Abstract

This paper exploits a far-reaching French reform as well as a very rich set of administrative data to evaluate the impact of a corporate tax credit aimed at reducing labor costs on several outcomes: employment, profit and wages. The effects of the Competitiveness and Employment Tax Credit (CICE), a refundable tax credit based on the wagebill, introduced in France in 2013, are estimated thanks to double difference methodologies, instrumented by the intensity of the intention to treat, thanks to data at the firm and individual levels on the period 2010-2014. Our results show that this relatively large tax break - about 17 billion euros per year, 0.8% of GDP - does not succeed in boosting employment in the first two years after being set. However they suggest that firms used the CICE to restore their margins. Moreover wages have increased significantly in more intensively treated firms, particularly those of white-collar employees. These results cast doubts regarding the effectiveness of such tax credits to boost employment. More importantly, they also provide new quasi-experimental evidence regarding rent sharing in the labor market.

Keywords: tax credit, incidence, rent sharing;
JEL codes: D22, H25, H32.

1We would like to thank institutions that built the databases (Insee, DGFIP, ACOSS, Douanes) and made them available for research on the CASD, and particularly their agents who diligently answered our questions about their content. We also thank Marc Ferracci, Sara Guillou, Yannick L’Horty, Etienne Lehmann, Benoît Ourliac, Bruno Palier, Etienne Wasmer for their comments in ad hoc meeting organized by France Strategy or in academic seminars. This work is supported by public grants overseen by the French National Research Agency (ANR) as part of the “Investissements d’avenir” program within the frameworks of the Centre d’accès sécurisé aux données - CASD (ANR-10-EQPX-17) and the LIEPP center of excellence (ANR-11-LABX-0091, ANR-11-IDEX-0005-02).

Researchers from the Banque de France participated to this work, the views expressed in this paper are their own and do not necessarily reflect those of the Banque de France or the Eurosystem.
1 Introduction

In the context of a globalized economy in which many developed countries face sluggish economic growth and low employment rates, governments have sought to increase firm competitiveness and boost economic activity by implementing policies aiming at reducing labor costs. In France, between 1993 and 2004 a series of direct payroll tax cuts have been implemented, targeting the bottom of the wage distribution, partly in order to offset the impact of the minimum wage on labor cost (Bunnel and L’Horty, 2012). In 2013, this set of policies was complemented by a large corporate income tax (CIT) credit whose amount is proportional to the wage bill. This policy, called the Competitiveness and Employment Tax Credit (CICE) was conceived as a mere continuation of the pre-existing payroll tax cuts. It is well possible however that firms respond to wage bill-based CIT credits differently than to payroll tax cuts. Actually, a qualitative analysis conducted through interviews of CEOs, accountants and human resources directors shows that firms failed to see the direct link between CICE and labor costs (Carbonnier et al. 2016). Accordingly, firms could respond to a CIT credit by increasing their net profit or by sharing the benefit with their employees through wage increases. These effects are likely to be all the more different that labor and good markets are not competitive and that there exists rent sharing between employers and employees within the firm.

In this paper, we evaluate this far-reaching reform, taking advantage of a very rich set of administrative data, in order to understand how firms react in response to tax cuts and labor cost shocks. The CICE was introduced in France January 1st 2013. This scheme consists of a CIT credit equal to 4% of the eligible wage bill in 2013 and 6% of that eligible wage bill in 2014. Crucial for identification strategy, the eligible wage bill corresponds to the sum of gross wages for employees paid less than two and half-time the hourly minimum wage. In other words, the wages of salaried just above this threshold are not eligible to the CETC and this discontinuity generates important variation in the intensity of treatment between firms (even for firms with very similar wage structure) that we are going to exploit.

Our empirical analysis relies on a very rich dataset at the firm and individual levels. Very precise data on firms wage structure are found in annual social declarations database (DADS) at the level of each job (one observation per position for each company and one observation per job for each employee), built by Insee (French statistic agency). This database, exhaustive at the level of salaried jobs, also informs about the type of position held both in contractual terms and in terms of tasks. General information on the corporate structure of production and profits come from FARE database and consist in corporate tax return which are collected by the General Directorate of Public Finance (DGFiP) matched with survey data build by Insee. This database is exhaustive at the level of the companies. DGFiP also specifically builds MVC file informing the company’s entitlements to CICE and its imputations, deferrals or reimbursements.

Our empirical strategy consists in estimating the effects of the CICE by comparing the evolution of employment, wage and profits (in levels or in growth rates) for companies more or less benefi-
ciaries of the CICE due to the existence of this threshold in wagebill eligibility (double differences estimations). To ensure the exogeneity of the treatment – the magnitude of CICE received as a share of labor cost – we also instrument the CICE actually received by the CICE that firms could get, according to the characteristics of their production structure the years preceding the introduction of the CICE. To check for the robustness of this identification strategy, fixed effects and controls are introduced to ensure the common trend assumption between the treated and control firms.

We also implement a matching estimator that allows us to isolate the variation in treatment intensity that comes from the discontinuity in the eligibility at the 2.5 minimum wage threshold. The matching estimator consists roughly in matching firms prior to treatment on several point of their cumulative density function ensuring that the remaining variation in treatment intensity stems from difference in wage structure around the 2.5 minimum wage threshold that we consider as good as random. Finally, the potential existence of remaining diverging trends is also directly tested through placebo regressions implement on pre-treatment period.

Our results suggest that CICE did not succeed in boosting employment in the two first years (2013 and 2014). However the results suggest that firms used the CICE to restore their margins as the CICE has a positive and significant – though small – impact on profit. Moreover the estimates show that the corporate income tax credit has been partially shifted onto wages. Differencing the effect on wages per type of worker, it appears that white collar are the main indirect beneficiaries of the scheme. These results bring new evidence on the existence of rent sharing between capital and labor, particularly in favour of insiders (especially white-collar workers).

An important literature has been dedicated to the evaluation of policies aiming at reducing labor cost. Many studies focus on social contribution cuts. Bohm and Lind (1993) and Benmmarker et al. (2009) for Sweden, and Korkeaäki and Uusitalo (2009) for Finland have developed estimates based on geographical differences in rates (taking advantage of regional reforms in social security contributions), and conclude to the absence of effect on employment. Social contribution cuts in France appear to have had more favorable effects on employment: Crépon & Desplatz (2001) and Chéron et al., (2008) found strong impact although Kramarz & Philipon (2001) did not. A potential reason could be that they are more targeted on low wages. However, Huttunen et al. (2013) use double difference estimation method (by age group) to assess the impact of social contribution cuts targeting low-wage workers in Finland: they found no impact at the extensive margin and only a very limited impact at the intensive margin.

One reason of the importance of low-wage targeting for explaining the impact of social contribution cuts comes from wage incidence. Gruber (1994), Anderson and Meyer (1997, 2000), and Murphy (2007) demonstrate, through natural experiments in the United States, that the share of social contributions actually paid by employers is inversely proportional to the level of wages. Moreover, taxation incidence on wages is not limited to social contributions: three recent empirical analyses (Arulampalam et al., Dwenger et al., 2011, Liu & Altshuler 2013) found that about half of the CIT rate cuts were passed on to employees through wage increases.
Our contribution to the literature is threefold. First, we evaluate the impact of the CICE jointly on three different outcomes (employment, wage and profits) and thus provide new quasi-experimental evidence on the incidence of corporate income tax credit. Moreover using detailed information on individual workers, we are able to document the existence and magnitude of rent sharing in the labor market and more importantly to which categories of employees it is most relevant (job stayers versus new hires, white-collars or blue-collars). Finally, our estimates, based on a large and still ongoing CIT credit program, point to weak employment effects, which casts new doubts on the relative effectiveness of such incentives. Given the popularity of cuts in corporate income tax as a way to boost economic activity, our results are informative to the current policy debate.

The rest of the paper is organized as follows. The CICE scheme is explained in section 2, the databases are presented in section 3 and the identification strategy is detailed in section 4. The results of the estimates are presented and discussed in section 5. Section 6 concludes and puts into perspective the impacts of CICE onto the different outcomes in order to draw the global picture of its impact aftermaths.

2 The tax credit for competitiveness and employment: how does it work?

The French tax credit for competitiveness and employment, named hereafter CICE, was introduced January 1st 2013. It is proportional to a firm’s wagebill so it is a tool which aims at decreasing firms labor costs (at least in the eyes of the government). While almost all firms can benefit from it, not all employees are eligible. Indeed, the CICE applies only to employees paid less than 2.5 the minimum hourly wage, it is therefore equal to 0 for all employees paid more than 2.5 the minimum wage. For eligible employees, it is equal to 4% of the wagebill in 2013, and to 6% of the eligible wagebill in 2014 and 2015. The CICE is still ongoing but due to data constraints, our analysis relies on the evaluation of the CICE up to 2015.

Figure 1 presents a comparison of the CICE (in red) payroll taxes cuts pre-existing the time of its implementation. As one can see, there exists before 2013 some payroll tax cuts which target low wages: they consist in around 26% at the minimum wage and continuously decrease to become null at 1.6 minimum wages. In contrast, the CICE, which comes in addition and not in replacement to pre-existing cuts, is flat up to 2.5 the minimum wages. In fact, the CICE has several characteristics which are crucial for our identification strategy:

- **The CETC does not target low wages:** All wages up to 2.5 the minimum wage are eligible to the policy, which, given the distribution of wages in France represents a high share of workers. Figure 2 presents the share of wagebill eligible to the CETC by socio-professional category. Several points emerge from the analysis of these graphs. First of all, regarding blue collar workers and other employees (on the bottom row respectively on the left and right
sides), nearly all the salaried workers are eligible. This is not surprising given that most of these workers are paid much less than 2.5 the minimum wage. However, more importantly, for executives and intermediate professions (top left and top right respectively), a non negligible share of employees is also eligible to the CICE. This is important as this means that while most firms are eligible to the CICE (meaning that there is no much variation in treatment status in the extensive margin), firms will be in contrast more or less exposed to the CICE depending on the skill composition of their workforce (there exist important variation in treatment in the intensive margin). This is precisely this variation in treatment intensity (rather than in treatment status) that we are going to exploit in our empirical analysis.

- **The CICE is discontinuous**: An other important feature of the French CICE is that it is discontinuous at 2.5 minimum wage. This means that if one employee is paid 2.49 the minimum wage, she will get the maximum of tax credit (i.e. 4% of the total wagebill in 2013 and 6% in 2014 and 2015) while if an employee is paid 2.51 the minimum wage, the company will get no tax credit for this employee. This is particularly important for our identification strategy. Indeed, not only this means that there will be variation in treatment intensity between firms according to their skill structure or size, this means that even for firms with relatively similar skill structure or size, very small differences in the wage structure can translate into large variation in treatment intensity, whether or not the employees are paid just above or just below the threshold of 2.5 minimum wages. This is reflected in Figure 3 which depicts variation in treatment intensity according to firm size in 2013. The first graph on the top left presents the distribution of tax credit (expressed as a share of wagebill) received by firms in 2013 (in blue) and in 2014 (in white), for all firms. As one can see, many firms get 4% of CICE (as a share of wagebill) in 2013 because all their employees are eligible. The other graphs present the same distribution but by firm size category. Interestingly, there is
Figure 2: Share of wagebill under 2.5 hourly minimum wage in 2012

Source: DADS 2012.

not only variation between firms of different size but also between firms belonging to similar size categories. This is especially true for SMEs (on the bottom left) and for larger firms (on the bottom right). This is precisely on the exploitation of this variation in treatment intensity between relatively similar firms upon which relies our identification strategy.

- **The CICE was not anticipated:** Finally it is important in the perspective of the evaluation to emphasize that firms could not anticipate the CICE, neither foreseen the threshold at 2.5 the minimum wage. Indeed, the implementation of the CICE was partly influenced by a report made by Louis Gallois, on the behalf of the government, which emphasized that unemployment was high and that France was loosing market share, so that improving firm competitiveness was crucial. But interestingly, the report recommended to cut payroll taxes up to 3.5 the minimum wage but many French labor economist have protested against this idea on the argument that elasticity of employment to change in labor cost is higher for the lower part of the wage distribution. So in the end, first of all, the form taken by the CICE differs greatly from the report recommendation because it was set at 2.5 the minimum wage and not at 3.5. Second, the CICE took the form of a tax credit rather than a direct cut in payroll taxes (for
budgetary purposes). Finally, the timing was also very short between the report (which has been given to the prime minister November 5th 2012 and the implementation of the CICE beginning January 1st 2013.

3 Data

The present empirical analysis is based on three administrative databases, built from firms returns to the tax agency (DGFip, the French General Directorate for Public Finance) and to the institution responsible to collect social contribution (ACOss). DGFip has computed, since the reform, a database specifically informing about the amount and use of the CICE at the firm-level (MVC database). They also provide in association with Insee (the French statistical agency) a database on firms accounting (FARE database). ACOss provides in association with Insee a database on
workers and wages at the contract level (DADS database). We got access to these databases for the years 2010 to 2014.

3.1 MVC database

DGFiP specifically built the MVC files informing the firms’ initializations of CICE rights. This database, which began to be created for the 2013 vintage, contains five variables for all firms likely to benefit from the CICE - i.e. more than 800,000 observations. These five variables are: initialization, the amount of tax credit to which the company is entitled, initialized on its tax returns; increase, upward adjustments given the evolution of the company’s wage structure; decrease, similar downward adjustments; imputation, the amount of CICE that companies were able to deduct from their CIT.

These variables allow us to understand the CICE distribution. After pairing with the other databases (and the loss of some companies absent from certain bases), the total amount initialized in 2013 is 9.8 billion euros. A large number of companies benefit from a relatively small amount of CICE, with about EUR 2 756 for micro-enterprises and EUR 24 492 for SMEs, whereas the amounts received by large companies are ten to one hundred times larger: the 288 large companies present in the base have initiated in 2013 a tax credit approximately equal to that of the 496,750 micro-enterprises.

Initializations, besides being highly variable, represent relatively small amounts for companies: it exceeded one percent of turnover for only one quarter of the companies in 2013 and less than half in 2014 (which also illustrates the increase in CICE amounts between 2013 and 2014). Moreover, the collection of these amounts remains very spread out over time because of the nature of the tax credit nature of the CICE. The econometric results depend on this since any CETC impacts which would occur through the relaxation of budgetary constraints could only be observed after some years and cannot be estimated in our framework. Note that these mechanisms should not be at stake given that French firms are not budget constraints (Kremp and Sevestre 2013). On the contrary, incentive effects – especially in terms of employment linked to labor costs – are quicker to occur and the initialization of tax credit is precisely defined in time: our econometric framework should therefore be adapted to estimate them.

3.2 FARE database

General information on the production structure of companies and their benefits is presented in the FARE database of the ESANE system (annual business statistics). It is built by Insee on the basis of the tax data, social declarations and a survey. The purpose of the survey questionnaire is to produce structural business statistics; it should be noted that the questionnaire sent to companies was amended in 2011. This database covers all firms (including firms without employees) with the exception of the financial sector and farms.
Our dependent variables regarding the average workforce or the profitability of the firm come from this dataset. On this last point, the accounting entry for the CICE is unclear and it is likely that the different companies have accounted for it differently (deduction of labor costs, operating subsidies, other operating income or CIT deduction). Thus, the various measures of profit may or may not take into account the CICE according to how it is accounted for. We have tried to address this problem by considering three profit indicators: EBIT and EBITDA as a proportion of turnover, as well as operating income as a proportion of operating costs. We also use variables from FARE as controls: productivity (value added divided by average workforce) and capital stock (tangible and intangible assets).

While all other databases are defined at the firm level (with the SIREN number identifying them), the FARE files compute combinations for some of them, which is called profiling. Indeed, some major groups have transformed parts of their production chain into independent legal units, while decisions remain at the central level. In order to provide a better overview of the productive structure, Insee gathers different legal units (with different SIREN numbers) into a single entity. For the six historical profiled companies, which only appear in the database in their profiled form, we consider the profiled company and similarly profile the other databases. The hundreds of other profiled companies are present in the database both under their individual SIREN and under their profiled SIREN. We consider for them only the individual SIREN.

3.3 DADS database

The annual social data declaration (DADS) files contain information on each salaried contract in each company: net and gross wages, working time, socio-professional categories, types of contracts, sex of the employee... There is one observation per contract for each company and employee. Thus, the same employee can be found several times in the dataset if she has contracts with several companies. It is therefore a database to be used from the point of view of the companies and not of the employees. In addition, it is important to know that DADS are presented in the form of regional files and that observations concerning employees of an enterprise located in one region but residing in another region are present in the regional files of the two regions. A first work before starting the analysis therefore consisted in purifying these databases from double accounts.

Moreover, for each item, the values of the variables are also given for the previous year. This makes it possible to construct changes in the variables from one year to the next for each item. Indeed, the identifiers of the contracts are not recognizable from one vintage to the other and it is therefore not possible to build a panel of contracts. On the other hand, the company identifiers are the SIRENs, stable over time, and we therefore constitute panels of companies. Thus, as far as wage increases are concerned, we have operated in two ways. On the one hand we calculated the average wages per firm each year, and compared them from one year to the next. Since the changes can be due both to changes in the wages themselves or to the structure of employment in the company,
we have also calculated the growth hourly wage for each position present two following years in the same firm. Then, we aggregated by calculating for each year the average of individual wage growth. Pay data is accurate in that it is at the job level, but relatively imprecise as to what it covers. Gross remuneration includes “all remuneration received by the employee under her contract of employment, before deducting compulsory contributions”. For instance, it includes bonuses for end of fixed-term contracts (corresponding to 10% of the amounts received during the contract). This can lead to biases in the observation of hourly wage growth since these bonuses inflate the total gross earnings for the contract year but not the number of hours worked. In order to measure the growth of hourly wages, it is therefore necessary to purge the bases of these observations at the end of the contract.

In order to carry out our identification strategy, it is necessary to be able to measure the potential CICE to which an enterprise would have been entitled before the actual reform implementation, according to its productive structure. However, this is not possible on the basis of actual tax data, which did not collect such information prior to 2013. However, the DADS database allows us to approach these values thanks to the precision on wage structures companies. It is indeed possible to calculate the share of wagebill below 2.5 minimum wage, and to compute a potential CICE. This calculation for the years 2013 and 2014 is very close to the amounts of CICE actually initialized with the tax departments and presented in the MVC database. Similar wage structure indicators are also built at other thresholds: 1.5, 2, 3 and 3.5 minimum wage.

3.4 Building the merged database

We are working on the matching of the three previously presented databases. After the DADS-MVC matching, we calculate the ratio of the CICE imputed on the basis of the DADS database over the actual CICE initiated in the MVC database. We exclude from the sample the firms whose ratio belongs to the upper percentile in 2013 or in 2014. We then perform the matching with the FARE database. Only the companies present in the 3 bases (DADS-FARE-MVC) are kept.

We then make two selections. First, we keep only companies that have at least one full-time equivalent job over the year, so as not to be biased by the empty shells. Then, we constructed the balanced panel database over the period 2010-2014. There are then slightly fewer than 500,000 firms in the final database used for the estimates.

4 Identification Strategy

The aim of the present evaluation is to use the French CICE reform to estimate the impact of wage costs’ decreases on firms’ behavior. Calling $Y$ the dependent variable and $C$ the cost variable (depending on the types of behavior studied, we can look at the total production costs $TC$ or wagebill only $WB$ only). We intend to measure the elasticity $\epsilon_{Y,C} = \frac{\partial \ln(Y)}{\partial \ln(C)}$. This elasticity may result from various economic mechanisms. This may be a form of rent sharing in the case of wage
increases resulting from CIT rates decreases (Arulampalam et al. 2012, Liu and Altshuler 2013, Dwenger et al. 2011), substitution between production factors whose relative prices have been modified (Chirinko et al., 2011, Karabarbounis and Neiman 2013) or changes in the volume of output due to lower prices associated with lower costs.

Obviously, firms’ production costs are strongly related to firms’ behavior, and it is not possible to directly estimate the link between costs and the various dependent variables. The reform of the CICE not only needs to be evaluated per se, it also provides an opportunity to assess how firms react to an (indirect) decrease in wage cost. Indeed, it exogenously alters the production costs through a tax credit based on wages lower than 2.5 minimum wage. We use this exogenous variation in production costs to implement a double difference estimation of the impact of wage costs on firms’ behavior.

Such a sharp discontinuity leads to think that there should be some behavior of firms around the threshold: the CICE rate is constant (4% in 2013 and 6% starting in 2014) and suddenly died down to 2.5 SMICs. Thus, a full-time employee paid two and a half times the minimum wage opened in 2014 an annual tax credit of EUR 2,600 for his employer. If she had been paid even a few euros more, her employer could not have received any tax credit. Hence, employers may be particularly reluctant to grant increases to their employees close to the threshold or they will seek to set the wage.

Figure 4: Distribution of wage growth of stayers, 2010-2015

Notes: stayers are defined as workers in permanent contract working full-time (32 hrs per week or more) who kept the same occupation within the same firm between t and t-1.
Source: DADS 2010-2015.
of their new recruits as far as possible below this threshold. In their extreme configurations, strong employer reactions to these two issues (increases and hires) could lead to bunching at the threshold (Saez 2010). In less extreme configurations, Carbonnier et al. (2014) showed that a discontinuity in a framework where the assignment variable was only imperfectly controlled could lead not to a point of accumulation but to a discontinuity in the values of the variables involved.

We first test such behaviors by implementing regression discontinuity design for wage increases of stayers and for the wage distribution of new hires. We did not find the tiniest impact for neither, whatever the subgroup tested (per firms’ size and industry or per employees’ socioeconomic category). Actually, figure 4 shows the distribution of wage growth of stayers from 2010 to 2015 and figure 5 shows the distribution of wage of new hires during the same period. Neither a bunching nor a discontinuity appears on these figures.

Figure 5: Distribution of wage of new hires, 2010-2015

We can deduce from these negative results that there is no behavior of sharp optimization around the threshold. Nevertheless, the tax cut may change the firms behavior in other ways. Collective or individual bargaining may lead to rent sharing with employees. Hence, we estimates the impact of the CICE by comparing firms more strongly impacted to firms more lightly affected by the tax cut.

However, such an estimate generally requires dividing firms in two groups: the treatment group containing firms impacted by the reform and the control groups containing those which are not.
It is not possible here to set up a control group because virtually all companies benefit from the reform. However, the extent to which CICE reduces production costs varies widely among firms, including between like-minded firms in the same economic sector. Figure 3 shows the distribution of treatment intensity, which is spread among the possible intensities, particularly for larger firms. Even for SMEs, the distribution is spread for most industries, as shown by figure 6, presenting the two extreme in terms of spread of distribution of treatment intensity. Both show a large variation in treatment intensity.

Figure 6: Distribution of treatment intensity for SMEs of Manufacturing and service to individuals

![Graph showing distribution of treatment intensity for SMEs in Manufacturing and Services to individuals](image)

Sources: DADS-FARE-MVC 2013-2014

We therefore implement double difference estimations on the treatment intensity, considered as a continuous variable. The logarithm of the dependent variable is regressed on the logarithm of the production cost (less the CICE from 2013). This intensity of treatment can be considered on the basis of wage costs only (regressions on employment and wages) or on total production costs (profits). However, two main reasons may cause estimation bias:

1/ **Reverse causality:** any company increasing its payroll one year - for reasons independent of the CICE - *de facto* increases the intensity of its treatment. Thus, treatment intensity is fundamentally endogenous to payroll growth (as long as it remains below 2.5 minimum wage).

2/ **Common trend assumption:** any double difference estimate requires that the common trend assumption between more intensively and less intensively treated groups be verified. Here, this means that firms that are more or less intensely treated by the CICE (*i.e.* companies whose eligible wagebill is more or less important compared to production costs) would have behave the same way in the absence of the CICE. This is not the case and it is therefore necessary to ensure that regressions are effectively controlling for potential heterogeneity of trends.
The statistical treatment of these two potential biases will be different and presented in the next two subsections.

4.1 Reverse causality

In order to tackle the reverse causality issue, a common solution used in the literature is to assign treatment on the lagged values of the variables which constitute the tax base or the subsidy base. This strategy was used by Auten and Carroll (1999) in their estimation of the impact of the taxation of earned income, by applying the variation on the rate of earned income the year preceding the reform. In our case, it comes to use the relative stability in the production structure and to consider the ratio of eligibility the years preceding the introduction of the CICE as a proxy of the ratio of eligibility \textit{ex ante}. In other words, we use the ratio of eligibility that firms would have had given their production structure before the implementation of the CICE so as not to take into account their endogenous response behavior in the computation of the ratio of eligibility and avoid the reverse causality issue. The same type of methodology was used in the case of France by Crépon et Desplat (2001) to evaluate the impact of social contribution rebates in France.

In order to ensure that the reverse causality is not anymore an issue, one has to check for the validity of the instrument. A good instrument must fulfill two conditions: it has to be exogenous (contrary to the regressor that it is intended to instrument) and is has to be highly correlated with this regressor. Regarding the first criterion, temporal lags ensure exogeneity. The intensity of treatment is calculated with previous year wage structure, which has been chosen by firms in order to adapt the 2012 economic situation (with past dependency), without knowing about the existence and future introduction of the CICE. Indeed, the tax credit has been voted at the very end of 2012, and was presented and discussed in very short time at the end of this year. Consequently, the intensity of the intention to treat (potential treatment prior to firm behavior in response to treatment) can be considered as exogenous.

Regarding the second criterion, one can analyze the power of prediction of the effective treatment (i.e. of the CICE initialized in 2013 according to the tax records in the MVC database). In our case, it comes from the relative stability of firm production structure over time. Indeed, regressions of effective treatment (tax credit effectively initialized by companies in 2013 according to the MVC) on the instrument (i.e. tax credits predicted according to the wagebill of wages inferior to 2,5 the minimum wage the year preceding the reform), reveal the predictive power of this instrument (table 1).

The coefficient is always highly significant and very near from unity: even 0.73 for the regression with full control set and fixed effects. Besides, these regressions of the actual treatment intensity on the treatment intensity calculated on the pre-reform wage structure contribute to explain most of the variance of the treatment intensity: more than 90% of the CICE initialized when measured as a share of wage cost, even without controls nor fixed effects.

The main principle of the double difference estimation is to compare the evolution of treated
Table 1: Regressions of the actual treatment intensity on the instrument for 2013

<table>
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<tbody>
<tr>
<td>Calculated CICE (2012)</td>
<td>0.96***</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
</tr>
<tr>
<td>Observations</td>
<td>2,017,921</td>
</tr>
<tr>
<td>R²</td>
<td>0.93</td>
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<tr>
<td>Controls</td>
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<tr>
<td>Fixed Effects</td>
<td>√</td>
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Notes: *: p<0.05; **: p<0.01; ***: p<0.001.
Sources: DADS, FARE, MVC 2010-2014.

and control groups before and after a reform. In order to do so, we estimate a panel regression with individual fixed effects, a time dummy and a time dummy interacted with the treated group. Given that the control group is not composed of firms which do not benefit from the tax credit (extensive margin) but rather by firms less intensively treated (intensive margin), we interact the time dummy with the “intention to treat” (i.e. the tax credit that firms could get given their production structure the years preceding the reform). This is summarized in the following equation 1.

\[
\ln(Y_{i,t}) = \alpha + \beta_{13}.I_{i,t}.I_{t=2013} + \beta_{14}.I_{i,t}.I_{t=2014} + \sum_k \gamma_k.X_{k,i,t} + \sum_f \gamma_f.I_{[f]} + \epsilon_{i,t} 
\]

where \( I_{i,t} = -\ln(1 - \frac{\text{CICE}_{t-1}.Z(x)_{i,t}}{\text{CICE}_{t-1}}) \) is the intention to treat computed as a share of production costs. The variable \( Z(x)_{i,t} = \frac{\sum_j h_{j,i,t}.w_{j,i,t}.I_{[w_{j,i,t} < w]}}{\sum_j h_{j,i,t}.w_{j,i,t}} \) give the share of the wagebill of firm \( i \) at year \( t \) under \( x \) time the minimum wage: the subscript \( j \) stands for the job contract, \( h_{j,i,t} \) for her number of hours work in year \( t \) in firm \( i \) and \( w_{j,i,t} \) her hourly wage, \( w \) stands for the legal hourly minimum wage. Note that depending on the specification, production costs correspond to the total wagebill (from the DADS database) or to the total production costs (from the FARE database). \( X_{j,i,t} \) stand for the values of different controls \( j \), \( I_{[f]} \) for the different fixed effects and \( i \) refers to firms and \( t \) to year. For ensuring exogeneity, as for treatment variables, control variable are also lagged one year.

The coefficients \( \beta_{13} \) and \( \beta_{14} \) can be interpreted as elasticities of the variable \( Y_{i,t} \) relative to production costs for 2013 and 2014. Note that a “negative sign” was added in front of the intensity variable for the ease of interpretation given that the CICE represents a diminution in costs. This choice was made so that regressions coefficients can be easily interpreted as the impact of the CICE: a positive sign in result tables means that the CICE has a positive impact on the outcome variable.

4.2 The common trend assumption

To be relevant, the double difference estimation relies on a strong assumption: the one of “common trend assumption”. In other words, this method is valid if and only if firms with different intensity to treat follow the same trend before the introduction of CICE. This assumption, when verified, means that differences between the treated and less treated firms would have remained constant.
over time in the absence of the policy under evaluation, and therefore ensure that relatively less intensively treated firms can serve as valid counter-factual for more intensively treated firms. In the opposite case, if those firms would not follow the same trend before the reform, it would be impossible for the econometrician to disentangle, in the post-reform evolution between the treated and less intensively treated firms (double difference estimation), what can be attributable to the policy from what can be attributable to any other confounding factor.

As this is not always the case, one can take into account any potential pre-reform different trends by including several controls for capturing these trends. This becomes a common trend *ceteris paribus*. In this purpose, we add controls in the regressions. First, we introduce “sector × year” and “firm-size × year” fixed effects in order to capture all specific sectoral and size class trends. We also control for firm fixed effects to control for all the unobservable which are specific to a firm and constant over time. Moreover we add different time-varying controls at the firm-level which can also influence our outcome variables: productivity (measured as a ratio of valued added on average employment), capital stock (tangible and intangible assets) as well as firm average wage.

In order to capture most of the intrinsic differences pre-reform between the firms which (will) become more intensively and less intensively treated after the introduction of the CICE, we control for the share of wagebill inferior to 2.5 the minimum wage, $Z(2.5)_{i,t}$, without interacting it with the year dummies.

Moreover, as in France, there are some yearly variations in the minimum wage and some exemptions which are proportional to the minimum wage, these variations can impact the total wagebill and therefore also impact our outcome variables. As a consequence, we also add controls of the share of wagebill exposed to the minimum wage variations to avoid estimation bias. In particular, we introduce $IMISC_{i,t}^a = Z(1.5)_{i,t-1}.1_{[t=a]}$, for the different years $a$, which is the share of the wagebill constituted to payroll for workers payed less than 1.5 the minimum wage.

To go further with the common trend assumption, we do the same as above, but constituting cells of similar firms and running the regressions separately within each cell. We lose the power of the very large database – there is much less firm within each cell – but we get the precision of identifying between very similar firms. The cells are constructed so that within-cells firms have the same overall wage structure but only small differences around the CICE threshold.

In order to create these cells, we first calculate for each firms the share of the wagebill at 2 and 3 minimum wage the year prior to the reform: $Z(2)_{i,2012}$ and $Z(3)_{i,2012}$. Then, we split the different firms according to the deciles of these two variables $D_i^{Z(2)}$ and $D_i^{Z(3)}$. Finally, we construct the 100 cells of firms $Cell_i = [D_i^{Z(2)}, D_i^{Z(3)}]$. Within each cells, the firms have the same share of the wagebill constituted of wages under 2 minimum wage, between 2 and 3 minimum wage and above 3 minimum wage. Hence, their difference in treatment intensity is only due to the distribution of their wage bill between 2 and 3 minimum wage, with respect to the threshold of 2.5 minimum wage.

In order to get enough variation in treatment intensity, we implement the double difference regressions according to equation 1 separately within each cells containing firms which have at least
50% of their wagebill between 2 and 3 minimum wage. Then, we recalculate the mean estimate weighted by the number of firms within each cell and the standard error of this mean estimate. In the following, we refer to this results as "regressions per cell" (PC). The general estimation over the full sample being refered to as "regressions on full sample" (FS).

In order to check that these methods properly capture the intrinsic pre-reform differences between firms relatively more or less intensively treated, a usual test consists in operating "placebo" regressions. The idea is to proceed to the same regression as described in equation 1, but only on the years preceding the effective introduction of the CICE, in order to measure the "fictive effect" of the introduction of the CICE in 2012. This comes to estimate the following equation 2.

\[
\ln(Y_{i,t}) = \alpha + \beta_{\text{placebo}} \cdot I_{i,t}[t=2012] + \sum_k \gamma_k \cdot X_{k,i,t} + \sum_f \gamma_f \cdot I[f] + \epsilon_{i,t}
\]

The placebo test is valid only if the coefficient \(\beta_{\text{placebo}}\) is not significantly different from zero; meaning that the dependance of the outcome variable in the structure of production which induces the intention to treat is stable before the introduction of the CICE. In other words, this is a test of the common trend assumption. If the placebo test validates the common trend assumption, the coefficients \(\beta_{13}\) and \(\beta_{14}\) can be seen as unbiased estimates of the elasticity of the outcome variable \(Y\) on wage cost (or production costs depending on the outcome of interest).

### 5 Results

The results of our double difference estimations of the impact of CICE are presented in the following subsections, respectively on employment, profit and wages. One should note that for each outcome of interest, we present the results of regressions weighted by the workforce in 2012. Unweighted regressions give more importance to small firms because they are more numerous; they reveal the behavior of firms, considered as decision-making units. Conversely, weighted regressions give more weight to firms with a greater share of jobs; their coefficients are closer to an interpretation of macroeconomic effects. Besides, as highlighted by Solon et al. (2015), the comparison of weighted and unweighted regression is informative as it can reveal the existence of heterogeneity in firm behavior (according to firm size in our case) when coefficients differ. We also implement unweighted regressions but we choose to present only the results of the weighted regressions. Nevertheless, the results of the two types of regressions are qualitatively the same.

#### 5.1 Employment

The objectives of the CICE was primarily to boost employment; this is usually the main goal of policies aiming at decreasing labor cost. There are several ways of counting employment: the two most usual being the number of workers employed (whatever their working time) and the number of full-time equivalent jobs (or equivalently the number of hours worked). We analyze primarily the number of workers, through the number of job contracts from DADS database. Furthermore,
we analyse as robustness checks the number of hours (given by the DADS database) and the mean workforce in each firm (given by the FARE database). The results of the impact of CICE on employment are presented in table 2. The first two columns present the result for all kind of positions, columns 3 and 4 only for executives and professionnals and the last two columns for blue colar workers and other employees. For each category of employee, there is the results of the placebo test then the actual estimation, with both methodologies: double difference on full sample and separate regression per matching cells.

Table 2: Impact of the CICE on employment

<table>
<thead>
<tr>
<th>Dependent variable : number of workers</th>
<th>All (FS)</th>
<th>Executives and professionals (FS)</th>
<th>Blue collars and other employees (FS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Placebo test</td>
<td>0.265 (0.219)</td>
<td>0.115 (0.358)</td>
<td>0.500 (0.488)</td>
</tr>
<tr>
<td>CICE int. 2013</td>
<td>-0.288 (0.176)</td>
<td>-0.539 (0.446)</td>
<td>-2.140*** (0.883)</td>
</tr>
<tr>
<td>CICE int. 2014</td>
<td>-0.368* (0.166)</td>
<td>-0.885** (0.290)</td>
<td>-1.732*** (0.618)</td>
</tr>
<tr>
<td>Observations</td>
<td>1,087,756</td>
<td>45,873</td>
<td>1,051,550</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.998</td>
<td>0.991</td>
<td>0.996</td>
</tr>
</tbody>
</table>

(FS): regression on full sample; (PC): separate regressions per cells. Productivity, assets and wage structure controls, firm FE, year × sector FE, year × size FE included. Weighted Regressions. Robust standard errors in parentheses (firm level cluster), * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Sources: DADS, FARE, MVC 2010-2014.

First of all, it should be noticed that the two methodologies allows to control for the pre-reform trend heterogeneity: all placebo tests validate the common trend assumption. On overall, the results suggest that the CICE has had no impact on employment If any, the effect on employment would be non significant and rather negative.

Given that average effects can hide heterogeneity between workers, we reproduce these estimates for different socio professional categories of employees apart. The rather negative impact of CICE seems to comes mainly from the effect on blue collar workers and other employees, whereas the impact on executive and professionnals appear positive. Whatever, this impact is not very strong as it appears only in the estimations on the full sample: the results of the methodology of separate regressions per matching cells are insignificant.

This results may be surprising at first sight, but they can be rationalized. We discussed then after presenting the corresponding results on profits and wages. First, it can be that firms need more time before adjusting employment but data for the year 2015 are not available yet to test for such an hypothesis. Second, it could be that labor costs mainly impact labor demand through substitution effects between labor market segments. Contrarily to previous French payroll taxes, CICE is not targeted to low wages only and may overturn the substitution from high skill to low
skill workers incitated by previous tax cuts. Last, it could be that firms prefer using the CICE for another purpose, for instance by restoring their margins or by increasing the wage of (some) of their employees. The topic of the next subsections is to test these last hypothesis.

5.2 Profits

If the CICE has not been used to increase the workforce, keeping the tax credit as net profit is another possible use. However, it is not trivial to properly measure it because there is no automatic way of including it in firm accounts. Companies were advised to account for the CICE as “deduction of personnel costs”. If they did it in this way, then the CICE should appear in the profit indicator. We use the ratio of operating income over operating costs as operating margins’ indicator. Nevertheless, many other accounting entries were possible. Some firms account CICE as operating subsidies, other operating income or CIT deduction. In the last case, the CICE would not appear in the accounting as reported by FARE database and the operating margin is before CICE: an unchanged operating margin in that last case means that firms keep CICE to increase their profits. In the previous cases, an increase of profits implies an increase of the operating margins’ indicator. Hence, the estimations, presented in table 3, are somewhat fuzzy.

<table>
<thead>
<tr>
<th>Table 3: Impact of the CETC on profits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent variable: operating margins</td>
</tr>
<tr>
<td>(FS)</td>
</tr>
<tr>
<td>Placebo test</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>CICE intensity 2013</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>CICE intensity 2014</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Observations</td>
</tr>
<tr>
<td>$R^2$</td>
</tr>
</tbody>
</table>

Notes: (FS): regression on full sample; (PC): separate regressions per cells. Productivity, assets and wage structure controls, firm FE, year × sector FE, year × size FE included. Weighted Regressions. Robust standard errors in parentheses (firm level cluster), * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Sources: DADS, FARE, MVC 2010-2014.

Nevertheless, the placebo tests validate the common trend assumption. The estimates are all positive, but only the estimates for 2014 with the methodology of double regression on full sample is significant. These results do not constitute a smoking gun evidence that firms keep a share of CICE to increase their profits, but indicate that it should have been so. Actually, restoring French firm profits was one of the main goal of CICE, with the aim of giving them ease to invest in new production and new technologies.
5.3 Wages

If only a fraction of the CICE has translated into increases in firm profits and if they did not use this credit to hire, firm might have shared the benefits of the tax credit with their employees. Figure 4 shows that firms do not redistribute CICE exactly to the employees the amount of CICE they give them access to. Therefore, the redistribution of CICE to the employees should have occurred in a more broad way, through relatively general rent-sharing, independently from position of each employee’s wage vis-à-vis the threshold. We test the impact of CICE on the wages by implement previously presented methodologies with the mean wages of stayers as dependent variable (table 4).

Table 4: Impact of the CETC on wages

<table>
<thead>
<tr>
<th>Dependent variable: mean wages of stable employees</th>
<th>All</th>
<th>Executives and professionals</th>
<th>Blue collars and other employees</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(FS)</td>
<td>(PC)</td>
<td>(FS)</td>
</tr>
<tr>
<td>Placebo test</td>
<td>0.408***</td>
<td>0.147</td>
<td>0.336</td>
</tr>
<tr>
<td></td>
<td>(0.118)</td>
<td>(0.148)</td>
<td>(0.175)</td>
</tr>
<tr>
<td>CICE int. 2013</td>
<td>1.160***</td>
<td>0.490***</td>
<td>1.144***</td>
</tr>
<tr>
<td></td>
<td>(0.092)</td>
<td>(0.129)</td>
<td>(0.164)</td>
</tr>
<tr>
<td>CICE int. 2014</td>
<td>1.074***</td>
<td>0.363***</td>
<td>1.057***</td>
</tr>
<tr>
<td></td>
<td>(0.077)</td>
<td>(0.097)</td>
<td>(0.135)</td>
</tr>
<tr>
<td>Observations</td>
<td>1,014,498</td>
<td>42,674</td>
<td>203,557</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.978</td>
<td>0.766</td>
<td>0.950</td>
</tr>
</tbody>
</table>

Notes: (FS): regression on full sample; (PC): separate regressions per cells. Productivity, assets and wage structure controls, firm FE, year × sector FE, year × size FE included. Weighted Regressions. Robust standard errors in parentheses (firm level cluster). * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Sources: DADS, FARE, MVC 2010-2014.

Placebo tests fail for the methodology of double difference estimation on the full sample, except for executives and professionals. However, the placebo tests validates the common trend assumption for all estimations through the separates regressions per matching cells. Hence we focus on the results of this last methodology.

If considering all employees, it appears a significantly positive impact of CICE on wages, suggesting that the benefits of the CETC were partially transferred to some employees trough wage increases in 2013 and in 2014. Moreover, the value of the rent sharing – around 50% – is very close to previous estimates of the CIT incidence on wages (Arulampalam et al. 2012, Dwenger et al. 2011, Liu & Altshuler 2013).

However, these effects on wages are not the same for all types of workers. Executives and professionals benefit from large wage increases very early in time, as the estimates of rent-sharing is large and significant as soon as 2013. Contrarily, blue collars and other employees benefit from no wage increase in 2013, but only one year later (the estimates are even negative with the full sample
methodology). These results meet those on employment, which shows that CICE benefits more to executives and professionals than to blue collar workers and other employees.

6 Conclusion

In this paper, we exploit a large French CIT reform, introduced in 2013, (competitiveness and employment tax credit, CICE) to assess the impact of corporate tax aiming at reducing labor costs on firm behavior. Our empirical analysis relies on three exhaustive databases which contain precise information at the firm and individual levels on the period 2010-2014. We set two identification strategy in double difference based on the intensity of the intention to treat (one on full sample and one with separate regressions within mathin cells) to quantify the impact of the introduction of this tax credit on three different outcomes: employment, profit and wages.

The results give new evidence about the importance of taking into account rent sharing in favor of capital and in favor of white-collar employees when it comes to assess the effectiveness of tax incentives. The impact of CICE on firm profits appears positive, even if fuzzyness is due to the multiplicity of the possible accounting of CICE. Firms therefore used the CETC to restore their margins. As regards to wages, the impact of CICE is strongly and significantly positive. However, the results suggest that the CICE has had no positive impact on employment.

Even more, some counter-intuitive results are found for lower socio-professional categories, whereas the coefficients are zero or even positive for upper socio-professional categories. The same pattern appears for wage increases: the benefits are stronger for upper socio-professional categories than for lower socio-professional categories. Indeed, previous payroll tax cuts in France were sharply targeted on low wages (figure 1). CICE extends the tax cuts for higher wages, and a large share of intermediate professionals, and even executives of professionals opens right to large amounts of CICE for their employers (2).

Yet, empirical evaluations of targeted payroll tax cut that occurred in France during the 1990’s (Crépon & Desplat 2001, Kramarz & Philippon 2001, Bunel & L'Horty 2012) show that the positive impact on overall employment was due to substitution from high skill to low skill labor demand. It is possible that the extension of tax cut to higher wages relaxes the incentive and leads to substitution in the opposite way. Nevertheless, the higher benefit in terms of rent sharing for upper socio-professional categories than for lower socio-professional categories may also be directly explained by the different bargaining power of the employees depending on their skills.

References


