DO EXEMPTIONS FROM SOCIAL SECURITY CONTRIBUTIONS AFFECT JOB CREATION?

NEW EMPIRICAL EVIDENCE FROM FRENCH OVERSEAS REGIONS

Aziza GARSAA[*], Nadine LEVRATTO[**], Luc TESSIER[***]

Abstract **-** *Targeted reductions in employers' social security contributions are conceived as a key policy instrument used to facilitate job creation when labor cost is so high that it may deter companies from hiring new employees. Among the different measures in force in France, the set of instruments implemented in overseas Départements is the most accomplished form as the rates of exemption as well as the base and scope of these measures have reached their maximum there. This paper seeks to determine to what extent these instruments contribute to job creation looking at the growth rate in the number of employees through the use of an unbalanced panel of business entities with at least one employee. This dataset is drawn from a matching between several administrative data sources from 2004 to 2011. We study the differentiated effects of the payroll tax using a quantile regression on panel data estimation technique. We show that the impact of the exemption rate and of the intensity of use of the various measures on changes in the number of employees differ according to the establishment growth rate. The impact tends to decrease as the growth rate increases. However, these effects may significantly differ according to the size class and the industry in which the business operates. Large ones tend to be globally advantaged compared to the small ones. The coefficients associated with exemption rate are higher for most of the entities in manufacturing industry but only for a small part of those in business services.*

Key-words **-** FIRM GROWTH, JOB CREATION, LABOUR COST, REDUCED SOCIAL SECURITY CONTRIBUTIONS, QUANTILE ESTIMATIONS ON PANEL DATA

JEL Classification **-** C14, J3, J38, L25

[*] EconomiX, Université Paris Ouest, Nanterre-La Défense; aziza.garsaa@u-paris10.fr
[**] EconomiX, CNRS, Université Paris Ouest, Nanterre-La Défense et Centre d'Etudes de l'Emploi; nadine.levratto@u-paris10.fr
[***] Erudite, Université Paris Est Marne-la-Vallée et Centre d'Etudes de l'Emploi; luc.tessier@u-pem.fr

1. INTRODUCTION

An excessive labor cost is considered as responsible for unemployment. This settlement has motivated many governments to implement a large set of devices aiming at reducing labor cost. Among the different schemes available, the reduction in social security contributions (RSSCs) targeting low wages has become one of the most popular.

Theoretically, the fall in the relative cost of labor resulting from the RSSCs has a positive effect on employment [Nickell and Bell, 1997]. As pointed out by Calmfors [1994], this relationship rests upon an equilibrium framework synthesized by the Layard-Nickek diagram (1986). Assumptions and underlying mechanisms are such that the decrease in low wages induces a substitution effect between low skilled and qualified workers [Malinvaud, 1998] and/or equipment [Mihoubi, 1997]. The decrease in production costs it causes also improves the competitiveness of the companies benefiting from the measure. These companies then face a higher demand leading to an increase in their demand for labor [Turquet, 2002]. On the whole, the number of jobs created or maintained is higher than it would be without such an intervention.

A large number of applied studies have already investigated the incidence of payroll taxes on a national scale [Marx, 2001]. They mainly deal with public policy evaluation and are based on comparisons between supported companies and a reference group using different techniques to choose the samples and to estimate the models (Remy [2005], Ourliac and Nouveau [2012] propose comprehensive surveys on the literature). A first generation of studies, initiated by Brittain [1971], extended by Beach and Balfour [1983] and updated by Kugler and Kugler [2009], pays attention to time series and focuses on international comparisons. A second generation of works, launched by Hamermesh [1979], is based upon microdata able to reflect the broad range of payroll taxes applicable to individuals participating in the labor market. Both analyze incidence effects of payroll tax roll back on labor supply (Holmlund [1983]; Anderson and Meyer [2000]; Lang [2003]) and have found mixed results which are still debated.

The high and increasing cost RSSCs induce in France motivated an abundant literature on their efficiency too. After a first set of papers resting upon macro models and data (Lafargue, [2000], Sneessens, [1993]) initiated a long series of studies based upon micro-data. The main innovation arrived with Crépon and Desplatz [2001] who introduced the an *ex-ante* labor cost into a propensity score method.[1] Whatever the technique used, these papers conclude that RSSCs have a positive global effect whose intensity at the individual level depends on the firm's characteristics [Bunel and L'Horty, 2012]. The question is thus far from being definitively solved. The conclusion by Euzeby [1995], who consid-

[1] The method of propensity score (Rosenbaum and Rubin [1983]), or propensity score matching, is the most developed and popular strategy for causal analysis in observational studies. Introduced by it Rosenbaum and Rubin [1983], it involves calculating the conditional probability (propensity) of being in the treated group (of the exposure) given a set of covariates, weighting (or sampling) the data based on these propensity scores, and then analyzing the outcome using the weighted data.

ered, twenty years ago, that "Employers' contributions are ... at the heart of numerous discussions, controversies and proposed reforms relating to the financing of social security" (p. 227) still holds. It has been revived by Nickell et al. [2005] for whom the impact of labor taxation on the labor market "remains a subject of some debate despite the large number of empirical investigations" (pp. 8-9). Recent academic literature [Bunel and L'Horty, 2012] and operational reports [European Commission, 2011] attest to the continuing interest raised by this question. This paper aims thus at proposing a new way to address the problem.

Unlike previously research focusing on the causal effect of different types of social security contributions and their reforms on labor market outcomes, our purpose is to appreciate to what extent employers react to a decrease in the cost of labor per employee by hiring more workers. What are the dynamics of this process? Does it differ according to the type of industry? Does it depend on the firm size?

We tackle these questions at the finest level, that of the establishment, using a unique database made available by the French National Institute of Statistics and Economic Studies (*Institut National de la Statistique et des Etudes Economiques* - INSEE) and the Central Agency for Social Security Bodies (Agence Centrale des Organismes de Sécurité Sociale - ACOSS) consisting of quarterly data related to employment, wages, exemptions and social security contributions. Our study provides some insight into the question of why establishments may differ in their propensity for creating jobs not only because of the sensitivity of the demand for labor [Hamermesh, 1993] but because other individual characteristics are taken into account. We show first that the rate of exemption is far from being either the sole, or the main determinant of job creation. Instead and this is a second point, size, industry, qualifications and market dynamics dominate in determining establishment decisions. Third, we refine the results about the relationship between individual growth and labor cost using the quantile regression for longitudinal data. This method makes it possible to consider the fixed effects of the policy at the establishment level. An additional precision results from the use of quarterly data which helps to determine how the policy measure and the period interact to produce the final result.

The remainder of the paper is structured in the following way. Section 2 recalls the origin and the main characteristics of the measures adopted to decrease the labor cost in France. Section 3 describes the dataset, the empirical model and the econometric strategy adopted. The results of our study are presented and discussed in section 4. Finally, in section 5, an outlook for further research is given.

2. THE POLICY

Exemptions on Social Security contributions paid by employers as a mean to reduce labor cost were initially introduced in France in 1993 as a very targeted instrument. They were specifically devoted to employees whose wages were below 1.2 times the minimum wage (SMIC) and only related to the family social security contributions. As the unemployment rate has continued to rise, the scope of the measure has been progressively extended. The last 2003-2005 reform was implemented in order to unify the targeted exemptions from social security contributions for all companies.[2] A report of the European Commission (2011) puts some emphasis on the importance of this employment policy in France which has no equivalent in other European country. As a consequence, the cost of these policies for the public budget increased dramatically. The global cost of RSSCs increased continuously since its inception. It rose to Euros 29.9 billion in 2012 (1.5% of French GDP).

Already generous in mainland regions, an experimental scheme is applied in overseas regions. The rates and the level of wages targeted are higher in overseas regions than in mainland. The scheme consists in:

- A decreasing scheme for companies employing less than 11 workers. For these firms, the exemption of the employer's contribution reaches 100% of the sums payable when the hourly remuneration is below 1.4 times the minimum wage. Between 1.4 times and 2.2 the minimum wage, the exemption is limited to the share of the wage below 1.4 the minimum wage. From this threshold, the amount of the exemption linearly decreases according to a scale fixed by decree[3] until cancellation for employees whose remuneration equals 3.8 times the minimum wage.

- Another decreasing scheme for companies employing 11 workers and more providing that they belong to a long list of targeted industries. In that case, the exemption of social security contribution equals 100\% for any remuneration strictly below 1.4 times the minimum wage. From this maximum the rate of exemption decreases linearly down to zero for employees whose remuneration equals 3.8 times the minimum wage.

- An enhanced exemption arrangement for companies located in specific areas or operating in specific industries in the four main departments and Saint Martin. In those companies, the exemption rate is 100\% for remunerations up to 2.5 times the minimum wage and decreasing up to the maximum upper limit of 4.5 times the minimum wage.

The case of overseas regions is suitable to an analysis of the effects on establishment growth for two main reasons. Firstly, there is no difference in nature between the framework used in mainland France and the policy implemented in overseas regions, a factor which is satisfying from the point of view of institutional representativeness. Secondly, its superior intensity (larger field of coverage, higher rates and higher thresholds) makes it possible to catch sight of the best results such a scheme could produce on establishments' growth as a source of jobs.

---

[2] Employers' social contributions are normally about 40 percentage points of gross wage. Thanks to the exemption schemes, it is only of 26 points at the minimum wage level and decreases linearly with wage until it stops at 1.6 points of gross minimum wage. All the firms and about two thirds of the labor force are concerned.

[3] The same decree applies to the two other schemes.

3. DATA, EMPIRICAL MODEL AND ECONOMETRIC STRATEGY

3.1. Data and selection of the variables

In this paper we use a large dataset of establishments[4] having at least one employee located in six French overseas regions[5] operating between January 2004 and the end of December 2011. We built an unbalanced panel consisting in more than 30,000 establishments declaring at least one employee over three successive quarters.[6] Table1 presents the coverage rates of the panel according to different criteria.

Our dataset reflects the industrial structure of these regions over the period. Considering the number of employees, trade, human health, and business services are the main sectors. Appendix 1 provides details on the distribution of the main variables[7] before and after filtering the data. For any establishment we know the number of employees, the type and the total of any kind of RSSC the establishment received, and the payroll attributable to the eligible and non-eligible employees.

Table 1. Coverage rate of the panel

Year	Number of establishments	Percentages of			
		Operating establishments	Number of employees	Payroll	Exemptions
2004	22,554	75.9	75.1	74.5	73.8
2005	26,086	77.4	78.0	77.3	75.6
2006	31,013	79.0	81.5	83.4	78.8
2007	35,848	77.8	83.7	84.4	80.2
2008	37,532	81.6	86.6	86.8	81.9
2009	38,186	84.5	88.8	88.6	84.0
2010	39,154	85.4	89.2	90.0	85.8
2011	36,941	78.3	79.7	84.4	83.8

Sources: INSEE, ACOSS. Computations are authors' ones.

3.2. Empirical model

In order to address the impact of RSSCs on job creation we estimate a growth model, augmented for variables describing the rate of RSSCs, the intensity of the use of these measures by any establishment and, as it is a quarterly model, interaction variables which determine to what extent the sensibility of an establishment to rebates on social security contribution may differ over the year, as well as dummy variables to consider the existence of a possible seasonal effect which can be strong in small island economies [Schubert et al., 2011]. Our basic econometric model directly derives from the multivariate model of

[4] Temporary agency workers, sole proprietorships, in-home employers and home workers are not taken into account by the administrative sources.

[5] Guadeloupe, French Guiana, Martinique, Reunion, Saint-Barthelemy and Saint-Martin.

[6] This condition is introduced to get at least two successive growth rates, a requirement to run the estimation.

[7] Age has been omitted because it comes from a different source (CLAP dataset) whereas our main purpose is the representativeness of our sample compared to ACOSS dataset which is exhaustive.

firm growth (see Coad [2009] for a survey). It begins with a standard definition of firm growth such as equation 1:

$$GROWTH_{i,t} = ln(Empl_{i,t}) - ln(Empl_{i,t-1}) \quad (1)$$

From the basic Gibrat model revisited [Coad, 2009], the best way to examine the origins of growth is to express it in a regression framework enriched with different factors determining growth. Our point of departure is thus a basic growth model as in equation 2:

$$GROWTH_{i,t} = \beta_0 + \beta_1 Size2_{i,t-1} + \beta_2 Size3_{i,t-1} + \beta_3 Size4_{i,t-1} + \beta_4 Age_{i,t} + \beta_5 RSSC_{i,t} + \beta_6 Intens_{i,t} + \beta_7 RSSCxQ2_{i,t} + \beta_8 RSSCxQ3_{i,t} + \beta_9 RSSCxQ4_{i,t} + \beta_{10} Q2_{i,t} + \beta_{11} Q3_{i,t} + \beta_{12} Q4_{i,t} + \varepsilon_{i,t} + \alpha_i \quad (2)$$

where $GROWTH_{i,t}$ denotes the change in the number of employees in a given establishment i in a given quarter Q, $RSSC_{i,t}$ measures the rate of exemption establishment *i* benefits from at time *t* and $Intens_{i,t}$ is the number of measures effectively applied to the establishment *i* at time *t* used as a proxy for the intensity in the use of exemption of social security payments by employers. We also add interaction variables $RSSCxQj_{i,t}$, $j=\{1, 2, 3\}$ to appreciate the influence of the quarter on the intensity of the relationship between the rebate on social contributions and the change in the number of employees. Q1, $Size2$ and $RSSCxQ1$ are used as references.

Table 2. Descriptive statistics of the main explicative variables

	mean	sd	p50	min	max
Growth	0.001	0.262	0.000	-4.394	4.779
Size1	0.840	0.366	1.000	0.000	1.000
Size2	0.076	0.266	0.000	0.000	1.000
Size3	0.059	0.236	0.000	0.000	1.000
Size4	0.024	0.152	0.000	0.000	1.000
LnAge	4.324	0.967	4.443	0.000	6.950
RSSC	0.239	0.093	0.281	0.000	0.400
RSSCxQ1	0.059	0.113	0.000	0.000	0.400
RSSCxQ2	0.060	0.114	0.000	0.000	0.400
RSSCxQ3	0.061	0.115	0.000	0.000	0.400
RSSCxQ4	0.058	0.112	0.000	0.000	0.400
Observations	964,122				

Source: INSEE, ACOSS. Computations are authors' ones.

Several points in the empirical model are worth noticing. First, instead of considering *lnEmpl* as a continuous variable, we follow Bunel and L'Horty [2011] and introduce the establishment size as a dummy variable. Secondly, we complement the model with interaction variables to assess the impact of seasonality on the relationship between establishment's growth and reduced rates of social security contributions. Interacting variables makes it then possible to take into account the seasonality of the economic activity and, thus, of employment. If the rate of social security exemptions and the increasing number of measures used do not play any role in determining employment growth, coefficients will not be significantly different from zero. But if the policy factors have an influence on establishment behavior, what is the hypothesis posed in this paper, then the coefficients will not equal zero.

The characteristics of the panel are presented Table 2.

3.3. Estimation

Previous studies of the determinants of exemption of Social security contributions employ classical econometric techniques to assess the impact of a change in the policy and to compare supported firms to a reference of non-supported ones [Bunel and L'Horty, 2011]. Our purpose is quite different as we are interested not only in estimating the effects of RSSCs on job creation but also how they vary across the distribution while accounting for the unobserved individual-specific heterogeneity. The econometric strategy compatible with these questions usually lies in applying a quantile regression (QR below) which makes it possible to examine the different quantiles of the conditional distribution [Koenker and Bassett, 1978] and then to identify the effects of an explanatory variable in any point of the distribution of the explained variable. However, the estimation of a panel data fixed effects model within a quantile regression is not straightforward. It is especially the case when T is short.[8] The main problem comes from the fact that pooled data do not take into account unobserved heterogeneity. As pointed out by Ponomareva [2010] "... the standard methods that difference out fixed effects are no longer applicable since the quantiles of the difference in general are not equal to the difference in quantiles but rather are some intractable object..." Ponomareva [2010], p. 2).

In this paper we perform a method recently developed to introduce fixed effects in quantile method, following the work of Koenker [2004]. His estimator makes it possible to correct the endogeneity resulting from a possible correlation between fixed effects and one of the explanatory variables in the model.[9] Canay [2011] has improved this method by introducing an estimator able to clean up fixed effects. He proposes a simple transformation of the explained variable that gets rid of the fixed effects under the assumption that these effects are location shifters.[10] This new method provides an estimator consistent and asymptotically normal as both n and T go to infinity. The technical details on the estimator are given in the appendix 2.

In accordance with the basic principle Canay [2011] estimation is run using the transformed form of the growth variable, i.e. the initial variable purged of fixed effects, as an explanatory variable. Fixed effects have to be removed because exemptions of social security contributions depend on the fulfillment of some requisites (number of employees, level of wages, location mainly) which

[8] When the number of coefficients goes to infinity but the number of time periods is small, the incidental parameters problem harms the consistency of the estimators [Galvao, 2011].

[9] According to Canay [2011], Koenker [2004] method presents a serious drawback, as it requires a large number of parameters to estimate. According to Matano and Naticcioni [2012] these two methods lead to roughly similar results.

[10] Location shift variables affect all quantiles in the same way. Koenker [2004] and Lamarche [2010] also foresee this assumption.

tend to remain unchanged over time. This could lead to a significant correlation between these fixed effects and the exemption rate causing a bias in the results. We performed thus a Hausman test to test the nullity of the correlation between the individual fixed effects and at least one explanatory variable. The null hypothesis supporting the absence of a correlation has been rejected. These elements support the use of a transformed variable, named *Growth** hereafter.

4. RESULTS AND COMMENTS

This Section presents the central empirical findings with respect to the effect of the social contributions cuts on variation in the number of employees.

The influence of the technique on the results obtained is controlled comparing the outputs we have obtained using OLS and FE. As expected, OLS are always biased whereas FE over-or under-estimates the effects of explained variables on some points of the distribution of the growth rate. The first subsection reports the basic results for the total sample, while the second subsection proposes some additional robustness checks considering several sub samples referring to industry and size criteria. In each case, we focus on RSSCs. The analysis of this direct effect is supplemented by considerations about interaction variables and *Intens* narrowly connected to the policy. Additional elements about more traditional explanatory variables are also introduced in the comments for the total sample to complete the comparison between our results and previous research. The results are reported as graphs; the detailed tables for the whole sample are presented in the Appendix 3 (Table 4) but they have only been presented in a synthetic form for the subsamples.[11]

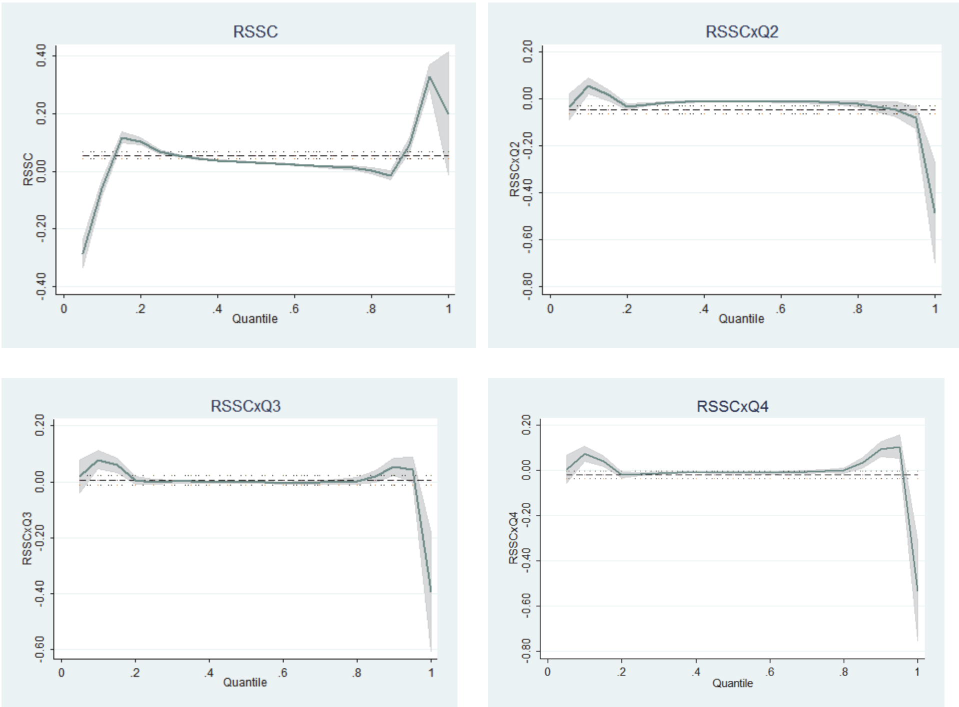
4.1. Aggregate analysis

Throughout this section, the independent variables of interest are *RSSC*, reported Figure 1, and *Intens*, as well as the interaction variables.

Looking at the upper graph on the left (Figure 1), it becomes clear that the RSSCs have a significant contribution in explaining the growth path of establishments. Their influence is however different according to the growth rate of employment. Indeed, RSSCs play a differentiated role along the growth rate distribution. It is negative on the extreme right side and stabilizes at a higher level at least equal to 0.012 as growth rate increases, the maximum value being observed in 0.90 quantile. Our results are partially in agreement with the theoretical approaches reiterated in the review of literature [Bauduin et al., 2011]. We see that (a) reduced rates of social security contributions contribute to supporting employment, (b) this positive effect tends to decrease along the central part of the distribution, (c) the effect is especially strong in establishments exhibiting high growth, and (d) the difference in the efficiency of the policy is sensitive to the quarter considered.

[11] The tables report estimates for the quantiles $\theta \in \{0.10, 0.25, 0.50, 0.75, 0.90\}$. Complete estimations for the breaking down by size and industry are available upon request from the authors.

Figure 1. Estimated coefficients for the variable RSSC and interaction variables (2004-2011)



The graph shows the values of the estimated coefficient of the variable RSSC as a function of the conditional distribution of the employment growth rate. The bold, dotted horizontal line is the fixed-effects estimated coefficient. It corresponds to the OLS estimation of the transformed model, where the transformed variable Growth replaces the dependent variable Growth. The thin, dashed parallel lines represent the confidence intervals of the fixed-effects estimation. The graph was estimated using the ''grqreg'' package in STATA 12 software. The estimation was run on 884,798 observations over the 2004-2011 period.*

The influence the season has on the effect of RSSCs on employment change is, indeed, important as shown by graphs representing *RSSCXQ2*, *RSSCXQ3*, and *RSSCXQ4*, which represent the coefficients for the interaction variables. Even if weak, the coefficients are significantly different from zero, a variation which allows us to consider that the establishments do not react in the same way to the decrease in labor cost caused by reduction of social security contribution according to the season. In these economies where annual economic cycle is strongly shaped by tourism, this differentiated effect can be strong (Witt and Witt [1995] and Alleyne [2002]). The sign of the interaction variable *RSSCXQ2* is negative from .25Q until the extreme right side of the distribution. April, May and June correspond to the downward period in the annual economic cycle.[12] This can explain why companies are less affected by the labor cost reduction

[12] Short-term regional outputs demonstrate that unemployment rates usually increases whereas activity in transportation, accommodation and other tourist activities usually slow down during the second quarter [Institut d'Emission de l'Outre Mer, 2012].

than during the first quarter. The effect of RSSCs on establishments' growth is significantly higher over the 3rd and 4th quarters for companies experiencing a decrease in the number of employees (0.10 quantile). The sign becomes negative but weakly significant for establishments in the middle of the distribution for the two last quarters and becomes positive for 0.90 quantile. All the remaining coefficients are non-significant.

Looking at the number of measures the establishments make use of, one may see differentiated effects according to the establishment growth rate. On the left side of the distribution the relationship between *Intens* and the change in the number of employees is significantly negative. It becomes non-significant on 0.25 and becomes positive from 0.50 quantile. The highest effect of the cumulating of different schemes concerns fast growing establishments. The increasing contribution of *Intens* to the explained variable may be interpreted as an effect of the social optimization some establishments are able to practice. Indeed, thanks to their in-depth knowledge of the policy, some managers are able to efficiently combine the different employment subsidies available. Some research considers that this type of optimization is similar to a deadweight effect, defined as the rate of subsidy payments which are paid to workers who would have been employed in absence of the subsidy (Brown et al. [2011], Oskamp and Snower [2006]).

Table 4, Appendix 3, reporting the complete results also shows that the difference between *Size2*, *Size3* and *Size4* respects the usual findings in firm growth analysis (Coad [2009] and Bottazzi et al. [2011]). Smaller entities tend to exhibit a higher growth rate than large ones, this hierarchy holding on any quantile. The explanatory variable, *lnAge*, is non-significant on 0.10 quantile and negative on the rest of the distribution. This result is consistent with the literature [Serrasquiero et al., 2010]. Indeed, it is broadly admitted that there is a reverse relationship between age and job creation. From 0.25 quartile, this result is confirmed, the negative influence exerted by age being all the more important as the growth rate increases.

Our results go in the same direction as the results obtained by Oskamp and Snower [2006] according to low-wage subsidies. Reductions in labor cost can have a positive effect as they stimulate low-skilled and medium-skilled employment. However, empirical evidence suggests that reductions in taxes on labor do not solve employment problems [Fitoussi, 2000]. This is indeed the case in France as demonstrated by Gafsi et al. [2005], according to whom the mechanisms that have been implemented in France have had a very weak global impact on employment. When one takes into account macroeconomic effects, through activity, prices, wages and fiscal balance, the impact on employment can still be considered as very low in relation to the budgetary cost of these policies. The same mitigated appreciation concerning earlier measures is expressed by Bunel et al. [2009], who studied the effects of the reform enacted in January 2003 for the RSSCs system used in mainland France. They consider that the global consequences of the changes on job creation have been very weak. They reach the same conclusion considering the decrease in labor taxes experimented in restaurants in 2011 [Bunel and L'Horty, 2011] and demonstrate that the measures implemented in overseas regions from 2003 to 2009 did not increase the total number of jobs in these economies [Bauduin et al., 2010]. However, these papers are quite confident in these policies, as they should, in the long run, promise an increase in the rate of employment. Nevertheless, they rely on radically different methods. Bunel et al. [2009] and Gafsi et al. [2005] are macroeconomic papers whereas Fitoussi [2000] proposes a survey of the literature.

4.2. Sectoral analysis

The analysis performed in the previous Section considered aggregated data. In this section, we exactly run the same investigations, but at a disaggregated level. Proceeding this way allows us to check the robustness of the previous findings and to test to what extent their reliability resists to more disaggregated analysis. We split the initial panels in two different ways: by industry and by size. As in the previous Section, we use the transformed variable of the difference in logarithm of the number of employees from one quarter to another as an explained variable.

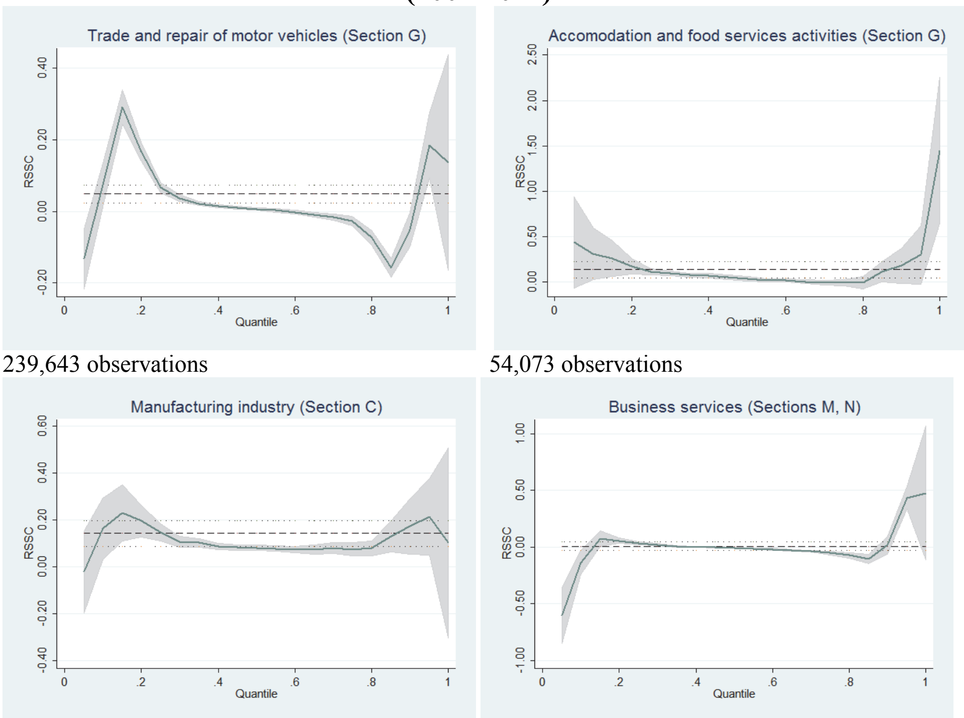
4.2.1. By industry

Some analyses have been carried out for the four main sectors (Accommodation and Food Service Activities, Manufacturing Industry, Trade and Repair of Motor Vehicles Industry, and Business Services) in order to check for specific behavior. Figure 2 presents the estimated coefficients associated with the variable *RSSC* in four different industries.[13] Our main result does not change: the effect of the reduction in social security contributions is closer to zero in the central part of the distribution than on its left and right parts. However, the value of the coefficients changes according to the industry (the coefficients are presented in Table 5).

The global effect of *RSSC* on establishment growth is the strongest in Accommodation and Food Service Activities with one exception on 0.75 quantile. The effect of the rebates are especially strong on the left part of the distribution where the marginal rates reach 0.31 on 0.10 quantile and 0.114 on 0.25 quantile. This brings evidence on the high sensitivity to the reduction in labor cost for the establishments with a decreasing number of employees. From 0.10 quantile, the gap between the coefficients for this industry and the general population decreases and even cancels on 0.50 quantile as the two coefficients equal 0.03. The influence of interaction variables also differs from the general case. No coefficient, except *RSSCXQ3* on 0.25 quantile, is significantly different from zero. This leads us to consider that the influence of *RSSC* on establishment growth in this industry does not differ according to the season; the establishments react in the same way during the high- and the low-season. We cannot notice a great difference between this industry and the general population as far as the number of measures enacted by an establishment is considered. Indeed, in the Accommodation and Food Services Industry, *Intens* is associated with a negative sign and a very low coefficient (0.00566) on 0.25 quantile whereas the marginal effect of this variable becomes significantly positive and increases from 0.50 to 0.90 quantiles.

[13] The detailed results are available from the authors on request.

Figure 2. Estimated coefficients for the variable RSSC by industry (2004-2011)



239,643 observations — 54,073 observations

77,728 observations — 111,913 observations

Note: Sections correspond to the first level of the French classification of activities (NAF Rev. 2, 2008). See Figure 1 for the technical details.

The coefficients associated with *RSSC* for the Manufacturing Industry, strongly mimic the general results but in a smoother way. The coefficients associated with *RSSC* along the distribution of the growth rate are always positive, marking a difference with the total population, but they are higher in the center of the distribution than they were in the aggregate analysis. The cumulating of measures also generates a positive effect on the right part of the distribution. This confirms the results obtained for the total population. However, the first decile is not negatively affected by the variable *Intens*, an effect which differs from the one depicted in the previous Section. Interaction variables also reveal a specificity of the Manufacturing Industry compared to the total population. Indeed, the effect of *RSSC* on employment growth is significantly different for the establishments on the left side of the distribution and over the fourth quarter only (see Table 5).

The estimation for the establishments belonging to the Trade and Repair of Motor Vehicles Industry produces results quite far from the general population. The value of the coefficients associated with *RSSC* are positive on the left side of the distribution whereas they were negative for the total sample and negative on the right part instead of being positive as in the estimated general model. The effects of the exemptions are the strongest for 0.10 quantile. Then they decrease to reach almost zero for 0.50 quantile and become negative from the 0.75 quantile. In this industry, rebates on social security contributions exert a positive effect on establishments which do not create jobs but a negative one on growing establishments. There is not much difference for the interaction variables. The signs associated with these variables allow us to consider that the reaction of establishments to cuts in social security contributions differ according to the quarter. The coefficients are systematically weaker than in the first quarter except for the extreme parts of the distribution during the last quarter.

Table 5. Estimates of the effects of RSSCs in the four main industries

	OLS	FE	2-STEP	2-STEP	2-STEP	2-STEP	2-STEP
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
			10%	25%	50%	75%	90%
VARIABLES	Growth	Growth	Growth*	Growth*	Growth*	Growth*	Growth*
Trade and repair of motor vehicles industry							
Intens	0.00492***	0.00776***	-0.00917***	-0.000948***	0.00577***	0.0110***	0.0226***
	(0.000464)	(0.000710)	(0.00108)	(0.000256)	(8.45e-05)	(0.000284)	(0.000881)
RSSC	0.0281**	0.0485***	0.0738**	0.0666***	0.00636***	-0.0271***	-0.0512**
	(0.0126)	(0.0175)	(0.0309)	(0.00717)	(0.00186)	(0.00637)	(0.0244)
Observations	239,643	239,643	239,643	239,643	239,643	239,643	239,643
Manufacturing industry							
Intens	0.00449***	0.00751***	0.000565	2.02e-05	0.00648***	0.0113***	0.0114***
	(0.000788)	(0.00118)	(0.00148)	(0.000496)	(0.000194)	(0.000551)	(0.00105)
RSSC	0.0453	0.143***	0.163**	0.147***	0.0818***	0.0753***	0.174***
	(0.0294)	(0.0360)	(0.0674)	(0.0193)	(0.00575)	(0.0150)	(0.0605)
Observations	77,728	77,728	77,728	77,728	77,728	77,728	77,728
Business services							
Intens	0.00611***	0.0108***	-0.00337**	0.000965**	0.00754***	0.0155***	0.0216***
	(0.000805)	(0.00125)	(0.00159)	(0.000415)	(0.000179)	(0.000463)	(0.00161)
RSSC	-0.00826	0.00880	-0.138**	0.0319***	-0.00493*	-0.0512***	0.0180
	(0.0190)	(0.0262)	(0.0539)	(0.00738)	(0.00297)	(0.00827)	(0.0402)
Observations	111,913	111,913	111,913	111,913	111,913	111,913	111,913
Accomodation and food services activities							
Intens	0.00497***	0.00897***	-0.00176	-0.00566***	0.00663***	0.0196***	0.0222***
	(0.00114)	(0.00180)	(0.00230)	(0.00101)	(0.000297)	(0.00126)	(0.00199)
RSSC	0.0738	0.135**	0.311**	0.114***	0.0375***	-0.00620	0.179*
	(0.0467)	(0.0537)	(0.144)	(0.0177)	(0.0142)	(0.0160)	(0.101)
Observations	54,073	54,073	54,073	54,073	54,073	54,073	54,073

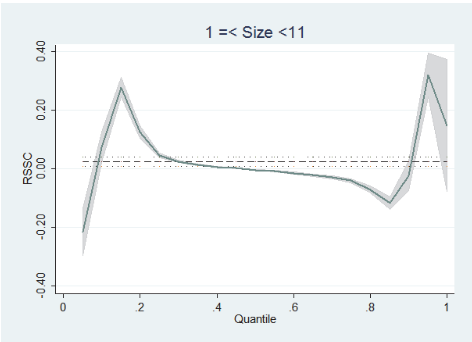
Standard errors in parentheses.
**** $p<0.01$, ** $p<0.05$, * $p<0.10$.*
Standard errors estimated by Bootstrap (number of Bootstrap samples = 100).
Growth represents the transformed variable (Growth* = $(lnEmpl_{i,t} - lnEmpl_{i,t-1}) - \hat{\alpha}_i$).*

A quite different pattern results from the estimation for the establishments of Business Services whose growth of employment is negatively affected by *RSSC*, except for the 0.25 quantile where the sign is significantly positive and the 0.90 quantile where the coefficient becomes insignificant. The same departure from the results obtained with the estimations run for the general population can be pointed out for the interaction variables. Compared to the effects of the social security exemptions in the first quarter, the only establishments for which employment changes negatively react to RSSCs in the second quarter belong to the 0.50 and 0.90 quantiles. The effect is however stronger over the third and fourth quarters on the left and right tails only. Instead, the coefficients associated with the variable *Intens* do not exhibit this sort of difference. They are as weak and ordered as in the general model, except for the 0.25 quantile.

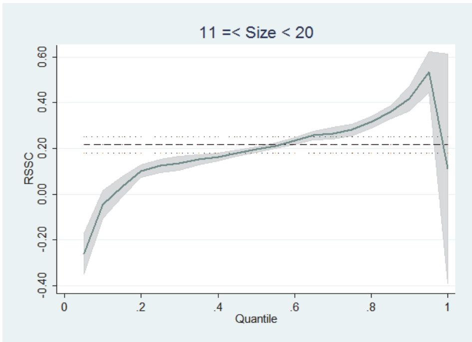
4.2.2. By size

Breaking down by size the total population also enables observation of different behavior of establishments according to their number of employees. At a first level of analysis, four classes respecting the thresholds for the general model have been identified in accordance with the number of employees at the beginning of the period. At a second level, all size classes have been broken down to take into account the effect of the lagged size on the growth rate, to keep information on the effect of the number of employees on the growth rate.

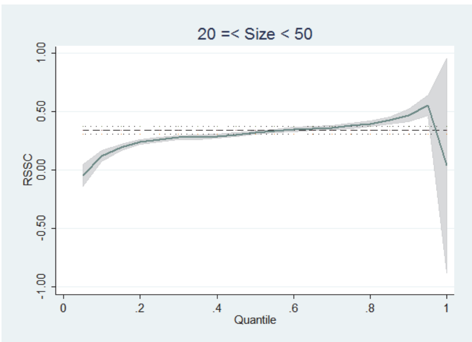
Figure 3. Estimated coefficients for the variable RSSC by size (2004-2011)



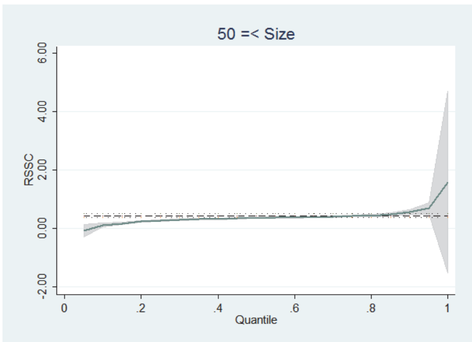
734,318 observations



60,355 observations



50,283 observations



19,842 observations

See Figure 1 for the technical details.

The results concerning the two key variables *RSSC* and *Intens* are presented in Table 6. The effects of reduced rates of social security contributions clearly differ according to establishment size as shown by Figure 3. The coefficients estimated for the smaller ones (establishments employing more than one but fewer than 11 employees) are the weakest of the broken-down analysis and are far from the general model. Indeed, if the values of the estimated coefficients decrease as long as we move to the right of the distribution, and go up for the last quantile, the signs clearly differ. The growth in the number of employees in the smallest establishments benefit from a positive influence of *RSSC* on the left side of the distribution. The sign of this variable is negative on 0.50 and 0.75 quantiles. The effect of the rebates are also significantly lower over the second and fourth quarters compared to the first one as shown by the values of the coefficients of the interaction variables from 0.25 percentile, whereas only the extreme left of the distribution has a better reaction during the third quarter than in the first one.

Table 6. Estimate of the effects of RSSCs in the four size classes

	OLS	FE	2-STEP	2-STEP	2-STEP	2-STEP	2-STEP
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
			10%	25%	50%	75%	90%
VARIABLES	Growth	Growth	Growth*	Growth*	Growth*	Growth*	Growth*
1 ≤ Size < 11							
Intens	0.00626***	0.0109***	-0.0109***	-0.000937***	0.00799***	0.0167***	0.0340***
	(0.000331)	(0.000514)	(0.000969)	(0.000189)	(4.82e-05)	(0.000233)	(0.000770)
RSSC	0.0149*	0.0235**	0.0737***	0.0461***	-0.00359***	-0.0403***	-0.0235
	(0.00822)	(0.0110)	(0.0268)	(0.00388)	(0.00117)	(0.00340)	(0.0263)
Observations	754,318	754,318	754,318	754,318	754,318	754,318	754,318
11 ≤ Size ≤ 20							
Intens	0.00664***	0.00627***	0.0129***	0.00548***	0.00379***	0.00205***	-0.00284***
	(0.000735)	(0.00109)	(0.000912)	(0.000515)	(0.000270)	(0.000500)	(0.000934)
RSSC	-0.0280	0.215***	-0.0452	0.124***	0.195***	0.280***	0.418***
	(0.0190)	(0.0303)	(0.0310)	(0.0148)	(0.00607)	(0.0136)	(0.0277)
Observations	60,355	60,355	60,355	60,355	60,355	60,355	60,355
20 ≤ Size < 50							
Intens	0.00435***	0.00525***	0.00497***	0.00309***	0.00341***	0.00258***	0.000205
	(0.000635)	(0.000938)	(0.000713)	(0.000329)	(0.000281)	(0.000397)	(0.000694)
RSSC	-0.0116	0.341***	0.122***	0.261***	0.322***	0.379***	0.471***
	(0.0171)	(0.0309)	(0.0252)	(0.00906)	(0.00718)	(0.0110)	(0.0273)
Observations	50,283	50,283	50,283	50,283	50,283	50,283	50,283
50 ≤ Size							
Intens	0.00338***	0.00487***	0.00318***	0.00298***	0.00373***	0.00318***	0.00314***
	(0.000954)	(0.00149)	(0.000783)	(0.000391)	(0.000303)	(0.000463)	(0.000987)
RSSC	0.0863***	0.442***	0.121***	0.272***	0.362***	0.429***	0.560***
	(0.0310)	(0.0550)	(0.0357)	(0.0134)	(0.00869)	(0.0152)	(0.0414)
Observations	19,842	19,842	19,842	19,842	19,842	19,842	19,842

Standard errors in parentheses.
**** $p<0.01$, ** $p<0.05$, * $p<0.10$.*
Standard errors estimated by Bootstrap (number of Bootstrap samples = 100).
Growth represents the transformed variable (Growth* = ($lnEmpl_{i,t}$ - $lnEmpl_{i,t-1}$) - $\hat{\alpha}_i$).*

The clear-cut discrepancy between the left and the right side of the distribution also holds for the effect of the explained variable *Intens*. The influence of this variable follows an upward trend along the distribution. It is negative on the left side. This confirms the problems that small and declining establishments face when they try to combine different measures. They suffer from decreasing returns of the measure due to administrative and management costs of RSSCs. It is worth noticing that the lagged size still plays a role in determining employment growth since as establishments pass the threshold of 11 employees, the value of $\hat{\beta}$ associated with the variable *Size* becomes negative compared to the reference class, i.e. the entities whose lagged size is strictly below 11 employees.

The results are radically different for larger establishments. All in all, *RSSC*s effectively contribute to their growth; the estimated coefficients are non-significant for the extreme left tail of the distribution for the establishments having more than 11 but fewer than 20 employees only. The effect of social contributions cuts on employment growth is weaker for establishments employing at least 11 and fewer than 20 employees than for the larger ones. Exemptions of social security contributions tend thus to strengthen job creation in the biggest establishments. The comparison with the value of the estimated coefficients for the whole sample (Table 1) tends to highlight the unequal sensitivity of establishment growth to RSSCs according to their size. The larger ones (50 employees and more) exhibit coefficients whose value is eight to ten times higher than the ones associated with the quantiles for the general sample. These establishments are thus the most supported by the measures.

The variable *Intens* is always significant but quite close to zero in any size class. However, the cumulation of measures plays its strongest effect in the smaller establishments. There is one exception to this systematically positive effect. It concerns establishments employing fewer than 11 employees of the left side of the distribution for which the coefficient of *Intens* is negative whereas it is positive in other size classes. One may consider that the complexity of the exemption system is a drawback for these entities.

4.2.3. By area

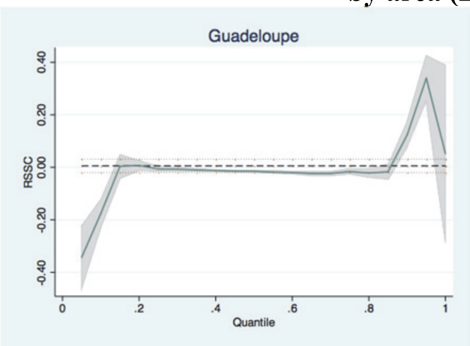
We conclude our investigations of the influence of rebates on social contributions by breaking down the sample by area. As in the previous Sections, we constructed an unbalanced panel for each department[14]. The similarity of the results we obtain brings evidence on their robustness. Figure 4 shows the value of the estimated coefficients associated with the variable *RSSC*.[15] Looking at the results, it is obvious that three areas (Martinique, French Guiana and La Réunion) out four exhibit the same pattern as the total population. From 0.25 quantile, exemptions on social security contributions have a positive effect on employment growth.

The sensitivity along this part of the distribution is, however, different, as the strongest influence appears on the 0.75 and 0.90 quantiles in French Guiana, on the 0.25 quantile in Martinique and La Réunion. The lowest intensity of this

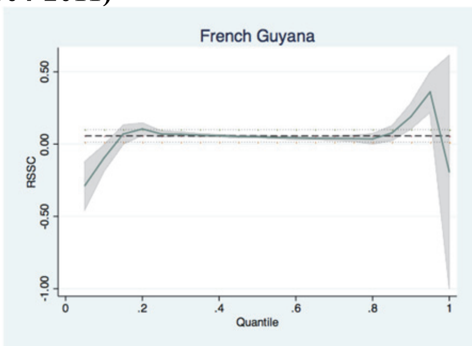
[14] Saint-Martin and Saint-Barthelemy have been dropped out because they became independent from Guadeloupe from 2007.
[15] Complements are provided in Table 7, Appendix 4.

effect observed thanks to the interactions variable RSSCXQ2 is confirmed for Martinique from the 0.25 quantile and, to a lesser extent for French Guiana and La Réunion (0.25 and 0.50 quantiles). This similarity does not hold anymore looking at results obtained estimating the model using the population of establishments located in Guadeloupe. Indeed, these entities reveal a negative sensitivity to social contributions cuts for 0.10, 0.50 and 0.75 quantiles. A positive effect is only observed on the 0.90 quantile. One can also point out that the effect of the measure on employment growth is significantly lower in all quarters compared to the first one for the right side of the distribution.

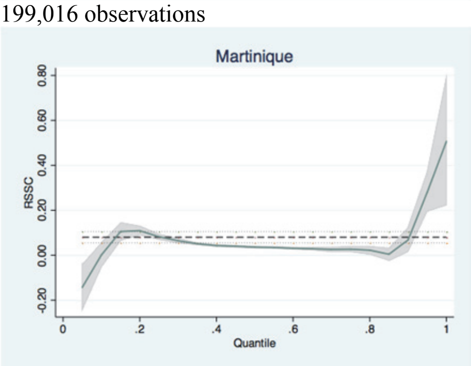
Figure 4. Estimated coefficients for the variable RSSC by area (2004-2011)



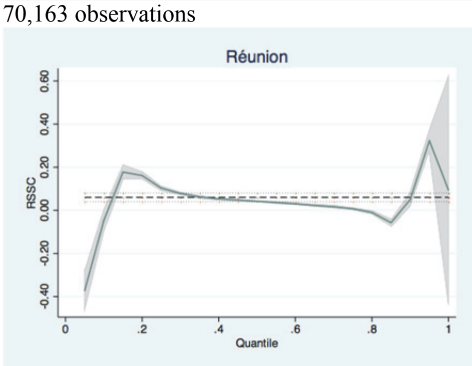
199,016 observations



70,163 observations



201,566 observations



380,030 observations

See Figure 1 for the technical details.

5. CONCLUSION

This paper empirically investigates the role that reduced rates on social security contributions on payroll may play in decreasing labor cost and engendering establishments' growth. Our study finds the following empirical results. First, the relationship between establishment’s growth and RSSCs is positive, robust to alternative estimation techniques, depending on the season, and also depending on growth rate in the number of employees. Indeed, the effect of the decrease in the labor cost caused by RSSCs differs according to the establishment's growth path. Our results demonstrate that the sensitivity of growth to this policy is unevenly distributed along the growth rate distribution. Second, reduction in social security contributions, which are a key element in the indirect labor cost reduction policies, has had very different effects depending on the size and sector. If breaking down the total sample by industry, size class and location confirms the overall trend outlined in the global analysis, it also reveals some specificities. Indeed, establishments operating in Business Services and, to a lesser extent, Trade and Repair of Motor Vehicles Industries in the breaking down by activity do not react in the same way as the whole population: for a majority of them, employment growth is negatively correlated to RSSCs.

The nature of the data mobilized, as well as the econometric strategy adopted, enable us to provide differentiated results going beyond the general tendencies usually emphasized by the literature aiming at generating evidence about the efficiency of labor cost reduction policies. The use of infra-annual data enables us to refine the analysis of the effects of such measures. Firstly, it makes it possible to cope with the seasonality of economic cycle and its influence on job creation or destruction. We have indeed been able to pinpoint the differential effect of RSSCs according to the quarter. Corresponding to a peak in tourism and, thus, to a high level of economic activity, the first quarter is naturally more favorable to establishment growth, a factor which softens the impact of partial exemptions from social security contributions paid by employers. Secondly, the novelty of the results achieved comes from the use of a quite innovative econometric technique, i.e. quantile regression for panel data with fixed effects [Canay, 2011]. It combines the respective advantages of quantile regression and fixed effects models. This method is appropriate for the estimation of the effects of payroll tax rebates on establishment growth and highlights the difference of sensitivity. Indeed, the impacts of the exemption rate and of the intensity of use of the different measures on changes in the number of employees depend not only on the size class and on the age of the establishments but also on their growth rate. For the whole sample, the effects of RSSCs tend to be the highest on the last quantiles of the distribution. This result confirms the idea that the policy implemented tends to promote job creation in successful businesses and to temper job destruction in declining ones. Moreover, these effects may significantly differ according to the size class and the industry in which the establishments operate. Large ones tend to be advantaged compared to the ones whose total number of employees is fewer than eleven whereas the estimated correlation between growth and exemption rate is higher for most of the establishments in the Manufacturing Industry but only for a small part of those in business services.

These calculations are based on a micro-econometric framework and do not take into account macroeconomic interactions via, for example, labor market equilibrium and adjustment of prices and wages. In the end, a limit to the method comes from its inability to take volume effects or effects of inter-industry substitution into account. In addition, it does not specify the impact of the measure by level of qualification and wage. The availability of additional data related to skills and wages could be explored in future studies.

REFERENCES

Abrevaya, J. and Dahl, C. M. (2008). The effects of birth inputs on birthweight: Evidence from quantile estimation on panel data. *Journal of Business and Economic Statistics*, 26: 379-397.

Alleyne, D. (2002). Forecasting tourist arrivals: the use of seasonal unit root pretesting to improve forecasting accuracy. In *23rd Annual Review Seminar*, Central Bank of Barbados. Barbados.

Anderson, P. and Meyer, B. (2000). The effects of the unemployment insurance payroll tax on wages, employment, claims and denials. *Journal of Public Economics*, 78: 81-106.

Bargain, O. and Kwenda, P. (2009). *The informal sector wage gap: new evidence using quantile estimations on panel data*. Discussion paper 4286, IZA.

Bauduin, N., Legendre, F., and L'Horty, Y. (2011). Réformer les baisses de cotisations sociales ultramarines? *Travail et Emploi*, 125: 41-52.

Bauduin, N., L'Horty, Y., and Legendre, F. (2010). Les baisses de cotisations sociales ultramarines. *Revue Française d'Economie*, XXIV(3): 167-191.

Beach, C. and Balfour, F. (1983). Estimated payroll tax incidence and aggregate demand for labor in the United-Kingdom. *Economica*, 50(197): 35-48.

Bottazzi, G., Coad, A., Jacoby, N., and Secchi, A. (2011). Corporate growth and industrial dynamics: evidence from French manufacturing. *Applied Economics*, 43(1): 103-116.

Brittain, J. (1971). The incidence of social security payroll taxes. *American Economic Review*, 61(1): 110-125.

Brown, A. J. G., Merkl, C., and Snower, D. (2011). Comparing the effectiveness of employment subsidies. Labor Economics, 18(2): 168-179.

Bunel, M., Gilles, F., and L'Horty, Y. (2009). Les effets des allègements de cotisations sociales sur l'emploi et les salaires : Une évaluation de la réforme de 2003. *Economie et Statistique*, 429-430: 77-105.

Bunel, M. and L'Horty, Y. (2011). *Les effets des aides publiques aux hôtels-cafés-restaurants et leurs interactions: une évaluation sur micro-donnés d'entreprises*. Technical report, Centre d'Etudes de l'Emploi.

Bunel, M. and L'Horty, Y. (2012). The effects of reduced Social Security contributions on employment: an evaluation of the 2003 French reform. *Fiscal Studies*, 33(3): 3171-3198.

Calmfors, L. (1994). Politiques actives du marché du travail et chômage. cadre d'analyse des aspects cruciaux de la conception des mesures. *Revue Economique de l'OCDE*, 22: 8-51.

Campos, M. M. and Centeno, M. (2012). *Public-private wage gaps in the period prior to the adoption of the euro: an application based on longitudinal data*. Working paper, w 201201, Banco de Portugal, Economics and Research Department.

Canay, I. A. (2011). A simple approach to quantile regression for panel data. *Econometrics journal*, 14(3): 368-386.

Coad, A. (2009). *The Growth of Firms: a Survey of Theories and Empirical Evidence*. Edward Elgar, Cheltenham, UK and Northampton, MA, USA.

Crépon, B. and Desplatz, R. (2001). Une nouvelle évaluation des effets des allègements de charges sociales sur les bas salaires. *Economie et Statistique*, 348(1): 3-24.

D'Haultfoeuille, X. and Givor, P. (2012). La régression de quantiles en pratique. In *Journées de Méthodologie Statistique*, Paris.

European Commission, E. (2011). *The role and impact of labor taxation policies*. Technical report, Employment, Social Affairs and Equal Opportunities DG.

Euzeby, A. (1995). Reduce or rationalize Social Security contributions to reduce unemployment? *International Labor Review*, 134: 227-242.

Fitoussi, J.-P. (2000). Allègements des charges sur les bas salaires. *Revue de l'OFCE*. 74: 33-51.

Gafsi, I., L'Horty, Y., and Mihoubi, F. (2005). Réformer les exonérations de cotisations sociales sur les bas salaires. *Revue Française d'Economie, 19(3): 91-116.*

Galvao, A. (2011). Quantile regression for dynamic panel data with fixed effects. *Journal of Econometrics*, 164(1): 142-157.

Hamermesh, D. (1979). New estimates of the incidence of the payroll tax. *Southern Economic Journal*, 45(4): 1208-1219.

Hamermesh, D. (1993). *Labor Demand*. Princeton University Press, Princeton, New Jersey.

Holmlund, B. (1983). Payroll taxes and wage inflation: The Swedish experience. *Scandinavian Journal of Economics*, 85(1): 1-15.

Institut d'Emission de l'Outre Mer, I. (2012). Te*ndances conjoncture outre-mer-4eme trimestre 2011*. Note n 44.

Koenker, R. (2004). Quantile regression for longitudinal data. *Journal of Multivariate Analysis*, 91(1): 74-89.

Koenker, R. and Bassett, G. (1978). Regression quantiles. *Econometrica*, 46(1): 33-50.

Kugler, A. and Kugler, M. (2009). Labor market effects of payroll taxes in developing countries: Evidence from Colombia. *Economic Development and Cultural Change*, 57(2): 335-358.

Lafargue, J.-P. (2000). Effets et financement d'une réduction des charges sur les bas salaires. *Revue Economique*, 51(3): 489-498.

Lamarche, C. (2010). Measuring the incentives to learn in Colombia using new quantile regression approaches. *Journal of Development Economics*, 96(2): 278-288.

Lang, K. (2003). *The effect of the payroll tax on earnings: A test of competing models of wage determination*. Working Paper 9537, NBER, Cambridge, MA 02138.

Layard, R. and Nickell, S. (1986). Unemployment in Britain. *Economica*, 53(210): 121-169.

Malinvaud, E. (1998). *Les cotisations sociales à la charge des employeurs : analyse économique*. La documentation francaise, Paris.

Marx, I. (2001). Job subsidies and cuts in employers' social security contributions: The verdict of empirical evaluation studies. *International Labor Review*, 140(1): 69-83.

Matano, A. and Naticchioni, P. (2012). *What drives the urban wage premium? Evidence along the wage distribution*. Working Papers - Dipartimento di Economia 13-DEISFOL, Dipartimento di Economia, Sapienza University of Rome.

Matano, A. and Naticcioni, P. (2012). Wage distribution and the spatial sorting of workers. *Journal of Economic Geography*, 12: 379-408.

Mihoubi, F. (1997). Coût des facteurs et substitution capital-travail: une analyse sur le secteur manufacturier. *Economie et statistique*, 301-302(January): 129-148.

Nickell, S. and Bell, B. (1997). *Unemployment Policy-Government Options for the Labor Market*, chapter Would Cutting Payroll Taxes on the Unskilled Have a Significant Impact on Unemployment?, pages 296-328. Cambridge University Press.

Nickell, S., Nunziata, L., and Ochel, W. (2005). Unemployment in the OECD since the 1960s. What do we know? *The Economic Journal*, 115(500): 1-27.

Oskamp, F. and Snower, D. (2006). *The effect of low-wage subsidies on skills and employment*. Technical Report 1292, Kiel Institute for the World Economy.

Ourliac, B. and Nouveau, C. (2012). *Les allègements de cotisations sociales patronales sur les bas salaires en France de 1993 à 2009*. Technical Report 169, DARES.

Ponomareva, M. (2010). *Quantile regression for panel data models with fixed effects and small T: identifiation and estimations*. University of Western Ontario.

Remy, V. (2005). *Eléments de bilan sur les travaux évaluant l'efficacité des allègements de cotisations sociales employeurs*. Technical Report 101, DARES.

Rosenbaum, P. R. and Rubin, D. B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika*, 70(1): 41-55.

Schubert, S., Brida, J., and Risso, W. (2011). The impacts of international tourism demand on economic growth of small economies dependent on tourism. *Tourism Management*, 32(2): 377-385.

Serrasquiero, Z., Nunes, P., Leit~ao, J., and Armada, M. (2010). Are there nonlinearities between SME growth and its deteminants? A quantile approach. *Industrial and Corporate Change*, 19(4): 1071-1108.

Sneessens, H. (1993). *L'économie française en perspective, chapter Pénurie de main d'oeuvre qualifiée et persistance du chômage*. La Découverte et la Documentation Française, Paris.

Turquet, P. (2002). Les allègements de cotisations sociales dans le cadre des politiques publiques d'emploi françaises: objectifs et conséquences. *Travail et Emploi*, 90(April): 69-86.

Witt, S. F. and Witt, C. A. (1995). Forecasting tourism demand: A review of empirical research. *International Journal of Forecasting*, 11(3): 447-475.

APPENDIX 1.

Main characteristics of the data

The dataset used in this paper comes from the merging of different administrative databases running from 2004 to 2011. The exemption rate, the intensity of use of the different measures and the growth rate of the number of employees have been calculated from ACOSS files. They provide quarterly information about 71,324 establishments operating at least one quarter over the period among which 69,949 have been exonerated at least once. The other information (age, location, etc.) comes from INSEE databases (Clap-REE). The cleansing of the dataset to compose an unbalanced panel consisting in establishments declaring at least one employee over three consecutive quarters from T12004 to T42010 led us to drop out from the data set observations corresponding to one missing information. We get thus a dataset containing more than 29,000 establishments.[16]

Table 3. Descriptive statistics of the sample before and after the filtering of the data

Variables	Total population							
	2004-Q4				2011-Q4			
	Mean	P10	Median	P90	Mean	P10	Median	P90
Growth	0.023	-0.154	0	0.288	0.006	-0.182	0	0.223
Size1	0.817	0	1	1	0.843	0	1	1
Size2	0.075	0	0	0	0.066	0	0	0
Size3	0.062	0	0	0	0.05	0	0	0
Size4	0.025	0	0	0	0.021	0	0	0
RSSC	0.299	0.056	0.282	0.314	0.022	0.026	0.268	0.305
Variables	Unbalanced panel							
	2004-Q4				2011-Q4			
	Mean	P10	Median	P90	Mean	P10	Median	P90
Growth	0.02	-0.154	0	0.251	0	-0.182	0	0.182
Size1	0.831	0	1	1	0.854	0	1	1
Size2	0.079	0	0	0	0.071	0	0	0
Size3	0.065	0	0	0	0.054	0	0	0
Size4	0.025	0	0	0	0.021	0	0	0
RSSC	0.239	0.066	0.282	0.311	0.022	0.046	0.265	0.303

[16] They are 29,711 in 2004, 33,717 in 2005, 39,262 in 2006, 46,063 in 2007, 46,018 in 2008, 45,180 in 2009, 45,847 in 2010 and 47,174 in 2011.

APPENDIX 2.
The quantile estimation on panel data method

In our application we use the Canay [2011] method briefly described hereafter.

$$Y_{it} = X'_{it}\theta_\mu + \alpha_i + u_{it}$$

with $E(u_{it} / X_i \, , \alpha_i) = 0$

$t = 1, \ldots, T$ and $i = 1, \ldots, n$ respectively represents the indexes of time periods and individuals. The vector X_{it}includes explanatory variables. The constant $\alpha_i$stands for the unobserved individual-specific heterogeneity. $u_{it}$is an error term changing over time. Canay [2011] proposes then the following two-step procedure, noted 2-STEP:

- Step 1 estimates the individual heterogeneity parameters such as $\hat{\alpha}_i \equiv E_T[Y_{it} - X'_{it}\hat{\theta}_\mu]$ with $E_T(.) = T^{-1}\sum_{t=1}^{T}(.)$ and $\hat{\theta}_\mu$ the within or fixed-effects estimator of θ_μ.

- Step 2 determines the transformed variable $\hat{Y}_{it} \equiv Y_{it} - \hat{\alpha}_i$ from the method made available by Koenker and Bassett [1978]. It proceeds according to the following maximization program:

$$\hat{\theta}(\tau) \equiv \underset{\theta \in \Theta}{\operatorname{argmin}} \, E_{nT}\,[(\rho_\tau(\hat{Y}_{it} - X'_{it}\theta)]$$

According to Canay [2011], this method provides a consistent and asymptotically normal estimator of $\theta(\tau)$ if and only if[17] :

1. $(Y^*_{it}, X_{it}, \alpha_i) \sim i.i.d$ and $E(\alpha_i) = 0$ where :
$Y^*_{it} \equiv \hat{Y}_{it} - \hat{r}_i$ with $\hat{r}_i \equiv (\alpha_i - \hat{\alpha}_i)$

2. For all $\tau \in \mathcal{T}, \theta \in \Theta$ where Θ a convex and compact space and $\mathcal{T}$ a closed subinterval of [0,1].

3. Y^* has bounded conditional on X and $\Pi(\theta, \tau, r) \equiv E[g_\tau(W, \theta, r)]$ has a Jacobian matrix such as :

$J_1(\theta, \tau, r) = \frac{\partial}{\partial\theta}\Pi(\theta, \tau, r)$ is continuous and fully-ranked,

$J_2(\theta, \tau, r) = \frac{\partial}{\partial r}\Pi(\theta, \tau, r)$ is uniformly continuous where :

$W = (Y^*, X)$ and $g_\tau(W, \theta, r) = \rho_\tau(Y^* - X'\theta + r)X$ with $\rho_\tau(u) = \tau - I(u < 0)$

Canay [2011] proposes two possible methods to estimate the asymptotic variance of the coefficients: the covariance Kernel and the bootstraps. Bootstraps present serious advantages [D'Haultfoeuille and Givor, 2012] and Monte-Carlo simulations provided by Canay [2011] for T = 10 and N = 100 show better performance than previous estimators [Koenker [2004], Koenker and Bassett [1978] and Abrevaya and Dahl [2008]] and a bias which looks very decent [Campos and Centeno, 2012]. Like some authors such as Bargain and Kwenda [2009] who compare wages gap in the informal sector, Matano and Naticchioni [2012] who aim at disentangling the role played by different theoretical explanations in accounting for the urban wage premium along the wage distribution, or Campos and Centeno [2012] also interested in the evolution of public wages and the public-private wage gaps, we also adopt the method proposed by Canay [2011] to esti-

[17] This presentation is directly inspired by Campos and Centeno [2012].

mate how the effects of employers' social security payment rebates on job creation differ across the growth distribution. As pointed out by Galvao [2011] "the quantile regression model has a significant advantage over models based on the conditional mean, since it will be less sensitive to the tail behavior of the underlying random variables representing the forecasting variable of interest, and consequently will be less sensitive to observed outliers." (p. 3).

APPENDIX 3.

Detailed results

Table 4. Estimates for the total sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
			10%	25%	50%	75%	90%
VARIABLES	Growth	Growth	Growth*	Growth*	Growth*	Growth*	Growth*
Size2	-0.0415***	-0.167***	-0.114***	-0.190***	-0.155***	-0.114***	-0.202***
	(0.00109)	(0.00189)	(0.00196)	(0.000678)	(0.000514)	(0.000726)	(0.00146)
Size3	-0.0317***	-0.284***	-0.188***	-0.288***	-0.278***	-0.257***	-0.342***
	(0.00125)	(0.00317)	(0.00167)	(0.000581)	(0.000395)	(0.000689)	(0.00155)
Size4	-0.0293***	-0.383***	-0.259***	-0.370***	-0.376***	-0.375***	-0.467***
	(0.00192)	(0.00580)	(0.00164)	(0.000664)	(0.000466)	(0.000810)	(0.00204)
LnAge	-0.00800***	-0.0382***	-0.000488	-0.0214***	-0.0345***	-0.0472***	-0.0894***
	(0.000310)	(0.000833)	(0.000859)	(0.000125)	(5.43e-05)	(0.000252)	(0.000918)
Intens	0.00577***	0.00994***	-0.00138***	0.000168	0.00742***	0.0135***	0.0194***
	(0.000277)	(0.000426)	(0.000511)	(0.000138)	(5.23e-05)	(0.000176)	(0.000509)
RSSC	-0.00265	0.0553***	-0.0608***	0.0689***	0.0309***	0.0121***	0.0924***
	(0.00661)	(0.00940)	(0.0135)	(0.00328)	(0.00103)	(0.00285)	(0.0124)
RSSCxQ2	-0.0501***	-0.0465***	0.0570***	-0.0234***	-0.0106***	-0.0165***	-0.0444***
	(0.00878)	(0.00888)	(0.0170)	(0.00387)	(0.00133)	(0.00408)	(0.0156)
RSSCxQ3	0.00276	0.00379	0.0789***	-0.000115	-0.00322**	-0.000514	0.0528***
	(0.00880)	(0.00892)	(0.0169)	(0.00384)	(0.00155)	(0.00377)	(0.0163)
RSSCxQ4	-0.0188**	-0.0186**	0.0757***	-0.0156***	-0.00919***	-0.00294	0.0942***
	(0.00863)	(0.00876)	(0.0173)	(0.00364)	(0.00143)	(0.00384)	(0.0171)
Q2	0.0230***	0.0204***	0.0249***	0.00923***	0.00302***	0.00625***	0.0140***
	(0.00224)	(0.00227)	(0.00326)	(0.00103)	(0.000363)	(0.00105)	(0.00314)
Q3	0.00821***	0.00720***	0.00344	0.00213**	0.00178***	0.00465***	0.00537*
	(0.00225)	(0.00228)	(0.00362)	(0.00103)	(0.000438)	(0.000987)	(0.00321)
Q4	0.0214***	0.0218***	0.0202***	0.00880***	0.00456***	0.00708***	0.00885**
	(0.00219)	(0.00222)	(0.00311)	(0.000975)	(0.000384)	(0.000907)	(0.00346)
Constante	0.0238***	0.169***	-0.181***	0.0791***	0.169***	0.250***	0.582***
	(0.00221)	(0.00448)	(0.00527)	(0.00112)	(0.000404)	(0.00148)	(0.00492)
Model	OLS	FE	2-STEP	2-STEP	2-STEP	2-STEP	2-STEP
Observations	884,798	884,798	884,798	884,798	884,798	884,798	884,798
R^2	0.00390						
R^2 Adj.	0.00388						
F							
R^2 between		0.0171					
R^2 within		0.000554					
R^2 overall		0.00238					
Pseudo R^2			0.0617	0.2161	0.1910	0.1179	0.0940

Standard errors in parentheses.
**** $p<0.01$, ** $p<0.05$, * $p<0.10$.*
Standard errors estimated by Bootstrap (number of Bootstrap samples = 100).
Growth represents the transformed variable (Growth* = ($lnEmpl_{i,t}$ - $lnEmpl_{i, t-1}$) - $\hat{\alpha}_i$).*

APPENDIX 4.

Table 7. Estimate of the effects of RSSCs in the four *Départements*

	OLS	FE	2-STEP	2-STEP	2-STEP	2-STEP	2-STEP
	(1)	(2)	(3) 10%	(4) 25%	(5) 50%	(6) 75%	(7) 90%
VARIABLES	Growth	Growth	Growth*	Growth*	Growth*	Growth*	Growth*
Guadeloupe							
Intens	0.00624***	0.0103***	0.00127	0.000266	0.00734***	0.0127***	0.0180***
	(0.000641)	(0.000955)	(0.00113)	(0.000396)	(0.000124)	(0.000459)	(0.00127)
RSSC	-0.00954	0.00562	-0.176***	-0.00641	-0.0146***	-0.0160***	0.123***
	(0.0134)	(0.0187)	(0.0270)	(0.00523)	(0.00216)	(0.00524)	(0.0254)
Observations	199,016	199,016	199,016	199,016	199,016	199,016	199,016
French Guyana							
Intens	0.00699***	0.0127***	0.00697***	0.00196***	0.00854***	0.0180***	0.0184***
	(0.00104)	(0.00158)	(0.00158)	(0.000539)	(0.000232)	(0.000919)	(0.00158)
RSSC	-0.0108	0.0570*	-0.0962**	0.0694***	0.0508***	0.0379***	0.190***
	(0.0227)	(0.0325)	(0.0460)	(0.0115)	(0.00375)	(0.0112)	(0.0444)
Observations	70,163	70,163	70,163	70,163	70,163	70,163	70,163
Martinique							
Intens	0.00503***	0.00779***	-0.00228**	-0.00109***	0.00596***	0.0103***	0.0161***
	(0.000588)	(0.000886)	(0.000995)	(0.000298)	(0.000122)	(0.000393)	(0.00133)
RSSC	0.0220*	0.0803***	0.00148	0.0824***	0.0364***	0.0270***	0.0682***
	(0.0132)	(0.0183)	(0.0273)	(0.00668)	(0.00212)	(0.00653)	(0.0263)
Observations	201,566	201,566	201,566	201,566	201,566	201,566	201,566
Réunion							
Intens	0.00615***	0.0108***	-0.00361***	0.000278	0.00811***	0.0153***	0.0221***
	(0.000401)	(0.000623)	(0.000700)	(0.000202)	(7.08e-05)	(0.000213)	(0.000741)
RSSC	-0.0109	0.0602***	-0.0470*	0.103***	0.0420***	0.00732*	0.0501***
	(0.0105)	(0.0154)	(0.0241)	(0.00505)	(0.00189)	(0.00412)	(0.0173)
Observations	380,030	380,030	380,030	380,030	380,030	380,030	380,030

Standard errors in parentheses.
**** p<0.01, ** p<0.05, * p<0.10.*
Standard errors estimated by Bootstrap (number of Bootstrap samples = 100).
Growth represents the transformed variable (Growth* = ($lnEmpl_{i,t}$ - $lnEmpl_{i,\ t-1}$) - $\hat{\alpha}_i$).*

LES EXONÉRATIONS DE COTISATIONS SOCIALES PATRONALES DYNAMISENT-ELLES L'EMPLOI ?
UNE ANALYSE EMPIRIQUE SUR LES DÉPARTEMENTS D'OUTREMER

Résumé - *Les exonérations de cotisations sociales patronales font partie des principaux dispositifs utilisés pour inciter à la création d'emplois lorsque le coût du travail est réputé si élevé qu'il décourage les entreprises de procéder à l'embauche de nouveaux salariés. Parmi les différentes mesures mises en œuvre en France, celles dont bénéficient les Départements d'outremer sont les plus généreuses puisque l'assiette y est la plus large et les taux d'exonérations les plus élevés. Cet article cherche à déterminer dans quelle mesure ces instruments d'action publique contribuent à la création d'emplois à l'aide d'un panel non-cylindré d'établissements comptant au moins un salarié. La base de données est constituée à partir de la fusion de différentes sources administratives couvrant la période 2004-2011. Nous étudions les différents effets des exonérations de cotisations sociales en utilisant la technique de la régression quantile adaptée aux données en panel. Nous montrons que l'impact des exonérations et le cumul de plusieurs dispositifs sur le taux de croissance des effectifs salariés varie selon le rythme de croissance des établissements. L'impact tend en effet à diminuer au fur et à mesure que le taux de croissance de l'emploi augmente. Ces effets sont cependant influencés par la taille et le secteur d'activité d'appartenance de chaque établissement. L'effet des exonérations sur l'emploi est davantage marqué dans les grands établissements, dans ceux de l'industrie manufacturière et dans une moindre mesure dans le secteur des services aux entreprises.*

Mots-clés - CROISSANCE DE LA FIRME, CRÉATION D'EMPLOIS, COÛT DU TRAVAIL, EXONÉRATIONS DE COTISATIONS SOCIALES PATRONALES, RÉGRESSION QUANTILE SUR DONNÉES EN PANEL