

# EVALUATION OF THE PAYROLL TAX'S IMPACTS ON THE EMPLOYMENT IN BRAZIL

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**Abstract:** The objective of the present article was to evaluate the impact of the public policy payroll tax on the employability of some sectors in the national Brazilian context between the years 2013 and 2016. We decided to use the panel data method given the advantage of working with an expanded database (54 sectors and 44 months), with low collinearity and greater degree of freedom, which implies in improving the efficiency of the results. Based on the results found, it was possible to affirm that there was no evidence of significant effects of the payroll tax on the employment rate, since the effects were not significant, in fact, they were negative. It means the government spent more money that the companies created new employments, so, the objective of this public policy was not achieved. Therefore, this study contributed to the public administration literature in the improvement of public policy evaluation methods.

**Key-Words:** panel data; evaluation of public policies; payroll exemption.

**Resumo:** O objetivo do presente artigo foi avaliar o impacto política pública da desoneração da folha de pagamento sobre a empregabilidade de alguns setores no contexto nacional brasileiro entre os anos de 2013 e 2016. Optou-se por utilizar o método da regressão com dados em painel, tendo a vantagem de trabalhar com um banco de dados ampliado (54 setores e 44 meses), com baixa colinearidade e maior grau de liberdade, o que implica em melhorar a eficiência dos resultados. Com base nos resultados encontrados, foi possível afirmar que não houve evidência de efeitos significativos da desoneração da folha de pagamento sobre o emprego, uma vez que os efeitos não foram significativos, na verdade, foram negativos. Isso significa que o governo gastou mais dinheiro que as empresas criaram novos empregos, sendo assim, o objetivo dessa política pública não foi alcançado. Portanto, este estudo contribuiu para a literatura da administração pública na melhoria dos métodos de avaliação de políticas públicas.

**Palavras-Chave:** Dados em Painel; Avaliação de Políticas Públicas; Desoneração da Folha.

**Área Temática:** 15. Finanças públicas locais e regionais, política fiscal.

**JEL Classification:** H83.

## 1. INTRODUCTION

The debate on public policy, as a discipline and area of knowledge, had its origin in the United States, where four great names can be highlighted as ‘founding fathers’ of the area of public policy, are: *Harold Dwight Lasswell; Herbert Alexander Simon; Charles Edward Lindblom; and David Easton* (Souza, 2006). Some important definitions within public policies, it has been noted that Latin-Speaking countries find it difficult to distinguish some essential terms from political science, such as in the case of Portuguese, the term *political* assumes up to two main connotations, one thing that English-speaking countries can already easily differentiate between the use of terms. In the case of English-speaking countries, *politics* is understood as political activity and competition; already *policy* is understood as a strategic action. Thus, the term public policy deals with the concrete and symbolic content of political decisions (Secchi, 2010).

Consistent with this, Barreiro & Furtado (2015), understand that the meaning of the word public policy is something fundamental as a first step to understand the importance of this instrument in the current context, with regard to social, economic and political aspects arising from the maturation of organized civil society and the production of new knowledge in the field of public management and bringing with them new challenges between State and society.

In this sense, one of the important concepts within the field of public policies, that deserve to be highlighted, it's the concept of *policy cycle*, where some authors introduced the idea that public policy would be like a cycle formed by several stages, which constituted a process of learning and dynamic at the same time. These stages of the policy cycle can be separated into five points: *agenda setting, policy formulation, decision making, policy implementation and policy evaluation*. These stages can be framed in three major phases: the definition of the agenda is a *political phase*, the formulation of policies and the decision making are *technical phases*, and the implementation and evaluation of policies are *organizational phases* (Souza, 2006; Wu et al., 2014).

This article sought to emphasize the stage of the *policies evaluation*, in the specific case of Decree number 7,828 of October, 2012 (Payroll Tax), which regulates the impact of the social security contribution on revenue due by companies that deal with the arts. 7 to 9 of Law 12,546/11, as the case of companies: (i) collective road passenger transport, with fixed, municipal, intermunicipal, metropolitan, intermunicipal, interstate and international routes; (ii) the construction industry; (iii) rail and subway passenger transport; (iv) construction of infrastructure works, among others (Brazil, 2011 & 2012). An important point to note it's the structure of the public policy cycle formed through five points that are used as a basis for sustaining it is not a single form of debate on public policy issues, the cycle is used in order to demonstrate in a clearer and more concise way how these policies can be carried over the course of time, from their idea of creation to their evaluation; remembering that evaluation is not an exclusive point to be made only in the final phase of the cycle, since it can be done before or during the process.

According to the Charge of Relief (2012), one of the objectives of the payroll relief policy was to foment the formalization of jobs in the labor market, since the social security contribution would come through the billing and not more about the payroll. Thus, the objective of this article was to evaluate the impact caused by the payroll tax in relation to the employability of 54 sectors in the national context (which were used as a sample of this work), with an analysis of the year 2013 up to the year 2016, through the application of the econometric method of linear regression with panel data.

The debate about payroll relief has gained ground in Brazil, recent work has been elaborated on this, such as: Neves Jr., Fernandes & Barreto (2016), who sought to measure and analyze, through accounting expertise, the impacts caused by the implementation of 'payroll

exemption' in a company in the infrastructure construction sector; Ludwig, Borget & Kremer (2016), verified whether there was a reduction of costs in two companies analyzed in the construction segment; Echevarrieta et al. (2015), demonstrated the impacts caused by the 'employer social security contribution', as from the period of payroll tax relief, in the hotel sector in Florianópolis; Silva et al. (2018), verified the financial impact caused by the implementation of the payroll exemption in the food industry in Mato Grosso; Silveira & Raupp (2017), investigated the payroll exemption on labor charges incurred by an information technology company in Florianópolis; Barth, de Souza & Oliveira (2016), analyzed the influence of tax exemption on the calculation of tariffs in the intercity transport sector, evaluating issues related to the economic balance of public service providers; and finally, Ferrari et al. (2017), identified the cost behavior of companies in the yarn and fabric sector listed on BM & FBOVESPA.

As noted in these papers, it was noticed that the works are more focused on the analysis of the costs caused by the payroll tax on the finances of the companies in different specific sectors. This was somewhat different from this work, since it sought to treat all sectors together, from the application of an econometric method and the public policy literature.

## **2. THEORETICAL BACKGROUND**

### **2.1 Origin and concept of public policies**

As already described in the introduction, public policy as an area of knowledge had its origin in the United States, where they sought to break with some ideas that were being followed by the European tradition that carried out studies and research in this area, where they concentrated on the analysis on the State and its institutions. In the United States, in contrast, the area has emerged in the academic world, moving directly to the focus on government action studies (Souza, 2006).

In the literature on *policy analysis*, it seeks to differentiate some dimensions of politics, such as: the processional dimension *politics* that has in view the political process, constantly conflicting, regarding the imposition of objectives, the contents and distribution decisions; and the material dimension of *policy* which refers to concrete content, it means, the configuration of political programs, the technical problems and the material content of political decisions. However, what should not be overlooked is the fact that in political reality these dimensions are intertwined and influenced simultaneously, not being something that occurs separately (Frey, 2000).

For some authors such as Secchi (2010) and Souza (2006), there is no consensus as to the definition of what a public policy is. In this way, there are innumerable ways of defining what it is, provided it has in its conceptual essence the *public problem* - which can be understood as the difference between the current situation and an ideal situation possible for the public - that is, a public policy can be considered as an elaborate guideline to face a problem, and that basically has two fundamental elements, that are: public intentionality and response to a public problem. In this sense, a job creation policy can be considered as a measure whose purpose is to solve a public problem (in this case, unemployment). Following this reasoning, Ollaik & Medeiros (2011) describe that the state undergoes continuous changes always trying to improve the way of dealing with public problems, besides the necessary adjustments due to its evolution. Finally, in order to a problem to be considered *public*, it must have representative implications, both quantitatively and qualitatively, being relevant to the community. A possible definition for the term is highlighted by Castaños-Lomnitz (2006, p. 116), where the author considers that "public policy must be the result of a joint reflection of scientists and public officials on public and scientific issues." There is ongoing feedback between social science and creative thinking about other public issues.

For this work, the term *public policies* refers to the broad spectrum of processes used to arrive at de facto decisions and policies, from the elaboration of policy proposals to the issuance of governmental regulations and public consultation for parliamentary decision-making, which involves describing some steps that public policies must take before they can be achieved, and the concept of the public policy cycle that was best addressed in the subsequent sub-topic (Joss & Brownlea, 1999).

## 2.2 Public policy cycle

This model of analysis sees public policy as a cycle formed by several stages that constitute a process of learning and dynamic at the same time. According to the sequential approach (policy cycle), public policies follow a series of steps in their life cycle, and can basically be divided as follows: "perception and problem definition, agenda-setting, elaboration of programs and decision-making, implementation of policies and, finally, evaluation of policies and eventual correction of the action" (Frey 2000, p. 226, Teirlinck et al., 2012). In practice, the sequence of these stages does not follow a linear logic, but it is useful to make these distinctions to understand the opportunities for integrating public policies between different policy domains and different stages of the policy cycle (OECD, 2005a).

In the first stage of the cycle, there are *political discussions* to verify which problems will be considered public and important to enter the agenda. Secondly, there is the *formulation of the options* to be used to solve the problems that were previously included in the agenda, that is, the development of alternatives for possible courses of action that providers can take to solve the problems chosen. In the third moment, the *selection of the best option* occurs, which means the choice by the provider of the policy among the alternatives that were formulated and made available to be selected. In the fourth moment, it is when the *public policy takes on a real format* and begins to be, in fact, operationalized. Finally, in the fifth moment (focus of this work), the *verification* of the degree to which a public policy is achieving its objectives occurs, and if it is not, improvements must be made (Wu et al., 2014). Vaz & Lotta (2011), also show that the stages of formulation, implementation, operation and evaluation of public policies demand the displacement of people (government leaders and technicians, consultants, employees of organizations involved etc.) to other localities.

According to Ferreira, Alencar & Pereira (2012), when analyzing public policies from the perspectives of the policy cycle, it can be observed that its main presupposition lies in the strategic vision that recognizes the need to use the classic administrative functions that were described by Henri Fayol, who are: plan, organize, direct and control, whose meanings are described in the formulation, implementation and evaluation stages. If the public administrator focuses only on this strategic view, he runs the risk of interpreting public policy as just an administrative action divided into some stages and ends up disregarding it as a complex product of forces of social and political contexts.

Experience from New Zealand and Finland (in relation to innovation aspects in countries) suggests that more traditional involvement of stakeholders should be expanded to develop participatory governance systems in which groups of experts and lay people have an active voice in agendas and formulations of public policies (OECD, 2005b).

According to Boekholt & den Hertog (2004), the participation of stakeholders interested in the policy cycle shows two different aspects: positive and negative. The *positive* aspects are summarized in: greater policy orientation for users; greater transparency in the rules of the game; and greater assistance in networking among different stakeholders. The *negative* aspects are: a more time-consuming decision-making process; an increase in transaction costs of policy formulation; and a greater risk of distortion of the behavior of the interested actors in favor of certain groups or positions.

## 2.3 Policy evaluation

In the last decades, international organizations of cooperation and financing have tried to develop methodological proposals of evaluation, they can be highlighted: The Organization of the United Nations, World Bank, Organization for Cooperation and Economic Development (OECD), the Economic Commission for Latin America and the Caribbean (ECLAC). The existence of different forms of evaluation classification is emphasized by the fact that there is no single definition about this. The evaluation can be classified according to its *timing*, that is, whether it is done before, during or after the implementation of the public policy. In this sense, evaluation would not occur only at the end of the public policy cycle, as predicted by the cycle model. However, the public policy cycle is only a way of analyzing public policies, dividing them into stages, since in reality they do not necessarily follow those steps in a linear way and are hardly done following the imagined structure (Faria, 2005; Ramos & Schabbach, 2012).

It is important to note that the debate on public policy evaluation in Brazil and in the United States had a greater focus on health, education and social welfare. However, it has been noted that the volume of US research in this area is almost double the number of surveys conducted in Brazil, this helps to explain why there are more non-Brazilian organizations contributing more to the development of methodologies for evaluating public policies (Crumpton et al., 2016).

The analysis and evaluation of policies implemented by a government involve factors of different natures (Amaral & Oliveira, 2011). According to Derlien (2001), there are three functions attributed to the evaluation of policies, these being information, reallocation and legitimation. These functions seek to demonstrate the evolutionary phases of evaluation research, having a temporal cut in the years 1960 and 1990.

According to Faria (2005), the evaluation can be differentiated according to its objectives: 1 - **instrumental**: says that to decision making not only depends on the quality of the evaluation, but also on the adequate disclosure of its results; 2 - **conceptual**: relates to evaluation findings, which may end up altering the way program technicians understand the nature, mode of operation and impact of the program; 3 - **as an instrument of persuasion**: it is used to mobilize support for the position that decision-makers already have about the changes needed in the program; 4 - **for "enlightenment"**: it occurs with the accumulation of knowledge coming from diverse evaluations, impacts on the networks of professionals and opinion formers, as well as changes the beliefs and the form of action of the institutions.

In Brazil, public policy evaluation research is still considered very premature compared to other countries. The evaluation of social policies began only in the 1980s, but still occurred unbalanced between different types of social policies. This inequality is even more evident when the number of studies produced for certain programs is verified and the absence of studies on other programs (Figueiredo & Figueiredo, 1986).

According to Ramos & Schabbach (2012), the focus given to the evaluation of public policies in Brazil did not attract the interest of the academic world, which devoted its studies to the areas of sociology and political science. The latter focus their efforts on the processes of agenda formation and policy formulation, to the detriment of studies of implementation, evaluation and monitoring processes. In this way, the authors affirmed that certain stages of the public policy cycle receive more attention than others.

In addition, there is no consensus as to what the assessment actually is. This concept allows for several definitions, some of which are somewhat contradictory. This is explained by several factors, such as the variety of disciplines, institutions and performers, as well as the needs and clients reached in the universe of evaluations (Ala-Harja & Helgason, 2000). However, it is possible to say that, in general, the authors define that the main goals of the

evaluation can be characterized as: the improvement of the decision-making process, the appropriate allocation of resources and the responsibility.

One of the possible definitions is that of Bechelaine & Cagnagnaroff (2014), who, in their article the authors, defined evaluation as a set of research instruments that goes beyond identifying problems and proposing solutions. More than that, it points out changes that could lead to improvements in public policies and programs.

According to Howlett, Ramesh & Perl (2013, p. 199), "the concept of policy evaluation refers broadly to the stage of the process in which it is determined how a policy is actually working in practice." Already to Ceneviva & Farah (2012), the evaluation of public policy is seen not only as a management tool, but above all as a means to measure the performance of policies and programs and to establish the parameters for the accountability of bureaucracy and government.

To the authors Amaral & Oliveira (2011), a public policy implies the intervention of the State that aims to concretize social rights conquered by society. Public policies are agreements signed in time and are subject to the correlations of force that are constructed, negotiated and legitimized in different contexts. Thus, to Ferreira, Alencar & Pereira (2012), public policy evaluation enables policy makers and implementers to be able to make more assertive decisions, thus maximizing public expenditures in the various activities where they have state influence.

In this way, it is possible to say that, in general, the authors described above define that the main goals of evaluation can be characterized as: improving the decision-making process, appropriate allocation of resources and maintaining quality standards in the evaluated.

## **2.4 Payroll tax**

Discussions about the changes in the structure of collection of costs for labor benefits have existed in Brazil since the mid-1990s, with the increasing degree of informality of the Brazilian economy being the main source of concern. Among the various problems related to the high level of informality in an economy, the reduced collection base of the social security system was considered one of the most worrisome and, therefore, was the main motivator of the debate about the payroll exemption in the period (Meyer, Spolador & Lucinda, 2015).

The so-called tax from payroll was established through Law number 12,546 of December 14, 2011, which replaced part of the social security contributions of the payroll by the adjusted gross revenue, which, according to its 8<sup>th</sup> art., it means gross revenue excluding sales canceled and unconditional discounts granted. However, the referred exemption was only regulated by Decree Number 7,828 of October 16, 2012 and regulated by Rule RFB 1,436 of December 30, 2013, and for discussion on the payroll tax in this work, we opted for the adoption of the Decree already mentioned as basis for understanding (Brasil 2011, 8<sup>th</sup> art.; 2012; RFB, 2013).

The nomenclature was granted in this way due to the fact that the payroll is no longer burdened, and the burden of the employer social security charge (INSS Patronal), which previously had a basis of calculation based on the payroll reports, transferred to a base of calculations based on the financial statements, that is, before paying an INSS Patronal of 20% on the payroll and with the exemption, this percentage was excluded from the charges on the sheet and started to be taxed on the adjusted gross revenue, whose name was known as the Social Security Contribution on Gross Revenue (SSCGR), and its percentages vary according to the economic activity of the company, ranging from 1% to 4,5%. It is important to point out that the individual social security contribution (the one deducted from each employee), the contributions related to the Risk of Accident at Work (RAW) and the value for other entities (third parties), remain unchanged. Another important point to note is that, starting in 2015, the companies to which they deal with the exemption, were able to choose whether or not to choose

the payroll exemption, which was not the case at the beginning of the process (Bertini & Wünsch, 2014; Brasil, 2015).

It is important to note that the payroll tax exemption covers all taxation systems in the country (real profit, presumed profit and simple national), however, since the simple national is a differential taxation system, the latter receives the interpretation of this tax exemption differentiated form of payment, for example, the application is only made in a single annex of the five existing ones, which is the case of Annex IV, which includes companies such as: (i) collective road passenger transport; (ii) construction industry; (iii) rail and subway passenger transport; (iv) construction of infrastructure works, among others (Brazil, 2006 & 2016). And the cases of 20% 'INSS Patronal' and the payment of 'third parties' also do not apply to this tax regime.

According to the Charge of Relief (2012), the objectives of payroll relief are multiple and the three main ones can be highlighted: 1 - at first it seeks to increase the competitiveness of the national industry, by reducing labor costs and stimulates exports, exempting them from the social security contribution; 2 - *in the second moment, it seeks to stimulate even more the formalization of the labor market, once the employer's social security contribution will be charged on the billing and not more on the costs of the payroll*; and 3 - Finally, it reduces asymmetries in the taxation between the domestic and imported products, imposing on the latter an additional on the rate of Cofins-importation equal to the rate of the relief that the domestic industry will pay. In this way, the objective of the exemption that this work was based on the analysis of public policy was the second objective, which concerns the stimulus to the formalization of jobs in the labor market, since the payroll charges would be reduced and would be taxed on billing at other rates.

### **3. METHODOLOGY**

#### **3.1 Search sample**

At the time of sample determination, 54 sectors were selected, according to their National Classification of Economic Activities (NCEA). The period covered by this research was from 2013 to 2016, but for the panel data to be balanced, the values referring to the months of January of all these years were excluded. Analyzing the type of panel that we will use, we have to: **Number of observations > Number of time periods.**

Thus, we are facing a long panel, since the number of observations exceeds the number of time period. This means that for dynamic models with fixed effects, with long panels, one can opt for the within estimator, whereas for short panels one should prefer the GMM estimation (Marques, 2000).

The data referring to these NCEAs of the sample were taken from Brazilian Federal Revenue's database (RFB), in payroll tax, as well as data from GREU (General Register of Employees and Unemployed), which also followed the same pattern.

#### **3.2 Panel data**

The regression with panel data, or longitudinal data, is a powerful tool in data analysis that uses both time series and cross-section. The panel data allow us to estimate the effects of the unobserved variables among the different groups, revealing individual heterogeneity. Another advantage is the possibility of working with an expanded database with a greater degree of freedom, which cooperates for the efficiency of results (Arellano, 2004).

This research focused on analyzing the impacts on the sectors of the economy, in terms of employment generation, from the public policy of relief, as well as capturing the effects that

are not directly related to the policies of relief itself. In this type of analysis, the mitigation of the individual variations occurs, trying to test the general effects, those that fall on all sectors.

Differently from time-series or cross-sectional regressions, the panel data models have two subclassifications, time and individuals:

$$Y_{it} = \varphi_i + X_{it}\beta + \mu_{it} \quad (1)$$

Given a set of  $x_{it}$  independent variables there exist  $i$  individuals, representing the cross-sectional data where  $i \in (1,2,3, \dots, N)$  and  $t$  number of periods, indicating the time series, where  $t \in (1,2,3, \dots, T)$ . So, the independent variable is represented by  $x_{it}$ .

For this study,  $i$  indicates the economic sectors that received the benefits of relief,  $\varphi_i$  is the intercept that is represented by a scalar variable and that is fixed in time (predictable, non-random value),  $\beta$  the coefficient (or parameter) that will be tested and  $X_{it}$  is the relief variable, which varies as a function of the time  $t$  of the months of duration of the relief policy and in each sector  $i$ . Since  $Y_{it}$  is the dependent variable that measures the level of employment and  $\mu_{it}$  is the unobservable value of the specified individual effect, that is, the error variable that causes the impacts of the redundancy on employment not to reach the expected value, as for example that the resources of the relief work as a method of increasing the profit of the companies and not of greater contracting of people.

The regression models are formed by errors, angular coefficients and intercepts. In the panel data model equations, the intercepts, angular coefficients and intragroup errors, or intergroups, may vary. The *pooled model*, or model for clustered data, does not consider the temporal and spatial dimensions of the data, it assumes that the coefficients remain the same over time and between individuals (Pesaran, 2015).

In this type of model there are usually problems of inconsistency caused by the correlation between the error term and the explanatory variable. Thus, it is necessary to perform the *Breusch-Pagan test*, which results in testing the hypothesis of the presence of unobserved effects interfering in the analysis. Thus, we verified the variances of the errors by checking if they behave in a homocedastic way (null hypothesis), that is, when the variance of the error terms ( $\varepsilon$ ) is constant (Hair, 2009). The test performed in this work found a **p-value = 0,337388**, which implied in the acceptance of the null hypothesis that the errors are homocedastically distributed.

In works that use fixed effects models the angular coefficients are constant ( $\beta_i = \beta_j$ ) and the intercepts vary between individuals ( $\varphi_i \neq \varphi_j$ ). The fixed effects model is based on the premise that the characteristics of each individual influence the explanatory variables and to different degrees, that is, the independent variable  $X_{it}$  is correlated with  $\varphi_i$ . That is, by making the error  $\Omega_{ij}$  vary according to:

$$\Omega_{ij} = \varphi_i + \mu_{it} \quad (2)$$

The two unobservable components of the error  $\Omega_{ij}$  represent the invariant effect of each individual at time  $\varphi_i$  and their respective error terms. Thus, the difference of fixed and variable effects is:

- ✓ In the random-effect model there is no correlation between  $\varphi_i$  and  $X_{it}$ ;
- ✓ In the fixed-effect model there is a correlation between  $\varphi_i$  and  $X_{it}$ .

From the grouped data model, we have two extensions: the fixed effects model and the random effects model; however, the relevant distinction between the two models is not whether



the effect  $\varphi_i$  is fixed or not, but whether it is correlated with the explanatory variables (Reinaldo, 2017).

Regarding the best method, Baltagi (2013) states that there is no consensus as to which technique would be the best if fixed or variable effects, but there seems to be a larger group of researchers in the literature who show a greater inclination towards random effects models. The main difference between the two models is fundamentally how each treats the effects not observed.

For Hsiao (2014) one of the main advantages of panel data analysis is the use of a greater number of information, the reduction of collinearity problems and the increase in efficiency in estimation. The union of time series and cross section increases the degree of freedom of the sample, that is, it increases the number of observations in relation to the number of parameters to be estimated. The larger the sample size, the greater the degree of freedom and consequently the better the result of our estimation of the parameter values.

The problems of multicollinearity may arise from difficulties in preparing the research, choosing the most appropriate model for the study and in cases where the number of variables exceeds the number of observations (Montgomery, Peck & Vining, 2006). However, the panel data contribute to reduce the collinearity problems directly related to the greater number of variables, since in this model an increase in the number of observations occurs.

#### 4. ANALYSIS OF RESULTS

The panel analyzed is balanced, since all individuals have the same time period, unlike the unbalanced panel in which individuals have different time periods. The model has 2,538 observations, being 54 sectors and 47 months, thus being a long panel.

**Table 1 – Hausman’s test**

| Dependent variable:<br>Employment (E) | (b) Fixed  | B (random) | (b-B) Difference | Sqrt (diag (V_b_VB)) |
|---------------------------------------|------------|------------|------------------|----------------------|
| Discharge                             | -0.0000196 | -0.0000146 | -4.92e-06        | 0.1319               |

**Note:** Hausman test - Null hypothesis: difference in coefficients not systematic

$$\chi^2(1) = (b-B)'[(V_b-V_B)^{-1}](b-B) = 0.46$$

$$\text{Prob}>\chi^2 = 0.4971$$

**Source:** Prepared by the authors based on the research data.

To determine which model to use (fixed or random effects), the *Hausman* specification test is applied, where the consistency of one estimator is compared to another. The hypothesis test shows that the difference between the coefficients is not systematic, that is, there is no correlation between the explanatory variables and the error term of the two estimators, so the most appropriate method, in this case, is the random effects, since the difference between them was considered very low panel.

**Table 2 – Panel data – random effects (GLS)**

| Dependent variable:<br>Employment (E) | Coefficient  | Std. Error  | z                  | p-value    |
|---------------------------------------|--------------|-------------|--------------------|------------|
| Const                                 | -551.022     | 284.202     | -1.939             | 0.0525 *   |
| Tax Relief                            | -1.46344e-05 | 5.66265e-06 | -2.584             | 0.0098 *** |
| Mean dependent var                    | -916.7447    |             | S.D. dependent var | 8527.413   |
| Sum squared resid                     | 1.84e+11     |             | S.E. of regression | 8511.769   |
| Log-likelihood                        | -26567.65    |             | Akaike criterion   | 53139.30   |
| Schwarz criterion                     | 53150.97     |             | Hannan-Quinn       | 53143.53   |

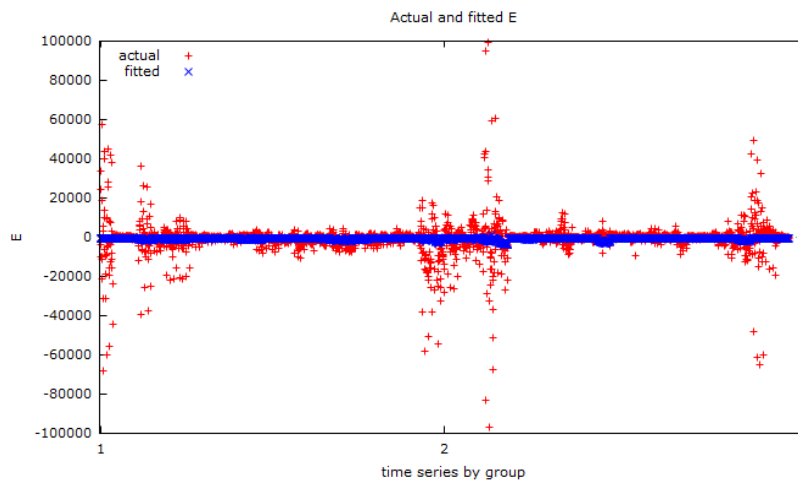
**Note:** \*Breusch-Pagan test - Null hypothesis: Variance of the unit-specific error = 0

Asymptotic test statistic: Chi-square(1) = 30.5743  
with p-value = **0,337388**  
\*\*Test for normality of residual - Null hypothesis: error is normally distributed  
Test statistic: Chi-square(2) = 12097.8  
with p-value = **0,000000**

**Source:** Prepared by the authors based on the research data.

It is important that the linear regression model has its distribution of its constant error terms, that is, that have a homoscedastic distribution and the same variance. In order to identify whether heteroskedasticity exists in the distribution of errors, the *Breusch-Pagan test* is performed. In table 2, the result found was significant, which implies that one accepts the null hypothesis that the residues distribute homocystematically and corroborate in the absence of unobserved effects.

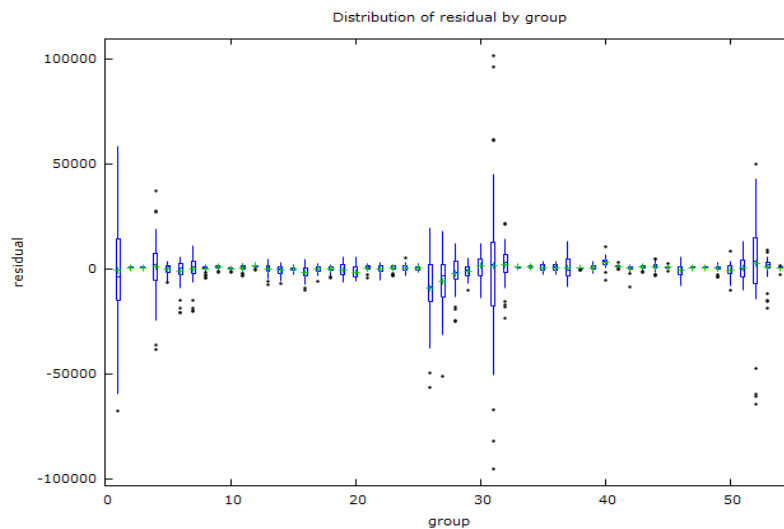
**Figure 1 – Random effects - real and adjusted**



**Source:** Prepared by the authors based on the research data.

In figure 1, it was observed the points that describe the prediction of the residues are close to the line of the average values formed by the used data. The red dots represent the distribution of the sample residues and the blue dots the distribution of the residues based on the prediction equation, which increases the degree of confidence of the regression.

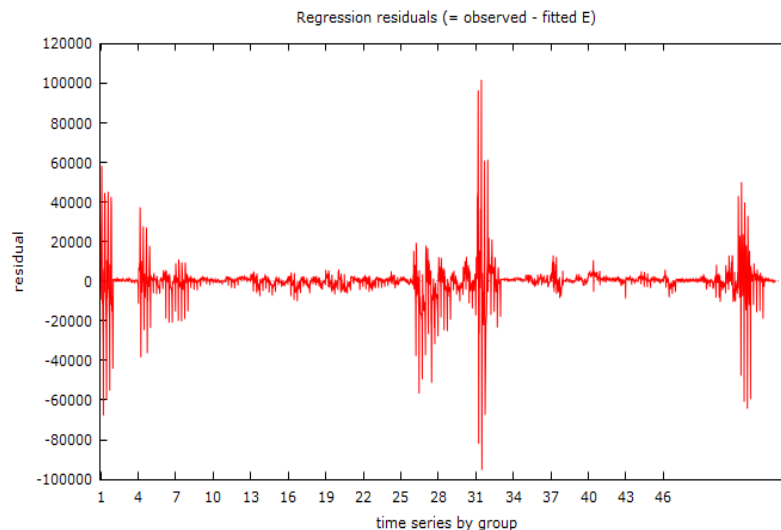
**Figure 2 - Residual plot - random effects (by group)**



**Source:** Prepared by the authors based on the research data.

In figures 2 and 3 the residues are observed both over time and on the basis of the sectors analyzed. Figure 2 was the one that sought to observe the residues based on the sectors, and figure 3 that sought to observe them over time.

**Figure 3** – Residual plot - random effects (by time)



**Source:** Prepared by the authors based on the research data.

In the figures it was verified that the sectors with the greatest variance around the mean were: 1, 10, 41, 42, 47 and 54 (Agriculture, livestock and related services; Food manufacturing; Building construction; Infrastructure works; Retail trade; Repair and maintenance of computer equipment and personal items), the other sectors adjusted well around the average.

Thus, these tests that were expressed through the figures and the initial tables served to demonstrate that the data used in this research met the basic requirements for the use of the linear regression data analysis method with panel data, which helped strengthen the statements that came later.

The regression tests showed that the impact of the payroll tax cuts had their employment level close to zero. In this way, it was concluded that to each one of the real expenditures by the government with the payroll tax, it generated -0.0000146 jobs, which characterizes the policy as being inefficient in its goal of job creation. Emphasizing the second objective of this public policy, which was demonstrated in the theoretical framework through the Charge of Relief (2012), which highlighted the search for stimulating the formalization of jobs in the labor market, it was noted that the government committed more resources with the resignation fiscal (from the point of view of social security collection), from what it obtained from return with the generation of jobs by the companies in the sectors that had the policy of the relief.

As previously mentioned, public policy evaluation can be classified according to its *timing*, that is, it can be performed: before, during or after its implementation (Faria, 2005; Ramos & Schabbach, 2012). This work analyzed the *ex-post* data for its implementation, however, it is worth noting that this policy was also evaluated by the government at other times, once it was noticed the implementation of new sectors over the years. Thus, this policy of exemption has been evaluated at different times, which confirms the fact that the evaluation of a policy is not an exclusive "end of cycle" stage, but that it can happen at different times. In general, the evaluation is intended to estimate the results of the policy or program (Ceneviva & Farah, 2012).

And in order to corroborate with the statements made above - that the taxation policy was inefficient in its job creation objective - it was sought to emphasize the sectors where it was most inefficient. Based on the data presented above, it was noted that only 16 from the 54

sectors were statistically significant, that is, they presented their *p-value* with significance of 1%, 5% or 10% of acceptance, being these the sectors: 3, 15, 21, 38, 41, 42, 45, 49, 52, 56, 61, 69, 77, 82, 85 and 94. Of these 16 sectors considered significant, only 6 (Preparation of leathers and manufacture of leather articles; Manufacture of pharmaceuticals and pharmaceuticals; Telecommunications; Legal, accounting and auditing activities; Education and Activities of associative organizations), obtained a coefficient with positive relation with the dependent variable employment, although with very low values. This means that only these six sectors, from the 54 analyzed, had a positive impact in order to achieve the goal of formalization of employment, but not at the level desired by the government, since it had estimated a positive impact of this policy on the Gross Domestic Product (GDP), in relation to the employment level of 0.44% (Baid, 2013).

## 5. CONCLUSIONS

Evaluating the public policy of tax relief implemented by the Federal Government, it was possible to conclude that the results of the change in the social security contribution on the payroll for the social security contribution on gross revenue did not reach the objective by which the policy was created: that the tests were not significant. In fact, from 2013 to 2016, unemployment has followed an upward trend, opposing the objectives of the tax relief policy itself.

Contrary to what was expected, in some sectors, the payroll taxation policy resulted in a higher burden on company billings. Such evidence can be identified when, in 2015, the federal government stepped back from the measure and offered the option of whether or not companies opt for the payroll tax. It was concluded that it was an inefficient policy, both the burden it generated on the public budget and its functionality.

Finally, tests were carried out to determine the effect time of the policy of relief, and it was observed that the maturity of the policy occurs in the fifth month of implementation of the policy, and that in this way it is a policy that does not have its observed effects in the very short term.

One of the limitations of this study was that it did not have access to accurate information from the set of companies, at sector level, that adhered or not to the resources of the exemption and as recommendations for future research, it would be relevant to develop a method capable of including only companies in the sample who effectively participated in the tax relief policy instead of including all companies in the sector. The panel data method could also be used to assess the impact of the tax relief on profit and tax collection.

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