 (2.36)	4.28 (1.81)
Number of Observations	4,448	3,606	3,734	4,066	15,854

Notes : Regressions for the LFS panels of 77-79, 78-80, 79-81, and 80-82 (linear probability models). Dependent variable is non-employment in the exit year of the panel (79, 80, 81, and 82, respectively). Independent variables : indicator for " hours=40 " (only reported coefficient), industry, region (Ile de France or other), skill-level (3 positions), sex, diploma (6 positions), experience (4 positions), seniority (4 positions), labor market status (apprentice or not). The population includes all full-time workers of the private sector working between 36 and 40 hours in the median year of each panel (78, 79, 80, and 81, respectively). Column 1 reports estimates for the panel 80-82, Columns 2, 3, and 4 report estimates for the panels 77-79, 78-80, and 79-81 respectively. Column 5 reports pooled estimates and all variables are interacted with the relevant year indicator except for the " hours=40 " variables for which we introduce a pooled coefficient and a coefficient specific to year 1981 (panel 80-82).
In Row A, we do not condition by hours in the entry year of the panel. In Row B, two additional variables on hours in the first year of the panel are introduced : " hours in first year of the panel strictly below 40 " and " hours in first year of the panel strictly above 40 ".
Robust standard errors are given between parentheses.

Table 4 : Employment to Non-Employment Transitions of Workers Employed 39 or 40 Hours in 1982, 1983, 1984, and 1985

			Employment Losses Cumulated Over		Number of
		Proportion	One year	Two years	Observations
82	40 hours	27.9	8.2	16.5	1,700
	39 hours	72.1	6.6	12.6	4,397
	Difference		1.6	3.9	
83	40 hours	21.9	6.9	12.6	1,214
	39 hours	78.1	6.4	11.8	4,331
	Difference		0.5	0.8	
84	40 hours	20.3	7.9	14.8	1,112
	39 hours	79.7	6.6	11.9	4,371
	Difference		1.3	2.9	
85	40 hours	19.1	5.7	11.9	996
	39 hours	80.9	6.3	12.1	4,225
	Difference		-0.6	-0.2	

Notes : LFS panels for years 82-84, 83-85, 84-86 and 85-87. Statistics computed using the non-employment variables in the median and in the final year of each panel. Observations: All full-time workers employed 39 or 40 hours in the first year of the panel.

Table 5 : Job Losses and Hours Worked : Late Reduction.
Total Effects and Effect for Low-Wage Workers.
Panel by Panel Estimation

Period	"hours=40" indicator	"hours=40" indicator	"hours=40" and low-wage indicator
82-84	1.28	0.53	8.49
NE_{83}	(0.77)	(0.77)	(3.66)
82-84	2.71	1.75	10.87
NE_{84}	(1.02)	(1.04)	(4.50)
82-84	4.13	2.96	13.24
$2NE_{84}$-NE_{83}	(1.63)	(1.66)	(7.09)
83-85	-0.08	-0.06	-0.14
NE_{84}	(0.81)	(0.79)	(3.02)
83-85	-0.36	-0.53	1.21
NE_{85}	(1.04)	(1.05)	(3.72)
83-85	-0.64	-1.01	2.56
$2NE_{85}$-NE_{84}	(1.62)	(1.66)	(5.70)
84-86	0.91	0.93	-0.38
NE_{85}	(0.89)	(0.90)	(3.98)
84-86	2.05	1.81	2.94
NE_{86}	(1.16)	(1.18)	(5.22)
84-86	3.20	2.68	6.28
$2NE_{86}$-NE_{85}	(1.82)	(1.84)	(8.32)
85-87	-0.94	-1.38	3.30
NE_{86}	(0.85)	(0.82)	(3.42)
85-87	-0.53	-1.80	9.48
NE_{87}	(1.15)	(1.14)	(4.34)
85-87	-0.12	-2.21	15.66
$2NE_{87}$-NE_{86}	(1.83)	(1.84)	(6.81)

Notes : Panel by panel regressions (linear probability models). Dependent variable Employment loss in the median year or in the last year of the panel. Independent variables : industry, region (Ile de France or other), skill-level(3 positions), sex, diploma (6 positions), experience (4 positions), seniority (4 positions), labor market status (apprentice, short-term contract, or long-term-contract), wage level (5 positions defined wrt the minimum wage in the relevant year), and indicator for " hours=40 " (only reported coefficient in column 1), indicator for " hours=40 " and its interaction with an indicator for a low-wage worker, i.e. with wage between 0.95 and 1.1 times the minimum wage (both are the only reported coefficients in column 2).
Observations : Full-time workers of the private sector employed either 39 or 40 hours in the entry year of the panel.
Robust standard errors between parentheses.

Table 6 : Job Losses and Hours Worked : Late Reduction.
Total Effects and Effect for Low-Wage Workers.
Pooled Estimates

Period	hours=40 indicator	Hours=40 and Year=82 indicator	hours=40 indicator	Hours=40 and Low-wage indicator	Hours=40 and Year=82 indicator	Hours=40, Low-wage, and Year=82 indicator
NE_{t+1}	0.00	1.29	-0.10	0.79	0.64	7.70
	(0.49)	(0.91)	(0.49)	(1.97)	(0.91)	(4.14)
NE_{t+2}	0.40	2.30	-0.10	4.06	1.84	6.80
	(2.04)	(1.20)	(0.49)	(2.49)	(1.22)	(5.15)
Number of Observations	22,345					

Notes : Pooled regressions (linear probability models). Dependent variable: Employment loss in the median year or in the last year of each panel. Independent variables : industry, region (Ile de France or other), skill-level(3 positions), sex, diploma (6 positions), experience (4 positions), seniority (4 positions), labor market status (apprentice, short-term contract, or long-term-contract), wage level (5 positions defined wrt the minimum wage in the relevant year), and an indicator for " hours=40" and its interaction with a year indicator for 1982 (both are the only reported coefficients in column 1), an indicator for " hours=40", its interaction with a year indicator for 1982, an indicator for "hours=40" interacted with an indicator for a low-wage worker, i.e. with wage between 0.95 and 1.1 times the minimum wage, and its interaction with a year indicator for 1982 (all four are the only reported coefficients in column 2).
Robust standard errors between parentheses.

Table 7: Summary and Tests of Possible Effects and Constraints

	One-year Effect (Low-wage)	One-year Effect (High-wage)	Two-year Effect (Low-wage)	Two-year Effect (High-wage)	Degrees of Freedom (d)	Test statistics χ^2 (d)	p-value
Unconstrained	8.34 (4.06)	0.64 (0.91)	8.64 (5.00)	1.84 (1.22)	-	-	-
Constrained:							
Low-wage effects = High-wage effects	0.99 (0.88)		2.18 (1.19)		2	3.45	0.18
1-year effects = 2-year effects	8.40 (3.99)	0.75 (0.90)	8.40 (3.99)	0.75 (0.90)	2	1.78	0.41
1-year effects = 0	0	0	1.69 (3.69)	1.25 (0.90)	2	4.68	0.10
1-year effects High-wage = 0	8.31 (4.06)	0	8.62 (5.00)	1.25 (0.90)	1	0.49	0.48
1-year=0 (High-wage) and 1-year=2-year (Low-wage)	8.37 (3.99)	0	8.37 (3.99)	1.25 (0.90)	2	0.50	0.78
1-year effects = 2-year effects for Low-wage	8.40 (3.99)	0.64 (0.91)	8.40 (3.99)	1.84 (1.22)	1	0.006	0.94
Total effects: If	$\pi_1 + \pi_2$ (Low-wage)		$\pi_1 + \pi_2$ (High-wage)				
1-year effects = 2-year effects for Low-wage	8.40 (3.99)		3.03 (1.94)		-		

Notes: All computations are based on Table 6 results. The last three columns present the basis for the test of the restrictions given in the corresponding line.

Appendix 1

In this section, we present a theoretical model that reflects the changing workweek institutions and their consequences on firms labor demand.

Consider a firm that produces with the following production function *f(h,l,k)* where *h* are weekly hours, where *l* denotes total employment, and where *k* denotes capital. The firm faces a cost function that comprises wages, where *w* denotes the hourly wage, θ denotes the overtime premium for all hours above h_s the mandated standard hours, hiring costs, firing costs, the cost of capital *r*.

To model the details of the French situation, we will have two periods in our model; one that precedes the reduction in the workweek (*d=0* and before); one that is at, and follows, the reduction of the workweek (*d=1*). We will assume that the changes were unexpected by firms. We will also assume that firms choose hours in excess of standard hours in both periods (see Hunt, 1999 with the same assumption). Hence, assuming that we are in a stationary situation, we have:

$$C_0 = w_0 h_0 l_0 + w_0 \theta (h_0 - h_{s,0}) l_0 + \frac{t}{2} e_0^2 + \frac{f}{2} s_0^2 + r k_0$$

where *e* denotes the number of hires in the firm whereas *s* denotes the number of separations (i.e. excluding quits). The flow equation for employment is:

$$l_0 = (1-q) l_{-1} + e_0 - s_0$$

where l_{-1} denotes employment at the previous date, and where *q* denotes the exogenous quit rate. In this situation, the firm optimizes on capital, hours, hires, and separations. Importantly, since hires and separations both entail a cost, as only the difference between hires and separations matters for production through employment, it is never optimal to hires and fire simultaneously. Hence, at least one of *e* or *s* is equal to zero.[15] The marginal cost of a hire is the following:

$$C_e = w_0 h_0 + w_0 \theta (h_0 - h_{s,0}) + t e_0$$

while the marginal cost of a separation is:

$$C_s = -w_0 h_0 - w_0 \theta (h_0 - h_{s,0}) + f s_0$$

and the marginal cost of a supplementary hour is:

$$C_h = w_0 l_0 + w_0 \theta l_0 = w_0 l_0 (1+\theta)$$

Now, consider what happens after the French reform of 1982. First, standard hours, $h_{s,1}$, decreased. Second, monthly wages did not decrease (by law for minimum wage workers whereas it was only suggested for other workers but firms followed the suggestion). Hence, hourly pay increased for those who were already employed in the firm while hourly pay was left unchanged for new hires. Two wage rates prevailed at those dates for otherwise identical workers. These various facts are modeled in the next paragraphs.

In period 1, the cost function that faces the firm is:

[15] The proof is straightforward. One must write the lagrangean with the multipliers for $e_0 \geq 0, s_0 \geq 0$ and look at the first-order conditions for hires and separations.

$$C_1 = \quad w_1^1 h_1 e_1 + w_1^1 \theta (h_1 - h_{s,1}) e_1 + w_0^1 h_1 [(1-q) l_0 - s_1] + w_0^1 \theta (h_1 - h_{s,1}) [(1-q) l_0 - s_1] + \frac{t}{2} e_1^2 + \frac{f}{2} s_1^2 + r k_1$$

where w_1^1 denotes the wage of the new hires, and where w_0^1 denotes the wage of the workers that were present in the firm before period 1. Because of the legal restrictions and the "suggestions" to the firms, the following equation holds:

$$w_0^1 h_{s,1} = w_0 h_{s,0}$$

or

$$w_0^1 = w_0 \frac{h_{s,0}}{h_{s,1}} > w_0$$

and

$$w_1^1 = w_0$$

Therefore, the marginal costs functions are as follows:

$$C_{e_1} = \quad w_1^1 h_1 + w_1^1 \theta (h_1 - h_{s,1}) + t e_1$$
$$C_{s_1} = \quad - w_0^1 h_1 - w_0^1 \theta (h_1 - h_{s,1}) + f s_1$$

and

$$C_{h_1} = w_1^1 (1+\theta) e_1 + w_0^1 (1+\theta) [(1-q) l_0 - s_1]$$

which can be reformulated in terms of the period 0 wage and the standard hours in both periods:

$$C_{h_1} = w_0 (1+\theta) \left[[(1-q) l_0 - s_1] \frac{h_{s,0}}{h_{s,1}} + e_1 \right]$$

This last formula shows that the marginal cost of an additional hour is decreasing in separations at a greater rate than in period 0, because of the changing standard hours.
To give an intuition of the result, w.l.o.g., we assume that the production writes as *f(h,l,k) = phl* where *p*, the productivity is constant. Then, one has $C_{h_1} = p l_1, C_{e_1} = p h_1, C_{s_1} = -p h_1$. Hence, if one denotes

$$\psi_1 = w_1^1 (1+\theta) - p, \psi_0 = w_0^1 (1+\theta) - p, \xi_1 = w_1^1 \theta h_{s,1}, \xi_0 = w_0^1 \theta h_{s,1}$$

one derives the following relations:

$$t \psi_0 e_1 + f \psi_1 s_1 = \psi_0 \xi_1 - \psi_1 \xi_0$$
$$- \psi_1 e_1 + \psi_0 s_1 = \psi_0 (1-q) l_0$$

These two equations show that there exist a wide range of values of the parameters for which simultaneous hiring and separations are possible at the equilibrium (where the two lines intersect). This situation is represented on figure 1.

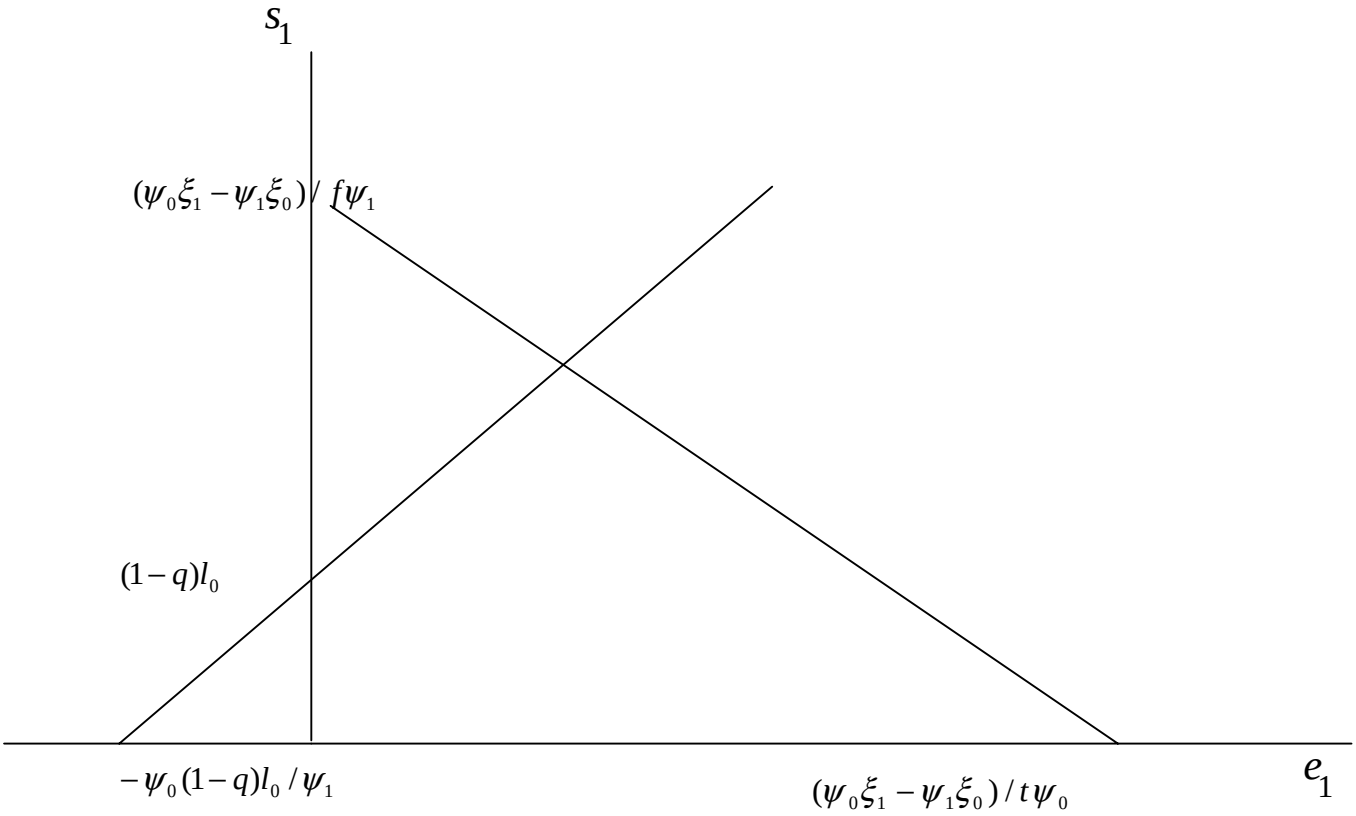

Figure 1

As one sees on the following formulas (assuming that $w_1^1(1+\theta) - p > 0$),

$$e_1 > 0 \Leftrightarrow (w_0^1 - w_1^1)\theta\, ph_{s,1} > f(1-q)l_0(w_1^1(1+\theta) - p)$$

$$s_1 > 0 \Leftrightarrow (w_0^1 - w_1^1)\theta\, ph_{s,1}(w_1^1(1+\theta) - p) + t(1-q)l_0(w_0^1(1+\theta) - p)^2 > 0$$

there will always be separations (unless the hourly productivity *p* in the new system be very high). In addition, the equilibrium zone where hiring and separations coexist is increasing with the wedge between the hourly pay of workers present in the firm before the reduction and the hourly pay of newly hired workers. It also increases with the overtime premium, productivity, and the quit rate, whereas it is decreasing with the firing costs.

In 1982, workweek hours decreased and, simultaneously, hourly pay of insiders increased. This increase was mandated by the February 1 decree for low-wage workers and was a consequence of the government suggestion for all other workers. Hence, simultaneous hiring and separations are to be expected at all pay-levels. Such effects may easily be interpreted in terms of job creation and job destruction à la Davis et Haltiwanger (1999) since, in this context, there is a difference between destructions (s_1) and net destructions ($s_1 - e_1$). This is in stark contrast with a situation of an increase in the minimum wage. Indeed, such an increase would generate separations but no hiring, since the pay increase would affect both workers inside the firm and the pool of potential applicants.

Finally, notice that the zone in which firm employment falls is located on the left of the first diagonal of the figure. As one can check using above equations, standard hours reduction will generally induce net employment losses.

Appendix 2
Statistical Models for the Analysis of Late Changes to 39 Hours

A.2.1 : Parameter of interest and nuisance parameters:

The conditional expectation of an output variable writes as :

$$E\left(NE_i \middle| x_i, D_{82i}, NE_{82i} = 0\right) = E\left(NE_i(1)T_{1i} + NE_i(2)T_{2i} \middle| x_i, D_{82i}, NE_{82i} = 0\right)$$

which can be re-expressed as the sum of four terms :

$$\begin{aligned}
&E\left(NE_i \middle| x_i, D_{82i}, NE_{82i} = 0\right) = \\
&E\left(NE_i(1) \middle| x_i, D_{82i} = 39, NE_{82i}(1) = 0, T_{1i} = 1\right) P\left(T_{1i} = 1 \middle| x_i, D_{82i} = 39, NE_{82i} = 0\right) 1\left(D_{82i} = 39\right) \\
&+ E\left(NE_i(1) \middle| x_i, D_{82i} = 40, NE_{82i}(1) = 0, T_{1i} = 1\right) P\left(T_{1i} = 1 \middle| x_i, D_{82i} = 40, NE_{82i} = 0\right) 1\left(D_{82i} = 40\right) \\
&+ E\left(NE_i(2) \middle| x_i, D_{82i} = 39, NE_{82i}(2) = 0, T_{2i} = 1\right) P\left(T_{2i} = 1 \middle| x_i, D_{82i} = 39, NE_{82i} = 0\right) 1\left(D_{82i} = 39\right) \\
&+ E\left(NE_i(2) \middle| x_i, D_{82i} = 40, NE_{82i}(2) = 0, T_{2i} = 1\right) P\left(T_{2i} = 1 \middle| x_i, D_{82i} = 40, NE_{82i} = 0\right) 1\left(D_{82i} = 40\right)
\end{aligned}$$

Using the fact that :

$$P\left(T_{2i} = 1 \middle| x_i, D_{82i}, NE_{82i} = 0\right) = 1 - P\left(T_{2i} = 1 \middle| x_i, D_{82i}, NE_{82i} = 0\right)$$

$$\text{and P}\left(T_{2i} = 1 \middle| x_i, D_{82i} = 39, NE_{82i} = 0\right) = 1$$

one can re-write the preceding relation as follows:

$$\begin{aligned}
&E\left(NE_i \middle| x_i, D_{82i}, NE_{82i} = 0\right) = E\left(NE_i(1) \middle| x_i, D_{82i} = 39, NE_{82i}(1) = 0, T_{1i} = 1\right) + \\
&+ \left[E\left(NE_i(1) \middle| x_i, D_{82i} = 40, NE_{82i}(1) = 0, T_{1i} = 1\right) - E\left(NE_i(1) \middle| x_i, D_{82i} = 39, NE_{82i}(1) = 0, T_{1i} = 1\right)\right] 1\left(D_{82i} = 40\right) \\
&+ \left[E\left(NE_i(2) \middle| x_i, D_{82i} = 40, NE_{82i}(2) = 0, T_{2i} = 1\right) - E\left(NE_i(1) \middle| x_i, D_{82i} = 40, NE_{82i}(1) = 0, T_{2i} = 1\right)\right] \\
&P\left(T_{2i} = 1 \middle| x_i, D_{82i} = 40, NE_{82i} = 0\right) 1\left(D_{82i} = 40\right)
\end{aligned}$$

A.2.2 : Testing the effect of the reduction of workweek hours:

The analog of the independence hypothesis given in our natural experience is:

$$H_A : E\left(NE_i(1) \middle| x_i, D_{82i} = 40, NE_{82i}(1) = 0, T_{2i} = 1\right) = E\left(NE_i(1) \middle| x_i, D_{82i} = 40, NE_{82i}(1) = 0, T_{1i} = 1\right)$$

In addition, we assume that the effect of the reduction is independent of the number of hours worked, 39 or 40, after the negotiation. Hence,

$$H_B : E\left(NE_i(1) \middle| x_i, T_{2i} = 0, D_{82i} = 39\right) = E\left(NE_i(1) \middle| x_i, T_{2i} = 0, D_{82i} = 40\right)$$

This hypothesis is equivalent to neglecting the cost induced by the 25% premium induced by a one hour overtime in case of a 40 hours outcome. The previous equation simplifies as:

$$\begin{aligned}
&E\left(NE_i \middle| x_i, D_{82i}, NE_{82i} = 0\right) = E\left(NE_i(1) \middle| x_i, D_{82i} = 39, NE_{82i}(1) = 0, T_{1i} = 1\right) + \\
&\left[\left(E\left(NE_i(2) \middle| x_i, D_{82i} = 40, NE_{82i}(2) = 0, T_{2i} = 1\right) - E\left(NE_i(1) \middle| x_i, D_{82i} = 40, NE_{82i}(1) = 0, T_{2i} = 1\right)\right)\right] \\
&P\left(T_{2i} = 1 \middle| x_i, D_{82i} = 40, NE_{82i} = 0\right) 1\left(D_{82i} = 40\right)
\end{aligned}$$

Proposition 1*: Under hypotheses H_A and H_B,, the reduction of the workweek has no effect on employment, i.e.*

$$NE_i(0) = NE_i(1) = NE_i(2) \quad \forall\, i$$

whenever

$$E\left(NE_i \middle| x_i, D_{82i}, NE_{82i} = 0\right) = E\left(NE_i \middle| x_i, NE_{82i} = 0\right)$$

Proof : Under these hypotheses, one has :

$$\left\{x_i, D_{82i} = 40, NE_{82i}(2) = 0, T_{2i} = 1\right\} = \left\{x_i, D_{82i} = 40, NE_{82i}(1) = 0, T_{2i} = 1\right\}$$

Therefore, one can write:

$$\begin{aligned}
&E\left(NE_i \middle| x_i, D_{82i}, NE_{82i} = 0\right) = E\left(NE_i(1) \middle| x_i, D_{82i} = 39, NE_{82i}(1) = 0, T_{1i} = 1\right) + \\
&\left[E\left(NE_i(2) - NE_i(1) \middle| x_i, D_{82i} = 40, NE_{82i}(2) = 0, T_{2i} = 1\right)\right] P\left(T_{2i} = 1 \middle| x_i, D_{82i} = 40, NE_{82i} = 0\right) 1\left(D_{82i} = 40\right)
\end{aligned}$$

and $E\left(NE_i \middle| x_i, D_{82i}, NE_{82i} = 0\right) = E\left(NE_i(1) \middle| x_i, D_{82i} = 39, NE_{82i}(1) = 0, T_{1i} = 1\right)$ does not depend on 1982 hours. **Q.E.D.**

A.2.3 : Measuring the effect of the reduction of workweek hours:

The parameter to be identified is :

$$\left[\left(E\left(NE_i(2)\middle|x_i, D_{82i}=40, NE_{82i}(2)=0, T_{2i}=1\right)-E\left(NE_i(1)\middle|x_i, D_{82i}=40, NE_{82i}(1)=0, T_{2i}=1\right)\right)\right]$$

We now write its expression for the 1982-1983 employment losses and for those of 1982-1984. For 1982-1983, we simply have:

$$\left[\left(E\left(NE_{83i}(2)\middle|x_i, D_{82i}=40, NE_{82i}(2)=0, T_{2i}=1\right)-E\left(NE_{83i}(1)\middle|x_i, D_{82i}=40, NE_{82i}(1)=0, T_{2i}=1\right)\right)\right]$$

whereas for 1982-1984 :

$$\left[\left(E\left(NE_{84i}(2)\middle|x_i, D_{82i}=40, NE_{82i}(2)=0, T_{2i}=1\right)-E\left(NE_{84i}\middle|x_i, D_{82i}=40, NE_{82i}(1)=0, T_{2i}=1\right)\right)\right]=$$

We can now rewrite the parameter after conditioning by the effect of the reduction in 1983 :

$$\begin{aligned}
&\left[\left(E\left(NE_{84i}(2)\middle|x_i, D_{82i}=40, NE_{82i}(2)=0, T_{2i}=1\right)-E\left(NE_{84i}\middle|x_i, D_{82i}=40, NE_{82i}(1)=0, T_{2i}=1\right)\right)\right]=\\
&\left\{E\left(NE_{84i}(2)\middle|x_i, D_{82i}=40, NE_{83i}(2)=0, T_{2i}=1\right)\left[1-E\left(NE_{83i}(2)\middle|x_i, D_{82i}=40, NE_{82i}(2)=0, T_{2i}=1\right)\right]+\right.\\
&\left.E\left(NE_{84i}(2)\middle|x_i, D_{82i}=40, NE_{83i}(2)=1, T_{2i}=1\right)E\left(NE_{83i}(2)\middle|x_i, D_{82i}=40, NE_{82i}(2)=0, T_{2i}=1\right)\right\}-\\
&\left\{E\left(NE_{84i}(1)\middle|x_i, D_{82i}=40, NE_{83i}(1)=0, T_{2i}=1\right)\left[1-E\left(NE_{83i}(1)\middle|x_i, D_{82i}=40, NE_{82i}(1)=0, T_{2i}=1\right)\right]+\right.\\
&\left.E\left(NE_{84i}(1)\middle|x_i, D_{82i}=40, NE_{83i}(1)=1, T_{2i}=1\right)E\left(NE_{83i}(1)\middle|x_i, D_{82i}=40, NE_{82i}(1)=0, T_{2i}=1\right)\right\}
\end{aligned}$$

Given that we measure the two-years cumulated employment losses, i.e. $NE_{83i}=1 \Rightarrow NE_{84i}=1$, we have :

$$E\left(NE_{84i}(2)\middle|x_i, D_{82i}=40, NE_{83i}(2)=1, T_{2i}=1\right)=1$$

$$\text{et } E\left(NE_{84i}(1)\middle|x_i, D_{82i}=40, NE_{83i}(1)=1, T_{2i}=1\right)=1$$

Furthermore, if we neglect the second-order terms, i.e. if:

$$H_c: \begin{cases} E\left(NE_{84i}(2)\middle|x_i, D_{82i}=40, NE_{83i}(2)=0, T_{2i}=1\right)E\left(NE_{83i}(2)\middle|x_i, D_{82i}=40, NE_{82i}(2)=0, T_{2i}=1\right)\approx 0 \\ E\left(NE_{84i}(1)\middle|x_i, D_{82i}=40, NE_{83i}(1)=0, T_{2i}=1\right)E\left(NE_{83i}(1)\middle|x_i, D_{82i}=40, NE_{82i}(1)=0, T_{2i}=1\right)\approx 0 \end{cases}$$

the parameter writes as:

$$\begin{aligned}
&\left[\left(E\left(NE_{84i}(2)\middle|x_i, D_{82i}=40, NE_{82i}(2)=0, T_{2i}=1\right)-E\left(NE_{84i}(1)\middle|x_i, D_{82i}=40, NE_{82i}(1)=0, T_{2i}=1\right)\right)\right]=\\
&\left\{E\left(NE_{84i}(2)\middle|x_i, D_{82i}=40, NE_{83i}(2)=0, T_{2i}=1\right)+E\left(NE_{83i}(2)\middle|x_i, D_{82i}=40, NE_{82i}(2)=0, T_{2i}=1\right)\right\}-\\
&\left\{E\left(NE_{84i}(1)\middle|x_i, D_{82i}=40, NE_{83i}(1)=0, T_{2i}=1\right)+E\left(NE_{83i}(1)\middle|x_i, D_{82i}=40, NE_{82i}(1)=0, T_{2i}=1\right)\right\}
\end{aligned}$$

Since we intend to measure employment losses induced by the reduction of workweek hours in difference from what would have been the absence of a change in standard hours, we introduce additional terms in the above expressions.

For 1982-1983, we have :

$$\begin{aligned}
&\left[\left(E\left(NE_{83i}(2)\middle|x_i, D_{82i}=40, NE_{82i}(2)=0, T_{2i}=1\right)-E\left(NE_{83i}(1)\middle|x_i, D_{82i}=40, NE_{82i}(1)=0, T_{2i}=1\right)\right)\right]=\\
&\pi_1(2, x_i)-\pi_2(1, x_i)+\eta_1(x_i)=\left(E\left(NE_{83i}(2)-NE_{83i}(0)\middle|x_i, D_{82i}=40, NE_{82i}(2)=0, T_{2i}=1\right)-\right.\\
&\left.E\left(NE_{83i}(1)-NE_{83i}(0)\middle|x_i, D_{82i}=40, NE_{82i}(1)=0, T_{2i}=1\right)\right)+\\
&\left(E\left(NE_{83i}(0)\middle|x_i, D_{82i}=40, NE_{82i}(2)=0, T_{2i}=1\right)-E\left(NE_{83i}(0)\middle|x_i, D_{82i}=40, NE_{82i}(1)=0, T_{2i}=1\right)\right)
\end{aligned}$$

and for 1982-1984 :

$$\begin{aligned}
&\left[\left(E\left(NE_{84i}(2)\middle|x_i, D_{82i}=40, NE_{82i}(2)=0, T_{2i}=1\right)-E\left(NE_{84i}(1)\middle|x_i, D_{82i}=40, NE_{82i}(1)=0, T_{2i}=1\right)\right)\right]=\\
&\pi_1(x_i,2)+\pi_2(x_i,2)-\pi_2(x_i,1)-\pi_3(x_i,1)+\eta_2(x_i)+\eta_1(x_i)=\\
&E\left(NE_{83i}(2)-NE_{83i}(0)\middle|x_i, D_{82i}=40, NE_{82i}(2)=0, T_{2i}=1\right)+\\
&E\left(NE_{84i}(2)-NE_{84i}(0)\middle|x_i, D_{82i}=40, NE_{83i}(2)=0, T_{2i}=1\right)-\\
&E\left(NE_{83i}(1)-NE_{83i}(0)\middle|x_i, D_{82i}=40, NE_{82i}(1)=0, T_{2i}=1\right)-\\
&E\left(NE_{84i}(1)-NE_{84i}(0)\middle|x_i, D_{82i}=40, NE_{83i}(1)=0, T_{2i}=1\right)+\\
&\left\{E\left(NE_{84i}(0)\middle|x_i, D_{82i}=40, NE_{83i}(2)=0, T_{2i}=1\right)-E\left(NE_{84i}(0)\middle|x_i, D_{82i}=40, NE_{83i}(1)=0, T_{2i}=1\right)\right\}+\\
&\left\{E\left(NE_{83i}(0)\middle|x_i, D_{82i}=40, NE_{82i}(2)=0, T_{2i}=1\right)-E\left(NE_{83i}(0)\middle|x_i, D_{82i}=40, NE_{82i}(1)=0, T_{2i}=1\right)\right\}
\end{aligned}$$

We assume in the following that the η parameters are equal to zero. This hypothesis writes as:

$$H_D : \begin{cases} \left\{E\left(NE_{84i}(0)\middle|x_i, D_{82i}=40, NE_{83i}(2)=0, T_{2i}=1\right)=E\left(NE_{84i}(0)\middle|x_i, D_{82i}=40, NE_{83i}(1)=0, T_{2i}=1\right)\right\} \\ \left\{E\left(NE_{83i}(0)\middle|x_i, D_{82i}=40, NE_{82i}(2)=0, T_{2i}=1\right)=E\left(NE_{83i}(0)\middle|x_i, D_{82i}=40, NE_{82i}(1)=0, T_{2i}=1\right)\right\} \end{cases}$$

This hypothesis captures the following intuitive idea: The employment status of workers employed in firms that indeed implemented the reduction after April 1982, relative to what this status would have been had they implemented the reduction before this date (keeping their jobs in both cases), does not depend upon the status that would have been theirs in the absence of a reduction in workweek hours, conditional on observables.

A final hypothesis is made on the adjustment process itself: it takes at most two years to adjust. In addition, this length does not depend upon the date at which negotiations are completed:

$$H_E : \begin{cases} \pi_1(x_i,1)=\pi_1(x_i,2)=\pi_1(x_i) \\ \pi_2(x_i,1)=\pi_2(x_i,2)=\pi_2(x_i) \\ \pi_3(x_i,1)=\pi_3(x_i,2)=0 \end{cases}$$

This yields the following result:

Proposition 2*: Under hypotheses H_A to H_E , one can rewrite the employment loss probabilities as:*

$$E\left(NE_{83i}\middle|x_i, D_{82i}, NE_{82i}=0\right)=g(x_i)+\left(\pi_1(x_i)-\pi_2(x_i)\right)P\left(T_{2i}=1\middle|x_i, D_{82i}=40, NE_{82i}=0\right)1(D_{82i}=40)$$

$$E\left(NE_{83i}\middle|x_i, D_{82i}, NE_{82i}=0\right)=g(x_i)+\pi_1(x_i)P\left(T_{2i}=1\middle|x_i, D_{82i}=40, NE_{82i}=0\right)1(D_{82i}=40)$$

where

$$\pi_1(x_i)=E\left(NE_{83i}(2)-NE_{83i}(0)\middle|x_i, D_{82i}=40, NE_{82i}(2)=0, T_{2i}=1\right))$$

$$\pi_2(x_i)=E\left(NE_{84i}(2)-NE_{84i}(0)\middle|x_i, D_{82i}=40, NE_{83i}(2)=0, T_{2i}=1\right)$$

$$=E\left(NE_{83i}(1)-NE_{83i}(0)\middle|x_i, D_{82i}=40, NE_{82i}(1)=0, T_{2i}=1\right)$$

A.2.4 : Nuisance parameters : hypotheses and estimation

The central equation of our analysis does not allow us to directly identify the parameters of interest, $\pi_k(x_i)$, using only information on transitions, individual characteristics, and work hours in 1982 since it includes a nuisance parameter, $P\left(T_{2i}=1\middle|x_i, D_{82i}=40\right)$, i.e. the proportion of individuals employed 40 hours in 1982 and working in firms that did not complete their negotiations at that date. A first solution to the identification problem is to assume that the nuisance parameter is equal to 1 for all individuals. This corresponds to the following hypothesis: all workers employed in firms having completed negotiations before April 1982 indeed work 39 hours after the reduction. Hence, all firms in which negotiations led to a 40 hours workweek, one hour being compensated as overtime (based on the French LFS of 1983 to 1987, such firms comprise 20% of total employment), completed negotiations after April 1982. Since the nuisance parameter lies between 0 and 1, this hypothesis provides us with a lower bound of the parameter of interest.

Other solutions to the identification problem are all based on the share of workers employed 40 hours in 1982, 1983, … We examine two restrictions that provide identification. We consider (a) an hypothesis of independence between the date of negotiation and its outcome (40 hours with one hour overtime or 39 hours) and (b) an hypothesis where all firms in which the negotiation maintained a 40 hours workweek completed that negotiation before April 1982. This last case yields a lower of the nuisance parameter and, therefore, an upper bound of the effect of a shorter workweek. Under each hypothesis, we can identify the nuisance parameter. Indeed, one has:

$$P\left(T_2=1\middle|x_i, D_{82}=40\right)=P\left(D_{82}=40\middle|x_i, T_2=1\right)\frac{P\left(T_2=1\middle|x_i\right)}{P\left(D_{82}=40\middle|x_i\right)}=\frac{P\left(T_2=1\middle|x_i\right)}{P\left(D_{82}=40\middle|x_i\right)}$$

since all individuals employed in firms that did not complete negotiations in April 1982 have usual hours equal to 40. Furthermore, one has:

$$P\left(D_{82}=40\middle|x_i\right)=P\left(D_{82}=40\middle|x_i, T_2=0\right)+P\left(T_2=1\middle|x_i\right)\left(1-P\left(D_{82}=40\middle|x_i, T_2=0\right)\right)$$

$$P\left(D_{83}=40\middle|x_i\right)=P\left(D_{83}=40\middle|x_i, T_2=0\right)+P\left(T_2=1\middle|x_i\right)\left(P\left(D_{83}=40\middle|x_i, T_2=1\right)-P\left(D_{83}=40\middle|x_i, T_2=0\right)\right)$$

Given that $P\left(D_{82}=40\middle|x_i, T_2=0\right)=P\left(D_{83}=40\middle|x_i, T_2=0\right)$, one can express $P\left(T_2=1\middle|x_i\right)$ as:

$$P\left(T_2 = 1 \middle| x_i\right) = \frac{P\left(D_{82} = 40 \middle| x_i\right) - P\left(D_{83} = 40 \middle| x_i\right)}{1 - P\left(D_{83} = 40 \middle| x_i, T_2 = 1\right)}$$

from which we derive the nuisance parameter:

$$P\left(T_2 = 1 \middle| x_i, D_{82} = 40\right) = \frac{P\left(D_{82} = 40 \middle| x_i\right) - P\left(D_{83} = 40 \middle| x_i\right)}{P\left(D_{82} = 40 \middle| x_i\right)\left(1 - P\left(D_{83} = 40 \middle| x_i, T_2 = 1\right)\right)}$$

The hypothesis of independence between the negotiation date and the negotiation outcome means that, once all negotiations are completed, i.e. after 1983, the proportion of workers employed 40 hours is not dependent any more of the date at which negotiations were completed:

$$P\left(D_{83} = 40 \middle| x_i, T_2 = 1\right) = P\left(D_{83} = 40 \middle| x_i, T_2 = 0\right)$$

Therefore, the nuisance writes as:

$$P\left(T_2 = 1 \middle| x_i, D_{82} = 40\right) = \frac{P\left(D_{82} = 40 \middle| x_i\right) - P\left(D_{83} = 40 \middle| x_i\right)}{P\left(D_{82} = 40 \middle| x_i\right)\left(1 - P\left(D_{83} = 40 \middle| x_i\right)\right)}$$

Furthermore, an upper bound of the nuisance parameter, or equivalently a lower bound of the interest parameter is obtained for $P\left(D_{83} = 40 \middle| x_i, T_2 = 1\right) = 0$, which corresponds to a situation in which all firms that negotiated after April 1982 selected a 39 hours workweek (not very likely, indeed). The corresponding expression of the nuisance parameter becomes:

$$P\left(T_2 = 1 \middle| x_i, D_{82} = 40\right) = \frac{P\left(D_{82} = 40 \middle| x_i\right) - P\left(D_{83} = 40 \middle| x_i\right)}{P\left(D_{82} = 40 \middle| x_i\right)}$$

Appendix 3

Heterogeneity in $P(T_2 = 1 | D_{82} = 40)$

The proportion of individuals working 40 hours in 1982 employed in firms that did not complete the workweek reduction negotiations plays an important role in the evaluation of the impact of the reduction of the standard workweek. Under the assumption that the outcome of the negotiation does not depend on the date at which it was completed, this proportion can be computer from the different proportions of individuals employed 40 hours in 1982 and after. Nevertheless, these proportions are not homogeneous within the population and a fraction of this heterogeneity stems from the employer characteristics: industry, size, or region. To model this observed heterogeneity, we estimate an equation describing the fraction of workers employed 40 hours in 1982 and for all subsequent years based on workers' employing firms characteristics,

$$P(D_{82} = 40 | \tilde{x}_i) = F(\tilde{x}_i \beta_{82}) \rightarrow \hat{\beta}_{82}$$

$$P(D_t = 40 | \tilde{x}_j, t = 83, 84, 85) = F(\tilde{x}_j \beta_{83+}) \rightarrow \hat{\beta}_{83+}$$

and we construct from the estimated coefficients an estimator of the fraction of firms that have not completed negotiations:

$$\hat{P}(T_2 = 1 | D_{82} = 40, \tilde{x}_i) = \frac{F(\tilde{x}_i \hat{\beta}_{82}) - F(\tilde{x}_i \hat{\beta}_{83+})}{(1 - F(\tilde{x}_i \hat{\beta}_{83+}))F(\tilde{x}_i \hat{\beta}_{82})}$$

Finally, one can perform the following regressions when evaluating the impact of the workweek reduction:

$$E(NE_{83} | D_{82}, x_i, z_i) = x_i c_{83} + (z_i \gamma_1 - z_i \gamma_2) \left[\frac{F(\tilde{x}_i \hat{\beta}_{82}) - F(\tilde{x}_i \hat{\beta}_{83+})}{(1 - F(\tilde{x}_i \hat{\beta}_{83+}))F(\tilde{x}_i \hat{\beta}_{82})} \right] 1(D_{82} = 40)$$

$$E(NE_{84} | D_{82}, x_i, z_i) = x_i c_{84} + (z_i \gamma_1) \left[\frac{F(\tilde{x}_i \hat{\beta}_{82}) - F(\tilde{x}_i \hat{\beta}_{83+})}{(1 - F(\tilde{x}_i \hat{\beta}_{83+}))F(\tilde{x}_i \hat{\beta}_{82})} \right] 1(D_{82} = 40)$$

$$E(2NE_{84} - NE_{83} | D_{82}, x_i, z_i) = x_i c + (z_i \gamma_T) \left[\frac{F(\tilde{x}_i \hat{\beta}_{82}) - F(\tilde{x}_i \hat{\beta}_{83})}{(1 - F(\tilde{x}_i \hat{\beta}_{83}))F(\tilde{x}_i \hat{\beta}_{82})} \right] 1(D_{82} = 40)$$

Table A.3.1 presents the estimation results of the logit models from which we derive an estimate of the individual nuisance parameter. Explanatory variables are the employer's industry, size, and region of employment. Important differences, except for the region, show up. In particular, employees in small firms appear to work longer hours. Comparing estimates for year 1982 with those for all other years, we note that the coefficients' dispersion is greater in 1982, indicating that part of the observed heterogeneity is specific to year 1982, coming therefore from the reduction of the workweek. The estimated impact of the reduction of the standard workweek are presented in Table A.3.2. Accounting for this type of heterogeneity does not modify our previous evaluation of the effect of reducing the workweek to 39 hours on employment – non-employment transitions.

Table A.3.1 : Logistic Regressions of " Hours = 40 "

Year 1982 and Years 1983 to 1985

Year	1982	1983 to 1985
Constant	-0.84 (0.15)	-1.41 (0.10)
Food Industries	-	-
Intermediary Goods	0.29 (0.15)	0.37 (0.11)
Equipment Goods	-0.36 (0.15)	-0.09 (0.11)
Consumption Goods	-0.03 (0.16)	-0.02 (0.11)
Construction	0.55 (0.15)	0.46 (0.11)
Retail and Wholesale Trade	0.01 (0.15)	0.11 (0.11)
Transport	-0.42 (0.17)	-0.11 (0.11)
Service Industries	0.07 (0.14)	0.06 (0.10)
Rental Services	-0.32 (0.49)	-0.34 (0.30)
Insurance	-1.23 (0.45)	-0.68 (0.32)
Banking	-1.41 (0.26)	-1.22 (0.19)
Ile de France	0.12 (0.07)	-0.01 (0.05)
Size of the Firm : Missing	-0.08 (0.10)	0.04 (0.06)
Size of the Firm : Very Small	0.23 (0.11)	0.22 (0.07)
Size of the Firm : Small	0.31 (0.15)	0.14 (0.09)
Size of the Firm : Medium	-	-
Size of the Firm : Large	-0.38 (0.11)	-0.22 (0.07)
Size of the Firm : Very Large	-0.27 (0.09)	-0.18 (0.06)
Number of Observations	6,096	16,249

Notes : Logistic regressions of the indicator for " hours=40 ". Observations : Full-time workers of the private sector employed either 39 or 40 hours in the entry year of the panel.

Table A.3.2 : Job Losses and Hours Worked : Late Reductions.
Total Effects and Effect for Low-Wage Workers.
All Years Pooled, with Individual Probability of Late Negotiation.

Period	D40	$D40*P_{82}$	D40	D40*B	$D40*P_{82}$	$D40*B*P_{82}$
NE_{t+1}	-0.11	4.53	-0.11	0.16	1.97	26.08
	(0.48)	(2.44)	(0.47)	(1.93)	(2.42)	(10.70)
NE_{t+2}	0.31	7.20	-0.09	3.56	5.22	22.30
	(0.63)	(3.25)	(0.64)	(2.46)	(3.30)	(12.75)
Number of Observations	22,345					

Notes : Same as in Table 6. All variables for hours in year 1982 are interacted with the probability of late reduction (no negotiation before April 1982). The probabilities are based on the regressions reported in Table A.3.1.

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