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Payroll tax reductions and job flows in France

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Abstract

In France, policies that aim at reducing labour cost have extended to more and more workers since the beginning of the 90s. Evaluations of the effect of payroll tax reduction often use estimations of labour demand equations. In this paper, we estimate the impact of payroll tax cuts on job creations and destructions through the Fillon reform (2003). We consider several panels of establishments and build pseudo panels at the business sector level over 2002-2005. We then use a fixed effect instrumental variable approach we apply to our pseudo panels. Over 2002-2005, we show that increasing PTR increased job creation and decreased job destruction. On the other hand, decreasing PTR seems to let job flows unchanged.

1. Introduction

To reduce unemployment, payroll tax reductions on low wages have been implemented in many European continental countries since the beginning of the 90s. In France, economic policies have extended to more and more workers from the mandatory minimum wage within a fast-growing budget (2.9 billion € in 1992 to 29.9 billion € in 2009). Behind such policies is the view that lower labour costs increase employment. Nevertheless, on the one hand, the empirical effects on employment of payroll tax reduction are not clear. As reported in Blau and Kahn (1999) studies find small impacts on employment. Even for the literature which deals with estimating elasticities the results are rather mixed (Hamermesh, 1993; Layard *et al.*, 1991). On the other hand, when focusing on low skilled workers, results are clearer. As Neumark and Washer (2007) notice, the evidence for "disemployment" effects is strong for these workers. The employment effect of a reform that reduces the labour cost depends on several factors. If we focus on payroll tax reductions (hereafter PTR) paid by the employers, we can isolate three factors that strongly influence the efficiency of such a policy: the structure of the PTR, the elasticity of labour demand and labour supply to labour cost and the effect of PTR on wages. First, with regard to the question of the structure of PTR, the kind of employees who benefit from PTR is essential; that is why we need to differentiate low skilled workers from high skilled workers. Second, the amount of PTR is important according to the elasticity of labour demand to labour costs. Third, since wages and employment are jointly determined, the duration of PTR is crucial.

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Most papers focus on the net employment effect of labour costs. In our paper, we analyse the effect of Payroll Tax Reductions on job flows (hereafter JF), *i.e.* on job creation (hereafter JC) and job destruction (hereafter JD) and more generally on job reallocation (hereafter JR). Our idea is to test whether PTR increases JC or decreases JD through the implementation of the Fillon law (2003) in France. Indeed, some papers about job flows stipulate that job adjustment would be done through job creation in European countries whereas job adjustment would be done through job destruction in the United-States, where the labour market is supposed to be less regulated. We use concepts from the literature on gross job flows (Davis and Haltiwanger's definitions, 1990, 1992, 1999a and b) to estimate the employment effect of PTR. For this study, we merge three French administrative sources over 2002-2005 available at *Insee* (the French national statistical agency) and *Acoss-Urssaf* (the French Central Agency of Social Security Organisations). These *Insee* data enable us to run the analysis by distinguishing unskilled blue and white collar workers (hereafter the low skilled workers), skilled blue and white collar workers (hereafter the medium skilled workers) and managers, engineers, *etc.* (hereafter high skilled workers). The *Acoss-Urssaf* data allow us to get the amounts of PTR received by French establishments.

To evaluate the effect of PTR, we estimate job flows equations along with the empirical literature that deals with JC and JD determinants (Salvanes, 1997; Stiglbauer *et al.*, 2003; Gomez-Salvador *et al.*, 2004; OECD, 2009). We consider 4 establishments' panels over 2002-2005: they are balanced or not, to try to take account for establishments creation or destruction; as well, we distinguish all establishments from those that are the biggest (*i.e.* employing 5 workers or more). Our first idea is then to estimate the relationship between varying PTR and job flows at the establishment level, using within or first-difference models, combining them or not with instrumental variables to take account for the endogeneity of the variation in PTR. However; benefiting from an amount of PTR is not exogenous because it depends on wage and employment structures. Moreover, attempting to estimate the effect of PTR on job flows potentially implies to deal with several other kinds of endogeneity or selection problems. First, for an establishment, wages and employment are jointly determined. Second, net creation and destruction are not observed at the same time for a given establishment. Third, not all establishments employ all types of skills of workers: for instance, an establishment with no low skilled workers has a zero probability to destroy low skilled jobs. Fourth, over 2002-2005, many firms were created and other died. To cope with these problems, we use a pseudo panel data approach (Deaton, 1985 and Verbeek, 2007). We group establishment data at the 2-Digit sectoral level to be able to perform linear regressions by keeping all establishments. Since we have four establishments' panels (balanced or not; employing 5 workers or more, or at least 1 worker), we build four different pseudo panels.

Our findings are the following. First, considering within or first difference estimators on panels of establishments, we show that varying PTR is still positively (resp. negatively) correlated with JC (resp. with JD), once we control for a lot of observed variables as well as for an establishment unobserved fixed effect. Second to deal with the aforementioned problems while evaluating the impact of PTR on JF, we apply the within (fixed-effect) estimator on pseudo panel data that is identical to the instrumental variable estimator on individual data, where the level of aggregation is used as an instrument (Moffitt, 1993). We perform these regressions for overall employment, as well as for the three kinds of workers. We find that increasing PTR implies an increase in JC and a decrease in JD. On the other hand, decreasing PTR let job flows unchanged.

The paper proceeds as follows. Section 2 briefly describes the payroll tax reductions in France. Section 3 surveys literature on micro empirical evidence and motivates for a new analysis. Section 4 presents the data. In Section 5, we displays Job Flows indicators and descriptive statistics dealing with those indicators, as well as with PTR over 2002-2005. Section 6 discusses the estimation strategy. The results and discussion stand in Section 7. Section 8 concludes.

2. Payroll taxes in France: the Fillon reform

After several reforms since 1992, payroll tax reduction programs were harmonised in 2003 (The "Fillon reform"). In particular this last reform aimed at standardizing the different measures that had existed since the decrease in the standard working time duration from 39 down to 35 hours, in 2000. The Fillon reform simultaneously affected several components of labour costs. The minimum wage was raised in an exceptional way, the amount and structure of the payroll tax underwent large-scale change, and the laws governing overtime quota were profoundly modified.

First, the period 2003-2005 saw the harmonisation of six coexisting minimum wages: the five monthly wage guarantees (GMR – *garanties mensuelles de rémunération*) with the level of the 39 hour-minimum wage. In fact, the French minimum wage (called *Smic*) was introduced in 1970; it includes the basic wage, fringe benefits, and all other payments having the *de facto* character of a premium. Until 2009, the level of the hourly minimum wage was revised every year on July 1st according to inflation, half of any increase in hourly blue collar wage levels and possible government extra boosts (from 2010, it is revised the first of January). When the 35-hour work week was introduced in January 2000, one of the principles enshrined in the legislation was a guarantee of the purchasing power of employees earning the minimum wage and benefiting from the working time reduction (WTR). The payment of these employees was determined on the basis of their monthly wage before WTR. So the GMRs correspond to the hourly minimum wage at the time of adoption of the 35-hour work week multiplied by 169 hours. Employees working a 35-hour work week therefore automatically earned a higher hourly wage than the hourly minimum wage for the 39-hour work week.

Table 1a. Levels and evolutions of the GMRs and hourly minimum wage rates through the implementation of the Fillon (2003-2005).

	Juil-01	Juil-02	Juil-03	Juil-04	Juil-05
CPI growth rate		1.63%	1.89%	2.32%	1.72%
Hourly minimum wage (*Smic*)	6.67	6.83	7.19	7.61	8.03
Smic growth rate :		2.40%	5.27%	5.84%	5.52%
GMR1	1 081.21	1 100.67	1 136.15	1 178.54	1 217.88
(*WTR before July 1999*)		1.80%	3.22%	3.73%	3.34%
GMR2	1 094.65	1 114.35	1 145.54	1 183.40	1 217.88
(*WTR after June 1999 and before January 2000*)		1.80%	2.80%	3.30%	2.91%
GMR3	1 113.45	1 133.49	1 158.62	1 190.14	1 217.88
(*WTR after December 1999 and before July 2001*)		1.80%	2.22%	2.72%	2.33%
GMR4	1 127.23	1 147.52	1 168.16	1 195.03	1 217.88
(*WTR after June 2001 and before July 2002*)		1.80%	1.80%	2.30%	1.91%
GMR5		1 154.27	1 172.74	1 197.37	1 217.88
(*WTR after June 2002*)			1.60%	2.10%	1.71%

Sources: *Légifrance* and *Insee.*
Notes*:* Amounts are expressed in Euros. CPI: consumption price index.
Reading: Hourly minimum wage was increased from 6.67 to 6.83 Euros between July 2001 and June 2002; hence, over that time period, the *Smic* rose by 2,4%.

The five "generations" of GMR applied to employees moving towards the 35-hour work week before July 1st 1999, 2000, 2001, 2002 and 2003. Table 1a displays the levels and evolutions of the five GMRs, as well as of the French minimum wage, over 2001-2005.

Second, the Fillon law aims at merging 2 PTR devices. Indeed, at the beginning of 2003, two programs of payroll tax reductions existed. In fact, since June 1996, but before June 1998 and the implementation of the French 35 hours work week, there was a unique device that aimed at reducing employer payroll tax for low wage workers (the low wage payroll tax cut device; hereafter LWPTR). For each worker, every French establishment could benefit from this payroll tax cut that amounts to 18.6% of the wage at the *Smic* level and then decreases linearly towards 0 Euros for a wage that was larger than 1.3 times the minimum wage. In 1998 and 2000, Aubry 1 and 2 laws (the "Aubry reform") were adopted to reduce the standard working week from 39 to 35 hours - starting on 1 January 2000 for companies employing more than 20 people, and on 1 January 2002 for all other firms. The aim was to promote job creation and reduce unemployment by introducing work sharing. The Aubry reform did not oblige firms to adopt a 35-hour working week: firms can choose to reduce effective working time or pay overtime. These laws were an incentive for firms to implement a working time reduction: they diminished the payroll taxes of employers, who reduced the working hours of their employees. To benefit from these payroll tax cuts, firms had to sign agreements with unions to determine the size of the effective reduction in the hours of work, of the increase in hourly wage rates (level of "wage compensation") and the number of new jobs that would be created or preserved. For employees whose hours of work were cut, the working time reduction payroll tax reduction (WTRPTR) amounts to 26% times the wage at the GMR level (see supra), then decreasing linearly until 1.7 times the GMR. Hence, firms that decreased the effective working time of their workers benefited from a more generous system of payroll tax reductions to compensate additional costs of working time reduction. This last device replaces the previous for firms that decrease the working time of their workers. Table 1b displays the four steps through which the Fillon reform merges these two devices, between July 2003 and July 2005.

Table 1b. Changes in PTR devices through the adoption of the Fillon reform (2003-2005).

<table>
<tr><th></th><th>Working Time Reduction
Payroll Tax Reduction</th><th>Low Wage Payroll Tax Reduction</th></tr>
<tr><td>Before July 2003</td><td>1. Maximum reduction: 26% of the gross wage (at the GMR1 level). Linearly decreasing with gross wage until 1.7 times the GMR1, Then stable at 600 euros.</td><td>2. Maximum reduction: 18.6% of the gross wage. Linearly decreasing with it towards 0 eeuros at a wage that is greater than 1.3 times the gross Smic.</td></tr>
<tr><td>Between July 2003 and June 2004</td><td rowspan="2">3. Maximum reduction: 26% of the gross wage (at the GMR level). Linearly decreasing with it towards 0 Euros at 1.7 times the GMR2 (1 January 2000).</td><td>4. Maximum reduction: 20.8% of the gross wage. Decreasing with it towards 0 euros at 1.5 times the Smic.</td></tr>
<tr><td>Between July 2004 and December 2004</td><td rowspan="2">5. Maximum reduction: 23.4% of the gross minimum wage. Decreasing towards 0 euros at 1.6 times the Smic.</td></tr>
<tr><td>Between January 2005 and June 2005</td><td>6. Maximum reduction: 26% of the gross wage. Decreasing towards 0 euros at 1.6 times the GMR2.</td></tr>
<tr><td>Starting on 1 July 2005</td><td colspan="2">7. Maximum reduction: 26% of the gross wage.
Decreasing towards 0 at 1.6 times the Smic.</td></tr>
</table>

Sources: *Légifrance* and *Insee.*

Overall, in France, PTR represents 29.9 billion Euros (Table 1c) and 10.3 % of total payroll tax in 2009. 91 % of PTR are paid with state budget. 70% of PTR correspond to PTR on low wages. Since the beginning of the 90's, PTR has grown from 1.9 million in 1992 to 29.9 millions in 2009. In particular, they sharply rose during the implementation of the French 35 hours work week, between 1998 and 2001 (+7.2 percentage points). Although PTR decreased for WTRPTR establishments and increased for LWPTR establishments while implementing the Fillon reform, the whole amount PTR grew over 2001-2007. As well, the share of PTR in total PT, *i.e.* the ratio of PTR to PT, increased over 2001-2007.

Table 1c. Evolution of payroll tax reduction in France (1992-2009).

	1992	1995	1998	2001	2004	2007	2009
Billion €	1.9	6.2	11	18.2	20.1	27.2	29.9
Share in total Payroll Tax	1.4%	4.1%	6.3%	8.8%	8.9%	10.2%	10.3%

Source: Social Security Organism (Prévot, 2010).

Taking into account the fact that the Fillon reform simultaneously affected several components of labour costs, we want to evaluate to what extent PTR impact job flows, *ie.* job creation, job destruction and more generally job reallocation.

In this paper, we evaluate empirically the impact of the Fillon reform on job flows, considering a different approach to those of Bunel *et al.* (2010) or Simmonet and Terracol (2010).

3. Impact of PTR on employment: a review of the literature

3.1 Effect of PTR on employment

The first study using micro data that analyses the effect of PTR on employment is Hamermesh's (1979). Using the Panel Study of Income Dynamics over the 1968-1974 period of time, the author shows that an increase in payroll tax affects both employment and wages. He finds that an increase of 1% in payroll tax decreases wages by 0.3%. With the same methodology, Gruber (1997) shows that the 1981 reform of the social security system in Chile which reduced payroll tax had no effect on manufacturing employment, but on wages. The PTR only affected wages. Johansen and Klette (1997) analyse the effect on wages of a payroll tax cut for the Norwegian manufacturing industry over 1983-1993. They find that, on average, a reduction of 1% in the labour costs increases the hourly wages by 0.4%. Benmarker, Mellander and Ockert (2009) use a panel of Swedish firms over 2001-2004 to evaluate a modification of the payroll tax legislation that differentiate regions in 2002. They analyse separately continuing firms and firms that enter or exit of the sample. First, they find no employment effect and a positive effect on wages for continuing firms. Second, when they add entries and exits, they find a positive effect on firm entry (an elasticity of around 0.1), and no effect on firm exit; overall, and very interestingly, if there is any positive effect of payroll tax cut, it is through firm entry. Korkeamaki and Uusitalo (2009) use a panel of Finnish firms between 2001 and 2003 to evaluate a modification of the payroll tax legislation. They evaluate the employment and wage effects of PTR for firms which benefit from the payroll tax cut. As in Benmarker *et al.* (2009), the employment effect is only due to firm entry. Cruces *et al.* (2010) use firm administrative data for Argentina to evaluate the relation between payroll tax, wages and employment. They find that changes in payroll partially affect

the wages but have no significant effect on employment. As reported in Blau and Kahn (1999) studies find substantial impacts on wages but small impacts on employment.

For France, some previous studies investigate the relationship between PTR and employment. Crépon and Desplatz (2001) analyse the effect of the reduction in labour cost of low wage workers during the 90s. They use an employer-employee dataset and show that payroll tax reduction increases employment by almost 500,000 employees between 1994 and 1997. Kramarz and Philippon (2001) use the French labour Force surveys over the 1990-1998 time period and show that an increase in labour cost leads to an increase in the probability of losing jobs (the estimated elasticity is 1.5). Bunel, Gilles and L'Horty (2010) analyse the effect on employment and wages of the Fillon reform (2003) by merging three administrative data sources between 2002 and 2005. They show that the impact of the reform is slightly negative for the 35 hours-firms and slightly positive for the 39-hours firms. At the end, the overall effect is ambiguous. Moreover, they show a positive effect on wages for both types of firms. Simmonet and Terracol (2010) estimate the effect of the same reform on transitions from unemployment to employment by distinguishing the two kinds of firms. Their idea is to measure the labour demand as the increase or the decrease in transitions. They show that the Fillon reform decreases transitions for the 35-hours firms and has no effect for the 39-hours firms.

With sectoral data, Jamet (2005) analyses the consequences of PTR on low skilled employment between 1993 and 1997. She finds a positive employment effect on low skilled workers: about 150,000 jobs were created or saved. Gafsi, L'Horty and Mihoubi (2005) also find that 150,000 low skilled jobs were created or saved during the 90's, but they find a negative impact on high skilled jobs. Finally, the overall effect of PTR on whole employment is small.

3.2 Effect of PTR on job flows

Since the mid-80 and the beginning of the 1990s, a lot of papers distinguish job creation and job destruction among net employment variation. In particular, instead of simply considering the net variation in employment, those papers aim at studying job creations and job destructions along with the business cycle. Early papers include those of Leonard (1987), Davis and Haltiwanger (1990; 1992) or Blanchard and Diamond (1991) for the US, Boeri and Cramer (1991) for Germany, or Conti and Revelli (1998) for Italy.

From a theoretical point of view and along with this empirical literature, Mortensen and Pissarides (1994) develop job search and matching models to propose a new way to model labor market, including JC and JD to model unemployment changes. Within this framework, a lot of papers study the consequences on job flows of labour market policy aiming at reducing labour cost, in particular through PTR.

Mortensen and Pissarides (1999) analyze the effect of taxation. The authors consider a job search economy, as well as Nash bargaining on wages and endogenous destruction rates. Studying the impact of changing alternative labor market institutions (unemployment benefit, firing cost, hiring subsidy or PTR), they show that a decrease in PT leads to a decrease in unemployment mainly through a reduction in JD rate. Using the same framework, Sinko (2007) study the impact of PT and tax progression considering different types of wage determination (monopoly union, Nash bargaining or efficiency wages). Under monopoly union, her analytical results are ambiguous. Numerical simulations show that PTR induce an increase in JC (through an increase in the surplus of a match), and a decrease in JD (through a fall in the reservation probability). Combining tax credit and proportional tax in a revenue neutral manner, she shows that tax progression may improve employment if wages are set in a bargaining framework; moreover, tax progression promotes the emergence of less productive jobs and thus lowers average job productivity. This result is confirmed by Pierrard (2005)

who considers a similar framework, considering an intertemporal general equilibrium model and two kinds of workers. The author shows that diminishing employer social contribution impacts positively employment, but this goes more through reducing JD than increasing JC; moreover, PTR targeted at minimum wage increase much more net employment that if it was targeted at other wages. Within a general equilibrium model with three skill levels, but considering exogenous job destruction, Batyra et Sneessens (2010) get the same result through a direct link between JC and minimum wage. Including job competition does not reverse their results but sharply reduces the welfare gains of high skilled workers. The authors thus recommend combining large PTR for low skilled workers, smaller PTR for medium skilled jobs and no rebate at all for high skilled jobs.
Hence, these papers show that PTR should *(i)* increase JC and decrease JD *(ii)* be more efficient if they are more targeted on low skilled (or on low wage) workers.

From an empirical point of view, a recent strand of literature focuses on workers or on job flows magnitude (Job Reallocation, hereafter JR; JC or JD). In fact, Contini and Rivelli (1997), Davis and Haltiwanger (1999), Stiglbauer *et al.* (2003), Bassanini and Marianna (2009), Fuchs and Weyh (2010) or the recent OECD survey (OECD, 2009) aimed at studying job flows determinants. Within the same framework, some recent papers (Salvanes, 1997; Gomez-Salvador *et al.*, 2004; OECD, 2010) tried to evaluate the impact of labor market institutions on job flows. Indeed, studying the effect of labor market rigidities on job turnover for seven countries (Norway, Denmark, Netherlands, Germany, Italy, Canada and the US), Salvanes (1997) shows that job flows tend to decrease through employment protection, whereas it tends to grow through an employment subsidy that increases job creation. As well, using panel data over 1995-2000 for 13 European countries, Gomez-Salvador *et al.* (2004) look at the role of labor market institutional features in the dynamics of job creation and destruction. Their results confirm (negative correlation between employment protection legislation and JF) or complete (negative impact of an employment subsidy on JD, consistent with Leonard and Van Audenrode (1993)) those of Salvanes (1997). They moreover show that the tax wedge (the difference between the labor cost paid by the firm and the consumption wage received by workers, *i.e.* the sum of worker wage and employer payroll taxes) lowers JR through JC.

In this paper, we evaluate empirically the impact of the Fillon reform on job flows, hence considering a different approach to those of Bunel et al (2010) or Simmonet and Terracol (2010).

4. The data

4.1 The data sources

We use data from two different administrative sources available at *Insee* (the French national statistical agency) and three at *Acoss-Urssaf* (*Agence Centrale des Organismes de Sécurité Social,* the French Central Agency of Social Security Organisations). From *Insee*, the first data source is the DADS (*Déclarations Annuelles de Données sociales*), which is a matched employer-employee longitudinal data source, constructed from firm reports to the tax authority. The second source is another administrative source called FICUS (*FiChiers Unifiés de Suse*), which gives us measures of employment, value-added and other economic outcomes for most French firms. From *Acoss-Urssaf,* we use three databases called AROME (*Application du Recouvrement pour l'Observation et la Mesure des Encaissements*), ORME

(*Observation du Recouvrement sur les Mesures d'Emploi*) and SEQUOIA (*Système pour l'Etude QUantitative et l'ObservatIon des Assiettes*). They report information about establishments that benefited from payroll tax reductions.

The *DADS* data source includes data on all workers employed in private and semi public establishments. *Insee* has been receiving information from the tax authority since 1950 in order to elaborate statistics about employment and wages in France. This file is exhaustive and is available from 1993. In this file, all workers and establishments are followed by couple of years. Individual wages, employment periods, age, sex, and the skill level of the workers are extremely precisely measured. In particular, this dataset enables us to run the analysis by distinguishing unskilled blue and white collar workers (hereafter the low skilled workers), skilled blue and white collar workers (hereafter the medium skilled workers), and managers, engineers, *etc.* (hereafter high skilled workers), following the classification of Burnod and Chenu (2001). The firm or establishment identifiers are also known for each observation, where an observation corresponds to a person-establishment-year triplet. However, legal restrictions prevent us from connecting information on individual workers between couples of years. In this article, we use this exhaustive data – aggregated at the establishment level – for the years 2001 to 2005. For each year, we have a sample of approximately 1,500,000 establishments.

The FICUS dataset gives information about the firms to which establishments belong to. This information is available for all firms that are subject to the two major tax regimes. These regimes cover virtually the entire productive system, representing roughly 95 percent of taxable firms in terms of sales. The data were kept for the period 2000-2005. For each year, we have a sample of approximately 2,500,000 firms. They mostly contain various economic situation indicators: value-added, capital investment, firm's profits, *etc.*

We also need information about the nature of the PTR in every firm. For this, we use the *ORME* database provided by *Acoss*. This database allows us to identify different categories of establishments that benefited from PTR over 1999-2005 and to get the precise amount of money the establishment receives as PTR. This chiefly concerns the low wage rebate, the aids associated with Aubry 1 and 2 laws on the reduction of working time, as well as the aids associated with the Fillon reform of 2003.

To get a precise idea of the magnitude of PTR relatively to the wage bill, we have to compute the usual indicator that is the share of PTR out of the total labour cost (including the PTR). For that purpose, we also need information on the whole wage bill, as well as on employers' taxes that are effectively reported by firms. These are provided by two other *Acoss-Urssaf* datasets, *AROME* (for employers' social contributions) and *SEQUOIA* (for wage bill, workforce numbers).

Hence, these three *Acoss-Urssaf* datasets contain aggregate data at the level of each establishment, including the wage bill, workforce numbers, PTR, the payroll taxes due to establishments affiliated to the general social security regime.

4.2 The final datasets

Public establishments were excluded from the final sample, as did the establishments of firms with no right to PTR under the Fillon reform[4]. Firms benefiting simultaneously from two types of aids or discontinuously, as well as holding firms, domestic service firms, temporary employment agencies and public firms were all excluded. We only keep establishments that employ at least one worker. We get rid of firms in which the growth rate

[4] France Telecom, Orange, La Poste, RFF, EDF, GDF, ADP, SNCF, Banque de France, RATP, SEITA.

of employment or of value added, or in which the gross operating surplus are characterised by extreme values[5]. We also drop from final sample all establishments for which the labor productivity and capital intensity take negative values. Finally, establishments for which the ratio of PTR to the whole wage bill is greater than one were also excluded.

As final datasets, we consider 4 kinds of panels that are built at the establishment's level over 2003-2005. They are balanced (perennial establishments over the considered period of time) or not, to try to take account for establishments creation or destruction. As well, we distinguish panels that include all establishments employing 1 worker or more from panels with establishments that are the biggest (employing 5 workers or more). We thus get four panels of establishments. First, Panel 1 contains 116,989 perennial establishments employing 5 workers or more (3,581 million employees); among them there are 53,332 WTRPTR (resp. 64,657 LWPTR establishments) employing 2,230 (resp. 1,351) million employees. Second, Panel 2 is the same as Panel 1 except that it is unbalanced: in particular, it includes 229,751 establishments (5,270 million employees); among them, there are 97,643 WTRPTR (resp. 132,108 LWPTR) establishments that employ 3,124 (resp. 2,144) million employees. Third, Panel 3 is the same as Panel 1 except that it deals with establishments employing 1 worker or more: it contains 383,595 establishments (4,631 million employees) and among them there are 132,534 WTRPTR (resp. 251,061 LWPTR) establishments employing 2,674 (resp. 1,957) million employees. Fourth and finally, like Panel 2, Panel 4 is an unbalanced panel of establishments but they employ 1 worker or more: Panel 4 contains 562,695 establishments (5,972 million employees); among them, there are 185,167 WTRPTR (resp. 377,528 LWPTR) establishments employing 3,352 (resp. 2,619) million employees. Hence, considering Panels 1 to 4 allows us both to distinguish larger establishments from other and also to take account for establishment's demography.

Tables 2a and 2b report the establishment and employment distributions in each of the 4 considered Panels for both WTRPTR and LWPTR establishments. Looking at average establishment size classes, we see that considered samples are composed of a larger part of small establishments if they are unbalanced (Panel 2 vs. 1, or Panel 3 vs. 4) or if they contains all establishments whatever their size (Panels 3 and 4 vs. 1 and 2). Moreover, the main part of workers is employed in smaller establishments, employing fewer than 100 workers Otherwise, there are large differences between the four panels across broad business groups: whatever the panel we consider, there are much more establishments that come from trade (more than 30 percent), or from construction, business or personal services (around 10 percent). On the other hand, most workers are employed in there are more workers in the trade, the business services or intermediate goods business sectors, and far fewer are employed in consumption goods or personal services sectors. The same hold for the four panels and for the two kinds of establishments.

Comparing both WTRPTR and LWPTR establishments, we first see that there are fewer small establishments in the former than in the latter, whatever the kind of panel we consider. For instance, 33.4 (resp. 41.8; resp. 68.9; resp. 70.5) percent of WTRPTR establishments employ fewer than 10 workers in panel 1 (resp. panel 2; resp. panel 3; resp. panel 4) whereas 46.1 (resp. 56.0; resp. 84.2; resp. 85.5) percent of LWPTR establishments employ fewer than 10 workers. As well, in LWPTR establishments, most workers (62 to 72 percent of them) are employed in establishments with fewer than 50 workers; on the contrary, only 33 to 41 percent of workers are employed in such establishments. With regards to business sector of activity, for instance, there are more WTRPTR establishments than LWPTR establishments in the trade industry (34 percent against 29 on average).

[5] All establishments for which there were values smaller than the 1st percentile, or greater than the 99th percentile for at least one of the three quoted variables were dropped.

Table 2a. Distribution of establishments and employment: average size classes and business sectors. *WTRPTR establishments.*

Size classes			Broad business sectors (French NES16)		
	Establishment share (%)	Employment share (%)		Establishment share (%)	Employment share (%)
Panel 1. Balanced panel of establishments employing 5 workers or more.					
Employment < 10	33.4	5.7	Agricultural and food industries	4.3	6.0
10 <= Employment < 20	23.4	7.7	Consumption goods	5.0	7.0
20 <= Employment < 50	25.4	19.0	Car industries	0.6	2.6
50 <= Employment < 100	9.0	14.8	Equipment goods	5.4	9.6
100 <= Employment < 250	6.2	22.1	Intermediate goods	12.2	20.4
250 <= Employment < 500	1.9	15.1	Energy	0.5	1.2
500 <= Employment < 1000	0.5	8.4	Construction	10.3	6.2
1000 <= Employment < 2500	0.1	4.4	Trade	35.9	21.9
Employment >= 2500	0.02	2.9	Transport	4.3	5.4
			Finance	0.4	0.2
			Housing	1.3	0.9
			Business services	12.3	11.7
			Personal services	2.3	1.2
			Education and social services	5.3	5.7
Panel 2. Unbalanced panel of establishments employing 5 workers or more.					
Employment < 10	41.8	8.4	Agricultural and food industries	3.6	5.3
10 <= Employment < 20	22.3	9.0	Consumption goods	4.3	6.5
20 <= Employment < 50	22.1	20.1	Car industries	0.5	2.2
50 <= Employment < 100	7.2	14.3	Equipment goods	4.5	8.6
100 <= Employment < 250	4.7	20.7	Intermediate goods	9.6	17.8
250 <= Employment < 500	1.4	13.7	Energy	0.4	1.1
500 <= Employment < 1000	0.4	7.6	Construction	10.1	6.4
1000 <= Employment < 2500	0.1	3.9	Trade	31.3	20.4
Employment >= 2500	0.02	2.4	Transport	3.8	5.4
			Finance	1.8	1.3
			Housing	1.4	1.0
			Business services	12.7	12.9
			Personal services	11.6	5.8
			Education and social services	4.6	5.2
Panel 3. .Balanced panel of establishments of all sizes.					
Employment < 10	68.9	13.3	Agricultural and food industries	4.4	5.5
10 <= Employment < 20	11.5	8.0	Consumption goods	3.5	6.4
20 <= Employment < 50	11.9	18.7	Car industries	0.3	2.2
50 <= Employment < 100	3.9	13.5	Equipment goods	3.3	8.5
100 <= Employment < 250	2.6	19.7	Intermediate goods	6.6	18.0
250 <= Employment < 500	0.8	13.3	Energy	0.2	1.1
500 <= Employment < 1000	0.2	7.3	Construction	11.6	6.5
1000 <= Employment < 2500	0.05	3.9	Trade	35.4	22.2
Employment >= 2500	0.01	2.4	Transport	2.8	5.0
			Finance	0.5	0.2
			Housing	1.5	1.0
			Business services	10.2	11.7
			Personal services	15.5	6.5
			Education and social services	4.0	5.2
Panel 4.Unbalanced panel of establishments of all sizes.					
Employment < 10	70.5	14.3	Agricultural and food industries	4.3	5.2
10 <= Employment < 20	11.3	8.3	Consumption goods	3.4	6.2
20 <= Employment < 50	11.2	18.8	Car industries	0.3	2.1
50 <= Employment < 100	3.6	13.4	Equipment goods	3.3	8.1
100 <= Employment < 250	2.4	19.3	Intermediate goods	6.2	17.0
250 <= Employment < 500	0.7	12.8	Energy	0.2	1.0
500 <= Employment < 1000	0.2	7.1	Construction	12.1	6.8
1000 <= Employment < 2500	0.05	3.8	Trade	33.7	21.5
Employment >= 2500	0.01	2.2	Transport	2.8	5.2
			Finance	1.8	1.4
			Housing	1.6	1.1
			Business services	11.1	12.7
			Personal services	15.1	6.6
			Education and social services	4.1	5.0

Source: AROME, ORME and SEQUOIA (*Acoss-Urssaf*) databases, DADS and FICUS (*Insee*).
Field: Establishments coming from the private non-farm business and semi-public sectors over 2003-2005.

Table 2b. Distribution of establishments and employment: average size classes and business sectors. LWPTR establishments.

Size classes			Broad business sectors (French NES16)		
	Establishment share (%)	Employment share (%)		Establishment share (%)	Employment share (%)
Panel 1. Balanced panel of establishments employing 5 workers or more.					
Employment < 10	46.1	16.4	Agricultural and food industries	3.7	3.1
10 <= Employment < 20	30.2	20.1	Consumption goods	3.7	5.6
20 <= Employment < 50	17.6	25.9	Car industries	0.5	0.8
50 <= Employment < 100	3.7	12.3	Equipment goods	6.4	9.3
100 <= Employment < 250	1.9	13.7	Intermediate goods	11.4	14.9
250 <= Employment < 500	0.4	5.6	Energy	0.2	0.4
500 <= Employment < 1000	0.1	3.3	Construction	20.9	16.5
1000 <= Employment < 2500	0.03	2.2	Trade	27.9	23.4
Employment >= 2500	<0.01	0.4	Transport	7.8	9.0
			Finance	0.4	0.5
			Housing	1.4	0.8
			Business services	10.5	11.2
			Personal services	2.1	2.0
			Education and social services	3.2	2.5
Panel 2. Unbalanced panel of establishments employing 5 workers or more.					
Employment < 10	56.0	22.3	Agricultural and food industries	3.3	2.8
10 <= Employment < 20	25.4	20.1	Consumption goods	3.4	5.0
20 <= Employment < 50	13.9	24.2	Car industries	0.4	0.7
50 <= Employment < 100	2.8	11.2	Equipment goods	5.4	8.3
100 <= Employment < 250	1.4	11.9	Intermediate goods	9.0	12.4
250 <= Employment < 500	0.3	5.0	Energy	0.2	0.4
500 <= Employment < 1000	0.08	3.0	Construction	19.3	15.9
1000 <= Employment < 2500	0.03	2.0	Trade	25.2	21.5
Employment >= 2500	<0.01	0.3	Transport	7.0	8.5
			Finance	0.9	1.3
			Housing	1.7	1.1
			Business services	11.8	12.8
			Personal services	9.4	6.8
			Education and social services	3.1	2.5
Panel 3. Balanced panel of establishments of all sizes.					
Employment < 10	84.2	35.8	Agricultural and food industries	4.7	3.4
10 <= Employment < 20	9.0	16.1	Consumption goods	2.8	4.7
20 <= Employment < 50	5.0	19.8	Car industries	0.2	0.6
50 <= Employment < 100	1.0	9.4	Equipment goods	3.2	7.4
100 <= Employment < 250	0.5	10.1	Intermediate goods	5.3	11.7
250 <= Employment < 500	0.1	4.3	Energy	0.1	0.3
500 <= Employment < 1000	0.03	2.4	Construction	16.8	15.9
1000 <= Employment < 2500	0.01	1.8	Trade	32.1	24.7
Employment >= 2500	<0.01	0.	Transport	4.2	7.4
			Finance	0.4	0.5
			Housing	2.1	1.3
			Business services	8.7	10.8
			Personal services	15.1	8.5
			Education and social services	4.1	2.6
Panel 4. Unbalanced panel of establishments of all sizes.					
Employment < 10	85.5	37.3	Agricultural and food industries	4.6	3.3
10 <= Employment < 20	8.4	16.1	Consumption goods	2.8	4.6
20 <= Employment < 50	4.6	19.4	Car industries	0.2	0.6
50 <= Employment < 100	0.9	9.0	Equipment goods	3.1	7.1
100 <= Employment < 250	0.5	9.5	Intermediate goods	4.8	10.7
250 <= Employment < 500	0.1	4.1	Energy	0.1	0.3
500 <= Employment < 1000	0.03	2.4	Construction	16.7	16.0
1000 <= Employment < 2500	0.01	1.6	Trade	31.1	24.0
Employment >= 2500	<0.01	0.2	Transport	4.2	7.4
			Finance	0.8	1.1
			Housing	2.3	1.4
			Business services	9.7	12.2
			Personal services	15.1	8.7
			Education and social services	4.5	2.7

Source: AROME, ORME and SEQUOIA (Acoss-Urssaf), DADS and FICUS (Insee).
Field: Establishments coming from the private non-farm business and semi-public sectors over 2003-2005.

Otherwise, WTRPTR establishments employ much more workers than LWPTR establishments (18 percent against 13 percent) in the intermediate good industries. Thus WTRPTR and LWPTR industries refer to quite different establishments.

Tables 3a and 3b give further information over all four panels and both kinds of establishments. In particular, it confirms findings of Tables 2a and 2b (Establishment features) for both WTRPTR and LWPTR establishments. Moreover, labour productivity is greater in panels that contains a larger part of small establishments that are not perennial (unbalanced panels 2 and 4); the same can be observed for capital intensity. As to the population of workers that is employed by establishments, Table 3b show in LWPTR establishments there is a greater part of unskilled workers in panels with smaller establishments (panels 3 and 4 vs. 1 and 2); the same findings hold for the share of women or of workers aged less than 30 years old, to a lesser extent. Finally, as expected, wages are larger for more skilled workers.

However, they are smaller in panels that contain also small establishments (employing 1 to 5 workers - panels 3 and 4).

If we distinguish WTR and LW establishments, we see that capital intensity is larger in LW establishments. As well, the share of unskilled workers is smaller, but that of part-time workers or of women is greater in LW than in WTR establishments. Wages are on average (slightly) smaller in LW than in WTR establishments.

Hence, even if it may seem to be more convenient to follow the same establishments across time to study the impact of the PTR on job flows, we may suffer from a lack of information considering only balanced panels 1 and 3. As well, for both WTR and LW establishments, it is interesting to cope with all establishments whatever their size, or focusing only on larger ones. Finally, it is valuable to distinguish WTR and LW establishments. That is why we will work with our four panels (balanced or not; employing 1 worker or more or 5 workers or more) for both kinds of WTR / LW establishments.

Table 3a. Sample characteristics. Means or sums over 2003-2005. *WTRPTR establishments.*

Variables / Samples	Panel 1	Panel 2	Panel 3	Panel 4
Number of establishments:	53,332	97,643	132,534	185,167
Total number of workers:[a]	2,273	3,125	2,674	3,352
Establishment features:				
Average number of workers in an establishment	42.7	34.7	20.2	18.8
Small establishments (< 20 workers)[b]	56.8%	64.1%	80.5%	81.8%
Firms with more than one establishment	41.2%	40.9%	32.8%	32.9%
Average employment growth rate:	0.1%	0.4%	-0.1%	-0.2%
Performance indicators:				
Establishment profit ratio	18.0%	77.6%	18.0%	18.6%
Value added growth rate	5.1%	10.2%	4.8%	6.1%
Labor productivity	54.85	99.36	48.25	50.67
Capital intensity:	114.42	298.92	89.26	237.9
Workers:				
Part of low skilled workers	24.8%	25.8%	26.7%	26.2%
Part of medium skilled workers	41.1%	39.6%	39.5%	39.3%
Part of high skilled workers	34.1%	34.6%	33.8%	34.5%
Part-time workers	10.8%	11.6%	12.0%	12.0%
Part of women	35.7%	36.6%	37.4%	37.5%
Part of workers aged less than 30 years old	20.2%	21.7%	21.8%	21.9%
Part of workers older than 49 years old	21.1%	20.4%	20.4%	20.3%
Average hourly wage rates:				
All workers	19.38	18.90	17.22	17.31
Low skilled workers	13.50	13.29	12.98	12.95
Medium skilled workers	15.26	15.09	14.70	14.70
High skilled workers	26.65	25.71	24.41	24.41
Average annual wages:				
All workers	36,086	35,147	34,678	34,616
Low skilled workers	20,985	20,266	20,272	20,134
Medium skilled workers	28,112	27,627	27,568	27,373
High skilled workers	50,192	49,286	48,711	48,564

Sources: AROME, ORME and SEQUOIA (*Acoss-Urssaf*), DADS and FICUS (*Insee*).
Field: Firms employing 1 worker or more and coming from the private non-farm business and semi-public sectors over 2003-2005.
Notes: [a]Thousands of workers; [b]Percentage of establishments that employ fewer than 20 workers.

Table 3b. Sample characteristics. Means or sums over 2003-2005. *LWPTR establishments.*

Variables / Samples	Panel 1	Panel 2	Panel 3	Panel 4
Number of establishments:	64,657	132,108	251,061	377,528
Total number of workers:[a]	1,351	2,144	1,957	2,619
Establishment features:				
Average number of workers in an establishment	20.9	17.4	7.7	7.2
Small estab. (< 20 workers)[b]	76.3%	81.5%	93.2%	93.9%
Firms with more than one establishment	19.6%	18.3%	13.6%	13.5%
Average employment growth rate:	0.7%	1.7%	0.7%	0.7%
Performance indicators:				
Establishment profit ratio	17.9%	19.8%	18.0%	21.5%
Value added growth rate	3.6%	1.4%	3.5%	-0.7%
Labor productivity	68.24	71.80	63.40	71.57
Capital intensity:	217.07	562.03	178.46	557.0
Workers:				
Part of low skilled workers	18.5%	19.7%	22.7%	22.3%
Part of medium skilled workers	47.6%	45.2%	45.4%	44.8%
Part of high skilled workers	33.9%	35.0%	31.9%	33.0%
Part-time workers	7.4%	7.9%	10.1%	10.3%
Part of women	28.1%	29.1%	31.3%	31.6%
Part of workers aged less than 30 years old	20.5%	22.0%	22.0%	22.3%
Part of workers older than 49 years old	21.1%	20.4%	20.9%	20.7%
Average hourly wage rates:				
All workers	18.78	18.47	16.26	16.26
Low skilled workers	13.36	13.19	12.56	12.24
Medium skilled workers	15.08	14.88	14.21	14.20
High skilled workers	28.52	27.37	25.58	25.32
Average annual wages:				
All workers	36,219	35,872	33,728	33,801
Low skilled workers	21,685	21,050	20,471	20,276
Medium skilled workers	27,812	27,348	26,759	26,530
High skilled workers	55,074	53,944	52,208	51,881

Sources: AROME, ORME and SEQUOIA (*Acoss-Urssaf*), DADS and FICUS (*Insee*).
Field: Firms employing 1 worker or more and coming from the private non-farm business and semi-public sectors over 2003-2005.

Notes: [a]Thousands of workers; [b]Percentage of establishments that employ fewer than 20 workers.

5. Job Flows and PTR over 2002-2005

In the first part of this section, we present concepts from the literature on gross job flows to estimate the employment effect of PTR. We use the Davis and Haltiwanger's definitions (1999). These definitions are well-known but it is always useful and practical to remember them. In the second part of this Section, we display descriptive statistics dealing with job flows and PTR.

5.1 Job flows measures

Net job creation in t is measured by the difference in the jobs created between $t-1$ and t for an establishment e which increases employment: $C_{est} = \Delta EMP_{est}$ if $\Delta EMP_{est} > 0$; $= 0$ if $\Delta EMP_{est} \leq 0$. The opposite definition is considered for job destruction: $D_{est} = -\Delta EMP_{est}$ if $\Delta EMP_{est} < 0$; $= 0$ if $\Delta EMP_{est} \geq 0$. Considering average employment level over *[t-1; t]*, $Z_{est} = 0.5\left(EMP_{est} + EMP_{est-1}\right)$, we thus get net job flows (job creation, destruction and reallocation rates) at the establishment level:

$$JCR_{est} = \frac{C_{est}}{Z_{est}},\ JDR_{est} = \frac{D_{est}}{Z_{est}},\ JRR_{est} = \frac{C_{est} + D_{est}}{Z_{est}}$$

The same kind of expressions can be given to define such flows for a given skill. However, net job creation and destruction are never computable at the same time for a given establishment. The same hold as we consider the level of a given skill. Davis and Haltiwanger (1999) provide formulas for gross job flows ate the business sector *s* level in t :

$$C_{st} = \sum_{e \in S^+} \Delta EMP_{est}$$

where S^+ is the sub-set of establishments e that increase employment between $t-1$ and t and $\Delta EMP_{est} = EMP_{est} - EMP_{est-1}$ is the employment variation between *t-1* and *t* within a given establishment *e*.

Conversely, gross job destruction in t is measured by the difference in the jobs destroyed between $t-1$ and t for an establishment that reduces employment. For the sector s in t :

$$D_{st} = \sum_{e \in S^-} \left|\Delta EMP_{est}\right|$$

where S^- is the sub-set of establishments e that reduce employment between $t-1$ and t .

Gross job reallocation in t is measured by the sum of job creation and job destruction between $t-1$ and t :

$$R_{st} = C_{st} + D_{st}$$

In order to express the previous measures as rates, we need the sector size. We take its average size between S^+ and t :

$$Z_{st} = 0.5\left(EMP_{st} + EMP_{st-1}\right)$$

Hence, creation, destruction and reallocation rates the sector s are written:

$$JCR_{st} = \frac{C_{st}}{Z_{st}},\ JDR_{st} = \frac{D_{st}}{Z_{st}},\ JRR_{st} = \frac{R_{st}}{Z_{st}} \qquad (1)$$

As well, we can define job flows measures for each skill. Indeed, we can show that we have:

$$\sum_{e \in Q^+} \Delta EMP_{est}^q = \sum_{e \in S^+ \cap Q^+} \Delta EMP_{est}^q + \sum_{e \in S^- \cap Q^+} \Delta EMP_{est}^q$$

for each skill $q=L$ (low), M (medium) or H (high) worker with $q \in Q$ and for each establishment that create employment within the category of q-skilled workers ($e \in Q^+$).
As above for all workers, we consider the average number of the q-skilled workers employed in $t-1$ and t to get the sector s gross job creation rate for the q-skilled workers:

$$JCR^q_{st} = \frac{\sum_{e \in q^+} \Delta EMP^q_{est}}{Z^q_{st}}$$

In a similar way, we calculate JDR^q_{st} and JRR^q_{st}.

5.2 Linking the magnitude of job flows with PTR

Tables 4a and 4b display usual descriptive statistics on job flows for all workers[6]. First, and as usual, Tables 4 show that job reallocation rates decrease with the average size of the firm; this relation is mainly due to that of job creation rates with average firm size. Moreover, job reallocation rates are larger among services than among manufacturing industries. These conclusions hold for all four panels, but job reallocation rates are greater in panels that also contain small or non-perennial establishments. Second, the same kinds of findings are found for both WTR and LW establishments.

[6] The same statistics are also available for any type of workers (*i.e.* according to skill groups).

Table 4a. Job flows, average firm size and business sectors. *WTRPTR establishments.*

Sample	Panel 1			Panel 2			Panel 3			Panel 4		
Type of reallocation	JRR	JCR	JDR	JRR	JCR	JDR	JRR	JCR	JDR	JRR	JCR	JDR
By sector of operation:												
Manufacturing:												
Agricultural and food industries	6.2[a]	3.1	3.0	6.8[a]	3.6	3.2	6.9[a]	3.6	3.4	7.4[a]	3.8	3.7
Consumption goods	6.9	2.7	4.2	7.7	3.1	4.6	7.8	3.1	4.6	8.3	3.3	5.1
Car industries	6.0	2.2	3.7	6.3	2.6	3.7	6.5	2.6	3.8	6.4	2.5	3.9
Equipment goods	6.4	2.9	3.5	7.1	3.1	4.0	7.0	3.1	3.9	7.5	3.1	4.4
Intermediate goods	6.3	2.3	3.9	6.6	2.5	4.2	6.8	2.4	4.3	7.1	2.5	4.6
Energy	4.8	2.3	2.5	5.6	3.0	2.6	5.4	2.7	2.7	5.9	3.2	2.7
Services:												
Construction	8.0	4.7	3.2	9.1	5.6	3.5	9.4	5.4	4.0	10.2	5.8	4.4
Trade	6.5	3.5	3.0	7.4	4.2	3.2	7.7	4.1	3.6	8.3	4.4	4.9
Transport	7.0	3.7	3.2	7.6	4.4	3.3	8.2	4.1	4.1	8.7	4.4	6.3
Finance	9.7	4.3	5.4	9.3	4.5	4.9	11.8	5.8	6.0	10.8	4.6	6.2
Housing	7.4	4.2	3.1	8.9	5.1	3.8	9.3	5.2	4.1	10.3	5.4	4.9
Business services	9.2	5.4	3.8	10.8	6.6	4.2	10.6	6.0	4.5	11.7	6.6	5.2
Personal services	7.3	3.6	3.6	8.2	4.2	4.0	9.0	4.3	4.7	9.5	4.5	4.9
Education and social services	5.9	4.1	1.8	6.5	4.5	2.0	6.6	4.4	2.1	6.9	4.6	2.3
By average estab. size:												
Employment < 10	9.2	5.6	3.7	11.4	7.9	3.5	11.9	6.5	5.3	12.7	6.9	5.7
10 <= Employment < 20	9.3	5.2	4.1	10.1	5.6	4.4	9.9	5.4	4.5	10.7	5.8	4.9
20 <= Employment < 50	7.7	4.2	3.5	8.4	4.6	3.9	8.2	4.3	3.9	8.9	4.6	4.3
50 <= Employment < 100	6.9	3.5	3.4	7.8	4.1	3.7	7.4	3.8	3.7	8.2	4.1	4.1
100 <= Employment < 250	6.5	3.1	3.2	7.0	3.5	3.6	7.0	3.3	3.7	7.5	3.5	4.0
250 <= Employment < 500	5.6	2.4	3.4	6.2	2.8	3.4	6.2	2.7	3.5	6.6	2.8	3.8
500 <= Employment < 1000	5.4	1.9	3.4	5.8	2.2	3.7	5.7	1.9	3.7	6.0	2.1	3.9
1000 <= Employment < 2500	5.6	2.9	2.7	6.1	2.8	3.2	6.6	2.8	3.7	7.3	2.8	4.5
Employment >= 2500	4.2	1.3	2.9	4.7	1.2	3.5	4.2	1.3	2.9	4.7	1.2	3.5

Sources: AROME, ORME and SEQUOIA (*Acoss-Urssaf*), DADS and FICUS (*Insee*).
Field: Establishments coming from the private non-farm business and semi-public sectors over 2002-2005.
Note: [a]Percentage of the average employment rate computed over *t* and *t-1*.

Table 4b. Job flows, average firm size and business sectors. *LWPTR establishments.*

Sample	Panel 1			Panel 2			Panel 3			Panel 4		
Type of reallocation	JRR	JCR	JDR	JRR	JCR	JDR	JRR	JCR	JDR	JRR	JCR	JDR
By sector of operation:												
Manufacturing:												
Agricultural and food industries	8.1[a]	4.5	3.6	9.2[a]	5.5	3.7	10.1[a]	5.3	4.7	10.7[a]	5.6	5.1
Consumption goods	7.6	3.7	3.9	8.7	4.5	4.2	9.1	4.3	4.7	10.2	4.7	5.5
Car industries	6.3	2.9	3.4	7.0	3.4	3.6	7.0	3.3	3.7	7.5	3.4	4.1
Equipment goods	7.1	3.1	4.0	8.2	4.0	4.2	8.2	3.7	4.5	9.0	4.1	4.9
Intermediate goods	7.1	3.2	3.9	7.9	3.7	4.1	8.1	3.6	4.5	8.6	3.9	4.8
Energy	5.9	4.0	1.9	7.1	5.1	1.9	7.9	5.6	2.3	7.7	5.3	2.4
Services:												
Construction	8.2	4.7	3.5	9.5	5.9	3.6	10.3	5.7	4.6	11.1	6.2	4.9
Trade	7.7	4.5	3.2	9.0	5.6	3.4	9.9	5.4	4.5	10.7	5.8	4.9
Transport	8.0	4.8	3.2	9.3	5.8	3.5	9.3	5.4	3.9	10.2	5.9	4.3
Finance	8.8	3.3	5.4	8.2	4.0	4.2	10.3	4.3	6.1	9.5	4.4	5.0
Housing	9.7	6.1	3.6	12.5	9.0	3.5	13.5	7.9	5.6	14.8	8.6	6.2
Business services	9.5	5.4	4.2	11.7	7.3	4.4	11.6	6.4	5.2	13.1	7.3	5.8
Personal services	9.2	5.3	3.9	9.9	5.8	4.1	11.7	6.3	5.5	12.6	6.5	6.0
Education and social services	7.8	5.2	2.6	9.4	6.7	2.8	9.9	6.4	3.6	10.9	6.8	4.1
By average estab. size:												
Employment < 10	9.4	5.7	3.7	12.1	8.7	3.5	12.8	7.0	5.8	13.8	7.6	6.3
10 <= Employment < 20	9.1	5.0	4.2	10.0	5.5	4.5	9.8	5.2	4.6	10.6	5.6	5.0
20 <= Employment < 50	7.8	4.2	3.5	8.6	4.8	3.8	8.4	4.5	3.9	9.1	4.9	4.2
50 <= Employment < 100	7.3	4.0	3.2	8.0	4.4	3.6	7.8	4.2	3.6	8.5	4.5	4.0
100 <= Employment < 250	6.6	3.7	2.9	7.4	4.2	3.2	7.1	3.9	3.2	7.7	4.3	3.5
250 <= Employment < 500	6.3	2.8	3.5	6.5	2.8	3.6	6.8	3.0	3.9	7.3	2.9	4.3
500 <= Employment < 1000	6.5	2.5	4.0	7.8	3.5	4.3	7.9	2.8	5.0	8.9	3.4	5.5
1000 <= Employment < 2500	5.9	2.2	3.7	6.2	2.0	4.2	6.9	2.4	4.5	7.6	2.3	5.3
Employment >= 2500	4.6	0.5	4.1	4.6	0.5	4.1	4.6	0.5	4.1	4.6	0.5	4.1

Sources: AROME, ORME and SEQUOIA (*Acoss-Urssaf*), DADS and FICUS (*Insee*).
Field: Establishments coming from the private non-farm business and semi-public sectors over 2002-2005.
Note: [a]Percentage of the average employment rate computed over *t* and *t-1*.

Let us now have a look at JF over 2003-2005 (Tables 5a and 5b). First, in both kinds of establishments, Tables 5 show larger JF for low skilled workers than for medium skilled workers, and for medium than for high skilled workers (even to a lesser extent in this case). Second, we distinguish both kinds of establishments. Considering WTR establishments, on the one hand, JR tends to increase or remain stable; it is more noticeable at the skill level. Looking at evolutions in the components of JR – *i.e.* JC and JD, we see differences among skills. Indeed, there is a decrease in JC that is larger for high skilled workers than for medium

or low skilled workers. As well, JD decreases for low or medium skilled workers whereas they remain unchanged for high skilled workers[7].

On the other hand, considering LW establishments, JR increase slowly; the same hold at the skill level: JC increase for low, medium skilled workers, whereas they decrease for high skilled workers. Finally, JD diminish for low or medium skilled workers, whereas they increase for high skilled workers.

These results hold for all our panels. These descriptive statistics are very informative as to the economic situation that prevails over 2003-2005. Indeed, this time period corresponds to a recession or at least to a period characterized by low output growth rate, which may explain why job creations decrease or job destruction rate often increase.

Table 5a. Job flows for the different population of workers under consideration. *WTRPTR establishments.*

Population	All workers			Low skilled workers			Medium skilled workers			High skilled workers		
Type of reallocation	JRR	JCR	JDR	JRR	JCR	JDR	JRR	JCR	JDR	JRR	JCR	JDR
Panel 1. Balanced panel of establishments employing 5 workers or more.												
2003	6.77[a]	3.53	3.24	19.38	9.23	10.15	15.05	7.21	7.84	14.24	8.30	5.94
2004	6.65	3.25	3.40	16.68	7.43	9.26	13.34	6.45	6.89	12.59	7.00	5.58
2005	7.11	3.52	3.59	17.44	8.94	8.50	13.72	6.25	7.47	12.94	6.94	6.00
Panel 2. Unbalanced panel of establishments employing 5 workers or more.												
2003	7.79	4.06	3.73	20.58	9.86	10.73	16.67	8.05	8.62	9.06	9.48	6.74
2004	7.54	3.89	3.65	17.74	8.27	9.47	14.93	7.30	7.63	7.93	8.91	5.98
2005	8.00	4.31	3.70	18.18	9.63	8.54	15.23	7.37	7.86	7.98	8.53	6.46
Panel 3. Balanced panel of establishments of all sizes.												
2003	7.80	3.98	3.82	20.94	9.87	11.07	17.09	8.29	8.80	16.41	9.24	7.17
2004	7.66	3.74	3.93	18.28	8.29	9.99	15.41	7.42	7.99	14.63	8.04	6.58
2005	8.23	4.05	4.18	19.00	9.77	9.24	16.06	7.46	8.60	15.18	7.84	7.33
Panel 4. Unbalanced panel of establishments of all sizes.												
2003	8.63	4.23	4.40	22.22	10.49	11.73	18.06	8.55	9.50	17.41	9.49	7.92
2004	8.32	4.00	4.32	19.32	8.81	10.51	16.42	7.73	8.68	15.28	8.37	6.91
2005	8.78	4.41	4.37	19.71	10.14	9.56	16.83	7.95	8.87	15.84	8.29	7.55

Sources: AROME, ORME and SEQUOIA (*Acoss-Urssaf*), DADS and FICUS (*Insee*).
Field: Establishments coming from the private non-farm business and semi-public sectors over 2003-2005.
Note: [a]Percentage.

[7] Note that JC and JD are negatively correlated whatever the population of workers we consider (correlations are larger in panels with non-perennial or smaller establishments. Moreover, given a couple of skills (for instance low and medium skilled workers), JC (or JD) are negatively correlated; these correlations are larger for low skilled workers. By the end, given a couple of skills, JC of one kind of worker is positively correlated to JD of another kind of workers; these correlations are smaller if considering low and high skilled workers. These facts hold for WTR and LW establishments, as well as for all four panels. Corresponding tables are available in appendix (Tables A1 to A3).

Table 5b. Job flows for the different population of workers under consideration. *LWPTR establishments.*

Population	All workers			Low skilled workers			Medium skilled workers			High skilled workers		
Type of reallocation	JRR	JCR	JDR	JRR	JCR	JDR	JRR	JCR	JDR	JRR	JCR	JDR
Panel 1. Balanced panel of establishments employing 5 workers or more.												
2003	7.92[a]	4.33	3.59	25.43	12.42	13.00	15.19	7.88	7.31	16.00	8.87	7.14
2004	7.76	4.20	3.55	24.19	11.73	12.46	14.77	7.58	7.19	14.93	8.36	6.58
2005	8.07	4.44	3.63	24.59	12.36	12.24	15.07	8.10	6.97	15.70	8.21	7.49
Panel 2. Unbalanced panel of establishments employing 5 workers or more.												
2003	9.21	5.16	4.05	26.57	13.49	13.08	17.41	9.01	8.40	17.70	9.93	7.77
2004	9.13	5.39	3.75	25.61	13.16	12.45	16.76	8.92	7.83	16.69	9.78	6.91
2005	9.56	5.94	3.63	26.49	14.33	12.16	17.49	10.08	7.40	17.85	9.88	7.97
Panel 3. Balanced panel of establishments of all sizes.												
2003	9.79	5.18	4.61	28.23	14.14	14.09	19.35	9.81	9.54	20.01	10.69	9.32
2004	9.80	5.12	4.68	27.14	13.19	13.95	18.78	9.37	9.40	18.93	10.45	8.48
2005	10.1	5.52	4.58	27.80	14.33	13.47	19.55	10.59	8.96	20.17	10.10	10.07
Panel 4. Unbalanced panel of establishments of all sizes.												
2003	10.79	5.52	5.26	29.72	14.86	14.86	20.81	10.29	10.52	21.16	11.13	10.02
2004	10.74	5.59	5.14	28.71	13.95	14.76	20.09	9.99	10.10	19.88	10.97	8.91
2005	10.98	6.14	4.84	29.54	15.34	14.20	20.72	11.40	9.33	21.27	10.82	10.45

Sources: AROME, ORME and SEQUOIA (*Acoss-Urssaf*), DADS and FICUS (*Insee*).
Field: Establishments coming from the private non-farm business and semi-public sectors over 2003-2005.
Note: [a]Percentage.

Section 2 showed that the overall amounts of PTR given to firms rose over 2003-2005 considering the whole economy. However, it also recalls that WTR and LW establishments experiment from two different evolutions in PTR through the Fillon reform. First, in WTR establishments, Table 6a thus shows that PTR decrease sharply either considering whole amounts or rate of PTR; in particular, the PTR rate diminished by 1.15 (panel 4 – unbalanced panel of establishments employing 1 worker or more) to 1.36 (panel 1 – balanced panel of establishments employing 5 workers or more) percentage point between before and after the implementation of the Fillon reform. Second, and on the contrary, in Table 6b, we see that PTR rate increased over 2002-2005 by 2.49 (panel 2 – unbalanced panel of establishments employing 5 workers or more) to 2.70 (panel 3 – balanced panel of establishments employing 1 worker or more).

The question we ask next is to what extent the variations in JF over 2002-2005 can be related to the evolutions in PTR in both kinds of establishments.

Table 6a. Payroll tax cuts: overall amounts and tax cuts rates. *WTRPTR establishments.*

Year / PTR	Overall amounts[a]	Tax cuts rates[b]
Panel 1. Balanced panel of establishments employing 5 workers or more.		
2002	3,303,645,895	5.59
2003	3,206,710,285	5.28
2004	2,973,686,355	4.76
2005	2,701,104,667	4.23
Panel 2. Unbalanced panel of establishments employing 5 workers or more.		
2002	4,482,519,816	5.63
2003	4,318,959463	5.45
2004	3,907,985,874	4.92
2005	3,505,548,312	4.46
Panel 3. Balanced panel of establishments of all sizes.		
2002	4,076,688,850	5.84
2003	4,016,631,068	5.60
2004	3,776,608,018	5.12
2005	3,454,376,773	4.59
Panel 4. Unbalanced panel of establishments of all sizes.		
2002	4,969,227,155	5.75
2003	4,815,294,005	5.60
2004	4,345,929,989	5.06
2005	3,871,114,049	4.60

Sources: AROME, ORME and SEQUOIA (*Acoss-Urssaf*), DADS and FICUS (*Insee*).
Field: Establishments coming from the private non-farm business and semi-public sectors over 2002-2005.
Notes: [a]Euros; [b]Percentage.

Table 6b. Payroll tax cuts: overall amounts and tax cuts rates. *LWPTR establishments.*

Year / PTR	Overall amounts[a]	Tax cuts rates[b]
Panel 1. Balanced panel of establishments employing 5 workers or more.		
2002	632,568,462	1.69
2003	828,408,760	2.15
2004	1,255,123,624	3.21
2005	1,692,914,231	4.24
Panel 2. Unbalanced panel of establishments employing 5 workers or more.		
2002	912,257,806	1.75
2003	1,196,989,013	2.20
2004	1,775,093,941	3.21
2005	2,402,103,042	4.24
Panel 3. Unbalanced panel of establishments of all sizes.		
2002	1,097,322,104	2.12
2003	1,410,222,692	2.64
2004	2,064,164,543	3.74
2005	2,742,703,341	4.82
Panel 4. Unbalanced panel of establishments with all sectors		
2002	1,369,841,788	2.14
2003	1,760,456,766	2.65
2004	2,487,874,177	3.69
2005	3,224,463,433	4.75

Sources: AROME, ORME and SEQUOIA (*Acoss-Urssaf*), DADS and FICUS (*Insee*).
Field: Establishments coming from the private non-farm business and semi-public sectors over 2002-2005.
Notes: [a]Euros; [b]Percentage.

If we have a look at Tables 7a and 7b, whatever the kind of panel or of establishments we consider, Spearman correlation coefficients between JF and variation in PTR rates seem to be rather informative.

First, considering all workers, independently from any skill, and as expected, we see that JC and variation in PTR are positively correlated, as expected. The same hold for both LW or WTR establishments. On the contrary, there are negative correlations if we consider JD and variation in PTR, either considering LW establishments or WTR establishments.

Second, if we distinguish among workers, whatever the panel we consider and the kind of establishments (WTR or LW), variations of PTR are positively correlated with JC and negatively with JD for low-skilled and medium skilled workers. On the other hand, we have the contrary for JC and high skilled workers; the same hold for JD.

These findings are consistent with the fact PTR are targeted on low and medium wages / skills.

Even these correlations are expected, they do not represent any causal effects of varying PTR through the Fillon reform. The next two sections present the framework we use to evaluate the impact of the PTR on WTR and LW establishments, and then display corresponding results.

Table 7a. Job flows and variation in payroll tax cuts. Spearman correlation coefficients (2003-2005). *WTRPTR establishments.*

Type of reallocation / Population	Job reallocation rate	Job creation rate	Job destruction rate
	Panel 1.		
All workers	0.0188*** (<0.001)	0.0676*** (<0.001)	-0.0583*** (<0.001)
By skill level:			
Low skilled workers	-0.0099*** (<0.001)	0.0594*** (<0.001)	-0.0550*** (<0.001)
Medium skilled workers	0.0119*** (<0.001)	0.0544*** (<0.001)	-0.0560*** (<0.001)
High skilled workers	0.0257*** (<0.001)	-0.0612*** (<0.001)	0.0734*** (<0.001)
	Panel 2.		
All workers	0.0286*** (<0.001)	0.0636*** (<0.001)	-0.0505*** (<0.001)
By skill level:			
Low skilled workers	0.0046** (0.021)	0.0681*** (<0.001)	-0.0478*** (<0.001)
Medium skilled workers	0.0248*** (<0.001)	0.0524*** (<0.001)	-0.0474*** (<0.001)
High skilled workers	0.0243*** (<0.001)	-0.0587*** (<0.001)	0.0670*** (<0.001)
	Panel 3.		
All workers	0.0241*** (<0.001)	0.0680*** (<0.001)	-0.0544*** (<0.001)
By skill level:			
Low skilled workers	0.0115*** (<0.001)	0.0788*** (<0.001)	-0.0494*** (<0.001)
Medium skilled workers	-0.0054*** (<0.001)	0.0313*** (<0.001)	-0.0472*** (<0.001)
High skilled workers	-0.0295*** (<0.001)	-0.0824*** (<0.001)	0.0344*** (<0.001)
	Panel 4.		
All workers	0.0265*** (<0.001)	0.0660*** (<0.001)	-0.0503*** (<0.001)
By skill level:			
Low skilled workers	0.0174*** (<0.001)	0.0794*** (<0.001)	-0.0437*** (<0.001)
Medium skilled workers	-0.0050*** (<0.001)	0.0300*** (<0.001)	-0.0456*** (<0.001)
High skilled workers	-0.0333*** (<0.001)	-0.0825*** (<0.001)	0.0300*** (<0.001)

Sources: AROME, ORME and SEQUOIA (*Acoss-Urssaf*), DADS and FICUS (*Insee*).
Field: Firms employing 1 worker or more and coming from the private non-farm business and semi-public sectors over 2003-2005.
Notes: *P value*s within parentheses. *** (respectively ** and *) stands for significance at a 1% (respectively 5 or 10%) level.

Table 7b. Job flows and variation in payroll tax cuts variation. Spearman correlation coefficients. *LWPTR establishments.*

Type of reallocation / Population	Job reallocation rate	Job creation rate	Job destruction rate
	Panel 1.		
All workers	0.0108*** (<0.001)	0.0742*** (<0.001)	-0.0696*** (<0.001)
By skill level:			
Low skilled workers	-0.0371*** (<0.001)	0.0814*** (<0.001)	-0.0210*** (<0.001)
Medium skilled workers	-0.0463*** (<0.001)	0.0474*** (<0.001)	-0.0678*** (<0.001)
High skilled workers	-0.0293*** (<0.001)	-0.0937*** (<0.001)	0.0100*** (<0.001)
	Panel 2.		
All workers	0.0197*** (<0.001)	0.0811*** (<0.001)	-0.0771*** (<0.001)
By skill level:			
Low skilled workers	0.0499*** (<0.0001)	0.0972*** (<0.001)	-0.0232*** (<0.001)
Medium skilled workers	-0.0325*** (<0.001)	0.0552*** (<0.001)	-0.0684*** (<0.001)
High skilled workers	-0.0408*** (<0.001)	-0.1053*** (<0.001)	0.0103*** (<0.001)
	Panel 3.		
All workers	0.0149*** (<0.001)	0.0649*** (<0.001)	-0.0751*** (<0.001)
By skill level:			
Low skilled workers	0.0216*** (<0.001)	0.0766*** (<0.001)	-0.0381*** (<0.001)
Medium skilled workers	-0.0384*** (<0.001)	0.0192*** (<0.001)	-0.0543*** (<0.001)
High skilled workers	-0.1430*** (<0.001)	-0.1427*** (<0.001)	-0.0552*** (<0.001)
	Panel 4.		
All workers	0.0136*** (<0.000)	0.0621*** (<0.001)	-0.0626*** (<0.001)
By skill level:			
Low skilled workers	0.0287*** (<0.001)	0.0808*** (<0.001)	-0.0342*** (<0.001)
Medium skilled workers	-0.0382*** (<0.001)	0.0180*** (<0.001)	-0.0526*** (<0.001)
High skilled workers	-0.1425*** (<0.001)	-0.1418*** (<0.001)	-0.0550*** (<0.001)

Sources: AROME, ORME and SEQUOIA (*Acoss-Urssaf*), DADS and FICUS (*Insee*).
Field: Firms employing 1 worker or more and coming from the private non-farm business and semi-public sectors over 2003-2005.
Notes: *P value*s within parentheses. *** (respectively ** and *) stands for significance at a 1% (respectively 5 or 10%) level.

6. The econometric strategy

To evaluate the impact of varying PTR on job creation and destruction using establishments panel data, we want to estimate separately three job flows equations of the type (Gomez-Salvador (2004)):

$$JFR_{it} = X_{it}\beta + \Delta PTR_{it}\gamma + \varepsilon_{it} \quad (1)$$

for $JFR_{it}=JCR_{it}$, JDR_{it} or JRR_{it} that are our outcome variables. Subscripts *i* and *t* denote establishment and time respectively. Like in Bunel and L'Horty (2012), ΔPTR_{it} represents our variable of treatment and is the variation between *t-1* and *t* in the ratio of the payroll tax reduction to the wage bill; X_{it} refers to a multidimensional vector of control variables; and $\varepsilon_{it} = \mu_i + \delta_{it}$ is a composite error term, where μ_i is an unobserved establishment effect. We can estimate β from (1) using establishments' data over 2003-2005 and within (WE) or first-differenced (FE) estimator.

However, proceeding as such is very difficult for many reasons. Indeed, there are selection and endogeneity problems.

First, X_{it} is often supposed to be correlated with μ_i. If genuine panel data are available, using a within estimator solve the problem. This is the case of Panel 1 (establishments employing 5 workers or more) and Panel 3 (establishments employing 1 worker or more) – where several 4 periods of time are observed for the same establishment – but not necessarily that of Panels 2 and 4 that contain non-perennial establishments. However, Panel 1 and 3 suffers from large attrition because of firm demography (Section 4); thus, considering both panels may be misleading. Moreover, even for Panels 1 and 3, a given establishment cannot create and destroy jobs at the same time. Thus, there will be many zeros for each dependent variable while estimating (1) using establishments observations directly. A similar problem appears if we perform regressions on different skill groups: to be able to compare the effect of varying PTR according to different skills of workers, we have to work on the same establishments and consequently to impose that the establishment employs all types of skills; hence we may introduce a selection bias.

Second, the variable of treatment (ΔPTR_{it}) is endogenous. Indeed, as mentioned in Section 3, PTR for a given worker depends on her/his gross wage level; thus variations in PTR should also be correlated to the average wage level at the establishment. Besides, a given skill (either low, medium or high) group of workers is related to some professional categories (Burnod and Chenu, 2001) and thus of wages (Section 4). As shown in Table 3a and b in particular (Section 3), the establishment average (hourly or annual) wage of high skilled workers is larger than that of medium skilled workers, and that of medium skilled workers is larger than that of low skilled workers. Since any PTR amount decreases with wage level, PTR (and thus ΔPTR_{it}) should be correlated with the given skill wage. Otherwise, wages were proved to determine job flows (Davis and Haltiwanger, 1999). Wages are thus part of the X_{it} vector. Since wages and employment are jointly determined, wages are endogenous. Moreover, wages may also depend on minimum wages. In fact, the French minimum wage, as well as the five monthly wage guarantees were revised every year over 2003-2005 on July 1st so that hourly minimum wages go to a unique value on July 2005 (Table 1, Section 3). As often demonstrated in the literature (CSERC, 1996; Koubi and Lhommeau, 2006; Cette *et al.* 2012), increases in minimum wages should spread to the wages distribution.

For all these reasons, we decide to use a pseudo panel data approach (Deaton, 1985; Verbeek, 2007). We aggregate the establishment data at the sectoral level and consider the following equation:

$$JFR_{st} = X_{st}\beta + \Delta PTR_{st}\gamma + \varepsilon_{st} \quad (2)$$

where JFR_{st} (respectively X_{st} and PTR_{st}) is the average value computed of all observed JFR_{it}'s (respectively X_{it}'s and PTR_{it}'s) in business sector *s* at time *t*. Finally $\varepsilon_{st} = \mu_{st} + \delta_{st}$. Here, sector aggregations are based on a large number of establishments, the number *S* of sectors is fixed, whereas the number of establishment n_s per sector tends to infinity. We can treat μ_{st} as fixed unknown parameters ($\mu_{st} = \mu_s$) so that we use the within estimator on the pseudo panel. In this case, indeed, Moffitt (1993) shows that grouping can be viewed as an instrumental variable (IV*)* procedure. Each μ_i of equations (1) is decomposed into a sector effect μ_s and establishment *i*'s deviation from this effect. If we note z_{si} a dummy variable that is equal to 1 if establishment *i* is in sector *s*, we can write:

$$\mu_i = \sum_s \mu_s z_{si} + \upsilon_i \quad (3)$$

Substituting (3) into (1) and defining $Z_i = (z_{1i}, ..., z_{Si})$ and $\mu = (\mu_1, ..., \mu_S)'$ we obtain:

$$JFR_{it} = X_{it}\beta + \Delta PTR_{it}\gamma + Z_i\mu + \upsilon_i + \delta_{it} \quad (4)$$

If ΔPTR_{it} or X_{it} are correlated with μ_i, we can expect that they are correlated with υ_i. In equations (4), only an instrumental variables estimator will be consistent for β, γ and μ. Cohort dummies Z_i interacted with time dummies provide valid instruments for all explanatory variables in the model (including the full set of cohort dummies - Deaton (1985)). In other words, to be in a sector is an appropriate instrument because it is correlated with ΔPTR_{it} or X_{it} but not with $\upsilon_i + \delta_{it}$. Moffitt (1993) shows that the within estimator on the pseudo panel (equation (2)) is identical to *IV* estimators on the individual panel dataset (equation (4)).

However, the pseudo panel method suggested in Moffitt (1993) requires estimating averages within every cohort in our four panels of establishments. Indeed, to avoid measurement error while estimating averages, a large number of establishments per sector of activity is needed. According to Verbeek and Nijman (1992), more than hundred observations are needed on average; more recently, Devereux (2007) argues that cell sizes should be much larger, possibly 2000 or more. Thus, within each panel, we choose to group establishment data not at the most 4-Digit detailed sectoral level (called APE700), but at the 2-Digit sectoral level – so-called NES36 sectoral level of aggregation. Indeed, according to Table 8, either considering WTR or LW establishments, we see that the number of establishments per sector of activity is on average larger than 2000, except for panel 1 in the case of WTR establishments. Thus, data grouped at the 2-Digit NES36 sectoral level may be appropriate to evaluate the effect of PTR on JF[8].

[8] Table 10 also reports the distribution of the number of establishments per sector of activity: 90 percent of 2-Digit NES36 sector of activity contains more than 200 establishments (except for panel 1 in the case of WTR establishments).

Table 8. Effect of payroll tax reduction on job flows. Features of sectoral pseudo panels of establishments. *Grouping establishments at 2-Digit NES36 classification.*

Type of estimation	*WTR establishments*				*LW Establishments*			
Population / Sample	Panel 1	Panel 2	Panel 3	Panel 4	Panel 1	Panel 2	Panel 3	Panel 4
Average number of establishments within cohorts :	1,635	2,489	4,016	4,982	2,020	3,242	7,608	9,939
Distribution of establishments across cohorts:								
1st percentile	47	55	53	59	14	17	23	26
2.5nd percentile	48	56	55	60	14	20	23	29
5th percentile	81	107	108	130	50	116	133	210
10th percentile	148	223	238	287	102	145	205	257
25th percentile	320	533	638	791	327	566	789	926
50th percentile	856	1,226	1,689	1,979	853	1,293	2,777	3,640
75th percentile	2,251	3,158	4,458	5,781	2,940	4,306	10,140	13,317
100th percentile	10,496	14,498	29,834	36,294	13,534	20,356	45,683	61,896

Sources: AROME, ORME and SEQUOIA (*Acoss-Urssaf*) databases, DADS and FICUS (*Insee*).
Field: Firms employing 1 worker or more and coming from the private non-farm business and semi-public sectors over 2003-2005.
Notes: Standard errors are robust to heteroscedasticity, serial correlation and sectoral clustering. *Standard error* within parentheses. *** (respectively ** and *) stands for significance at a 1% (respectively 5 or 10%) level.

7. Results and discussion

Since we estimate JF equations, we first focus on JF determinants. Then, we display results and robustness checks.

7.1 Usual determinants for JF

Within the strand of literature that analyzes the determinants of JF, several factors have been put in evidence (Salvanes (1997), Contini and Revelli (1998), Davis and Haltiwanger (1999), Stiglbauer *et al.* (2003), Gomez-Salvador *et al.* (2004), Fuchs and Weyh (2010) or OECD (2009)).
First, Job Flows should be smaller in bigger establishments. A priori, average firm size is negatively correlated with the magnitude of JF. Moreover, for an establishment, belonging to a firm with more than one establishment should be negatively correlated with large JF. Second, JF are related with economic situation, positively with JC and negatively with JD.
Third, JF should be negatively correlated with capital intensity, as well as with wages. For a given population of workers, they are a priori negatively correlated to the average wage of the corresponding category of workers.

Fourth, JF may be correlated with net employment past growth rate, positively with JC, but negatively with JD.
Finally, JF are correlated with workers features within a firm. They should be bigger in firms where there are more workers that are younger than 30 years old. As well, a firm employing more women is characterized by larger JF[9].

7.2 Results

We estimate the links between PTR and job flows (job creation, job destruction or more generally job reallocation), for the whole population of employees, as well as for the three different workers' skill groups (low skilled, medium skilled and high skilled workers). For each skill group, we estimate the effect of the variation in the share of payroll tax reductions in the wage bill (PTR ratio) on job creation, job destruction and job reallocation controlling for a set of control variables presented in the previous sub-section. As control variables, we consider usual determinants mentioned in 7.1. In particular, establishments' characteristics: business sector of activity, establishment size, and the share of multi-establishment firms. We also use economic and financial performance indicators: the past growth rate of value-added, as well as gross operating surplus, the capital intensity ratio and labour productivity. Finally, we use workers' characteristics employed in the establishment: the average annual wage for the considered skill of worker, the share of women, the share of part-time workers, and the share of young (fewer than 30 years-old) or old (50 years old and more) workers. All these variables are introduced at time *t-1* in the equation. (Employment and value-added growth rates are measured between *t-2* and *t-1*.)

As a first step, we consider job flows equations using data at the establishment level. Job flows equations (1) control for all variables mentioned above, as well as for an unobserved establishment fixed effect. They were estimated using within or first-differences estimators, reweighting by the employment level for the considered category of workers (Stiglbauer *et al.* (2003)). Corresponding results are displayed in Tables 9a and 9b. In WTR and in LW establishments, higher tax cuts tax are associated to larger JC and smaller JD considering the whole employed population. Distinguishing among skills, both Tables show higher JC and smaller JD for low and medium skilled, but the opposite for high skilled workers. In WTR establishments, the same conclusions hold. These findings hold whatever the panel we consider.

[9] Corresponding Tables are available on request.

Table 9a. Effect of payroll tax reduction on job flows. Estimating job flows equations on panel data of establishments. Weighted Within or FD estimators, reweighting by the employment level of the given population of workers. *WTRPTR establishments*.

Type of estimation	Weighted Within estimator				Weighted FD estimator			
Population / Sample	Panel 1	Panel 2	Panel 3	Panel 4	Panel 1	Panel 2	Panel 3	Panel 4
Job reallocation rate								
All workers	0.057* (0.069)	0.105*** (<0.001)	0.092 (<0.001)***	0.081*** (0.002)	-0.013 (0.630)	-0.022 (0.353)	0.023 (0.245)	0.022 (0.259)
By skill level:								
Low skilled workers	0.125 (0.218)	0.135* (0.070)	0.014 (0.817)	-0.005 (0.934)	0.195** (0.032)	0.175*** (0.008)	0.080 (0.139)	0.066 (0.170)
Medium skilled workers	0.231*** (<0.001)	0.247*** (0.003)	0.148** (0.033)	0.133** (0.041)	0.326*** (<0.001)	0.426*** (<0.001)	0.272*** (<0.001)	0.308*** (<0.001)
High skilled workers	-0.016* (0.873)	0.082 (0.316)	0.216*** (0.004)	0.237*** (<0.001)	-0.092 (0.250)	-0.002 (0.970)	0.028 (0.632)	0.070 (0.221)
Job creation rate								
All workers	0.211*** (<0.001)	0.230*** (<0.001)	0.216*** (<0.001)	0.226*** (<0.001)	0.032 (0.103)	0.053*** (0.010)	0.059*** (<0.001)	0.059*** (<0.001)
By skill level:								
Low skilled workers	0.548*** (<0.001)	0.492*** (<0.001)	0.460*** (<0.001)	0.471*** (<0.001)	0.423*** (<0.001)	0.361*** (<0.001)	0.308*** (<0.001)	0.302*** (<0.001)
Medium skilled workers	0.409µ** (<0.001)	0.461*** (<0.001)	0.434*** (<0.001)	0.453*** (<0.001)	0.397*** (<0.001)	0.464*** (<0.001)	0.395*** (<0.001)	0.408*** (<0.001)
High skilled workers	-0.591*** (<0.001)	-0.445*** (<0.001)	-0.464*** (<0.001)	-0.417*** (<0.001)	-0.523*** (<0.001)	-0.432*** (<0.001)	-0.438*** (<0.001)	-0.402*** (<0.001)
Job destruction rate								
All workers	-.154*** (<0.001)	-0.125** (<0.001)	-0.123*** (0.001)	-0.145 (<0.001)	-0.045** (0.017)	-0.030* (0.067)	-0.035** (0.009)	-0.036*** (0.009)
By skill level:								
Low skilled workers	-0.423*** (<0.001)	-0.358** (<0.001)	-0.446*** (<0.001)	-0.476*** (<0.001)	-0.228*** (<0.001)	-0.187** (0.018)	-0.228*** (<0.001)	-0.236*** (<0.001)
Medium skilled workers	-0.178** (0.025)	-0.214*** (0.001)	-0.286 (<0.001)	-0.321*** (<0.001)	-0.071 (0.201)	-0.037 (0.422)	-0.124*** (0.001)	-0.099*** (0.006)
High skilled workers	0.575*** (<0.001)	0.527*** (<0.001)	0.680*** (<0.001)	0.653*** (<0.001)	0.440*** (<0.001)	0.430*** (<0.001)	-0.467*** (0.001)	0.472*** (<0.001)

Sources: AROME, ORME and SEQUOIA (*Acoss-Urssaf*), DADS and FICUS (*Insee*).
Field: Establishments of all sizes coming from the private non-farm business and semi-public sectors over 2003-2005.
Notes: Standard errors are robust to heteroscedasticity, serial correlation and sectoral clustering. *Standard error* within parentheses. *** (respectively ** and *) stands for significance at a 1% (respectively 5 or 10%) level.

Table 9b. Effect of payroll tax reduction on job flows. Estimating job flows equations on panel data of establishments. Weighted Within or FD estimators, reweighting by the employment level of the given population of workers. *LWPTR establishments*.

Type of estimation	Weighted Within estimator				Weighted FD estimator			
Population / Sample	Panel 1	Panel 2	Panel 3	Panel 4	Panel 1	Panel 2	Panel 3	Panel 4
				Job reallocation rate				
All workers	0.138*** (<0.001)	0.188*** (<0.001)	0.135*** (<0.001)	0.132*** (<0.001)	0.127*** (<0.001)	0.141*** (<0.001)	0.115*** (<0.001)	0.109*** (<0.001)
By skill level:								
Low skilled workers	-0.187 (0.153)	-0.109 (0.194)	-0.147*** (<0.001)	-0.151*** (<0.001)	0.058 (0.621)	0.054 (0.494)	0.045 (0.208)	0.026 (0.400)
Medium skilled workers	0.085 (0.106)	0.121** (0.010)	0.070** (0.019)	0.044 (0.109)	0.253*** (<0.001)	0.254*** (<0.001)	0.195*** (<0.001)	0.164*** (<0.001)
High skilled workers	0.542*** (<0.001)	0.462*** (<0.001)	1.068*** (<0.001)	1.039*** (0.002)	-0.017 (0.842)	0.028 (0.678)	0.532*** (<0.001)	0.558*** (0.001)
				Job creation rate				
All workers	0.419*** (<0.001)	0.450*** (<0.001)	0.377*** (<0.001)	0.377*** (<0.001)	0.467*** (<0.001)	0.451*** (<0.001)	0.361*** (<0.001)	0.377*** (<0.001)
By skill level:								
Low skilled workers	0.939*** (<0.001)	0.849*** (<0.001)	0.621*** (<0.001)	0.621*** (<0.001)	1.046*** (<0.001)	0.865*** (<0.001)	0.652*** (<0.001)	0.641*** (<0.001)
Medium skilled workers	0.531*** (<0.001)	0.619*** (<0.001)	0.572*** (<0.001)	0.543*** (<0.001)	0.637*** (<0.001)	0.661*** (<0.001)	0.602*** (<0.001)	0.565*** (<0.001)
High skilled workers	-0.735*** (<0.001)	-0.731*** (<0.001)	-0.691*** (<0.001)	-0.614*** (<0.001)	-0.903*** (<0.001)	-0.799*** (<0.001)	-0.701*** (<0.001)	-0.627*** (0.002)
				Job destruction rate				
All workers	-0.280*** (<0.001)	-0.261*** (<0.001)	-0.242*** (<0.001)	-0.245*** (<0.001)	-0.340*** (<0.001)	-0.311*** (<0.001)	-0.246*** (<0.001)	-0.245*** (<0.001)
By skill level:								
Low skilled workers	-1.126*** (<0.001)	-0.958*** (<0.001)	-0.767*** (<0.001)	-0.772*** (<0.001)	-0.988*** (<0.001)	-0.811*** (<0.001)	-0.608*** (<0.001)	-0.615*** (<0.001)
Medium skilled workers	-0.446*** (<0.001)	-0.499*** (<0.001)	-0.501*** (<0.001)	-0.499*** (<0.001)	-0.384*** (<0.001)	-0.407*** (<0.001)	-0.407*** (<0.001)	-0.401*** (<0.001)
High skilled workers	1.278*** (<0.001)	1.194*** (<0.001)	1.759*** (<0.001)	1.653*** (0.001)	0.920*** (<0.001)	0.827*** (<0.001)	1.233*** (<0.001)	1.185*** (<0.001)

Sources: AROME, ORME and SEQUOIA (*Acoss-Urssaf*), DADS and FICUS (*Insee*).
Field: Firms employing 1 worker or more and coming from the private non-farm business and semi-public sectors over 2003-2005.
Notes: Standard errors are robust to heteroscedasticity, serial correlation and sectoral clustering. *Standard error* within parentheses. *** (respectively ** and *) stands for significance at a 1% (respectively 5 or 10%) level.

Second, we know that estimating equations (1) using within or first-differenced does not allow us to take account for many sources of bias. Moreover, considering (1) does not fully help to solve many selection problems (see Section 6). Thus, findings displayed in Tables 9a and 9b may not refer to the true effect of PTR on JF through the Fillon reform. That is why we consider pseudo panel equations (2), use grouping data at the 2-Digit NES36 level and the within estimator suggested in Moffitt (1993) that is equivalent to an instrumental variable estimator where the variation in PTR ratio and every control variables were instrumented (Section 6). However, sizes of the sectoral cohorts are rather different; which may induce heteroscedasticity. Hence, all our equations are run reweighting by the the size of each cohort, *ie.* of the average employment level over *(t-1;t)* for the considered category of workers (Deaton (1985); Devereux (2007); Gardes *et al.* (2005)).

Table 10 contains corresponding results. For LW establishments – where PTR ratio increased while enforcing the Fillon reform -, they show that increasing PTR ratio had no impact on overall JRR, either considering JCR or JDR.. These results can be explained as follows. The rise in PTR for low and medium skilled workers had no impact on JCR, whatever the skill we consider. However, it led to a decrease in JDR for medium skilled workers, and to a decrease in JDR for high skilled workers over 2003-2005. For WTR establishments – where the PTR ratio decreased over 2002-2005 -, JC decreased and JD remained unchanged as a consequence of the Fillon reform. This may be explained by a decrease in JC for low skilled workers, but a rise in JC for high skilled workers. Otherwise, JD decreased for high skilled workers and hardly (2 panel out of 4) increased for medium skilled workers.

Table 10. Effect of payroll tax reduction on job flows. Estimating job flows equations on sectoral pseudo panel data. Within estimators, reweighting by the employment level of the given population of workers within the considered business sector. ***Grouping establishments at the 2-Digit NES36 level.***

Type of establishment	*WTR establishments*				*LW establishments*			
Population / Sample	Panel 1	Panel 2	Panel 3	Panel 4	Panel 1	Panel 2	Panel 3	Panel 4
Job reallocation rate								
All workers	-1.133** (0.039)	*-0.123 (0.766)*	-0.825 (0.117)	-0.120 (0.812)	1.097 (0.188)	-0.232 (0.815)	-1.570 (0.125)	-0.558 (0.554)
By skill level:								
Low skilled workers	-3.452 (0.301)	-2.391 (0.305)	-2.231 (0.361)	-0.819 (0.711)	4.917 (0.496)	-1.182 (0.906)	-2.995 (0.705)	-2.422 (0.774)
Medium skilled workers	3.574 (0.162)	2.016 (0.359)	1.397 (0.621)	1.611 (0.482)	-4.186 (0.117)	-4.573 (0.139)	-4.880 (0.121)	-5.222 (0.206)
High skilled workers	1.997 (0.226)	-0.249 (0.583)	0.601 (0.664)	1.473 (0.153)	-0.023 (0.993)	-1.463 (0.621)	-4.500 (0.225)	4.071 (0.222)
Job creation rate								
All workers	-1.035** (0.042)	-0.310 (0.474)	-0.880** (0.030)	-1.017* (0.084)	0.331 (0.712)	-0.413 (0.695)	-1.071* (0.056)	-0.714 (0.032)
By skill level:								
Low skilled workers	*-6.699*** *(0.025)*	-3.365* (0.099)	-4.787* (0.056)	-3.021 (0.203)	-2.209 (0.584)	0.338 (0.913)	-2.277 (0.502)	-1.965 (0.245)
Medium skilled workers	*-2.010 (0.109)*	-5.580 (0.164)	-3.630 (0.431)	-7.690 (0.140)	1.615 (0.168)	-1.615 (0.470)	0.452 (0.687)	-2.085 (0.424)
High skilled workers	2.888* (0.066)	6.185*** (<0.001)	2.976** (0.037)	7.064*** (0.001)-	-3.507 (0.184)	-0.268 (0.923)	-7.276** (0.045)	1.001 (0.742)
Job destruction rate								
All workers	-0.098 (0.226)	0.188 (0.651)	0.055 (0.903)	0.897** (0.016)	0.766 (0.143)	0.181 (0.705)	0.501 (0.348)	0.155 (0.731)
By skill level:								
Low skilled workers	3.247 (0.171)	0.974 (0.431)	2.556 (0.126)	2.201* (0.102)	7.726 (0.422)	-0.844 (0.935)	-0.718 (0.940)	-0.456 (0.959)
Medium skilled workers	5.584* (0.089)	7.595 (0.013)	5.027 (0.110)	9.300*** (0.018)	- 5.801** (0.029)	- 2.598** (0.050)	-5.332* (0.064)	-3.137 (0.122)
High skilled workers	-0.890 (0.611)	-6.435*** (0.004)	-2.374* (0.095)	-5.592*** (0.008)	3.484** (0.016)	1.731 (0.176)	2.776* (0.085)	3.069* (0.059)

Sources: AROME, ORME and SEQUOIA (*Acoss-Urssaf*) databases, DADS and FICUS (*Insee*).
Field: Firms employing 1 worker or more and coming from the private non-farm business and semi-public sectors over 2002-2005.
Notes: Standard errors are robust to heteroscedasticity, serial correlation and sectoral clustering. *Standard error* within parentheses. *** (respectively ** and *) stands for significance at a 1% (respectively 5 or 10%) level.

7.3 Robustness checks

As mentioned in Section 6, estimating equations (2) using pseudo panel data may imply bias while grouping variables. However, as reported in Section 6, the number of establishments per sector may not be large enough. As robustness, we also consider grouping establishment data at the 2-Digit NES16 sectoral level. In this case, there are fewer cohorts, but a larger number of establishments per sector of activity on average.

Corresponding results are contained in Table 11. In WTR establishments on the one hand, decreasing the PTR ratio seems to have a positive impact on JC and not any effect on JD. This finding is due to larger JCR for medium skilled workers and sometimes for low skilled ones; at the same time, JDR decrease for medium skilled workers. On the other hand, we get similar results as in Section 7.2 when grouping data at the 2-Digit NES16 level for LWPTR. Indeed, increasing PTR ratio implied no impact on JC rates, but smaller JD rates. These results can be explained through an increase in JC for medium skilled workers and a decrease in JD for the same socio-professional category of worker. Our conclusions hold whatever the panel we consider.

Table 11. Effect of payroll tax reduction on job flows. Estimating job flows equations on sectoral pseudo panel data. Within estimators, reweighting by the employment level of the given population of workers within the considered business sector. ***Grouping establishments at the 2-Digit NES16 level.***

Type of establishment	*WTR establishments*				*LW establishments*			
Population / Sample	Panel 1	Panel 2	Panel 3	Panel 4	Panel 1	Panel 2	Panel 3	Panel 4
				Job reallocation rate				
All workers	0.813	1.374***	1.318***	2.052***	0.202	0.078	0.001	0.079
	(0.117)	(<0.001)	(<0.001)	(0.001)	(0.604)	(0.840)	(0.995)	(0.788)
By skill level:								
Low skilled workers	-5.383	3.774	-4.681*	4.359	4.977	-0.580	0.452	-3.160
	(0.222)	(0.149)	(0.053)	(0.129)	(0.565)	(0.942)	(0.957)	(0.745)
Medium skilled workers	-0.207	0.971	0.446	0.922	-0.443	-0.145	0.579	0.154
	(0.896)	(0.547)	(0.728)	(0.425)	(0.434)	(0.842)	(0.211)	(0.781)
High skilled workers	-0.795	0.757	-1.300	0.965	1.051	-1.228	-1.353	-1.796
	(0.774)	(0.784)	(0.387)	(0.655)	(0.184)	(0.768)	(0.721)	(0.667)
				Job creation rate				
All workers	0.554	1.419***	0.950***	1.694***	0.562*	0.431	0.440	0.356
	(0.316)	(0.001)	(0.003)	(0.001)	(0.093)	(0.288)	(0.239)	(0.360)
By skill level:								
Low skilled workers	-2.589	4.710***	-1.864	5.118**	-2.644	-0.305	-3.095	-3.757
	(0.430)	(0.007)	(0.354)	(0.027)	(0.374)	(0.936)	(0.195)	(0.144)
Medium skilled workers	5.277***	3.017**	3.697**	2.886***	1.241***	1.553***	1.797***	1.805***
	(0.002)	(0.017)	(0.012)	(0.002)	(0.007)	(0.001)	(<0.001)	(<0.001)
High skilled workers	-2.036	-0.146	-1.305	0.171	0.053	0.606	-2.526	-1.043
	(0.315)	(0.941)	(0.438)	(0.927)	(0.977)	(0.897)	(0.612)	(0.826)
				Job destruction rate				
All workers	-0.437	-0.045	0.368	0.358	-0.360**	-0.353**	-0.439**	-0.435**
	(0.253)	(0.916)	(0.346)	(0.567)	(0.047)	(0.017)	(0.046)	(0.016)
By skill level:								
Low skilled workers	-2.794	-0.936	-2.816*	-0.760	7.619	-0.275	3.547	0.597
	(0.267)	(0.605)	(0.081)	(0.643)	(0.290)	(0.978)	(0.660)	(0.953)
Medium skilled workers	-5.484***	-2.046*	-3.251**	-1.963**	-1.684***	-1.698***	-1.218***	-1.651**
	(0.008)	(0.063)	(0.044)	(0.026)	(0.000)	(0.006)	(<0.001)	(0.013)
High skilled workers	1.240	0.903	0.006	0.793	0.998	-0.622	1.173	-0.752
	(0.491)	(0.536)	(0.997)	(0.564)	(0.459)	(0.501)	(0.494)	(0.432)

Sources: AROME, ORME and SEQUOIA (*Acoss-Urssaf*) databases, DADS and FICUS (*Insee*).
Field: Firms employing 1 worker or more and coming from the private non-farm business and semi-public sectors over 2002-2005.
Notes: Standard errors are robust to heteroscedasticity, serial correlation and sectoral clustering. *Standard error* within parentheses. *** (respectively ** and *) stands for significance at a 1% (respectively 5 or 10%) level.

8. Concluding remarks

To reduce unemployment, payroll tax reductions on low wages have been implemented in many European continental countries since the beginning of the 90s. In France, economic policies have extended to more and more workers from the mandatory minimum wage within a fast-growing budget.

Most papers that analyse the impact of PTR on employment focus on the net employment effect of labour costs. In this paper, we examine to what extent Payroll Tax Reductions increases job creation or decreases job destruction separately.

To proceed, we first use concepts from the literature on gross job flows (Davis and Haltiwanger's definitions, 1990, 1992, 1999a and 1999b) to estimate the employment effect of PTR. For this study, we merge three different administrative sources over 2002-2005 that

are available at *Insee* and *Acoss-Urssaf*. These data enable us to run the analysis by distinguishing unskilled blue and white collar workers (hereafter the low skilled workers), skilled blue and white collar workers (hereafter the medium skilled workers) and managers, engineers (hereafter high skilled workers).

To analyze the impact of PTR on job creation and destruction, we have to cope with four main problems. In fact, a firm that benefits from PTR is not exogenous for many reasons and in particular the fact that wages and employment are jointly determined. Moreover, considering job creation and destruction at the establishment level, we have to face the fact that there are many zeros for each dependant variable because an establishment cannot create and destroy jobs at the same time. As well, when we work with individual data, we have to impose that the establishment employs all types of skills – because, for instance, an establishment with no low skilled workers has a zero probability to destroy low skilled jobs – so we may introduce a selection bias in our estimation. Finally, a lot of establishments were created or die over 2002-2005; hence, considering a genuine panel over our period of study may be misleading. For these reasons, we use a pseudo panel data approach (Deaton, 1985 and Verbeek, 2007) at the 2-Digit sectoral level to be able to perform linear regressions by keeping most of the establishments over the 2002-2005 period of time. Indeed, estimation techniques based on pseudo panel data are identical to IV estimations where the level of aggregation is used as an instrument (Moffitt, 1993). On the one hand, we find that is no impact of increasing PTR on JC and a potential negative impact on JD (NES16 pseudo panel) in LW establishments; this is mainly due to the fact increasing JC for low and medium skilled workers decreased JDR for medium skilled workers, but inscreased JDR for high skilled ones. On the other hand, things seem to be less clear-cut as to decreasing PTR on JF in WTR establishments, even with regards to any of the skill groups.

As to further research, it may be interesting to enforce further robustness checks, like considering IV methods on a panels of establishments (Gardes *et al.*, 2005; Warunsiri and McNown, 2010); however, it relies on finding (at least) one valid instrument which is not easy (Stock and Yogo 2005). Otherwise, we could also use alternative estimators like those proposed in Verbeek and Nijman (1993) or Devereux (2007b), namely the EWALD estimator or an unbiased error in variable estimator. However, such analysis relies on different asymptotics. In particular, the EWALD estimator is consistent only if there is a large number of cohorts (and fixed number of individuals per cohort). It thus requires from us to use the 4-Digit APE classification, which may not be sufficient. Finally, it may be interesting to evaluate the effects of varying PTR on workers flows (hiring and firing rates).

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Appendices

Table A1a. Job creation and job destruction. Spearman correlation coefficients. *WTRPTR establishments.*

Sample / Population	All workers	Low skilled Workers	Medium skilled workers	High skilled workers
Panel 1	-0.849*** (<0.001)	-0.617*** (<0.001)	-0.731*** (<0.001)	-0.737*** (<0.001)
Panel 2	-0.846*** (0.817)	-0.602*** (<0.001)	-0.710*** (<0.001)	-0.718*** (<0.001)
Panel 3	-0.798*** (<0.001)	-0.522*** (<0.001)	-0.550*** (<0.001)	-0.501*** (<0.001)
Panel 4	-0.797*** (<0.001)	-0.502*** (<0.001)	-0.551*** (<0.001)	-0.494*** (<0.001)

Sources: AROME, ORME and SEQUOIA (*Acoss-Urssaf*), DADS and FICUS (*Insee*).
Field: Establishments coming from the private non-farm business and semi-public sectors over 2003-2005.

Table A1b. Job creation and job destruction. Spearman correlation coefficients. *LWPTR establishments*.

Sample / Population	All workers	Low skilled workers	Medium skilled workers	High skilled workers
Panel 1	-0.841*** (<0.001)	-0.537*** (<0.001)	-0.772*** (<0.001)	-0.627*** (<0.001)
Panel 2	-0.835*** (<0.001)	-0.535*** (<0.001)	-0.753*** (<0.001)	-0.614*** (<0.001)
Panel 3	-0.746*** (<0.001)	-0.439*** (<0.001)	-0.525*** (<0.001)	-0.338*** (<0.001)
Panel 4	-0.747*** (<0.001)	-0.429*** (<0.001)	-0.519*** (<0.001)	-0.334*** (<0.001)

Sources: AROME, ORME and SEQUOIA (*Acoss-Urssaf*), DADS and FICUS (*Insee*).
Field: Establishments coming from the private non-farm business and semi-public sectors over 2003-2005.

Table A2a. Job flows across qualifications. Spearman correlation coefficients. *WTRPTR establishments.*

Sample / Comparison	Low vs. Medium skilled workers	Medium vs. High skilled workers	Low vs. High skilled workers
	Job creation		
Panel 1	-0.1398*** (<0.001)	-0.1205*** (<0.001)	-0.0399*** (<0.001)
Panel 2	-0.1336*** (<0.001)	-0.1175*** (<0.001)	-0.0563*** (<0.001)
Panel 3	-0.1297*** (<0.001)	-0.0799*** (<0.001)	-0.0552*** (<0.001)
Panel 4	-0.1242*** (<0.001)	-0.0787*** (<0.001)	-0.0507*** (<0.001)
	Job destruction		
Panel 1	-0.1381*** (<0.001)	-0.1147*** (<0.001)	-0.0377*** (<0.001)
Panel 2	-0.1258*** (<0.001)	-0.1054*** (<0.001)	-0.0407*** (<0.001)
Panel 3	-0.1174*** (<0.001)	-0.0739*** (<0.001)	-0.0393*** (<0.001)
Panel 4	-0.1135*** (<0.001)	-0.0717*** (<0.001)	-0.0353*** (<0.001)

Sources: AROME, ORME and SEQUOIA (*Acoss-Urssaf*), DADS and FICUS (*Insee*).
Field: Establishments coming from the private non-farm business and semi-public sectors over 2002-2005.
Notes: *P value*s within parentheses. *** (respectively ** and *) stands for significance at a 1% (respectively 5 or 10%) level.

Table A2b. Job flows across qualifications. Spearman correlation coefficients (2002-2005). *LWPTR establishments.*

Sample / Comparison	Low vs. Medium skilled workers	Medium vs. High skilled workers	Low vs. High skilled workers
	Job creation		
Panel 1	-0.1586*** (<0.001)	-0.1476*** (<0.001)	-0.0157*** (<0.001)
Panel 2	-0.1421*** (<0.001)	-0.1348*** (<0.001)	-0.0327*** (<.001)
Panel 3	-0.1368*** (<0.001)	-0.0637*** (<0.001)	-0.0297*** (<0.001)
Panel 4	-0.1307*** (<0.001)	-0.0591*** (<0.001)	-0.0326*** (<0.001)
	Job destruction		
Panel 1	-0.1594*** (<0.001)	-0.1422*** (<0.001)	-0.0140*** (<0.001)
Panel 2	-0.1383*** (<0.001)	-0.1216*** (<0.001)	-0.0193*** (<0.001)
Panel 3	-0.1239*** (<0.001)	-0.0584*** (<0.001)	-0.0172*** (<0.001)
Panel 4	-0.1194*** (<0.001)	-0.0555*** (<0.001)	-0.0202*** (<0.001)

Sources: AROME, ORME and SEQUOIA (*Acoss-Urssaf*), DADS and FICUS (*Insee*).
Field: Establishments coming from the private non-farm business and semi-public sectors over 2002-2005.
Notes: *P value*s within parentheses. *** (respectively ** and *) stands for significance at a 1% (respectively 5 or 10%) level.

Table A3a. Job creation vs job destruction across qualifications. Spearman correlation coefficients (2002-2005). *WTRPTR establishments.*

Unskilled job creation vs. medium or high skilled job destruction		
Sample / Comparison	Unskilled JC vs Medium skilled JD	Unskilled JC vs High skilled JD
Panel 1	0.1702*** (<0.001)	0.0728*** (<0.001)
Panel 2	0.1617*** (<0.001)	0.0822*** (<0.001)
Panel 3	0.1682*** (<0.001)	0.1152*** (<0.001)
Panel 4	0.1622*** (<0.001)	0.1065**** (<0.001)
Medium skilled job creation vs. low or high skilled job destruction		
Sample / Comparison	Medium skilled JC vs Low skilled JD	Medium skilled JC vs High skilled JD
Panel 1	0.1772*** (<0.001)	0.1636*** (<0.001)
Panel 2	0.1675*** (<0.001)	0.1550*** (<0.001)
Panel 3	0.1806*** (<0.001)	0.1911*** (<0.001)
Panel 4	0.1740*** (<0.001)	0.1898*** (<0.001)
High skilled job creation vs. low or medium skilled job destruction		
Sample / Comparison	High skilled JC vs Low skilled JD	High skilled JC vs Medium skilled JD
Panel 1	0.0820*** (<0.001)	0.1706*** (<0.001)
Panel 2	0.0879*** (<0.001)	0.1693*** (<0.001)
Panel 3	0.1334*** (<0.001)	0.2003*** (<0.001)
Panel 4	0.1230*** (<0.001)	0.2009*** (<0.001)

Sources: AROME, ORME and SEQUOIA (*Acoss-Urssaf*), DADS and FICUS (*Insee*).
Field: Establishments coming from the private non-farm business and semi-public sectors over 2002-2005.
Notes: *P value*s within parentheses. *** (respectively ** and *) stands for significance at a 1% (respectively 5 or 10%) level.

Table A3b. Job creation vs job destruction across qualifications. Spearman correlation coefficients (2002-2005). *LWPTR establishments.*

Unskilled job creation vs. medium or high skilled job destruction		
Sample / Comparison	Unskilled JC vs Medium skilled JD	Unskilled JC vs High skilled JD
Panel 1	0.2042** (<0.001)	0.0569*** (<.001)
Panel 2	0.1874*** (<.001)	0.0661*** (<.001)
Panel 3	0.1956*** (<0.001)	0.0944*** (<0.001)
Panel 4	0.1878*** (<0.001)	0.0896*** (<0.001)
Medium skilled job creation vs. low or high skilled job destruction		
Sample / Comparison	Medium skilled JC vs Low skilled JD	Medium skilled JC vs High skilled JD
Panel 1	0.2176*** (<0.001)	0.1993*** (<0.001)
Panel 2	0.1949*** (0.006)	0.1774*** (<.001)
Panel 3	0.2106*** (<0.001)	0.2113*** (<0.001)
Panel 4	0.2021*** (<0.001)	0.2044*** (<0.001)
High skilled job creation vs. low or medium skilled job destruction		
Sample / Comparison	High skilled JC vs Low skilled JD	High skilled JC vs Medium skilled JD
Panel 1	0.0693*** (<0.001)	0.2103*** (<0.001)
Panel 2	0.0730*** (<0.001)	0.1968*** (<0.001)
Panel 3	0.1141*** (<0.001)	0.2212*** (<0.001)
Panel 4	0.1079*** (<0.001)	0.2145*** (<0.001)

Sources: AROME, ORME and SEQUOIA (*Acoss-Urssaf*), DADS and FICUS (*Insee*).
Field: Establishments coming from the private non-farm business and semi-public sectors over 2002-2005.
Notes: *P value*s within parentheses. *** (respectively ** and *) stands for significance at a 1% (respectively 5 or 10%) level.

Table A4. Effect of payroll tax reduction on job flows. Features of sectoral pseudo panels of establishments. *Grouping establishments at the 2 Digit NES16 classification.*

Type of estimation	*WTR establishments*				*LW establishments*			
Population / Sample	Panel 1	Panel 2	Panel 3	Panel 4	Panel 1	Panel 2	Panel 3	Panel 4
Average number of establishments within cohorts :								
Distribution of establishments across cohorts:	3,738	5,867	9,467	11,742	4,618	7,642	17,932	23,428
1st percentile								
2.5nd percentile								
5th percentile	186	311	292	345	121	159	228	286
10th percentile	186	313	292	345	121	159	228	286
25th percentile	187	332	294	352	122	165	229	288
50th percentile	250	369	404	444	286	393	513	605
75th percentile	701	1,779	2,033	3,706	870	1,777	5,384	7,441
100th percentile	2,433	3,669	4,972	6,168	2,394	4,731	10,479	13,953
	5,399	8,277	13,562	18,217	6,800	10,106	21,896	31,916
	18,795	26,494	46,915	58,385	18,071	27,186	80,527	107,577

Sources: AROME, ORME and SEQUOIA (*Acoss-Urssaf*) databases, DADS and FICUS (*Insee*).
Field: Firms employing 1 worker or more and coming from the private non-farm business and semi-public sectors over 2003-2005.
Notes: Standard errors are robust to heteroscedasticity, serial correlation and sectoral clustering. *Standard error* within parentheses. *** (respectively ** and *) stands for significance at a 1% (respectively 5 or 10%) level.