

DOCUMENT DE TRAVAIL

THE EFFECT OF WORKING TIME  
REDUCTION ON SHORT-TIME  
COMPENSATION:  
A FRENCH EMPIRICAL ANALYSIS

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# The Effect of Working Time Reduction on Short-Time Compensation: a French Empirical Analysis

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# ***The Effect of Working Time Reduction on Short-Time Compensation: a French Empirical Analysis***

Oana Calavrezo, Richard Duhautois, Emmanuelle Walkowiak

## ***Abstract***

*The short-time compensation (STC) program aims to avoid lay-offs in case of short-term downturns. According to insurance models, STC is an instrument of both job security and flexibility. This paper investigates the impact of workweek reduction to 35 hours on the French STC recourse. We quantify the average decrease in the STC authorized days with kernel matching estimators assessed on a balanced panel of French establishments. We highlight a substitution effect between STC and working time reduction (WTR) due to their internal flexibility role. As a consequence, the WTR policy refocused STC on its initial job security function.*

**Key words:** *Short-time compensation, working time reduction, flexibility, kernel matching estimators.*

**JEL-codes:** J21, J22, J68, C14

## **L'IMPACT DE LA RÉDUCTION DU TEMPS DE TRAVAIL SUR LE RECOURS AU CHÔMAGE PARTIEL**

### **RESUME**

Le chômage partiel (CP) est un dispositif qui permet aux établissements d'éviter les licenciements économiques en cas de difficultés passagères. Dans la littérature, on attribue au CP un double rôle de protection de l'emploi et de flexibilité. Ce papier étudie l'impact de la réduction du temps de travail sur le recours au CP. Nous estimons des modèles d'appariement sélectif sur un panel cylindré d'établissements français.

Nous mettons en évidence un effet de substitution entre le CP et la réduction du temps de travail principalement lié à leur rôle d'instruments de flexibilité interne. Comme conséquence, la réduction du temps de travail recentre le CP sur sa fonction initiale de protection de l'emploi.

**Mots-clefs :** Chômage partiel, réduction du temps de travail, flexibilité, estimateurs d'appariement à noyau.



# 1. INTRODUCTION

The fast modifications in firms' environment associated with a strong market competition, a rising uncertainty in consumer demand and the diffusion of information technologies, generate an increasing need for labour flexibility. According to the OECD (1995), three categories of flexibility can be distinguished: external quantitative flexibility (for example, fixed-term contracts, temporary work, layoffs, etc.), internal quantitative flexibility (such as flexible working hours) and internal qualitative flexibility (workers' polyvalence). In this context, a rich empirical literature regarding the evolution of flexibility practices has developed and in the 80's-90's one of the central debates concerned work-sharing (Bosch and Lehndorff, 2001). Until 2000, by implementing the working-time reduction (WTR) policy, the Netherlands, Germany and France wanted to decrease unemployment. Nowadays this debate is present more than ever in the French literature but its effects on the rising of employment or economic performances are mixed.

A great symmetry exists between WTR and the short-time compensation (STC) program, since STC also represents a working time flexibility tool. STC is a device which permits firms to avoid layoffs in case of short-term downturns or exceptional circumstances (disasters, important building work and restructuring, supplying difficulties, etc.). By applying the STC program, firms can temporarily reduce their activity below the legal working time or they can temporarily stop a part or their entire activity. STC can be considered as a tool of preventive economic aid, which allows employees to keep a contractual bond with their employer. Employees perceive a compensation for their wage loss caused by the temporary interruption of activity. The STC device is on the one hand, a quantitative flexibility instrument because it acts on the volume of worked hours, and on the other hand, it is an internal flexibility tool since it affects the workers of the establishment.

In France, WTR represents the most important shock which affected STC between 1995 and 2005 and it had a double impact. First, from January 1st, 2000, the legal workweek duration was reduced to 35 hours for the firms with more than 20 employees and from January 1st, 2002 for the firms with 20 employees or less. Second, the reduction of the legal working time duration made unsuited the STC legislation. The decree of June 28th, 2001 gives the current STC legislation. It refocused STC on its initial role of maintaining employees in employment in case of sharp economic downturns. Once WTR implemented, overtime and STC should not constitute any more the two only means of adaptation to the unexpected variations of activity. As a consequence, the evolution of the STC program and the WTR policy are part of the same reform and their effects on the STC authorizations cannot be identified separately. In this paper, we question the substitution between two instruments of internal quantitative flexibility (STC and WTR), in France, during the last decade.

Between 1995 and 2005, STC authorizations have strongly decreased. In 2005, 1.8 million STC days were authorized in France. Eight years before, at an equivalent economic situation, the number of STC authorized days was approximately six times higher. STC is traditionally more developed in continental Europe but nowadays it exists under different forms in most developed countries: the STC instrument in Great Britain, the Italian "Cassa Integrazione Guadagni" (CIG), the German "Kurzzeitlohn", the "Short-Time Compensation Program" (United States), the "Work Sharing Program" (Canada), etc. Even if the STC program is more used in Europe than in North American countries, it still appears as a rare phenomenon. In average, between 1995 and the 2005, STC authorizations have affected nearly 1% of the

French establishments and 2% of their employees (Calavrezo and al., 2006). In the 80's, in the US, we have a similar low STC participation limited to less than 1% of employers.

The effects of the STC program vary according the national institutions of the country where it is implemented. It is due to the double nature of the program. STC not only is a job security device, but it also plays a flexibility role. However, each program shares the common primary goal of avoiding layoffs during short-term economic downturns. The French empirical literature has not dealt with the flexibility generated by the STC recourse. Meanwhile, its efficiency according to the possible methods of implementation is discussed in many countries.

In a theoretical perspective, insurance models clearly distinguish the security and flexibility roles of the STC programs which differentiate North American and continental European STC systems. Van Audenrode (1994) shows that major fluctuations in working hours could be generated only if the STC system is more generous than the traditional unemployment insurance system. More precisely, by analyzing 10 OECD countries, Van Audenrode (1994) shows that in countries with generous STC systems the speed of adjustment of the total worked hours is higher in Europe than in the US, despite a much slower adjustment in number of employed workers. Because it is more difficult in European countries to fire a worker or to lay one off, STC is a mechanism that makes these discharges less necessary. This argument that holds good for France explains its internal flexibility role. Similarly, Houseman and Abraham (1993) consider that in France, STC is a cheap labour force adjustment mode which raises the firm's cost of declaring redundancies. It is due to the low flexibility of the French labour market. However, the flexibility role of STC is not convincing for the US, where external flexibility is less expensive, and so the STC program is relatively more costly than in Europe<sup>1</sup>. It is mainly a job security instrument and its efficiency is discussed (Burdett and Wright, 1989). For Burdett and Wright (1989), the STC recourse boosts work sharing in the sense that it does not lead to layoffs. As in the French case, the reduction of working time goes with flexible working hours, its implementation can entail a STC refocusing on its employment protection role. This goes in the sense of the 2001 reform. From this point of view, WTR and the change in the STC legislation which accompanied it would imply a decrease in the STC authorizations. This paper will test this proposition.

Within establishments, methods and periods of WTR implementation are very heterogeneous. Some establishments reduce their working time in an anticipated way, others do not. After the reduction of the legal working time duration, some establishments did not reduce their effective working time preferring to pay for overtime. In this paper we concentrate more precisely on the reduction of the effective working time duration before the decrease in legal working time. We can also say that these firms have anticipated WTR. Testing this hypothesis requires the measure of the average effect of the WTR on STC authorizations. This raises the selection bias methodological problem because the choice of reducing working time is not independent to the STC recourse. For this reason, we test evaluation models with kernel matching estimators (Heckman, Ichimura and Todd, 1998) on a balanced panel of 1 861 French establishments which belong to firms with at least 50 employees and they cover all industries. The sample is obtained by merging seven data

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<sup>1</sup> In time, 19 states have implemented the STC program. In the some states of the US, extra taxes on employers using STC represent a disincentive to the use of this instrument.

sources: the "STC authorizations" databases, the "Working Time Reduction" database and establishment and firm databases.

The rest of the paper is organized as follows. The second section presents the data and the model, the third section discusses the results and the fourth section provides conclusion.

## 2. THE EMPIRICAL APPROACH

### 2.1. Data

In order to assess the causal effect of WTR on the STC authorizations, we use a very original and rich statistical dataset obtained from matching seven databases.

*The monthly STC authorization databases* are produced by the Statistical Department of the French Labour Ministry in collaboration with the Departmental Directions of Work and Employment. They provide exhaustive information about the STC authorizations obtained by French establishments between 1995 and 2005. Similar aggregated databases were used by Gray (1998) to analyse the determinants of the STC recourse in France between 1983 and 1987. Gray (1998) works at a 35 industry level. On the contrary, our analysis is made at an establishment level. The databases provide information on STC authorized days, number of employees affected by the authorizations, size, region and industry. The STC authorized days measure imperfectly the STC compensated days. This information is available only several years after the use of the STC device. Thus, the STC authorized days represent an indicator of the entrepreneurial anticipations. From these databases we constituted an exhaustive STC panel. It covers 93 068 French establishments of all industries, which had at least one STC authorization between 1995 and 2005.

*The "Working Time Reduction" database* contains the declarations and the agreements of the firms which reduced their working time in order to benefit from the social security reduction. The database is produced by the social security covering organizations in collaboration with the Statistical Department of the French Labor Ministry and the Departmental Directions of Work and Employment. The database does not cover small firms. As a consequence, we restrain the field of the analysis to the establishments belonging to firms with at least 50 employees. This represents our first matching criterion. The database provides the date of WTR within establishments and then allows identifying establishments that did not reduce their working time.

*Establishment files* (UNEDIC) are annual exhaustive administrative sources relating to the establishments affiliated to the unemployment insurance. They cover the period 1995-2003. These files contain information about the total number of employees and the number of women. They permit identifying survivor establishments over the period. As a result we will work on a balanced panel. This condition represents our second matching criterion. Controlling for establishment survival can imply a causal effect estimation bias because we eliminate the most affected establishments by the economic situation. This control is nevertheless necessary, because it neutralizes the effects of the creation-destruction of establishments associated with the economic situation that would strongly bias the estimators.

Additional information about firms is obtained from four *firm databases*. Firstly, we use the *Bénéfices Réels Normaux files*. They are produced by the French National Institute of Statistics and they cover the period 1994-2003. They give the firm size, some economic



situation indicators (value-added rates, profitability rates and apparent labour productivities) and some workforce structure indicators (interim and subcontracting expenses). Secondly, we use the *ACEMO files* (from 1994 to 2004) produced by the Statistical Department of the French Labor Ministry in order to obtain firms' fixed-time contract rate. Thirdly, firm's group membership is given by the *LIFI databases*, which are produced by the French National Institute of Statistics. And fourthly, *MDST databases* tell if a firm was restructured between 1994 and 2004.

We finally work on a balanced panel of 1861 survivor French establishments between 1995 and 2003. This final sample is quasi-exhaustive<sup>2</sup> and it includes all the survivor establishments belonging to firms with at least 50 employees which had at least once a STC authorization. For each establishment we have two information lines, one for 1998 and another for 1999. So we finally work with 3722 observations.

## 2.2. The econometric model

Establishments which reduced their effective working-time before 2000 (anticipated WTR establishments) make the object of a non-random selection process concerning the anticipating phenomenon and even a process of auto-selection (if anticipating WTR is considered as an element of their internal strategy). This induces a selection bias. We can suppose that an establishment reducing its working time duration has a particular flexibility need or it is subjected to specific economic conditions which can explain its recourse to STC. Consequently, WTR is not independent of the STC recourse. To circumvent the selection bias, we estimate evaluation models with matching estimators. They were initially developed by Rubin (1974) in order to study the efficiency of the medical treatments. These models were mobilized in economy, in particular to test the efficiency of job training programs.

### 2.2.1. Evaluation models with Kernel matching estimators

Let us note  $T$ , a binary variable indicating if the individual received or not a treatment ( $T = 1$  if the individual is treated,  $T = 0$  if not). The efficiency of the treatment is measured through the result  $y_i$ . Thus each individual, will have two potential results:  $y_0$  (if  $T = 0$ ) and  $y_1$  (if  $T = 1$ ).  $y_0$  and  $y_1$  are never observed simultaneously, since an individual either is treated, or untreated, but never both at the same time. In other words, only the true health of the individual, noted  $Y$ , is observed:  $Y = y_1T + y_0(1-T)$ .

Only the couple  $(Y, T)$  is observed for each individual. Rubin (1974) defines the average treatment effect as the difference between what would be the health of an individual if he was treated and what it would be if he was not:  $C = y_1 - y_0$ . The average treatment effect is unobservable and individual, and consequently its distribution is not identifiable. If property of independence is respected  $(y_0, y_1) \perp T$ , there would be no selection bias.

In the majority of cases, the property of independence is not valid. A solution would be to compare the health of each individual who received the treatment with the health of an identical counterfactual who did not receive the treatment. To identify statistically the counterfactual, an approach consists in building a counterfactual population for which the

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<sup>2</sup> We loose establishments because of missing values on different indicators.

distribution of a number of observable characteristics ( $X$  – matching variables) is the same as for the group receiving the treatment. Consequently, the property of independence is respected conditionally to matching criteria  $(y_0, y_1) \perp T | X$ . When many matching criteria must be taken into account, finding a counterfactual can be problematic. Rubin and Rosenbaum (1983) solved this problem by showing that conditional independence with the  $X$  variables was equivalent to the independence compared to the propensity score. The propensity score constitutes a one-dimension summary of the matching variables and it estimates the probability of being exposed to the treatment, conditionally to these variables. In this work, we used the kernel estimator of Heckman, Ichimura and Todd (1998). For the calculation of the kernel estimator for the treated, each no-treated individual takes part in the construction of the counterfactual of the treated individual. The weight of the no-treated in the constitution of the counterfactual is given according to the distance between their score and the score of a treated individual.

### **2.2.2. Treated individuals and their counterfactuals**

In 2000, the legal duration of working time reduced (from 39) to 35 hours for all the establishments of our sample. Meantime, the reduction of the effective working time duration varied strongly from one establishment to another because legal duration and effective working time duration do not coincide inevitably. Before 2000, for the firms with more than 20 employees, the legal working time duration was set at 39 hours per week. Firms who anticipated the implementation of the WTR could have an effective working time duration set at 35 hours. Conversely, after 2000, although the legal duration of work is 35 hours for the establishments of our sample, we can identify establishments with an effective working time duration set to 39 hours. In this case they prefer to pay for overtime. So we work with two categories of establishments: establishments that anticipated WTR (they reduced the effective working time duration before January 1, 2000) and establishments that did not reduce their working time. The group of treatment consists of establishments which anticipated WTR and the counterfactual group is sought among establishments that did not reduce their working time. Formally, the treatment variable is written:

$$T = \begin{cases} 1, & \text{if the establishment anticipated WTR} \\ 0, & \text{if the establishment did not reduce its working time} \end{cases}$$

### **2.2.3. Performance variables**

Several dimensions of the STC recourse can be affected by the WTR. To quantify the evolutions of the STC authorizations, we use three categories of indicators: having STC authorizations after the WTR; variation in the number of STC authorized days; variation in the number of employees before and after the WTR. WTR effects can vary in time. Are they immediate? Are they durable or temporary? By using longitudinal data, we can evaluate the impact of the anticipated WTR up to three years after its implementation. If  $STC$  represents the STC authorized days,  $EMP$  the number of employees affected by these authorisations and  $t$  the year ( $t=1998, 1999$ ). Performance variables are computed for each establishment as indicated in table 1.

**Table 1**  
**Performance variables\***

Having STC authorizations after the WTR	$AUTSTC_1 = \begin{cases} 1 & \text{si } STC_{t+1} \neq 0 \\ 0 & \text{sinon} \end{cases}$
	$AUTSTC_2 = \begin{cases} 1 & \text{si } STC_{t+1} \neq 0 \text{ ou } STC_{t+2} \neq 0 \\ 0 & \text{sinon} \end{cases}$
	$AUTSTC_3 = \begin{cases} 1 & \text{si } STC_{t+1} \neq 0 \text{ ou } STC_{t+2} \neq 0 \text{ ou } STC_{t+3} \neq 0 \\ 0 & \text{sinon} \end{cases}$
Variation in the number of STC authorized days	$VARSTC_1 = STC_{t+1} - STC_{t-1}$
	$VARSTC_2 = \frac{1}{2}(STC_{t+1} + STC_{t+2}) - \frac{1}{2}(STC_{t-2} + STC_{t-1})$
	$VARSTC_3 = \frac{1}{3}(STC_{t+1} + STC_{t+2} + STC_{t+3}) - \frac{1}{3}(STC_{t-3} + STC_{t-2} + STC_{t-1})$
Variation in the employees affected by the STC authorizations	$VAREMP_1 = EMP_{t+1} - EMP_{t-1}$
	$VAREMP_2 = \frac{1}{2}(EMP_{t+1} + EMP_{t+2}) - \frac{1}{2}(EMP_{t-2} + EMP_{t-1})$
	$VAREMP_3 = \frac{1}{3}(EMP_{t+1} + EMP_{t+2} + EMP_{t+3}) - \frac{1}{3}(EMP_{t-3} + EMP_{t-2} + EMP_{t-1})$

#### 2.2.4. Matching criteria

We take into account three types of matching criteria: firms' standard characteristics, firms' economic performance and firms' workforce structure. The following variables are firms' standard characteristics:

- Establishment size (the quartiles of size);
- Establishment industry (manufacturing, service and agriculture & construction);
- Establishment region (following to the French National Institute of Statistics definition, we use the 8 regions of France);
- group membership (dichotomic variable explaining group membership);
- firm restructuring (which equals 1 if the firm restructured between 1994 and 2004, 0 otherwise);
- firm type (single-establishment firm versus multi-establishment firm).

Firms' economic performance is given by the following variables:

- the value-added variation rate: the difference between the value added at  $t$  and  $t-1$ , all divided by the value added in  $t-1$ . In this paper, we work with the quartiles of the value-added variation rate calculated for the precedent year;
- the apparent labour productivity: the ratio of the value added of the year  $t$  and the number of employees for the same year; we also work with its quartiles calculated for the precedent year;

- the profitability rate: it is calculate as the ratio of firm's profits in  $t$  and capital investment taken in  $t-1$ . We also choose to work with the quartiles of this variable calculated for the precedent year.

Concerning the workforce structure we have the following variables:

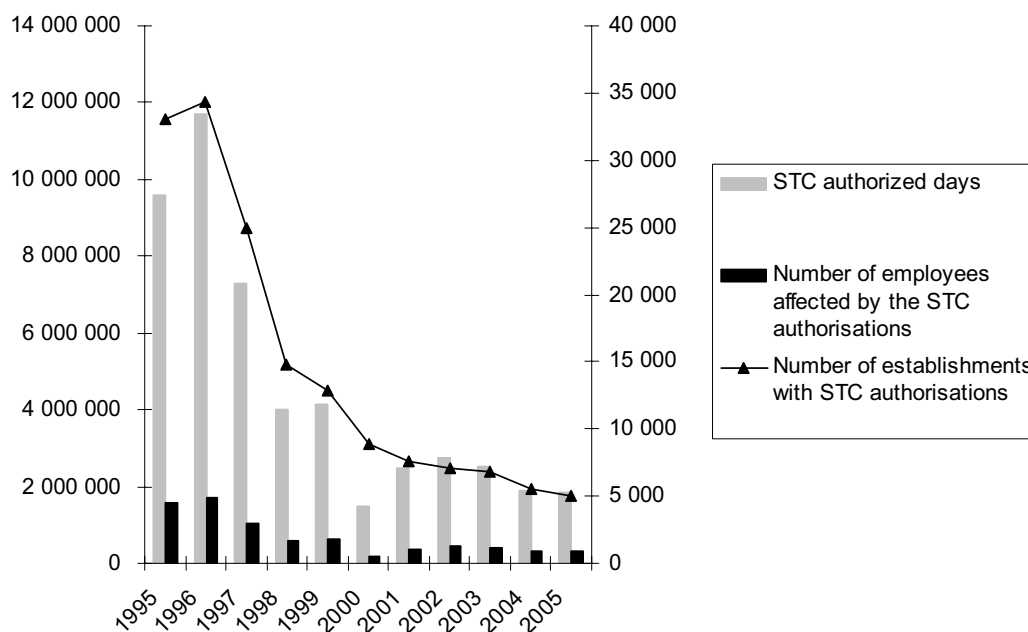
- interim recourse;
- subcontracting recourse;
- fixed-term contract recourse.

These three variables are dichotomic and they indicate the presence of these flexibility devices. We have finally decided to fix them for the year 1997. We also introduce a variable on the proportion of women (it is the ratio of the number of women in the establishment size and we work with its quartiles).

### 3. EMPIRICAL RESULTS

#### 3.1. STC stylized facts

**Graph 1**  
**Trends over 11 years**



*Source:* Annual STC authorization panel obtained from the monthly STC authorization databases covering the period 1995- 2005 (the Statistical Department of the French Ministry of Labour and the Departmental Directions of Work and Employment).

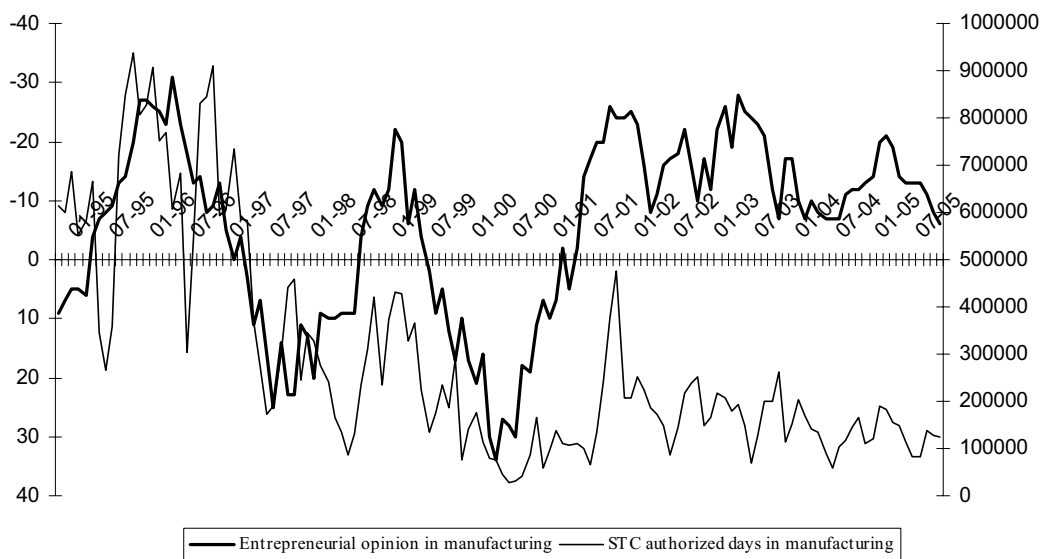
*Field:* more than 93 000 French establishments having STC authorizations (all sizes and all industries).

Graph 1 describes the evolution of the STC authorizations between 1995 and 2005 through three measures: the number of STC authorized days (on the left scale), the number of employees affected by the STC authorizations (on the left scale) and the number of establishments which obtained the STC authorizations (on the right scale)<sup>3</sup>. STC

<sup>3</sup> For a complete description of the STC recourse between 1995 and 2005 see Calavrezo, Duhautois and Walkowiak, 2006.

authorizations strongly decreased for the three measures. Between 1996 and 2005, the number of authorized days was divided by 6 and the number of employees affected by the authorizations decreased from 1.7 million to 300 000 (an 82% fall). Concerning the number of establishments with STC authorizations, the fall reaches 85%, diminishing from 34 000 establishments to 5 000. At the end of the 90's, the decreasing can be partly related to a constant economic growth. From 2001, date of the economic reversal, the increase in the STC recourse was not massive. We can assume that establishments are less concerned with the STC authorizations as a consequence of the WTR implementation.

**Graph 2**  
**Economic situation and number of STC authorized days in manufacturing**



*Source:* Monthly survey of the economic situation (the French National Institute of Statistics) and monthly STC authorization databases (the Statistical Department of the French Ministry of Labor and the Departmental Directions of Work and Employment).

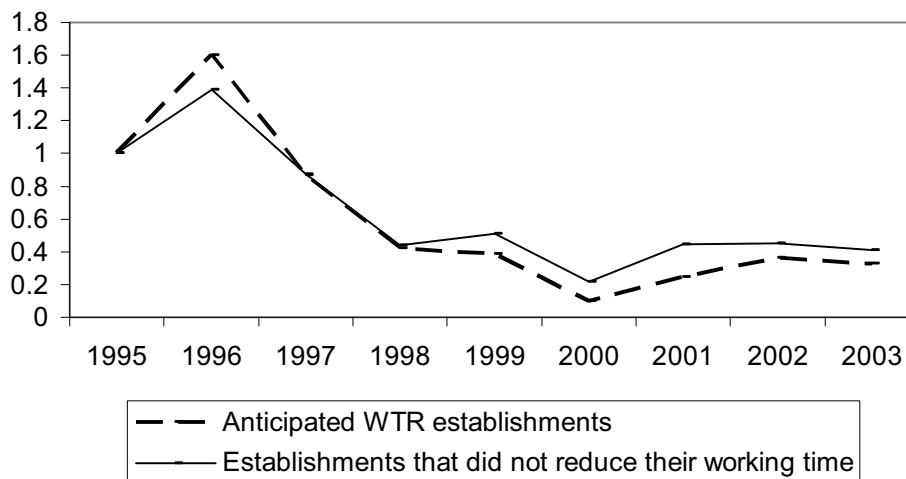
*Field:* Manufacturing

*Reading note:* The left scale is reversed so that the high part of the graph indicates a degraded economic situation and the low part a good economic situation.

But does the economic situation entirely explain the downward trend of the STC recourse? Graph 2 presents the connection between the economic situation and the STC use over the last decade by illustrating two monthly series: the entrepreneurial opinion in manufacturing (on the left scale) and the number of STC authorized days in manufacturing (on the right scale). This graph highlights the good adjustment between the businesses cycle and the STC authorizations. Between 1995 and 2005, STC authorizations can be regarded as a good indicator of the economic situation because STC authorizations are contracyclical. The graph also shows a weak disconnection in 1998 which coincides with the moment of implementation of one of the WTR laws and a strong disconnection when the legal work duration is obligatorily reduced for the firms with more than 20 employees (in 2000). This graph seems to confirm the importance of the impact of the WTR on the STC recourse.

In graph 3 we illustrate the STC authorized days index for establishments that anticipated WTR and for those that did not reduce their working time. Until 1998 we observe that the two indexes vary in a similar way and in 1998 and 1999 there is an important rupture surely due to WTR. After the WTR implementation we remark that the STC level is always lower for establishments that anticipated WTR.

**Graph 3**  
**STC authorized days index**



*Source:* establishments panel data obtained by merging seven databases. The STC authorized days index is calculated in the 1995 base.  
*Field:* 1861 survivor establishments between 1995 and 2003 that belong to firms with at least 50 employees (all sizes and all industries)

## 3.2. Matching results

### 3.2.1. The determinants of the WTR anticipation

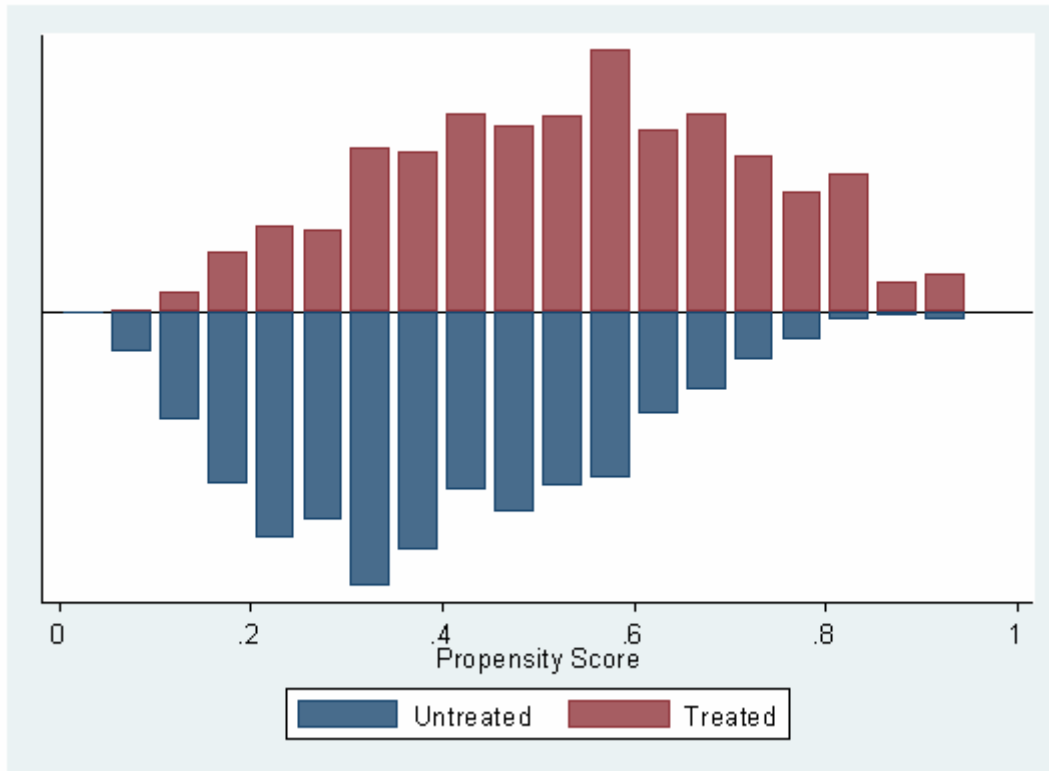
Is WTR the cause of the decrease in the STC recourse? The results of matching models allow settling the question. In order to check that there is not a heterogeneity effect, kernel matching estimators are computed on two samples. The first sample covers the 1861 establishments of the global panel (851 establishments that anticipated WTR and 1010 establishments that did not reduce their working time). The second sample covers 883 establishments which recurrently used STC (407 establishments that anticipated WTR and 476 establishments that did not reduce their working time). By taking into account the scarcity of the STC phenomenon, an establishment with a recurring STC recourse is defined as an establishment which between 1995 and 2005 had at least two STC utilisations. We use these two samples mainly to verify the robustness of the results.

In the first step of the econometric strategy, we estimate the probability of anticipating WTR with a logit regression, by introducing the matching variables presented in the previous section. This helps estimating the propensity score for each establishment and it allows constructing counterfactuals. These models require a sufficiently important common support which entirely depends on the quality of the model. For example, on the global sample, 43% of the anticipating WTR establishments have an estimated probability to have reduced WTR in an anticipated way lower than 0.5 and conversely 26% of the establishments that did not reduce their working time have a probability of having anticipated WTR higher than 0.5. The two distributions are largely overlapped. Graph 4 gives for the global sample, the propensity score distributions for the treated and the untreated, before matching. Moreover, as the number of the establishments that did not reduce their working time is higher, pairing is possible. Even if we firstly introduced all the controls, we finally keep 10% significant variables obtained with the stepwise procedure.

In order to verify the specification of the propensity score, we use a balancing test. It is directly implemented under Stata and the procedure is called PSTEST (Leuven and Sianesi,

2003). This test comes originally from Rosenbaum and Rubin (1985) and relies on the examination of standardized differences. The test calculates for each matching variable a measure of bias reduction. On the global sample, the lowest bias reduction is around 42% and there is a multitude of 90% values. So we can conclude that our model specification is very good.

**Graph 4**  
Propensity score calculated on the global sample



Source: establishments panel data obtained by merging seven databases.

Field: 1861 survivor establishments between 1995 and 2003 that belong to firms with at least 50 employees (all sizes and all industries)

Among control variables, we introduced establishment size because it mainly determines the retained strategy regarding WTR. We observe that the probability of anticipating WTR increases with the quartile of size. We also introduce industry levels to capture differences in the WTR implementation: WTR conventions are firstly signed in specific industries. Globally, manufacturing establishments have a higher anticipating WTR propensity than service industries establishments. Several French papers concerning the WTR evaluation show that introducing size and industry variables mitigates most of the selection bias. Localisation in different French regions and the fact that establishments belong to business groups are also taken into account: the anticipating WTR probability increases when establishments are involved in a network.

Regarding firms' economic performance, we introduce a labour productivity indicator, a profit indicator and an indicator of growth demand. The anticipating WTR probability evolves with the rank of labour productivity quartiles. Establishments belonging to firms with low apparent labour productivity (the first quartile) are more anticipating WTR than establishments belonging to firms with the strongest labour productivity (the fourth quartile). This can be explained by the fact that establishments hope that the early WTR implementation will cause a positive productivity shock. The evolution of the distributions of apparent labour productivity quartiles consolidates this interpretation: 33% of anticipating WTR establishments belonging to the first quartile improved their productivity one year after

the WTR (they change of quartile) and 50% of them two years afterwards. In other words, establishments with high productivity are not encouraged to anticipate the WTR since the potential productivity profits would be less important. Nevertheless, these results can also be related to a more complex phenomenon: firm age in the context of the WTR strategy. Generally low apparent labour productivity may correspond to “young” firms (Mac Guckin and Stiroh, 1999).

Regarding the profit indicator, the more firms are profitable, the more it is easy to adopt a new technology or a new organisation. Firms' economic situation is also measured with lagged value-added growth. Having low economic situations (the first value-added growth quartile) diminishes the probability of anticipating WTR rather than not reducing at all their working time.

Because the workforce structure determines a possible substitution between different flexibility types, it is important to take into account short-term contracts and interim recourse. We also think that firms which are linked to others by subcontracting may implement WTR differently than those which are not. Last but not least, an important share of women in the workforce increases the probability of implementing WTR. This can be related to the fact that highly feminized establishments might have special needs to organize working time.

### 3.2.2. The average decrease in the STC days

**Table2**  
Estimates of the WTR causal effect on the STC authorizations

Performance variable	Duration	Global Sample			Recurring Sample		
		ATT estimates	Standard error	T-stat	ATT estimates	Standard error	T-stat
Number of days	One year	-184,4	79,4	2,32	-263,5	136,6	1,92
	Two years	-261,2	88,9	2,94	-414,1	129,5	3,20
	Three years	-246,9	94,7	2,61	-559,7	195,2	2,87
Probability of STC use	One year	-0,04	0,01	2,92	-0,05	0,02	2,44
	Two years	-0,06	0,02	4,06	-0,07	0,03	3,36
	Three years	-0,06	0,02	3,49	-0,09	0,03	2,72
Number of employees	One year	-13,4	4,6	3,53	-18,9	8,4	2,24
	Two years	-16,8	4,1	4,13	-29,1	8,3	3,51
	Three years	-21,2	6,3	3,38	-36,4	9,3	3,92

Source: establishment panel data obtained by merging seven databases.

Field: For the global sample 1861 survivor establishments between 1995 and 2003 that belong to firms with at least 50 employees (all sizes and all industries) and for the recurring sample 883 establishments.

Table 2 presents the results of the estimations for the global sample and for the recurring sample for three categories of performance variables. The comparison between establishments that did not reduce their working time and the establishments that anticipated WTR releases stable results whatever the outcome measure used. Establishments that



anticipated WTR significantly decrease their STC recourse, compared with establishments that did not reduce their working time. On the global sample, at the very short run (one year after the WTR) the anticipating WTR establishments decrease by 4 points their STC recourse and at two and three years by 6 points. The impact of the anticipated WTR is stronger as the temporal window is broader because WTR represents a shock which would imply gradual structural changes in the organization.

If anticipating WTR establishments resort less intensely to STC, do they benefit of less STC authorized days or cover less employees than establishments that did not reduce their working time? Concerning the number of STC authorized days, on all temporal windows, anticipation of WTR leads to a strong average decrease. For example, the variation in STC authorized days for the three years leads to about 247 days and 21 employees average decrease. As the sample covers 851 establishments which reduced their working time in an anticipated way, it would mean that anticipation of WTR “would explain” a decrease of about 210 000 STC days. As between 1996 and 2005, on the global sample, for the establishments that reduced their working time in an anticipated way, the total decrease in the STC authorized days was 750 000, we “explain” 28% of this diminution as a WTR effect. Consequently, at a macroeconomic level this gives us an idea about the strong fall of the STC recourse, illustrated in graph 1.

For the robustness of the results our model was also implemented on a recurring establishment panel. Does anticipated WTR, have an impact on the STC recourse of the recurring establishments? Impacts are negative and much more important than on the global sample. For three years average, anticipated WTR leads to an average reduction of about 560 days or 36 employees affected by the STC. The sample of recurring establishments contains 407 anticipating WTR establishments. We can conclude that anticipated WTR “might translate” a fall of more than 18 000 employees affected by the STC authorizations.

For additional checking we also implemented another evaluation method: the difference in differences (DID) model. The DID results gave comparable measures for the STC reduction.

## 4. CONCLUSION

STC can be seen as an instrument of both flexibility and employment protection. WTR is a similar device with the initial objective of reducing unemployment by work sharing. Nevertheless, the impact of WTR on employment is not clear: Crepon and Kramarz (2002) conclude that changes in the French 1982 legal standard workweek<sup>4</sup> led to employment losses contrary to the initial goals. Freeman (1998) shows that work-sharing generated by market forces can increase employment whereas legislated policies rather have negative effects. The last French WTR implementation, progressively made between 1996 and 2002, also represents a flexibility instrument because firms could use worked hours differently. The STC decree of June 28th, 2001 is directly related to the WTR implementation. Since 2001, establishments have had to use in priority flexible working hours associated to WTR.

Our results show a real substitution effect between WTR and STC over the 1995-2005 period. By using kernel matching estimators on a balanced panel of establishments, we quantify the average decrease in STC authorized days. Indeed, the flexibility part of the STC program seems to have collapsed: until 2000 STC was inversely correlated to economic

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<sup>4</sup> On February 1, 1982, in France, there was a mandatory reduction of workweek hours from 40 to 39.

growth and after 2000 firms could not use STC as an internal flexibility instrument anymore. This suggests that WTR refocused the STC program on its initial role of keeping employees in employment.

## REFERENCES

- ABRAHAM, K.G., HOUSEMAN, S.N., 1993. "Does Employment Protection Inhibit Labor Market Flexibility? Lessons from Germany, France and Belgium". *NBER Working Paper*, No. W4390, june.
- BOSCH, G., LEHNDORFF S., 2001. "Working-Time Reduction and Employment: Experiences in Europe and Economic Policy Recommendations". *Cambridge Journal of Economics*, Oxford University Press, vol. 25(2), pages 209-43, March.
- BURDETT, K., WRIGHT, R., 1989. "Unemployment Insurance and Short-Time Compensation: The Effects on Layoffs, Hours per Worker, and Wages". *The Journal of Political Economy*. Vol. 97, No. 6 (Dec.), pp. 1479-1496.
- CALAVREZO, O., DUHAUTOIS, R., WALKOWIAK, E., 2006. « Le chômage partiel: quelles tendances », *Document de travail CEE*, n°68, septembre, 42 p.
- CREPON, B, KRAMARTZ, F., 2002. "Employed 40 hours or Not-Employed 39: Lessons from the 1982 Workweek Reduction in France". *Journal of Political Economy*, 110, 6, 1355-1389.
- FREEMAN, R.B., 1998. "Work-Sharing to Full Employment: Serious Opinion or Populist Fallacy?", pp. 195-222 in Freeman R.B. and P. Gottschalk (eds.), *Generating Jobs, How to Increase Demand for Less-Skilled Workers*, New York.
- GRAY, M., 1998. "When Might a Distressed Firm Share Work? Evidence from the Short-Time Compensation Programme in France", *British Journal of Industrial relations*. No. 36:1, march, pp. 43-72.
- HECKMAN, J., ICHIMURA, H., TODD, P., 1998. "Matching as an econometric evaluation estimator", *Review of Economic Studies*, 65(2):261-294.
- LEUVEN, E., SIANESI, B., 2003. PSMATCH2: *Stata module to perform full Mahalanobis and propensity score matching, common support graphing, and covariate imbalance testing*. <http://ideas.repec.org/c/boc/bocode/s432001.html>.
- MAC GUCKIN, R., STIROH, K., 1999. *Understanding Productivity Growth: Entry, Survival and the Competitive Process*, Research Report, The Conference Board, February, pp. 1-12.
- OECD, 1995. *Flexible Working-time: Collective Bargaining and Government Intervention*, Paris.
- RUBIN, D., 1974. "Estimating causal effects of treatments in randomized and non randomized studies," *Journal of Educational Psychology*, 66:688-701.
- ROSENBAUM, P.R., RUBIN, D. 1985. „Constructing a Control Group Using Multivariate Matched Sampling Methods that Incorporate the Propensity Score". *The American Statistician* 39(1), 33-38.
- ROSENBAUM, P.R., RUBIN, D. 1983. „The Central Role of the Propensity Score in Observational Studies for Causal Effects", *Biometrika*, 70 (1), pp.41-55.
- VAN AUDENRODE, M.A., 1994. "Short-Time Compensation, Job Security, and Employment Contracts: Evidence from Selected OECD Countries". *The Journal of Political Economy*, Vol. 102, No. 1. (Feb.), pp. 76-102.



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