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The Effects of Reduced Social Security
Contributions on Employment: an Evaluation of the
2003 French Reform

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The Effects of Reduced Social Security Contributions on Employment: an Evaluation of the 2003 French Reform

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Abstract¹

In 2003, the French government decided to reform the system managing the different minimum wage regulations and the targeted reductions to employers' social security contributions. The main objective of the reform was to simplify the complex regulations that were created by the progressive introduction of the 35-hour week. The reform incidentally created large variations in labour costs, depending on the type of firm and the wage level within the firm. This paper presents an evaluation of the impact of this reform on employment using a balanced panel of firms with more than five employees, drawn from a matching between several administrative data sources from 2000 to 2005.

In both types of firm, significant employment elasticities can be found with respect to labour costs that have the expected signs: a rise of 1% in average labour costs reduces employment by 0.4%. As the majority of firms that remained on the 39-hour week received greater reductions, the Fillon reform allowed them to raise their level of employment. Firms that adopted the 35-hour week experienced the opposite: the reform led to a fall in employment. Ultimately, the Fillon reform has had no clear effect on aggregate employment, measured either in job numbers or full-time equivalents (FTE).

Keywords: public policy evaluation, reduced social security contributions, labour costs, semi-parametric estimations

JEL Classification Codes: C14, J3, J38

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I. Introduction

In order to tackle unemployment, reduced social security contributions (RSSCs) targeting low wages have been put in place in many countries, especially in countries in Continental Europe where a minimum wage coexists with high employer-paid payroll taxes. These cuts have been felt since July 1993 in France and Belgium, and since 1994 in the Netherlands with the SPAK policy (*Specifieke Afdrachtskorting Lage Lonen*). Through a series of reforms since 1993, the French employment policy has developed to include more workers further from the compulsory minimum wage, at an ever-rising cost to public finance. The last 2003-2005 reform was implemented when François Fillon was France's Minister of Labour, in order to simplify the complex regulations created by the progressive introduction of the 35-hour week, and to unify the targeted cuts to employers' social security contributions for all firms. Whilst employers' social contributions are normally about 40 percentage points of gross wage, at the minimum wage level they are reduced to 14 percentage points for all firms. This reduction of 26 points decreases linearly with wage until it stops at 1.6 points of gross minimum wage. This tax cut affects just two thirds of the labour force at an *ex ante* cost of 25 billion Euros per year, which represents 1.3% of French GDP. Thanks to the Fillon reform, this reduction has become the crowning achievement of France's employment policy, with more cuts made to employers' social security contributions than in any other European Country at present, and with the largest number of French employment programs.

To assess the effects of this type of reform, there are three challenges. Firstly, this is a general reform which affects all firms in the private sector with no exceptions. There is no natural or even artificial counterfactual since the reform was not tested before being implemented. Secondly, the reform is a mix of three coinciding elements: new RSSCs, a high increase in minimum wage, and a relaxation of the rules regarding overtime. As a matter of fact, it is very difficult to identify the individual effect of each of these elements. Thirdly, the tax cuts are aimed at low wages; the number of exemptions depends on the wage distribution within a firm. In addition, the Fillon reform merged two previous reductions in social security contributions: low-wage tax credits (LWTC - see glossary at end of paper for terms) implemented by Balladur and Juppé between 1993 and 1998; and the working-time reduction tax-cut (WTRTC) implemented by Jospin and Aubry in 1998 as part of the 35-hour week policy. The effects of the reform are different from firm to firm, depending to the structure of payroll and the firm's circumstances regarding working-time reduction. The evaluation therefore requires datasets to be specific in order to take into account this double heterogeneity.

A large number of applied studies have already investigated the incidence of payroll taxes on a national scale. After a first generation of studies based on time series (Brittain, 1971; Vroman, 1974a; Beach and Balfour, 1983; Kugler and Kugler, 2008) and international comparisons (Vroman, 1974b; Bell and Nickell, 1997), a second generation of works was written drawing on microeconomic data (Hamermesh, 1979; Gruber 1997). In terms of French data, Kramarz and Philippon (2001), and Crépon and Desplatz (2001) analysed the impact of LWTC during the 1990s linked to the Juppé reform of 1995, which represented 5 billion Euros in tax expenditure: one fifth of current expenditure. A final generation of studies used time series at industry level (Jamet, 2005; Gafsi, L'Horty and Mihoubi, 2005) and found a substantially lower impact on employment than Crépon and Desplatz (2001) did, particularly for low-wage workers. But no study has yet evaluated the effects of the Fillon reform because of the complexity of the system and the lack of relevant data.

This paper evaluates the effects of this reform on employment by using a matching of a large administrative dataset and a balanced panel of more than 87,000 firms with five or more employees, enabling the amount each establishment actually benefited from RSSCs to be examined; all previous studies have simply ascribed schedules. First of all, the virtual labour cost (VLC) was calculated, which is the *ex ante* variation of the labour cost introduced by the Fillon reform. Then, both the semi-parametric and parametric methods were applied in order to estimate the effects of the reform, using the variation of the exemption amount between the establishment and a rich set of control variables as a way to identify the impact. Section II will describe the history of the Fillon reform and section III will show the dataset and display the descriptive statistics. Identification strategy and econometrics methodology will be presented in section IV and then section V will give the results of the estimations.

II. The policy

In order to simplify the complex regulations created by the progressive introduction of the 35-hour week and to unify the RSSC system for all firms, the Fillon reform² simultaneously affected several components of labour costs. The minimum wage was raised in an exceptional way, the amount and structure of RSSCs underwent large-scale changes, and the laws governing overtime quota were drastically modified. Before presenting the reform, let us examine the background.

1. Background

The French minimum wage, introduced in its current form in 1970, includes the basic wage as a gross hourly wage, fringe benefits, and all other payments with the *de facto* character of a premium. The level of the hourly minimum wage is revised every year on 1 July in line with inflation, any changes to the blue-collar worker's hourly pay (half of any increase), and any extra potential government boosts.

When the 35-hour week was introduced, two principles were set out by the Jospin government: firms could choose to enter the scheme or to stay out, thus remaining on the 39-hour week; and purchasing power at the minimum wage was to remain constant. Working 35 hours but being paid for 39 hours means an 11.4% increase in hourly wage. In order to avoid increasing the minimum wage for all workers, including those still on the 39-hour week, a specific minimum wage for workers on the 35-hour week was implemented, known as the monthly guaranteed wage (GMR).

The GMR corresponds to the hourly minimum wage at the time the 35-hour week was adopted, multiplied by 169 hours to calculate it on a monthly basis. Employees working a 35-hour week therefore automatically earned a higher hourly wage than those working a 39-hour week. As the minimum wage was periodically re-evaluated, the GMR differed depending on the transition date to the 35-hour week. In total, five different GMRs were applied to employees who moved to the 35-hour week before 1 July in 1999, 2000, 2001, 2002 and 2003. The GMR was reviewed based on inflation and on any changes to the blue-collar worker's basic monthly pay (half of any increase). Thus, before the Fillon reform was implemented, the GMR rose less than the hourly wage for those on the 39-hour week.

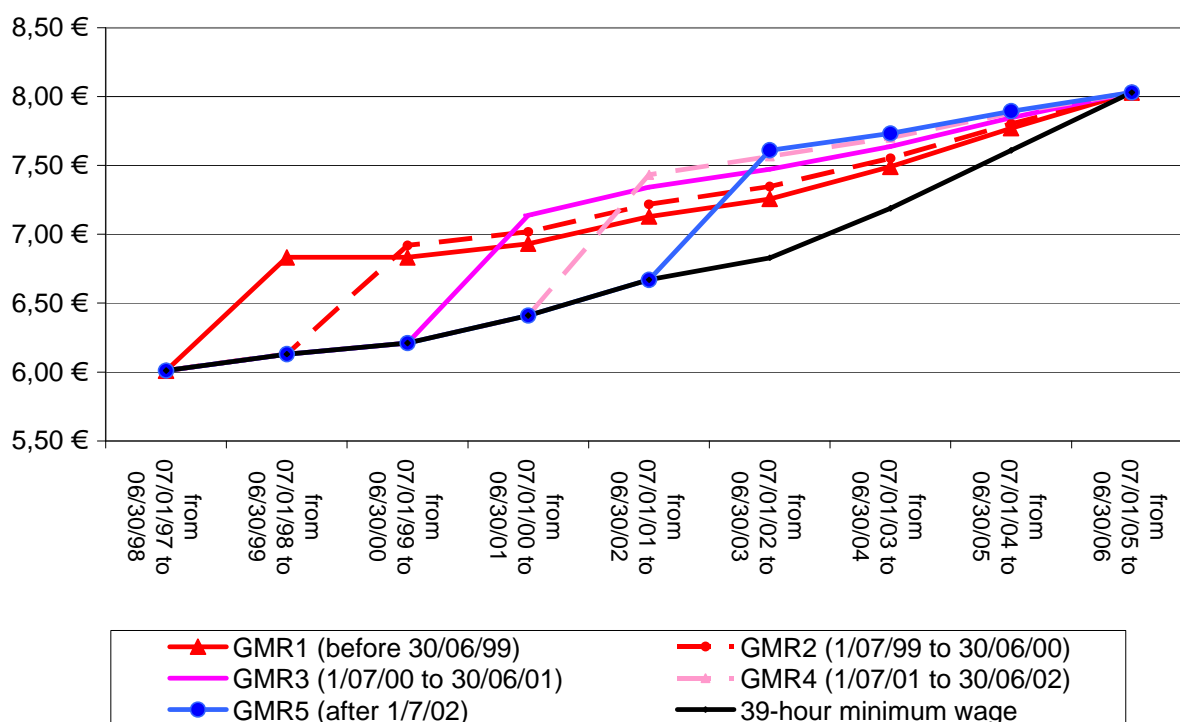
² Act No. 2003-47 of 17 January 2003 relating to wages, working time and employment development (*Loi n° 2003-47 relative aux salaires, au temps de travail et au développement de l'emploi*).

2. Unifying the Minimum Wage

A first aim of the Fillon reform was to get the hourly wage for the 39-hour week and the five different GMRs to converge upwards over three years. Therefore, from 2003 to 2005, these six coexisting minimum wages were brought into line with one another.

As Graph 1 illustrates, from 2001 to 2005, the gross hourly minimum wage rose by 20.4% in current Euros, whereas the various GMRs rose from 8.0 to 12.6%. Consequently, the increase in labour costs generated by the rise in the hourly minimum wage and GMR was higher for firms that had retained the 39-hour week.

Graph 1: Development of minimum wages in France, 1999-2005



Source: Legifrance (the official website of the French government for the publication of legislation, regulations, and legal information)

GMR1: minimum wage applied to firms that joined the 35-hour week before the end of June 1999.

GMR 2: minimum wage applied to firms that joined the 35-hour week between July 1999 and June 2000.

3. Unifying the Reduction in Social Security Contributions

With the unification of minimum wages, the main purpose of the reform was to harmonise the firm and employees' situation with regard to the RSSC schemes. After the Aubry laws of 1998 and 2000 were passed, which introduced the 35-hour week, two RSSC measures coexisted: firms remaining on the 39-hour week continued to benefit from LWTC implemented by the Balladur reform of 1993 and the Juppé reform of 1996; and firms adopting the 35-hour week enjoyed more generous reductions to compensate for the extra costs linked to the WTRTC.

In order to unify all these different schemes, RSSCs were merged to create a single combined system, which has been in force ever since. Labour costs have therefore evolved as a function of three main factors: the increase in minimum wage and GMR brought in with the laws on reduced working hours (RTT); the spread of the increase in these minima over all wages (see Koubi and Lhommeau, 2006); and the RSSC reform. Other smaller measures have been added to these changes, encouraging the use of overtime or modifying the regulation of part-time work.

The RSSC reform was imposed on all firms however, the difference in scale was much larger for firms benefiting from LWTCs: 18.2% for minimum wage workers on the 39-hour week, linearly decreasing to 0% for workers on 1.3 times the minimum wage. Transitory systems appeared from 2003 to 2005 before being replaced by the definitive system. In three consecutive stages, starting in July 2003, the reduction increased to 26% and the range was extended up to 1.6 times the minimum wage (see Appendix 1 for details of the transition).

III. Descriptive Analysis

As the shock of the Fillon reform is asymmetrical in terms of both wage bracket and firm, it is useful to take this double asymmetry into account in the analysis. This requires the use of specific data, which allow us to describe wage distributions by firm, while at the same time recording the system of reduction and its development over time.

1. The Data

For the first time, we have been able³ to merge two restricted administrative datasets on firms and their employees. We need specific datasets in order to find out the number of employees in each wage bracket (defined as a multiple of the French minimum wage). To process this information and various other indicators that characterise these establishments, we have used detailed administrative data files (compulsory information employers must keep about employees to give to financial administration) known as Annual Declarations of Social Data (DADS) from the National Institute of Statistics and Economic Studies (INSEE). Information about the nature of RSSCs in every firm is also required; to obtain this we have, for the first time, merged previous DADS with other detailed administrative files from the Central Agency of Social Security Organisations (ACOSS). ACOSS databases allow establishments that benefited from RSSCs between 1999 and 2005 to be identified. These aggregate data on each establishment comprise the wage bill, workforce numbers, RSSCs, the number of employees the reductions applied to, and payroll taxes due by establishments affiliated to the general social security system.

³ We have been granted special access to these data by the Statistical Confidentiality Committee (*Comité du Secret Statistique*), the French body supervising access to data for restricted firms.

After matching these two databases, we obtained an original dataset showing the development for each wage bracket (defined as a multiple of the French minimum wage), the type of subsidies obtained, the number of employees they applied to, and the total of any RSSCs the establishment received. The matched database contains 130,000 establishments (92,000 firms), employing 3 million people in FTE (Table 1).

Table 1: Database size in second half of 2004

	No. of establishments	No. of employees (FTE)
Initial ACOSS and/or DADS database	1.8 million establishments (1.4 million firms)	14 million employees
Initial ACOSS and DADS database of establishments with at least one employee (1)	688,000 establishments	9.2 million employees
Base (1) panel from 2000 to 2005 (2)	384,000 establishments	5.9 million employees
Final database drawn from base (2) for firms with more than five employees, matched with SUSE files and excluding extreme values	117,300 establishments (87,400 firms)	3 million employees

Source: AROME, ORME and SEQUOIA databases (ACOSS-URSSAF), DADS database (INSEE).

SUSE: the unified system for business statistics, or SUSE, is an exhaustive application of company profit declarations to the tax office; it is also part of INSEE.

The sample finally used in the econometric analysis is a balanced panel of private non-farm businesses and semi-public firms from 2000 to 2005⁴. This includes firms with more than five employees, that are present both in ACOSS and INSEE, and whose establishments always have their main activity recorded, excluding temporary agency workers, apprentices, trainees and home workers⁵ (gross workforce numbers registered on 31 December). Public establishments have been excluded from the sample as have establishments of firms with no right to RSSCs under the Fillon reform. Firms benefiting from two types of subsidy simultaneously or discontinuously, holding firms, domestic service firms, temporary employment agencies and public firms have all been excluded. Firms belonging to accommodation and food service activities have also been excluded because they received a special subsidy during this period. Finally, firms whose employment growth rate, production and labour costs are characterised by extreme values⁶, and whose average gross hourly wage is lower than the minimum wage have also been excluded. All these manipulations lead us to exclude 20,000 of the 150,000 establishments initially present in the sample (Table 1).

⁴ The data from 2000 to 2001 are used to construct lagged values for our indicators.

⁵ In the rest of this study, we shall use the distribution of employees by wage brackets (defined as a multiple of the French minimum wage). This information is difficult to obtain for very small firms, which is why we have chosen the threshold of five employees.

⁶ We thereby exclude all observations for which the values of the variables in question do not lie between -60% and +250%.

To carry out this evaluation, only firms whose establishments were present in both of the different files were retained. The final sample is a balanced panel of more than 87,000 firms; it includes firms with five or more employees⁷ (gross numbers registered on 31 December) present in the sample from 2000 to 2005 and that received RSSCs continuously from 2003 to 2004.

As RSSC measures were not always exclusive, establishments may have benefited from several in succession. The large majority of establishments in our sample - four out of five - have benefited from at least one RSSC measure. The 20% that have not benefited from any reduction measures are establishments that are present in the DADS (INSEE) files and not in the ACOSS files, but which are not excluded from the general scheme of reductions⁸. This category tends to overstate the number of *unsubsidised* firms because it includes some firms that have received subsidies, but have been incorrectly identified during the matching of the ACOSS and INSEE files. Among the establishments that have received at least one subsidy, four categories can be identified:

- Establishments that benefitted from LWTC until 2003 and then the Fillon RSSC; these represent more than 65% of subsidised establishments (and 40% of employees) and form the first category (referred to as LWTC - Fillon RSSC).
- Establishments that benefitted from the Second Aubry Law (WTRTC) then the Fillon RSSC in 2003; these constitute 20% of subsidised establishments (and 33% of employees).
- Establishments that benefitted from the First and Second Aubry Laws (referred to as First and Second Aubry Laws-WTRTC) and then the Fillon RSSC. Establishments that benefitted from the First Aubry Law represent slightly less than 10% of subsidised establishments (16% of employees).
- Hybrid establishments belong to different categories at the same time. They have changed from one category to another over the course of time or have received special subsidies (extra RSSCs for cutting working hours by more than 15% and for the road haulage industry). These establishments constitute a more marginal category.

To simplify the presentation we will focus on two main categories of firms. The first comprises *35-hour firms*, benefitting from the WTRTC (subsidies from the first and/or second Aubry law) and the Fillon RSSC after 2003. The second comprises *39-hour firms*, receiving the LWTC before 2003 and the Fillon RSSC after 2003. The hybrid type firms are excluded from the analysis. The attrition rate from 2002 to 2005 is higher for 39-hour firms (30%) than for 35-hour firms (20%).

Table 2 presents the characteristics of 35-hour and 39-hour firms. On average, 39-hour firms have smaller workforces than 35-hour firms (15 employees compared to 29). Firms on 35-hour weeks are thus more likely to employ more than 50 employees (about 12% compared to 5%) and they are also more unlikely to be very small firms (less than 10 employees). In

⁷ In the rest of this study, we shall be using the distribution of employees by wage bracket (multiples of the SMIC) for our analysis. As this information is difficult to obtain for very small firms, we have chosen a threshold of five employees.

⁸ The Fillon RSSCs concern employers of the private sector affiliated to the unemployment insurance system for employees in the general system, the agricultural system, as well as miners, sailors and notaries. Certain employers in the parapublic sector are also covered for employees whose jobs are eligible for unemployment benefit (e.g. private-public firms, large national firms). However, private employers, the State, local authorities and public administrative bodies are excluded.

addition, firms that have adopted the 35-hour week are more likely to come from trade industries, whereas firms keeping the 39-hour week are more likely to be in building or transport. Lastly, 39-hour firms are more likely to be located in the Ile-de-France or Rhône-Alpes regions. The categories of firms in our sample also differ in the composition of their workforce. Compared to firms that remained on the 39-hour week, those that adopted the 35-hour week employ a larger proportion of unskilled and highly skilled employees and a lower proportion of skilled labour.

On average, 39-hour firms employ a higher proportion of workers on low wages (less than 1.3 times the minimum wage) and a smaller proportion of workers on high wages (more than 1.6 times the minimum wage) than other firms. Finally and unsurprisingly, the number of annual hours worked per employee is lower for 35-hour firms than for 39-hour firms. It is also likely that these two categories of establishments differ in terms of work organisation and technology characteristics, as several applied studies on the transition to the 35-hour week have shown (notably Bunel 2005 and Gilles 2006).

Table 2: Characteristics of firms present in database, 2002

	39-hour firms	35-hour firms
Average no. of employees per firm	15.2	28.6
]5-10[	60.6%	52.4%
[10-20[	21.6%	17.1%
[20-50[	13.0%	18.1%
[50-200[	4.1%	9.8%
[200 and over	0.70%	2.5%
% of unskilled employees	25.0%	28.0%
% of skilled employees	51.0%	43.0%
% of highly skilled employees	24.1%	29.2%
% of part-time employees	23.3%	26.1%
Group	15.7%	25.0%
Branches of industry		
Food	5.7%	6.8%
Consumer goods and cars	4.2%	5.8%
Capital goods	5.0%	5.0%
Intermediate goods and energy	9.0%	11.5%
Building	21.7%	14.3%
Trade	33.2%	36.9%
Transport	6.7%	2.3%
Financial, real estate and business services	11.1%	11.3%
Other services	3.3%	6.1%
Herfindahl index	1.7%	2.4%
Exit rate	13.3%	12.2%

Table 2 continued

Wages and working hours	35-hour firms	35-hour firms
Average gross hourly wage (current €)	12.45	12.68
% of employees paid [0.8;1.1[times the minimum wage	5.8%	3.5%
% of employees paid [1.1;1.3[times the minimum wage	23.0%	15.8%
% of employees paid [1.3;1.6[times the minimum wage	21.6%	26.4%
% of employees paid [1.6 times the minimum wage and more	49.5%	54.3%
Average annual number of hours	1,729.9	1,618.9
Geographical location		
Ile-de-France	15.5%	9.2%
Rhône-Alpes	12.6%	9.8%
Provence-Alpes-Côte d'Azur	6.8%	6.8%
Other regions	65.1%	74.2%
Financial variables		
Margin rate	20.2%	22.5%
Labour productivity log	3.784	3.743
Wage variation, 2000-2002		
Less than median	43.1%	52.9%
Between median and third quartile	30.3%	23.2%
Over third quartile	26.6%	23.8%
Employment variation, 2000-2002		
Increase in employment	55.6%	60.0%
Number of establishments	82,737	34,561
Number of firms	60,223	27,225

Source: AROME, ORME and SEQUOIA databases (ACOSS), DADS and SUSE (INSEE).

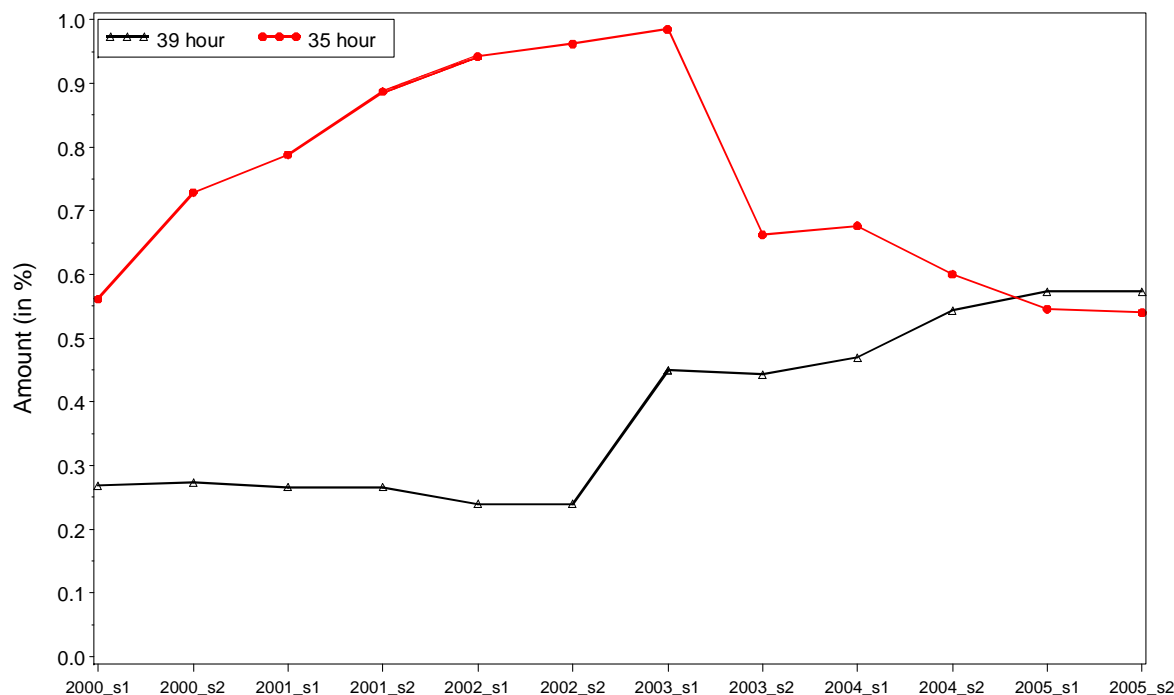
Sample: Panel of 87,448 firms with five or more employees from 2000 to 2005 in private non-farm business and semi-public sectors.

2. Clear Differences in Employment Rate Between Different Categories of Establishment

For each category of establishment, Graph 3 (below) shows the proportion of employees whose employer firm receives RSSCs⁹. As part of the first and second Aubry laws, firms were granted RSSCs for all of their employees whereas the Fillon reform only offered RSSCs for employees with a wage below 1.6 times the minimum wage (see Appendix 1). With the LWTC, only the lowest wages - below 1.3 times the minimum wage - were concerned, which represented about 25% of employees. With the Fillon reform, the proportion of employees benefitting from RSSCs converged to about 50% and therefore decreased for 35-hour firms and increased for 39-hour firms, as can be seen in Graph 3. It is also evident that at the end of this period, the proportion of employees concerned was higher for 39-hour firms than for 35-hour firms, reflecting a higher proportion of employees being paid less than 1.6 times the minimum wage in 39-hour firms (see Table 2).

⁹ These are gross workforce figures, not full-time equivalents: an establishment that transforms a full-time job into two part-time jobs increases the number of employees for RSSC purposes.

Graph 3: Rate of employees benefitting from RSSCs



Source: AROME, ORME and SEQUOIA databases (ACOSS), DADS and SUSE (INSEE).

Sample: Panel of 87,448 firms with five or more employees from 2000 to 2005 in private non-farm business and semi-public sectors.

In 2002, before the Fillon reform, 39-hour firms received, on average, social security contribution subsidies of €180 for every employee earning the minimum wage, whereas 35-hour firms received subsidies of €280. However, RSSCs were, on average, about €20 higher for an employee working a 39-hour week than an employee working a 35-hour week. This is because, although before 2003 all employees of 35-hour firms benefited from reductions, reductions for employees earning more than 1.7 times the minimum wage were small (about €50).

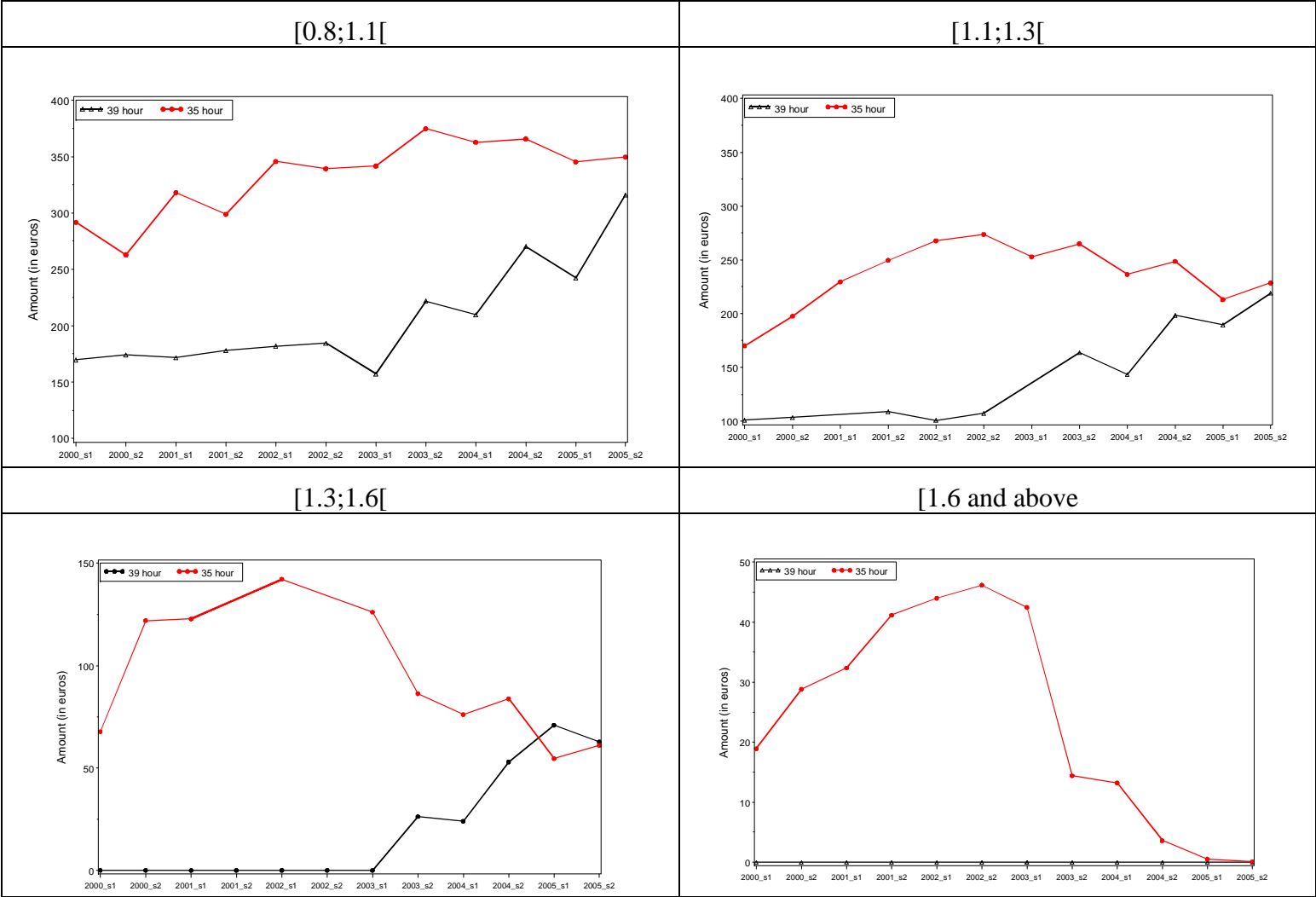
In the first half of 2005, after the Fillon reform, RSSCs for employees earning the minimum wage were about €300 per month for both categories of firm. In 2005, the average RSSC per employee earning 1-1.6 times the minimum wage was about €150 per month, for both categories of firm.

Graph 4 shows the amount of reduction per employee for each wage bracket (defined as a multiple of the French minimum wage)¹⁰; distinguishing different wage brackets is relevant because the subsidies are regressive with regard to wage. This is evident from Graph 4 where, for all categories of establishment, subsidies are at their highest when wages are low.

¹⁰ It can be noted that the amount of RSSC for each employee is not calculated using data from ACOSS. The use of this variable produces abnormally low reduction estimates (for example, less than €50 for 39-hour firms before 2002). The number of employees affected by social security contribution subsidies has therefore been recalculated using DADS data.

Remember that the Fillon reform sets out to harmonise heterogeneous situations, with the aim of ensuring that firms on the 35-hour week receive the same treatment as others. Given the sliding scales of reduction, the difference is small for the minimum wage but is substantial at around 1.3 times the minimum wage and for higher wages. We have therefore defined four wage brackets in Graph 4, expressed as proportions of the hourly minimum wage: close to the minimum wage; 1.1-1.3 times the minimum wage; 1.3-1.6 times the minimum wage; more than 1.6 times the minimum wage. Before the Fillon reform, the average subsidy was higher for 35-hour firms than for other firms at all wage levels. With the Fillon reform, these differing amounts converged towards one level, meaning the average subsidy for 35-hour establishments decreased (First and Second Aubry Laws-WTRTC) and subsidies for 39-hour establishments increased. This convergence is evident at all wage levels, varying in intensity from one wage bracket to another.

Graph 4: RSSC per employee, per wage bracket

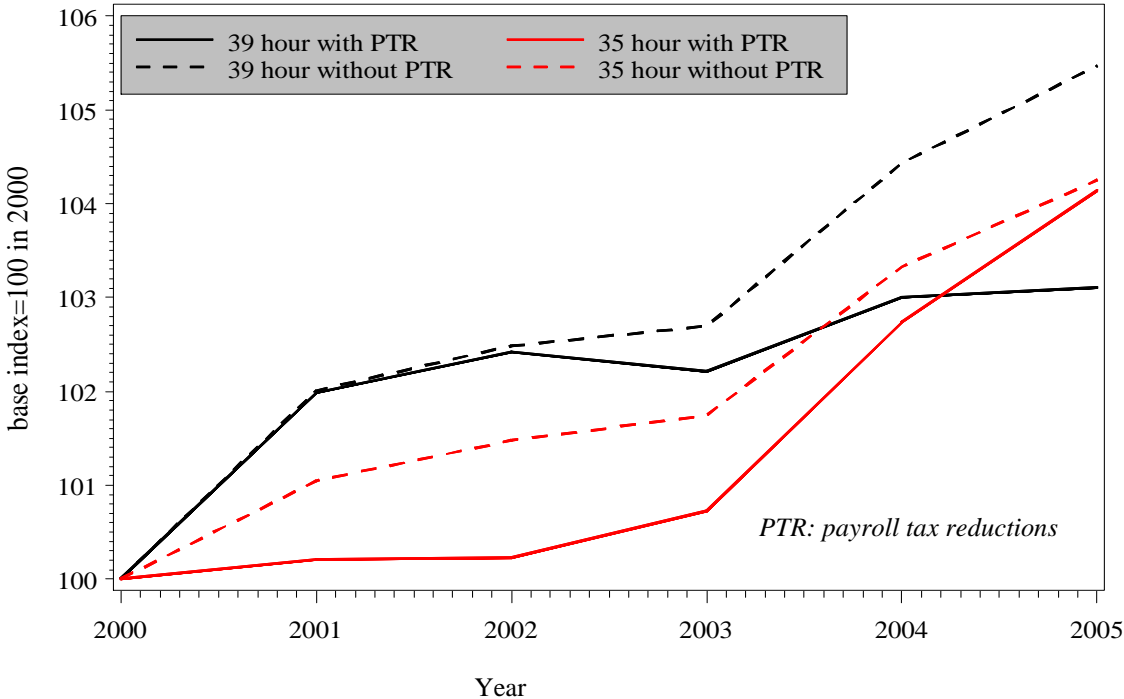


Source: AROME, ORME and SEQUOIA databases (ACOSS), DADS and SUSE (INSEE).

Sample: Panel of 87,448 firms with five or more employees from 2000 to 2005 in private non-farm business and semi-public sectors.

Labour costs - calculated per employee and taking RSSCs into account - are influenced by the Fillon reform, the minimum wage increase and the firm's specific wage policy. Labour costs rise more slowly in firms remaining on the 39-hour week than in those changing to the 35-hour week; Graph 5 illustrates this best. From 2001 to 2003, before the Fillon reform was implemented, labour costs per employee (FTE) were almost the same for 39-hour and 35-hour firms. Since 2003 however, labour costs per employee have increased by 3.5% for firms on the 35-hour week, while having only risen by an average of 1% for firms on the 39-hour week. Without the RSSCs that were introduced by the Fillon reform, labour costs per employee would have increased in closer proportions for both categories of firms: 2.9% for 39-hour firms and 2.4% for 35-hour firms.

Graph 5: Labour costs per employee



Source: AROME, ORME and SEQUOIA databases (ACOSS), DADS and SUSE (INSEE).
 Sample: Panel of 87,448 firms with five or more employees from 2000 to 2005 in private non-farm business and semi-public sectors.

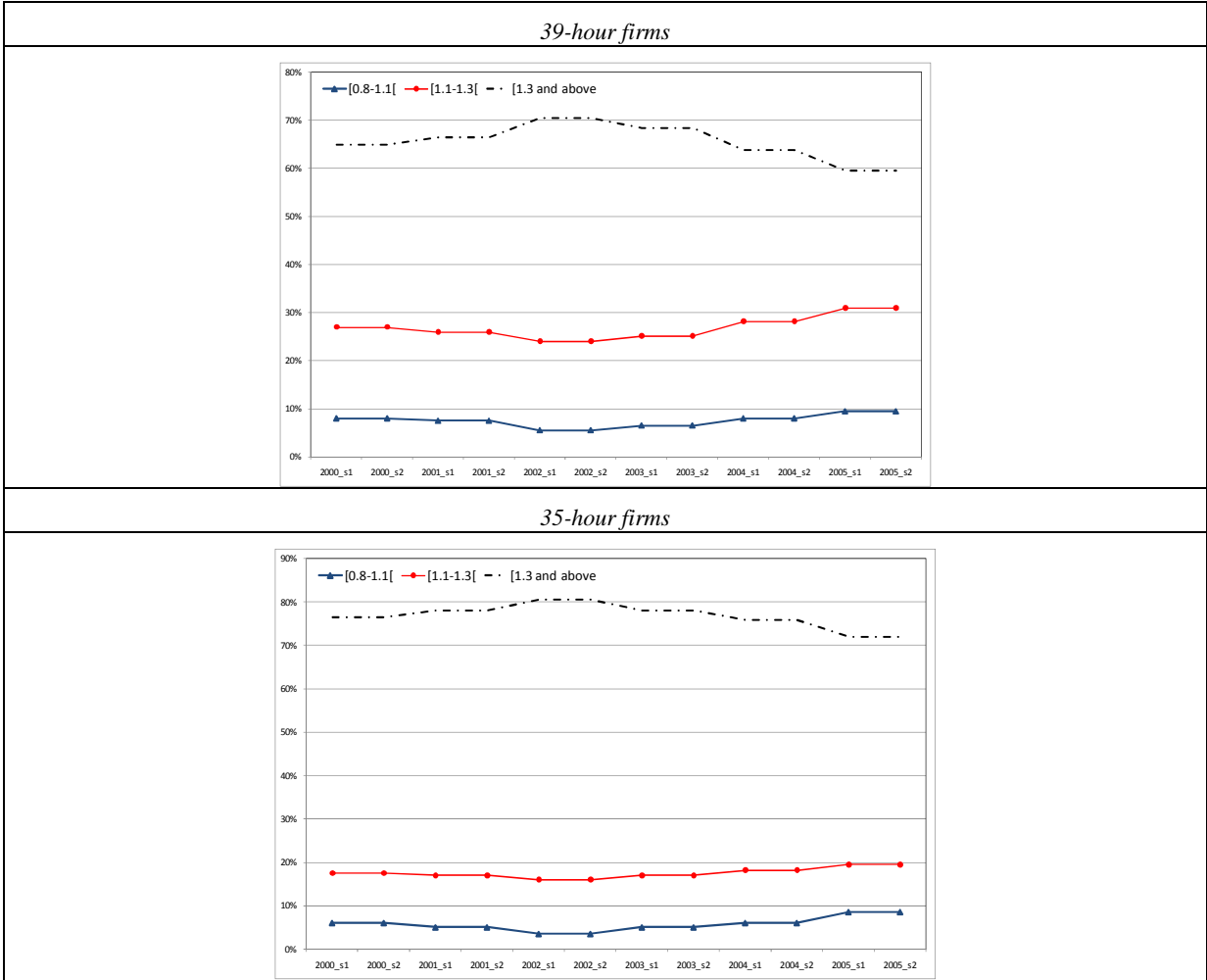
Graph 6 displays the development of wage structure in wage brackets (defined as a multiple of the French minimum wage) for the different categories of establishment from 2000 to 2005. During the Fillon reform, establishments on the 39-hour week saw a sharp increase in the proportion of low-wage employees and even more so for the proportion of employees earning 1.1-1.3 times the minimum wage, the wage bracket corresponding to the highest level of RSSCs.

Establishments on the 35-hour week also saw a rise in the proportion of low-wage employees, but on a smaller scale (6.6 percentage points against 7.9) and more concentrated around the minimum wage. These firms saw a sharp decrease in the proportion of high-wage earners - above 1.6 times the minimum wage - which was a category that previously received RSSCs, but since the Fillon reform was implemented, received none.

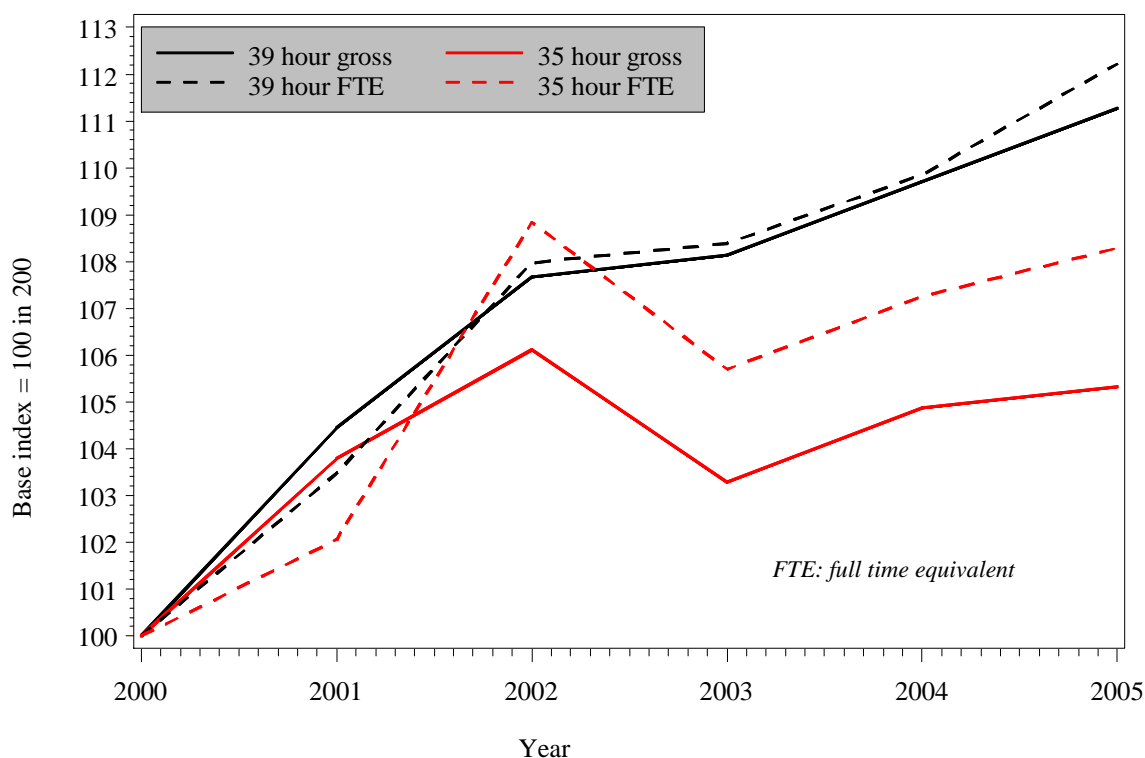
Employment rate is presented in Graph 7. It is evident that employment for 39-hour firms increased steadily by a total of just over 6.4% from 2001 to the end of 2005, while it remained

stable in 35-hour firms, and fell from 2002 to 2005 during the Fillon reform. The employment rate in this graph appears to move in the right direction, given the nature of the social security contribution shocks experienced by both categories of firms (a rise in the average RSSC for 39-hour firms and a fall for 35-hour firms) and given the development of labour costs (see Graph 5) however, this observation needs to be confirmed by econometric analysis in order to take into account the fact that this employment rate could be explained by factors other than RSSCs.

Graph 6: Employees per wage bracket



Graph 7: Employment rate



Source: AROME, ORME and SEQUOIA databases (ACOSS), DADS and SUSE (INSEE).

Sample: Panel of 87,448 firms with five or more employees from 2000 to 2005 in private non-farm business and semi-public sectors.

IV. Identification Strategy

To identify the specific impact of the Fillon reform on employment we must first evaluate the impact of such a reform on labour costs. The observed variations in labour cost are due to changes in RSSCs, the increase in minimum wages, and variations in employment and wage bill. The problem of endogeneity arose as some of the observed variations in labour cost are due to changes in employment structure and level of employment, caused by the RSSC reform. Due to this endogeneity, observed labour costs cannot be used to estimate the specific impact of the Fillon reform. To get an unbiased effect, we must follow Crépon and Desplatz's (2001) strategy. These authors calculated a VLC in order to estimate the impact of the LWTC reform, independent of any change in wages that was observed between 1994 and 1997. The VLC did not take the minimum wage increase into account, whereas our measurement did.

In this paper, to calculate a VLC for 2005, changes Fillon made to the RSSC scheme from January 2005 are applied to gross wages that were measured in June 2002. We did this for eight wage levels¹¹. Therefore, we were able to view variations in social security contribution rates as if wages and employment rates had remained the same from 2002 to 2005. The only variables that are supposed to affect average labour costs are: (i) the level of variables that were observed in 2002 (average wage level in the firm; average wage within the wage bracket; employment level and composition; and whether the firm adopts the 35-hour week);

¹¹ These wage brackets are defined as a multiple of the French minimum wage and are as follows: workers whose wage lies between 0.8 and 1.1 times the minimum wage; between 1.1 and 1.2 times the minimum wage; between 1.2 and 1.3 times the minimum wage; between 1.3 and 1.4 times the minimum wage; between 1.4 and 1.5 times the minimum wage; between 1.5 and 1.6 times the minimum wage; between 1.6 and 1.7 times the minimum wage; workers whose wage is higher than 1.7 times the minimum wage.

(ii) the changes the Fillon reform introduced for both categories of firms (changes to RSSC schemes and the increase in minimum wage or GMR [see section 1]).

Formally, we note ϕ^{02} the fraction of workers in a given firm that belong to each of the eight wage brackets in the first half of 2002. We obtain the gross wage by using the fraction note

$$w^{02} = w(\phi^{02}).$$

MW^{05} is the increase in minimum wage and GMR from 2002 to 2005. So the gross wage of 2002, taking into account the increase in minimum wages, note \tilde{w}^{02} , can be written as

$$\text{follows}^{12}: \bar{w}^{02} = w(\phi^{02}, MW^{05})$$

Finally the virtual labour cost is obtained

$$VLC = [1 + s^{05}(\bar{w}^{02})] \bar{w}^{02}$$

with $s^{05}(\cdot)$: the scale of the RSSC in the second half of 2005.

Table 3: Actual labour cost versus virtual labour cost, per worker

	Mean	Std	Median
Actual labour cost			
Total	6.3%	0.230	3.7%
39 hours	5.5%	0.245	2.0%
35 hours	7.2%	0.210	5.3%
Virtual labour cost			
Total	-0.1%	0.020	-0.1%
39 hours	-1.4%	0.016	-1.3%
35 hours	1.5%	0.013	1.3%

Weighted by staff

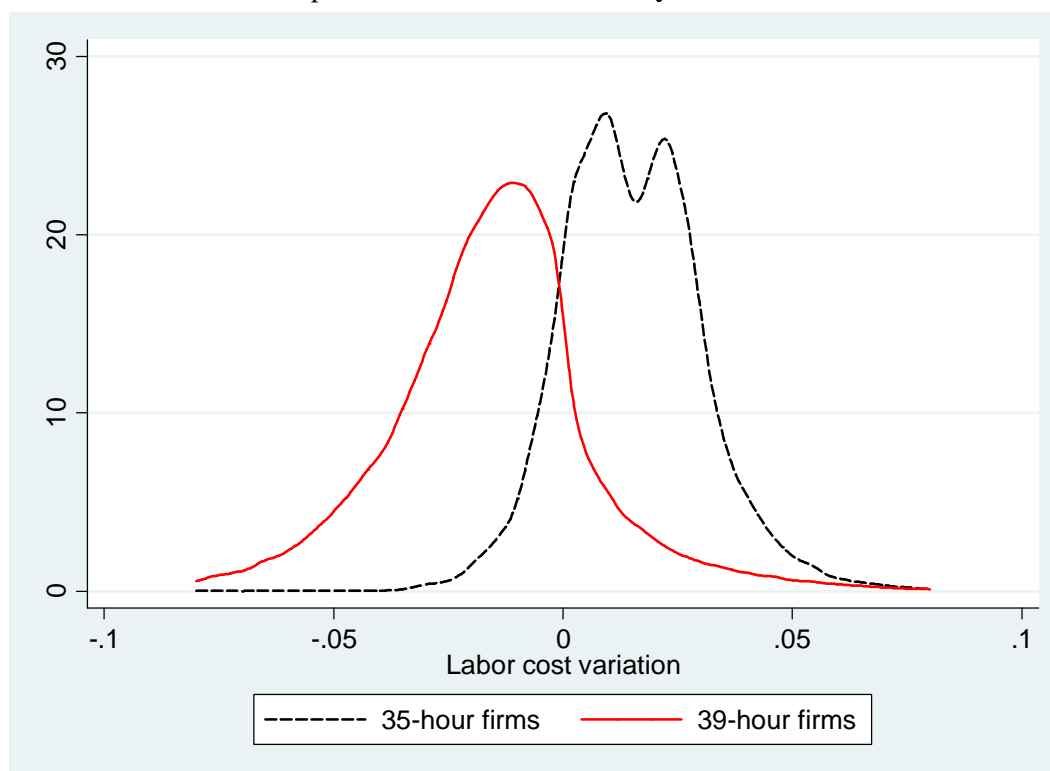
Source: AROME, ORME and SEQUOIA databases (ACOSS), DADS and SUSE (INSEE).

Sample: Panel of 87,448 firms with five or more employees from 2000 to 2005 in private non-farm business and semi-public sectors.

Table 3 illustrates the gap between actual labour cost (ALC) and virtual labour cost (VLC) and its development between 2003 and 2005: ALC increased by 6.3%, on average, whereas VLC fell by 0.1%. We can see clearly that the Fillon reform (i.e. the RSSC reform and the increase in minimum wage) reduced labour costs for 39-hour firms by 1.4%, but increased labour costs for 35-hour firms by 1.5%. Graph 8 shows the distribution of VLC caused by the Fillon reform. More than 85% of 35-hour firms faced an increase in VLC compared to 39-hour firms, which faced less than 15%.

¹² For the first wage bracket we apply the full minimum wage increase for 2002 to 2005 period. For the [1.1-1.2[and [1.2-1.3[wage brackets we apply a partial increase of the minimum wage. For the remaining wage brackets no wage increase are introducing. With this computation, workers who were paid below the 2002 minimum wage, remain below the 2005 minimum wage.

Graph 8: Labour costs caused by Fillon reform



Source: AROME, ORME and SEQUOIA databases (ACOSS), DADS and SUSE (INSEE).

Sample: Panel of 87,448 firms with five or more employees from 2000 to 2005 in private non-farm business and semi-public sectors.

The second step of our identification strategy is to explain employment variation using the variation in the VLC, as well as normal control variables. To test the impact, *ceteris paribus*, of a relative variation in average VLC on the variables of interest in the different sub-populations, we used two standard econometric methods: parametric and non parametric. The characteristics of these methods will now briefly be presented.

1. Propensity Score Method

Firstly, we use the method of semiparametric propensity score matching. Firms can be thought of as being under one of six treatments defined by the VLC: a huge reduction (less than 3%), a reduction [3%-1.5%]; a small reduction [1.5%-0.05%]; stability of labour cost; an increase [0.5%-2%]; and an increase of over 2%. For each firm, only one treatment can be observed. The five remaining are unobserved.

For each potential treatment, we denote $T_i^k = 1$ for $k=1, \dots, 6$ if the firm i is in the subject to treatment k . The potential outcomes associated are noted Y_{i1}, \dots, Y_{i6} .

The relevance of propensity score matching (PSM) estimation is to compare the situation of a firm subject, firstly, to a variable of its VLC, then to another variable resulting from a different VLC, under an assumption of selection on observables.

For this purpose, we use the kernel matching method. It is based on the construction, for each firm treated (e.g. benefitting from a greater decrease in VLC or suffering from a greater increase in VLC), of a counterfactual firm corresponding to a weighted mean of all the firms in the control (or reference) group (e.g. firms with a stable VLC). The weighting used is determined by the distance between the score obtained by a firm (i.e. the probability that the firm has been granted greater reductions, depending on its characteristics) and the score of

each firm in the control group. Initially, the Heckman, Ichimura and Todd estimator (1998) studied the effect of a dichotomous treatment. However, it is possible to extend it to cover multiple treatments (Lechner, 1999; Imbens, 2000, Frölich, 2004).

Let $C_{T=k}^{kl}$ denote the average causal effect of treatment T_i^k relative to treatment T_i^l

$$C_{T=k}^{kl} \equiv E(Y_{ik} | T_i^k = 1) - E(Y_{il} | T_i^k = 1)$$

As with all matching models, the problem comes from the fact that $E(Y_{il} | T_i^k = 1)$ is not observable. The estimated causal effect, used to get around this problem, is written as follows:

$$\widehat{C}_{T=k}^{kl} \equiv \frac{1}{N_k} \sum_{i \in T_k} \left[Y_i - \sum_{j \in T_k} \frac{K[(\widehat{p}_i^{kl} - \widehat{p}_j^{kl})/h_j]}{\sum_{j \in T_k} K[(\widehat{p}_i^{kl} - \widehat{p}_j^{kl})/h_j]} Y_j \right]$$

N_k corresponds to the number of firms benefiting from a variation k in labour costs and T_k is the set comprising these firms. $K[\cdot]$ denotes a kernel function and h_j a smoothing parameter, fixed at 0.06. The probabilities \widehat{p}_i^{kl} are deduced from probabilities estimated using an ordered probit model that allows us to calculate $\Pr(T^k = 1 | X_i)$ and $\Pr(T^l = 1 | X_i)$. We obtain:

$$\widehat{p}_i^{kl} = \frac{\Pr(T^k = 1 | X_i)}{\Pr(T^k = 1 | X_i) + \Pr(T^l = 1 | X_i)}$$

Standard errors and confidence intervals are computed through bootstrapping, replicating fifty samples with replacement.

It is important to test whether the covariates used in the ordered probit regressions are balanced in all treatment pairs of interest. Two tests are commonly performed. Firstly, the Dehejia and Wahba (DW) test (Rosenbaum and Rubin, 1985; Dehejia and Wahba, 2002) verifies the equality of means across treatments for each covariate. Secondly, Hotelling's T-square test (HTS) looks at whether the covariates are jointly different across groups of treatment. Both of these tests are performed for different sub samples defined by the propensity score and for which the equality between the mean propensity score cannot be rejected. When we perform these tests, many covariates appear as not balanced (see next section). To avoid this problem, we use a Coarsened Exact Matching (CEM) technique, developed by Iacus and Porro (2009), which is easy to apply with Stata (Blackwell and al, 2009). This algorithm gives the opportunity to bound *ex ante* the maximum imbalance and to restrict the sample to matched data only. Finally we perform the DW test and HST on these sub-samples.

2. OLS and Quantile Regression

The OLS (ordinary least squares) method estimates the average effect of the treatment consistently and without bias if it is exogenous. The model is written in the following form:

$$\Delta \ln Y_i = X_i \beta + VLC_i \gamma + \phi_i^1 \alpha_1 + \phi_i^2 \alpha_2 + u_i$$

where $\Delta \ln Y_i$ represents the growth rate of the dependent variable (employment), X_i represents a vector of exogenous variables that explain $\Delta \ln Y_i$ (\cdot) VLC_i represents the treatment variable (the variation in virtual labour cost), ϕ_i^1 and ϕ_i^2 represent variables indicating the fraction of workers in firms who earned [0.8-1.2[and [1.2-1.5[times the minimum wage, and u_i represents a residual.

The explanatory variables X_i refer to activity sectors (8 categories), firm size (5 categories), location (2 categories), a dummy variable indicating if the firm is a member of a business group, two aggregate variables associated with the firm's sector taken at NAF700 level and calculated for 2002 (the Herfindahl index which is an indicator of competition, and exit rate which gives an indication of turnover), the percentage of part-time employees, margin rate, labour productivity, the variation of wage per hour from 2000-2002 (3 categories), and the variation of employment also from 2000-2002. Details of this data can be found in Table A3. In addition to the OLS method, quantile regression (QR) - first developed by Koenker and Bassett (1978) - allows the effect of explanatory variables on the dependent variable to be measured at different points of its distribution and not just the mean, as is the case for the linear model estimated by OLS. This method, now widely used (Koenker and Hallock, 2001), is based on the following minimisation programme:

$$\min \left(\begin{array}{l} \sum_{i: \Delta \ln Y_i \geq X_i \beta_\theta + T_i \gamma_\theta} \theta |\Delta \ln Y_i - X_i \beta - VLC_i \gamma - \phi_i^1 \alpha_1 - \phi_i^2 \alpha_2| \\ + \sum_{i: \Delta \ln Y_i < X_i \beta_\theta + T_i \gamma_\theta} (1 - \theta) |\Delta \ln Y_i - X_i \beta - VLC_i \gamma - \phi_i^1 \alpha_1 - \phi_i^2 \alpha_2| \end{array} \right)$$

where θ represents the quantile considered. The estimated parameters β_θ and γ_θ can vary according to the quantile in question. In our case, the main attraction of this approach is that it allows us to control the homogeneity of the impact of a variation in wage cost, generated by the Fillon reform (2003), over the whole distribution of the variables of interest. Moreover, it allows us to assume residuals to be not normally distributed.

V. Results

1. Semi-Parametric Analysis

The results from the ordered probit are reported in Table A1 of the appendix. The introduction of covariates and their effects on sensitivity are examined through the use of two models. Model 1 contains only the size and industry of the covariate firms and model 2 contains geographical location, workforce structure (number of part-time workers and workers per wage bracket), and past wage and employment variation.

PSM will provide a reliable estimation of the effect of a variation in VLC on employment under the assumption of independence conditional on observables. This assumption implies that the covariates should be balanced between treated and non-treated groups. Lack of balance can induce misspecification of PSM. For all covariates, the DW test examines whether the weighted difference in means between the two groups are large or not, using

kernel matching.¹³ Hotelling's T-squared test considers whether those differences are jointly insignificant. Table 4 gives the results of such tests for unmatched and matched data for different blocks. The balancing test results using unmatched data clearly rejected our specification for model 1 but also for model 2¹⁴. However, using matched data provided by the CEM algorithm, the quality of our specification is higher.

Table 4: DW and HTS balancing tests on unmatched and matched samples for model 2

Propensity score segment	Below -3%	[-3.0%; -1.5%[	[-1.5%; -0.5%[	[+0.5%; +2.0%[	+2.0% and over
Number of blocks	19	24	15	13	12
<i>Unmatched with common support</i>					
# of treated	11,357	18,439	16,848	13,915	11,929
# of control	14,480	14,669	14,683	14,683	14,683
# of covariates appear as not balanced:					
-DW test	178/494	209/676	95/390	80/328	110/312
-HTS test	19/19	26/26	2/15	2/15	12/12
<i>Matched using CEM</i>					
# of treated	4,955	9,061	10,491	9,420	8,033
# of control	4,955	9,061	10,491	9,420	8,033
# of covariates appear as not balanced:					
-DW test	56/494	22/676	16/390	15/328	5/312
-HTS test	0/19	0/26	0/15	0/15	0/12

Source: AROME, ORME and SEQUOIA databases (ACOSS), DADS and SUSE (INSEE).

Sample: Panel of 87,448 firms with five or more employees from 2000 to 2005 in private non-farm business and semi-public sectors.

Having established that treated and not treated groups are comparable using balancing tests, we can estimate the specific effect of the treatment. Table 5 gives the causal effects on gross and FTE employment for five categories of variation in VLC. Five out of ten coefficients appear to be significant using model 1 and seven out of ten using model 2.

Finally, in order to present the estimation results in a very simple way, we have calculated the elasticities by dividing the estimated impact on the interest variable by the variation in labour costs, introduced by the Fillon reform, as previously described; Table 5 presents the details of this analysis. The overall weighted elasticity obtained for the sample is -0.689 for FTE employment and -0.516 for gross employment¹⁵.

¹³ Assuming that a standardised difference of greater than 20% is considered as large, in line with Rosembaum and Rubin (1985).

¹⁴ When tests for model 1 are done, (not listed here) based on unmatched samples, the majority of covariates appear to be not balanced.

¹⁵ It can be noted that by using the model 1, we obtain respectively -0.645 and -0.374.

Table 5: Coefficients of PSM estimation, by average labour cost

		Model 1		Model 2	
Gross employment					
Variation in average labour costs	Below -3.0%	0.148	0.123	0.406***	0.115
	[-3.0%; -1.5%[	0.230***	0.091	0.307***	0.09
	[-1.5%; -0.5%[	0.229***	0.091	0.155*	0.085
	[-0.5%; +0.5%[	<i>Ref.</i>		<i>Ref.</i>	
	[+0.5%; +2.0%[	-0.243**	0.117	-0.313***	0.104
	+2.0% and over	-0.134	0.11	-0.115	0.112
Full-time equivalent employment					
Variation in average labour costs	Below -3.0%	0.148	0.096	0.398***	0.088
	[-3.0%; -1.5%[	0.207***	0.071	0.302***	0.074
	[-1.5%; -0.5%[	0.167**	0.073	0.091	0.071
	[-0.5%; +0.5%[	<i>Ref.</i>		<i>Ref.</i>	
	[+0.5%; +2.0%[	-0.042	0.088	-0.203**	0.086
	+2.0% and over	-0.063	0.084	-0.166*	0.088
# observations		66,964		66,964	

Table 6: Estimated elasticity for model 2

Gross employment		No. of jobs created	Employment	Average variation of employment	Average variation of labour cost	Elasticity
Variation in average labour costs	Below -3.0%	2,046.6	77,134	2.7%	-4.0%	-0.67
	[-3.0%; -1.5%[	2,777.1	174,599	1.6%	-2.2%	-0.73
	[-1.5%; -0.5%[	1,621.6	209,829	0.8%	-1.0%	-0.79
	[-0.5%; +0.5%[	<i>Ref.</i>				
	[+0.5%; +2.0%[	-2,930.0	221,613	-1.3%	1.2%	-1.10
	+2.0% and over	NS	170,639	-	3.1%	0
Full-time equivalent employment						
Variation in average labour costs	Below -3.0%	2,006.3	66,315	3.0%	-4.0%	-0.76
	[-3.0%; -1.5%[	2,731.9	150,897	1.8%	-2.2%	-0.83
	[-1.5%; -0.5%[	Ns	180,495	0	-1.0%	0
	[-0.5%; +0.5%[	<i>Ref.</i>				
	[+0.5%; +2.0%[	-1,900.3	189,283	-0.9%	1.2%	-0.83
	+2.0% and over	-1,329.0	144,227	2.7%	3.1%	-0.30
# observations		66,964			66,964	

Source: AROME, ORME and SEQUOIA databases (ACOSS), DADS and SUSE (INSEE).

Sample: Panel of 87,448 firms with five or more employees from 2000 to 2005 in private non-farm business and semi-public sectors.

2. Parametric Analysis

Table 7 presents employment elasticities with respect to the average wage cost that we estimated for all firms. Details of the model's other coefficients are presented in Table A3. Following an increase of 1% in labour costs, these elasticities indicate the effects (%) on employment (measured in gross numbers and FTE). The elasticities are often significant and always have the expected sign. A rise of 1% in average costs reduces employment by about 0.43%.

The results are sensitive to the method of estimation. PSM gives a higher estimation of such elasticity. The results from quantile regression suggest that the estimation of elasticities obtained by OLS is higher for firms with a higher variation in staff.

Table 7: Estimation of elasticity of variables of interest with respect to changes in average labour costs for all firms

	OLS	Quantile regressions		
		25%	50%	75%
Gross employment	-0.429*** (0.038)	-0.318** (0.149)	-0.308*** (0.084)	-0.486*** (0.142)
Full-time equivalent employment	-0.522*** (0.037)	-0.229* (0.122)	-0.334*** (0.100)	-0.545*** (0.142)

Weighted by staff

Source: AROME, ORME and SEQUOIA databases (ACOSS), DADS and SUSE (INSEE).

Sample: Panel of 87,448 firms with five or more employees from 2000 to 2005 in private non-farm business and semi-public sectors.

3. Net Effect on Employment

Broadly speaking, the effect of the Fillon reform on employment has been very weak or even slightly negative. On the whole, 39-hour firms have benefited from it, despite the rise in the minimum wage, as average labour costs have fallen thanks to RSSCs. The effect of the Fillon reform on these firms has been positive. On the other hand, firms on the 35-hour week have experienced a rise in average labour costs, related mainly to the loss of RSSCs for employees earning over 1.7 times the minimum wage, to the end of the first Aubry Law-WTRTC measures, and to the increase in monthly guaranteed wages (for firms employing 20 people or more). This rise in labour costs led to a slight fall in employment.

We can attempt to specify the order of magnitude of these effects. For 39-hour firms, the overall effect on gross employment depends on the average change in average VLC (-1.42%) and on the elasticities obtained by the parametric and non parametric regressions in Tables 5 and 6. This gives us an effect of 0.61% or about 8,400 jobs for OLS, and 0.73% or about 10,100 jobs for PSM.

Even if we extrapolate this result to the whole active population, in other words the 15 million employees in the private non-farm sector, 46% of which work for 39-hour firms, the effect of the Fillon reform on employment shows only 42,000 jobs being saved or created (50,600 using PSM). A similar calculation can be done for FTE employment; in this case, the impact on employment is slightly stronger for OLS (0.74%) at 8,900 jobs for the sample and 48,800 jobs for the whole population. For PSM, the figure is 11,800 jobs for the sample and 64,400 for the whole population.

For 35-hour firms, the average change in VLC was +1.47% (weighted by workforce numbers). Given that the elasticity for gross and FTE employment is negative, the overall effect is also negative. For OLS (PSM), gross employment is -0.63% (-0.76%) or the loss of about 7,000 jobs (-9,800). If we were to extrapolate this result to the whole population (54% of the 15 million employees in the market sector were employed by 35-hour firms), the effect would be the loss of 51,000 jobs (61,500 for PSM). For FTE, the global effect is also negative and the loss varies from 58,600 to 78,300 jobs.

VI. Conclusions

The aim of the Fillon reform was to unify the different pre-existing schemes of social security contribution subsidies for low wages, in order to simplify the complex regulations that were created by the progressive introduction of the 35-hour week. The reform has had very different effects depending on the type of firm. The harmonisation of the different schemes produced a much more pronounced reduction in payroll taxes for firms that had not changed to the 35-hour week than for those that had, particularly for employees earning around 1.3 times the minimum wage. This is still observed when we consider the concomitant rise in the minimum wage, even with varied hypotheses about the spread of this rise along the wage distribution. Compared to pre-existing reduction schemes, the harmonisation that the Fillon reform brought about led to a fall in labour costs for wages slightly below the median wage and was more significant in firms that had not signed an agreement to move to the 35-hour week.

In this paper, we use a balanced panel of firms from 2002-2005. The beginning of this period is just before this reform was implemented (2002) and the end of this period is when the reform was completed in 2005. In 2002, we started to avoid interruptions in the DADS chain of processing¹⁶. The sample was restricted to a balanced panel because it is difficult to distinguish between the real creation and closure of establishments, and entries and exits from administrative files. To measure the distribution of employees in each firm, we have limited the sample to firms with five or more employees.

After presenting the nature of the shock and the data used, establishments are distinguished by variation in payroll tax during the reform. Through an econometric evaluation, it can be noted that employment rate increased more in firms that gained the most from increased RSSCs. We find employment elasticities with respect to labour costs that are significant and of the expected signs: a rise of 1% in average labour costs reduces employment by 0.4%. Overall, as the majority of 39-hour firms benefited from increased reductions, the Fillon reform led to relative growth in their level of employment. But for 35-hour firms, the opposite situation can be observed: the reform led to a relative fall in employment. Ultimately, because of this employment redistribution effect across firms, the Fillon reform had no clear effect on aggregate employment, whether measured in gross numbers or FTE.

So the overall effect of the Fillon reform on both 35-hour and 39-hour firms appears to have been very weak or even negative. This is an aggregate result for large groups of firms and is compatible with the possibility that the reform has had a significant impact for certain firms in particular activity sectors.

¹⁶ However, for firms present in the database in 2002, we use information over the period 2000-2002 as control. In fact the interruptions in the DADS chain does not affect the balanced panel.

These calculations are based on a micro-econometric framework and do not take into account macroeconomic interactions via, for example, labour market equilibrium and adjustment of price and wage. But it is likely that these macroeconomic effects are of low amplitude according to the weakness of the microeconomic impact of the reform. Moreover, our evaluation does not take volume effects or effects of inter-industry substitution into account. In addition, it does not specify the impact of the Fillon reform by level of qualification and wage. Further studies would be of use and could explore these different dimensions.

Bibliography

- Beach, C. and Balfour, F. (1983), 'Estimated Payroll Tax Incidence and Aggregate Demand for Labour in the United-Kingdom', *Economica*, vol. 50, No.197, pp. 35-48.
- Bell, B. and Nickell, S. (1997), 'Would Cutting Payroll Taxes on the Unskilled have a Significant Impact on Unemployment?', in D.J. Snower and G. de la Dehesa (eds), *Unemployment Policy: Government Options for the Labour Market*, Cambridge University Press.
- Brittain, J. (1971), 'The Incidence of Social Security Payroll Taxes', *American Economic Review*, vol. 62, No.4, pp. 735-738.
- Blackwell, M., Iacus, S. King, G. and Porro, G. (2009), 'CEM: Coarsened Exact Matching in Stata', *Stata Journal*, vol. 9 , No. 4, pp. 524-546.
- Bunel, M. (2005), 'Aides incitatives et déterminants des embauches des établissements passés aux 35 heures', *Economie et Statistique*, vol. 376, issue 1, pp. 91-115.
- Bunel, M., Gilles, F. and L'Horty, Y. (2010), 'Les effets des allègements de cotisations sociales sur l'emploi et les salaires: une évaluation de la réforme de 2003', *Economie et Statistique*, No. 429-430, août, pp.77-105..
- Crépon, B. and Desplatz, R. (2001), 'Une nouvelle évaluation des effets des allègements de charges sociales sur les bas salaires', *Economie et Statistique*, No. 348, issue 1, pp. 3-24.
- Dehejia, R. and Wahba, S. (2002), 'Propensity Score-Matching Methods For Non-experimental Causal Studies', *Review of Economics and Statistics*, vol. 84, issue 1, pp. 151-161.
- Gafsi, I., L'Horty, Y. and Mihoubi, Y. (2005), 'Vingt ans d'évolution de l'emploi peu qualifié et du coût du travail: des ruptures qui coïncident ?', *Revue française d'Economie*, vol. 19, issue 3, pp. 91-116.
- Gruber, J. (1997), 'The Incidence of Payroll Taxation: Evidence from Chile', *Journal of Labour Economics*, vol. 15, issue 3, S72-S101.
- Hamermesh, D. (1979), 'New Estimates of the Incidence of the Payroll Tax', *Southern Economic Journal*, vol. 45, issue 4, pp. 1208-1219.
- Heckman, J., Ichimura, H. and Todd, P. (1998), 'Matching as an Econometric Estimator', *The Review of Economic Studies*, vol. 65, issue 2, pp. 261-294.
- Iacus, S. M. and Porro, G. (2009), 'Random Recursive Partitioning: a Matching Method for the Estimation of the Average Treatment Effect', *Journal of Applied Econometrics*, vol. 24, issue 1, pp. 163-185.
- Imbens, G. (2000), 'The Role of Propensity Score in Estimating Dose-response Functions', *Biometrika*, vol. 87, issue 3, pp. 706-710.
- Jamet, S. (2005), 'Allègements généraux de cotisations sociales et emploi peu qualifié: de l'impact sectoriel à l'effet macro-économique', *Revue Française d'Economie*, vol. 19, issue 3, pp. 57-90.
- Frölich, M. (2004), 'Programme Evaluation with Multiple Treatments', *Journal of Economic Surveys*, vol. 18, issue 2, pp. 181-224.
- Koubi, M. and Lhommeau, B. (2007), 'Les effets de diffusion de court terme des hausses du SMIC dans les grilles salariales des entreprises de dix salariés ou plus sur la période 2000-2005', in INSEE, *Les salaires en France*, Paris.
- Kramarz, F. and Philippon, T. (2001), 'The Impact of Differential Payroll Tax Subsidies on Minimum Wage Employment', *Journal of Public Economics*, vol. 82, issue 1, pp. 115-146.
- Kugler, A. and Kugler, M. (2008), 'Labor Market Effects of Payroll Taxes in Developing Countries: Evidence from Colombia', *NBER Working Paper*, No. 13855, March 2008.

Lechner, M. (1999), 'Identification and Estimation of Causal Effects of Multiple Treatments Under the Conditional Independence Assumption', *IZA Discussion Paper*, No. 91.

Vroman, W. (1974), 'Employer Payroll Tax Incidence: Empirical Tests with Cross-Country Data', *Finances Publiques*, vol. 29, issue 2, pp. 184-200.

Table A1: Estimation of ordered probit

	Model 1		Model 2	
	Coef	Std	Coef	Std
Branches of industry				
Food	0.698***	0.024	0.626***	0.029
Consumer goods and cars	0.959***	0.023	0.857***	0.027
Capital goods	0.736***	0.022	0.592***	0.026
Intermediate goods and energy	0.801***	0.020	0.703****	0.025
Building	0.993***	0.019	0.914***	0.019
Trade	0.980***	0.018	0.853***	0.018
Transport			Ref	
Services	1.065***	0.019	0.900****	0.019
Firm size				
]5-20[			Ref	
[20-50[	0.159***	0.008	0.131***	0.014
[50-200[	0.412***	0.013	0.381***	0.017
[200 and over	0.682***	0.028	0.570***	0.030
Manufacturing sector * 20 employees and over	0.138***	0.008	0.363***	0.017
Geographical location				
Ile-de-France			-0.103***	0.009
Workforce structure				
% part-time <10%	-			
% part-time [10%-25%[	-		0.092***	0.009
% part-time 25% and over	-		0.338***	0.010
Wage bracket				
Employees earning 1.2 times the minimum wage (1)			-0.015*	0.009
(1)* Manufacturing sector			0.050***	0.017
% employees earning [1.2-1.5[times the minimum wage (ref [0-15%[
[15%-25%[			-0.147***	0.010
[25%-40%[(3)			-0.317***	0.011
[40% and over (4)			-0.664***	0.012
((3)+(4)) * 20 employees and over			0.109***	0.015
((3)+(4)) * manufacturing sector			-0.132***	0.016
Variation of wage, 2000-2002				
Less than median				
Between median and third quartile (5)			0.189***	0.010
Over third quartile (6)			0.331***	0.010
((5)+(6)) * 20 employees and over			-0.221***	0.015
Variation in employment, 2000-2002				
Increase in employment			0.074***	0.009
Increase in employment * manufacturing sector			-0.025*	0.016
Threshold 1	-0.201***	0.017	-0.453***	0.021
Threshold 2	0.550***	0.018	0.361***	0.021
Threshold 3	1.062***	0.018	0.905***	0.021
Threshold 4	1.518***	0.018	1.377***	0.021
Threshold 5	2.082***	0.018	1.952***	0.021

Source: AROME, ORME and SEQUOIA databases (ACOSS), DADS and SUSE (INSEE).

Sample: Panel of 87,448 firms with five or more employees from 2000 to 2005 in private non-farm business and semi-public sectors.

Table A2: **Distribution of firms by variation in labour cost**

	No. of obs.	Mean
Below -4%	10,144	-5.4%
[-3%; -4%[	8,514	-3.5%
[-2%; -3%[	14,091	-2.5%
[-1%; -2%[	19,192	-1.5%
[0%; -1%[	23,13	-0.5%
]0% - +1%]	13,56	0.5%
] +1% - +2%]	11,367	1.5%
] +2% - +3%]	9,658	2.5%
Above +3%	7,642	4.2%

Source: AROME, ORME and SEQUOIA databases (ACOSS), DADS and SUSE (INSEE).

Sample: Panel of 87,448 firms with five or more employees from 2000 to 2005 in private non-farm business and semi-public sectors

Table A3: OLS results

	Gross employment		Full-time equivalent employment	
	Coef.	Std.	Coef.	Std.
Branches of industry				
Food	-0.005	0.005	-0.007	0.005
Consumer goods and cars	-0.039***	0.004	-0.048***	0.004
Capital goods	-0.019***	0.004	-0.050***	0.004
Intermediate goods and energy	-0.036***	0.004	-0.042***	0.004
Building	0.044***	0.003	0.006**	0.003
Trade	Ref.		Ref.	
Transport	0.021***	0.003	0.005*	0.003
Services	0.024***	0.003	0.015***	0.003
Herfindahl index	-0.058***	0.009	-0.146***	0.008
Exit rate	-0.070***	0.019	0.037*	0.019
Firm size				
]5-20[	Ref.		Ref.	
[20-50[	0.022***	0.002	0.021***	0.002
[50-200[	0.022***	0.003	0.025***	0.003
[200 and over	0.018***	0.003	0.007**	0.003
Manufacturing sector * 20 employees and over	-0.47***	0.004	-0.040***	0.004
Group	-0.003*	0.002	-0.002	0.002
Geographical location				
Ile-de-France	-0.010***	0.002	-0.020***	0.002
Workforce structure				
% part-time	-0.028***	0.003	0.041***	0.003
Variation of wage, 2000-2002				
Less than median	Ref.		Ref.	
Between median and third quartile (5)	-0.009***	0.002	-0.004**	0.002
Over third quartile (6)	-0.006***	0.002	-0.007***	0.002
Variation of employment, 2000-2002				
Increase in employment	0.043***	0.002	0.045***	0.002
Increase in employment * manufacturing sector	0.031***	0.003	0.029***	0.003
Wage bracket				
% employees earning [0.8-1.2[times the minimum wage	0.029***	0.005	-0.014***	0.005
% employees earning [1.2-1.5[times the minimum wage	0.015***	0.004	-0.008**	0.004
Financial variables				
Margin rate	0.145***	0.005	0.156***	0.005
Log of labour productivity	0.005***	0.002	-0.004***	0.002
Treatment effect	-0.429***	0.038	-0.529***	0.037
Intercept	-0.094***	0.007	0.978***	0.007

Source: AROME, ORME and SEQUOIA databases (ACOSS), DADS and SUSE (INSEE).

Sample: Panel of 87,448 firms with five or more employees from 2000 to 2005 in private non-farm business and semi-public sectors.

Appendix 1: From the Aubry reform to the Fillon reform

Among the firms adopting the 35-hour work week, there are two main types of incentives to reduce working time: the First Aubry Law and the Second Aubry Law, differentiated by the date of entry into the 35-hour scheme.

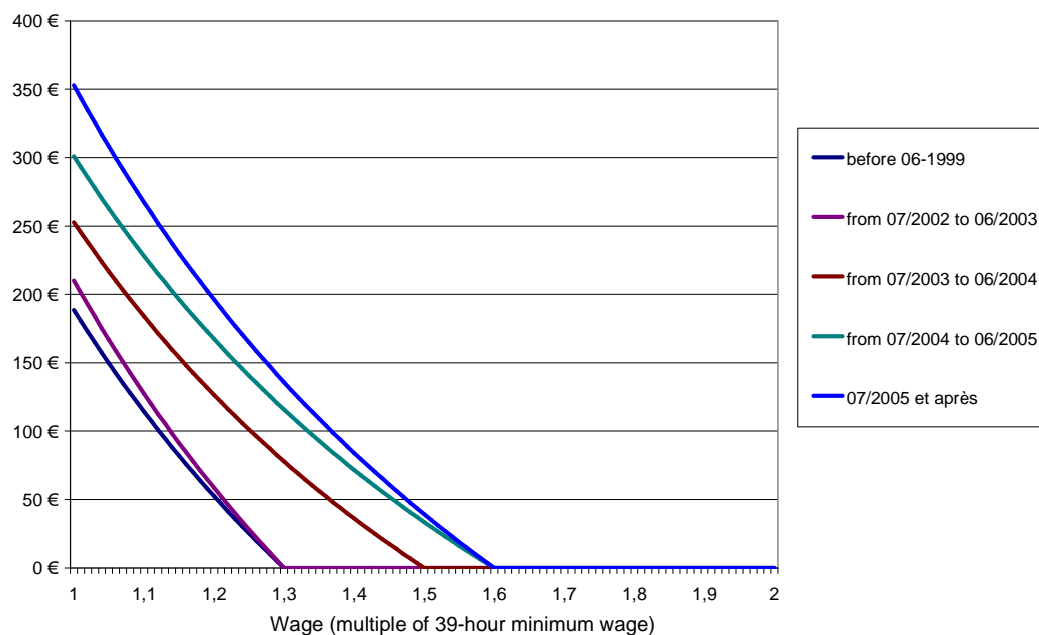
Firms that anticipated the legal change to the 35-hour week by reducing the effective working hours of their employees by at least 10% and increasing their workforce by a minimum of 6%, benefited from a subsidy every year, which varied from €752 to €1,300 per employee, depending on the date the firm adopted the 35-hour week. In addition, this subsidy could be accumulated over five years with the LWTC until 2000, then with the second Aubry law from 2000 to 2003, and finally with the Fillon reform from 2003 until July 2004. After this date, firms had to choose between either the Fillon reduction or first Aubry law reduction.

The rise in reductions was therefore clearly more pronounced in 39-hour firms at all wage levels. This relative advantage was intended to offset the rise in the gross hourly 39-hour minimum wage. In firms benefiting from the second Aubry law, the reform only marginally modified the reductions for low wages, but cut reductions for medium and high wages. The replacement of a convex scale by a linear scale meant that there was no change to the minimum wage, and there was a reduction in contributions up to about 1.6 times the minimum wage and an increase of about 2 percentage points above this wage level. For firms benefiting from the first Aubry law, which had up to this point received the highest level of subsidies for all wage levels, the harmonisation of scales resulted in lower reductions for all wage levels, particularly for the highest levels, because of the disappearance of flat-rate subsidies.

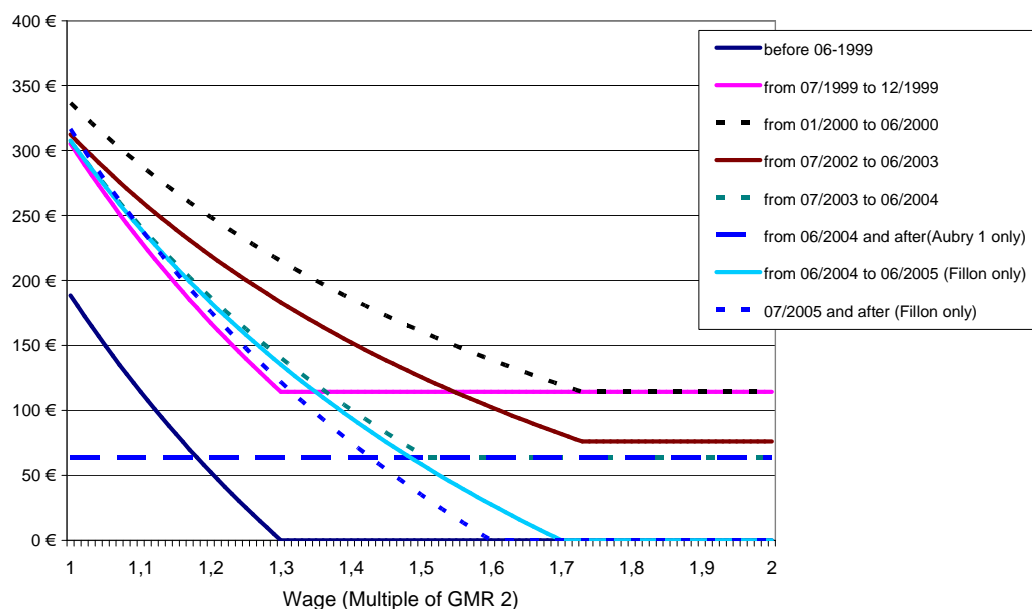
One particular difficulty in the evaluation is the timeframe in which the reform was implemented. All these concomitant modifications in labour cost components were implemented progressively. Over two years, from July 2003 to July 2005, a large number of successive reorganisations were carried out with the aim of harmonising wages and social security contributions. For firms that had retained the 39-hour week, the new measure was adopted in three stages (July 2003, July 2004 and July 2005). For firms that had adopted the 35-hour week, the transition took place in four stages (July 2003, July 2004, January 2005 and July 2005). The different provisional scales for the different initial situations (LWTC and the First and Second Aubry laws-WTRTC) are shown in Graphs A1, A2 and A3.

Graphs A1-A3: Monthly reductions per employee

A1: Firms remaining on the 39-hour week (LWTC followed by Fillon)



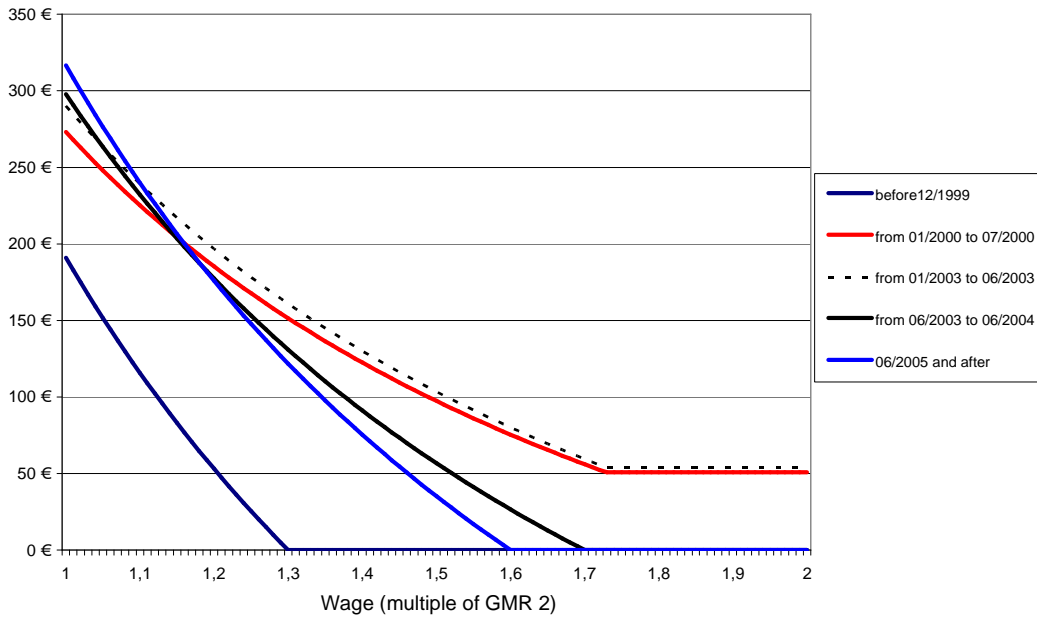
A2: Firms adopting the 35-hour week with the first Aubry law-WTRTC (cumulative with LWTC, the second Aubry law-WTRTC and the Fillon-second Aubry law)



Source: Legifrance

NB: This graph is based on the assumption that firms benefit from the highest level of reductions (i.e. €1,372 in the first year).

A3: Firms adopting the 35-hour week with second Aubry law-WTRTC



Source: Legifrance

From 2002 to 2003, the LWTC coexisted firstly with the first Aubry law-WTRTC and then with the second Aubry law-WTRTC. From 2002, the weight of these two measures reached 70% and mainly overtook the LWTC. Overall, these changes have resulted in a redistribution of RSCCs between firms, with less given to firms on the 35-hour week and more to those on the 39-hour week. However, within these two categories of firms, the strength of the positive or negative shock varied according to workforce structure, in terms of wage and skills. Within both categories of firm, reductions varied greatly from one firm to another.

Glossary

- ACOSS:** Central Agency of Social Security Organisations (*Agence Centrale des Organismes de Sécurité Sociale*)
- ALC:** Actual labour cost
- DADS:** Annual Declarations of Social Data (*Déclarations Annuelles de Données Sociales*)
- FTE:** Full-time equivalents
- GMR:** Monthly Guaranteed Wage (*Garantie Mensuelle de Ressources*)
- INSEE:** The National Institute of Statistics and Economic Studies (*Institut de la Statistique et des Etudes Economiques*)
- LWTC:** Low wage tax credit, implemented by Balladur and Juppé between 1993 and 1998
- RSSC:** Reduced social security contributions
- RTT:** Reduced working hours (*réduction du temps de travail*)
- SMIC:** French minimum wage (*salaire minimum de croissance*)
- VLC:** Virtual labour cost (the *ex ante* variation of labour cost) induced by the Fillon reform.
- WTRTC:** Working time reduction tax cut implemented by Mme Aubry and Jospin between 1998 and 2002 (*allègement de cotisations sociales sur les bas et moyens salaires pour les entreprises à 35 heures - mesure Aubry*).

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