Research, Society and Development, v. 10, n. 2, e54110212904, 2021
(CC BY 4.0) | ISSN 2525-3409 | DOI: http://dx.doi.org/10.33448/rsd-v10i2.12904

# Reinsertion wages in the job market considering the *Programa Seguro-Desemprego* Unemployment Insurance Program in Brazil

**Salários de reinserção no mercado de trabalho brasileiro considerando o Programa Seguro-Desemprego no Brasil**

**Salarios de reintegración al mercado laboral brasileño considerando el Programa de Seguro de Desempleo en Brasil**

Received: 02/12/2021 | Reviewed: 02/14/2021 | Accept: 02/19/2021 | Published: 02/28/2021

**Domingos Isaias Maia Amorim**
ORCID: https://orcid.org/0000-0001-6825-2317
University of São Paulo, Brazil
E-mail: domingos_isaias@hotmail.com
**Francisco José Silva Tabosa**
ORCID: https://orcid.org/0000-0003-1280-8907
Federal University of Ceará, Brazil
E-mail: franzetabosa@ufc.br
**Jair Andrade de Araujo**
ORCID: https://orcid.org/0000-0001-6297-9558
Federal University of Ceará, Brazil
E-mail: jairandrade@ufc.br
**Ahmad Saeed Khan**
ORCID: https://orcid.org/0000-0002-4079-7574
Federal University of Ceará, Brazil
E-mail: saeed@ufc.br
**Pablo Urano de Carvalho Castelar**
ORCID: https://orcid.org/0000-0001-9990-7873
Federal University of Ceará, Brazil
Email: pcastelar@ufc.br

**Abstract**
This work provides new estimates of the effect of the Brazilian Unemployment Insurance Program (*Programa Seguro-Desemprego*) at the national level and disaggregating the data considering urban and rural areas, using data from the National Household Sample Survey *(Pesquisa Nacional de Amostra Por Domicílio* - PNAD) on individuals for the year 2015. The methodology applied for empirical analysis is the Regression Discontinuity Design (RDD), using added covariates and entropy balancing. Our objective is to analyze if there is an effect of the unemployment benefit on reinsertion wages, and if it there is a positive relationship, based on the theoretical references of the Human Capital Theory and Job Search models. Among the main results found, the unemployment benefit program does not seem to exercise any significant change in the reinsertion wage, except for workers in the rural environment. It was also found that males receive lower reinsertion wages than females, and that the Northeast region of Brazil features the highest reinsertion wages.
**Keywords**: Unemployment insurance; Reinsertion wage; Regression discontinuity design; Added covariates; Entropy balancing.

**Resumo**
Este trabalho fornece novas estimativas do efeito do Programa Seguro-Desemprego no nível nacional e desagrega os dados considerando áreas urbanas e rurais, utilizando dados da Pesquisa Nacional de Amostra Por Domicílio (PNAD) em indivíduos para o ano de 2015. A metodologia aplicada para a análise empírica é através da Regressão com Descontinuidade (RDD), usando covariáveis adicionadas e balanceamento de entropia. O objetivo é analisar se há efeito do subsídio de desemprego nos salários de reinserção e se há uma relação positiva, com base no referencial teórico da Teoria do Capital Humano e nos modelos de procura de emprego. Dentre os principais resultados encontrados, o programa de seguro-desemprego não parece exercer variação significativa no salário de reinserção, exceto para os trabalhadores do meio rural. Verificou-se também que os homens recebem salários de reinserção mais baixos do que as mulheres, e que a região Nordeste do Brasil apresenta os maiores salários de reinserção.
**Palavras-chave**: Seguro-desemprego; Salário de reinserção; Regressão com descontinuidade; Covariáveis adicionadas; Balanceamento de entropia.

**Abstracto**
Este trabajo proporciona nuevas estimaciones del efecto del Programa de Seguro de Desempleo a nivel nacional y desagrega los datos considerando áreas urbanas y rurales, utilizando datos de la Encuesta Nacional por Muestra de Hogares (PNAD) en individuos para el año 2015. La metodología aplicada para el el análisis empírico se realiza a través de regresión de discontinuidad (RDD), utilizando covariables añadidas y equilibrio de entropía. El objetivo es analizar si existe un efecto de las prestaciones por desempleo sobre los salarios de reintegración y si existe una relación positiva, a partir del marco teórico de la Teoría del Capital Humano y en modelos de búsqueda de empleo. Entre los principales resultados encontrados, el programa de seguro de desempleo no parece tener una variación significativa en el salario de reintegración, excepto para los trabajadores rurales. También se encontró que los hombres reciben salarios de reintegración más bajos que las mujeres y que la región Nordeste de Brasil tiene los salarios de reintegración más altos.
**Palabras clave**: Seguro de desempleo; Salario de reintegración; Regresión con discontinuidad; Covariables agregadas; Entropía de equilibrio.

## 1. Introduction

Unemployment insurance programs, such as the *Programa Seguro-Desemprego* in Brazil, are highlighted by several authors for their social and economic importance. Balbinoto Neto and Zylberztaijn (2002) and Barros, Corseuil and Foguel (2000), for instance, report that, from the point of view of the worker, unemployment insurance functions as a source of temporary income from dismissal, which would enable the unemployed individual to be more selective in "choosing" their next job, making it possible to invest in the accumulation of more human capital.

However, there is criticism regarding the standardization of the distribution of benefits and the adverse effects of these programs, as it may encourage the worker to remain in unemployment. For Barros, Corseuil and Foguel (2000), the unemployment insurance program represents a subsidy for the search for a better job that should be available only when the worker is dismissed without just cause. From that perspective, the program can encourage induced resignation, especially in periods of economic recovery, and this reduction in the duration of employment can have a negative correlation on investments in specific human capital, productivity and wage levels.

Aiming to reverse a possible negative correlation between unemployment insurance and investment in human capital, Chahad (2003) suggests a few changes, among them, compulsory professional training for the beneficiaries of unemployment insurance, which would allow the worker a higher level of human capital, and possibly reintegration in the job market with a higher wage level, since receiving the benefit would become a signal for worker productivity.

The hypothesis presented here is that the effect of the unemployment benefit tends to increase the reintegration wages of the beneficiaries. Thus, what is tested in this work is whether this effect is occurring in Brazil, when considering the country as a whole, and when the data is decomposed into the urban and rural areas of the country. This discussion is relevant because the manner in which social programs are prepared has led to a growing range of questions, especially in terms of efficiency. Incentives created by an excessively benevolent unemployment insurance system can create distortions that make the program less effective and generate inefficiency in resource allocation.

For Camargo (2004), for example, the concern with the design of programs is as important as their own existence, since it is from this that the generation of correct incentives is produced, encouraging a behavior considered to be adequate by society.

In order to test the aforementioned hypothesis, a technique widely used in the fields of Economics and Political Science, as well as many other social, behavioral, biomedical and statistical sciences, was applied. Lee (2008) reports that the Regression Discontinuity Design (RDD) is considered one of the most credible non-experimental strategies within the framework of causal inference, arguing that the requirement of the covariates being "balanced" in the cutoff is a more natural and relevant sufficiency condition[1].

The contribution to the literature is to provide new evidence on the impact of the Brazilian Unemployment Insurance Program on the reinsertion wages of its beneficiaries for Brazil, disaggregating the urban and rural areas of the country, following

Teixeira and Balbinotto Neto (2016), who research the same topic for Brazil but, however, do not analyze the urban and rural areas separately. It is important to make the distinction between rural and urban areas of Brazil, given the specificities of each environment. For that purpose, we make use of the Sharp regression discontinuity model, using entropy balancing, and also added covariates to ensure the robustness of the results.

This work consists of six sections, including this introduction. The second section will present the theoretical models, starting with Fitzgerald (1998) and Pollak (2005), which highlight the effect of unemployment insurance programs on reinsertion wages. Then, in the third section, a brief review of the literature on unemployment insurance programs at the global and national levels is presented. The fourth section discusses the empirical strategy and the regression discontinuity design with added covariates and entropy balancing, as well as the source of the data. In the fifth section, we present the analysis and discussion of the results of the models estimated for Brazil as a whole, and for the urban and rural areas. Lastly, the concluding remarks.

## 2. The Unemployment Insurance Program (*Programa Seguro-Desemprego) and Reinseration Wages*

The debates concerning the *Programa Seguro-Desemprego*, or the Brazilian Unemployment Insurance Program, and its possible effects on the job market, especially in terms of the supply of labor and reinsertion wages, are linked to the Human Capital Theory and Job Search models.

### 2.1 The relationship between unemployment insurance and reinsertion wages from the Human Capital Theory

Using the estimated model to perform policy simulations highlighting the relationship between the unemployment insurance scheme and the unemployment rates of different age groups, Pollak (2005), using micro data for Germany, the UK and the US, suggests that unemployed economic agents receive random job offers of different levels of quality, which they can accept or reject. Following the loss of a job and during periods where that worker is unemployment, that economic agent's productivity declines. The model incorporates a government that collects taxes and social security contributions, provides unemployment insurance and social assistance and administers a public pension system.

It should be stressed that the presence of a stock of individual human capital, which depends on employment, can have important effects on the job market outcome in the presence of unemployment insurance.

For Pissarides (1992), presenting a job search model, if a worker's skills decrease during unemployment, shocks that affect the job market result in a persistent effect on unemployment. According to the author, for some reason, when the average unemployment increases, the average ability of the unemployed seems to be lower. Companies, for their part, find job creation less attractive, reinforcing the expansion in the length of periods of unemployment.

The effect of unemployment insurance programs on labor supply is then highlighted by Pollak (2005), who considers an economy composed by agents who live for an *L* period, who may be employed or unemployed during the first $L_r - 1$ periods of their lives, and are then retired afterwards. The agents maximize their expected utility life in each period $J_0$ of their lives, which can be presented as a function of time-separated consumption, expressed in (1)

$$max\ E_{j_0}[\sum_{j=j_0}^{L} \beta^{j-j_0}\, u_j(c_j) + \beta^{L-j_0} v(a_{L+1})], \quad (1)$$

Subject to a budgetary constraint that must hold with probability one. As explained in Pollak (2005), $u_j$ is the period utility function with the usual properties, $c_j$ is the consumption in period *j*, $\beta$ is the discount factor, and *v(.)* captures a bequest motive. $E_{j_0}$ is the mathematical expectation operator conditional on all information available in period $j_0$.

Also, let $a_j$ be the assets owned at the beginning of period $j$ and $y_i$ the net income (including all kinds of benefits, but excluding interest) received in the same period, then the period $j_0$ budget constraint for the remaining life span becomes

$$a_{j_0} + \sum_{j-j_0}^{L} R^{j_0-j}(y_j - c_j) = R^{j_0-L} a_{L+1} \quad (2)$$

where r is the risk-free interest rate, $R=1+r$,, and $a_{L+1}$ is a non-negative bequest. The budget constraint is required to hold for each individual, being identified by the allocation of each agent individually, and not only by an average.

According to Pollak (2005), economic agents begin their lives as unemployed workers, and the workers who occupy a job in period *j* earn a gross wage, given by (3)

$$w_j = w(m_j, q_j, q) \equiv \chi m_j (q_j + q) \quad (3)$$

which is a function of the job-specific "match quality" $m_j$ and the current individual skill level, consisting of a variable component $q_j$ and a fixed personal component $q$. $\chi$ is just a scaling parameter, related to the variable human capital, *i.e.*, it tends to be increasing over time. Employees never quit[2], but face the risk of being laid off with probability $\lambda$ per period (POLLAK, 2005).

Unemployed workers receive job offers at the Poisson rate $\varpi$. Thus, in each period, after making their consumption decision, these agents may be presented with zero, one, or several job offers, each characterized by its match quality $m$, sampled form a distribution $G(m)$. Agents consider the best offer and decide whether to accept or to reject the job (POLLAK, 2005).

As mentioned in Pollak (2005), the wage earned during employment depends on a variable individual skill component. These skills $q_j$ depend on the employment history of the agent: during unemployment, they deteriorate by a factor $1 - \delta_u$ per period, and while employed, a worker enjoys a skill increase by the factor $1 + \delta_e$. Immediately after being dismissed, $q_j$ declines by $1 - \delta_f$. A recursive formulation of the decision problem of agents using the Bellman approach can be written as (4)

$$v_j(a_j, s_j, q_j, m_j, \Omega_j) = \max_{a_{j+1}, m} \{u_t(c_j) + \beta E_j v_{j+1}(a_{j+1}, s_{j+1}, q_{j+1}, m_{j+1}, \Omega_{j+1})\} \quad (4)$$

Where the maximization is subjected to the budget constraint, expressed by (5)

$$a_{j+1} = R(a_j + y_j - c_j), a_{L+1} \geq 0 \quad (5)$$

And $a_{j+1}$ is a transition function for the worker in period $j$, based on $a_j, s_j, q_j, m_j, \Omega_j$.

The value of function $v_j(.)$ represents the discounted utility with the passing of time *j*, which can be characterized by a parametrized function. The $S_j \in \{e, u, r\}$ represent the current state of employment (employed, unemployed, retired), and Ω captures all the relevant information on the employment history of the individual necessary to calculate income. *m* is the match threshold, *i.e.*, if the best job offered to an unemployed agent in a certain period exhibits a match quality above *m*, it is accepted, otherwise the agent chooses to remain unemployed. Thus:

$$y_j = y(j, a_j, s_j, w_j, \Omega_j) = \begin{cases} w_j & if\ s_j = e \\ 0\ , & otherwise \end{cases} \quad (6)$$

*Ceteris paribus* a faster skill decline $\delta_u$ during unemployment or a higher value of a given job (higher $\delta_e$ or lower $\lambda$) imply a lower value of *m*. In other words, the worker receives the wage paid by the employer, if he or she has a job, and receives nothing if he or she is unemployed, and if that person is retired, that individual will be out of the job market. Being $m \in M$, which implies $m \geq \underline{m}$, $\underline{m}$ being the threshold for job acceptance.

Now, considering the inclusion of the Unemployment-Insurance Program in the job market, where the government provides worker insurance in the amount of *b*, financed by a proportional rate in the wage $\varphi$. The *Y* future earnings become:

$$Y(j, a_j, s_j, w_j, \Omega_j) = \begin{cases} (1-\varphi)w_j & if\ s_j = e; \\ b & if\ s_j = u; \\ 0 & if\ s_j = r \end{cases} \quad (7)$$

For Pollak (2005), regardless of whether the program generates human capital to the beneficiary workers, the reinsertion wage is positively changed. On the other hand, if human capital is expanded, the effect of the program is defined on the reinsertion wage, impacting the job market, since with the increase of the reinsertion wage requested by the workers, there is a reduction in the rate of acceptance of wages by the agents, resulting in an increase of the equilibrium unemployment rate of the economy.

Thus, we analyze in this work if the workers covered by the Unemployment-Insurance Program in Brazil reinserted themselves in the job market with higher wages because they were benefited by the program or not.

**2.2 Search for employment, unemployment insurance and reinsertion wage**

Theories that seek to understand unemployment flourished in the mid-1980s and 1990s (Fitzgerald, 1998). The incorporation of simple observations in the research at points where the theory of the labor market still presented inconsistencies has resulted in rich sets of models that have helped not only to understand how unemployment responds to various policies and regulations, but also to better understand other markets.

A model of job search is presented by Fitzgerald (1998), who analyzes how the decision environment of an unemployed worker affects not only their employment decisions but also the general level of unemployment. Subsequently, the source and nature of the data are analyzed[3]. Initially, the model focuses on the decision of an unemployed worker to accept a job offered or to continue looking for a better job. Among the attributes, the model provides a simple framework for capturing many of the central ideas on which job search theory is based, as well as interesting economic insights.

The model presented by the author suggests that workers seek to maximize the expected present value of their lifetime income, which is written as:

$$E \sum_{t=0}^{\infty} \beta^t y_t \quad (8)$$

where $\beta$ is the discount fator between 0 and 1 and $y_t$ denotes the income of the worker in period $t$[4]. Is is considered that ($y_t = w^u$) if the worker is unemployed, and ($y_t = w$) if the worker is employed with wage $w$. Thus, factor $\beta$ determines the rate in which workers discount their future earnings, and can be written as $\frac{1}{1+r}$, where $r$ is the real interest rate. As the workers presented in the model have time tending to ∞, this assumption can be considered as an approximation of the case in which the workers have many periods to live.

Now, considering the problem of the unemployed worker's decision to evaluate a wage offer $w$, his decision will depend on how the current offer compares to other offers that can be received. If the chances of receiving a substantially better offer in the next period were considerable, then the individual may choose to reject the current offer in the expectation of receiving a better offer in the near future.

The problem of the unemployed worker's decision featured in Fitzgerald (1998) uses the following notation; consider $v^{wait}(w)$ as the expected present value of income if the individual rejects a wage offer $w$ and waits for a better offer, $v^{accept}(w)$ if the expected present value of the income is accepted in $w$, and $v^{offer}(w)$ the expected present value of income when a wage offer $w$ is received. Each of these functions presupposes that the unemployed worker will behave in a way to optimize in future periods, in order to maximize the expected income as presented in (8).

The function of rejecting an offer and waiting for a better offer is given by:

$$v^{wait}(w) = w^{u} + \beta \mathrm{E} v^{offer} \tag{9}$$

Where $\mathrm{E}v^{offer}$ is the expected value of $v^{offer}$. Being the expected value included in the Unemployment Insurance subsidy that the worker receives monthly, plus the discount of the expected value of a new wage offer in the next period. It is important to highlight that $v^{wait}(w)$ is a constant, that Fitzgerald (1998) describes as $v^{wait}$, since $\mathrm{E}v^{offer}$ does not vary with $w$. This reflects the fact that the next period's wage offer is independent of the offer of the current period, so the value of rejecting an offer and waiting for a new offer is the same regardless of the offer of this period. The value of accepting a wage offer $w$ is:

$$v^{accept}(w) = w + \beta\alpha \mathrm{E} v^{offer} + \beta(1-\alpha) v^{accept}(w) \tag{10}$$

Thus, the worker accepting a wage offer, he or she will receive the income in this period. At the end of the period, that individual will be employed with probability $\alpha$, in which case the worker receives the discounted expected value of receiving a new offer in the following period, $\beta \mathrm{E} v^{offer}$, or will continue to work with probability$(1-\alpha)$, in which case that individual receives the discounted value of accepting the same wage offer in the following period, $\beta v^{accept}(w)$. Thus, the equation can be rewritten as:

$$v^{accept}(w) = \frac{w + \beta\alpha \mathrm{E} v^{offer}}{1 - \beta(1-\alpha)} \tag{11}$$

Through equation (11) it can be noted that $v^{accept}(w)$ linearly increases with $(w)$. According to Fitzgerald (1998), the problem for the worker with an offer at hand is to decide whether to accept the offer, with value $v^{accept}$, or rejects the offer, with value $v^{wait}$. The value of having an offer at hand is given by the following equation:

$$v^{offer}(w) = \max\{v^{accept}(w), v^{wait}\} \tag{12}$$

It should be noted that offers will be accepted only when the acceptance is more beneficial to the worker than waiting for a better offer. That is, the worker evaluates the labor supply according to the wage offered and comparing it to the reserve

(or waiting) wage. When the wages offered are greater than the waiting value, the worker accepts the new job, otherwise he or she continues to wait for a better opportunity. For Fitzgerald (1998), the solution to that problem is characterized by functions $v^{offer}(w)$ and $v^{accept}(w)$, and a constant $v^{wait}(w)$[5], which satisfies equations (9), (11) and (12).

Solving the reservation wage problem (considered here to be the unemployment insurance benefit), the reservation wage $w^r$ is the value of $w$ which satisfies:

$$v^{accept}(w^r) = v^{wait} \tag{13}$$

Using equations (9) and (11),

$$\frac{w^r + \beta\alpha \mathrm{E}v^{oferta}(w^r)}{1-\beta(1-\alpha)} = w^u + \beta\alpha \mathrm{E}v^{offer}(w^r) \tag{14}$$

The equation above states that the reinsertion wage is identified as the wage in which the value of accepting the wage offer (left side of the equation) is equal to the value of rejecting the offer (right side). That is, the reinsertion wage is the wage in which the worker is only indifferent between accepting or rejecting the offer. In order to solve the problem for the reintegration wage, it is necessary to attribute a function to it, which can be written as:

$$\mathrm{E}v^{offer}(w^r) = \left(\frac{1}{1-\beta}\right)\left[\frac{w^u + s(\overline{w} - w^r)^2}{2\left(\overline{w} - \underline{w}\right)}\right] \tag{15}$$[6]

Using equation (15) to substitute $\mathrm{E}v^{offer}$ in equation (14), we obtain a single equation for $w^r$:

$$w^r = w^u + \left[\frac{\beta(1-\alpha)}{1-\beta(1-\alpha)}\right]\frac{(\overline{w} - w^r)^2}{2(\overline{w} - \underline{w})} \tag{16}$$

However, $w^r$ appears in both sides of the equation. In order to simplify the notation, Fitzgerald (1998) defines a new function as being

$$\phi(w^r) = \left[\frac{\beta(1-\alpha)}{1-\beta(1-\alpha)}\right]\frac{(\overline{w} - w^r)^2}{2(\overline{w} - \underline{w})} \tag{17}$$

which is the second term on the right-hand side of equation (16). This function can be interpreted as the expected benefit of obtaining a new wage when the unemployed worker has an offer at hand. It is important to note that the function is decreasing in $w^r$, indicating that the expected earnings of a new salary decrease as $w^r$ increases. Given $w^r$ defined with $w$, this function will be 0, reflecting the fact that there can be no gain in a new offer since $w$ is the highest possible wage. Equation (16) can be rewritten thus:

$$w^r = w^u + \phi(w^r) \tag{18}$$

Equation (18) determines the value of the wage accepted by the worker based on all parameters of the model, including unemployment insurance and reinsertion wage. The left side can be understood as the benefit of accepting a wage offer at the

reserve wage level. The right side can be considered as the value of rejecting the offer and waiting for a new one. It includes the value of the unemployment insurance benefit $w^u$ plus the expected gain of a new period. Thus, the expected gain of receiving additional wage offers depends on how selective the person is. The more selective the person is, the lower the chances of getting an offer.

Fitzgerald (1998) points out that the reserve wage behavior of the unemployed worker in this model is observable in the "real world" behavior of individuals, where in each period, many workers choose to continue their job searches, even if they can accept low-paid jobs. This is probably because there is an expectation that they will find a better job offer eventually.

## 3. The Brazilian Unemployment Insurance Program

In this section, we present a brief historical context regarding the Brazilian unemployment insurance policies and some empirical evidence on the effect of receiving unemployment insurance benefits on the behavior of the unemployed workers and their reinsertion wages. Initially, a brief history of the *Programa Seguro-Desemprego*, or Unemployment Insurance Program in Brazil, and the evolution of its legislation, will be presented, followed by studies on the flow of unemployment, and, lastly, reviewing works on the effect of the Program on post-unemployment outcomes, in particular on the reintegration wage.

### 3.1 The *Programa Seguro-Desemprego* Unemployment Insurance Program and its legislation

Created in 1986, the historical background of the *Programa Seguro-Desemprego* unemployment insurance program dates back to the Brazilian Federal Constitution of 1946 (article 157, XV), referred to, then, as "assistance to the unemployed." However, only with the edition of Law no. 4,923, dated December 23, 1965, that such device was regulated, constituting a financial aid for places of employment with 50 or more workers, in cases of total or partial stoppage of companies with economic difficulties (BALESTRO and MARINHO, 2010). There is, thus, a limitation of the benefit for unionized workers or those working in large companies, for the payment depends on a formal request by the union, through sending lists of the beneficiaries with the respective documentation.

The origin of the *Programa Seguro-Desemprego*, or PSD, the Brazilian unemployment insurance program, originates from Decree-Law no. 2.284 of March 10, 1986. Its purpose is "to provide temporary financial assistance to the unemployed worker due to unfair dismissal or total or partial activities of the employer ". These resources came from the Brazilian Treasury and was, at the time, subjected to financing difficulties, especially relevant in the context of the growing public debt of the 1980s[7].

It was only with the Brazilian Constitution of 1988 that unemployment insurance became stable in its financing, and the collection of the Social Integration Program (*Programa de Integração Social* - PIS) and the Public Server Patrimony Program (*Programa de Patrimônio do Servidor Público* - PASEP) was reoriented, establishing a linkage of resources to finance unemployment insurance and creating the Workers' Assistance Fund (*Fundo de Amparo ao Trabalhador* – FAT) (BALESTRO and MARINHO, 2010). Following the FAT legislation, at least forty percent of the resources would be earmarked for economic development programs, through the Brazilian National Bank for Economic and Social Development (*Banco Nacional de Desenvolvimento Econômico e Social* - BNDES).

An employment stabilization mechanism, which would take into account economic cycles, was thought of as a financing proposal. Thus, the objective of the fund would exceed the support to the unemployed worker, also inducing the generation of jobs. The combination of economic efficiency and social protection is included in the main objectives of the PSD, presented by Law 10,608[8] of 2002 and described by Provisional Measure no. 2,164-41[9] of 2001 (BRAZIL, 2001).

Structurally speaking, the legal framework, provided since 1994, holds that the PSD anticipates what would be the overcoming of a trade-off between social protection and economic efficiency: the integration between unemployment insurance, labor intermediation and professional qualification.

This economic efficiency is seen through two different aspects, as presented by Balestro and Marinho (2010); the qualification associated with labor productivity gains, especially in more general skills in which employers would not be willing to invest resources, and the second aspect being related to the better functioning of the job market.

**3.2 Empirical Evidence on the Unemployment Insurance Program and Reinsertion Wages**

Without doubt the main objective of the Insurance-Unemployment Program is to insure workers against the loss of wage income. Thus, unemployment insurance systems in many countries aim to provide short-term income support to unintentionally unemployed workers while these individuals search for new job opportunities.

For Ahn (2018), these benefits increase the welfare of risk-averse individuals affected by adverse job shocks by smoothing consumption over time. On the other hand, at the same time, unemployment insurance can induce a moral hazard and create disincentives for rapid reintegration into the job market. As shown by Chetty and Finkelstein (2013) and Tatsiramos and Van Ours (2014), the payment of the benefit can cause unemployed individuals to seek new jobs, but to a lesser extent than in the absence of the benefit. It is also possible that employment opportunities may decline in time as the result of an extended period of unemployment, as suggested by Addison and Blackburn (2000), which the authors relate to being the result of stigmatization or the depreciation of human capital, which increases the duration of unemployment.

Seeking to avoid potential disincentives in the job search, policymakers considered and introduced additional services for benefit seekers, including job search monitoring and care. The empirical literature on how programs similar to the Brazilian unemployment insurance program affects the exit rate of unemployment is considerable, beginning in the mid-1990s, by Atkinson and Micklewright (1991) and Pedersen and Westergand-Nielsen (1993), who studied the effects of these benefits using cross-sectional data at the individual level, and concluded that benefit effects are generally significant in the US and UK studies, while most research concerning Continental Europe[10] finds insignificant or weak effects.

Several US and European works have explored policy-driven changes in benefit levels from discontinuous regressions that explore one or more discontinuities in the benefit duration, such as age at entry or pre-employment work experience. The assumption is that individuals on both sides of the discontinuity differ only slightly, except for exposure to different levels of unemployment insurance of the Program. Thus, the behavioral difference of individuals which are in proximity to either side of the discontinuity reveals how the difference in program acquisition affects behavior.

Authors such as Card and Levine (2000); Carling *et al.* (2001); Lalive (2008); Schmieder *et al.* (2012a, 2012.b) present an overview of recent studies on the effects of unemployment insurance programs for several countries. Considering the benefit of such programs to the reinsertion wage, we highlight the work of Card *et al.* (2007), which explores the subject based on a discontinuity in the relationship between work experience and the right to an unemployment benefit for Austrian workers; analyzing data for over one-half million job losers, the authors obtain three empirical results: first, that a lump-sum severance payment equal to two months of earnings reduces the job-finding rate by 8-12% on average; second, that an extension of the potential duration of unemployment insurance benefits from 20 weeks to 30 weeks similarly lowers job-finding rates in the first 20 weeks of search by 5-9%; and, lastly, increases in the duration of search induced by the two programs have little or no effect on subsequent job match quality.

Uusitalo and Verho (2010), who used a change in policy in Finland to analyze the effect of the unemployment program's replacement rate on the duration of unemployment, found that the change in the structure of the benefit reduced the chances of re-employment by 17%, on average; Schmieder *et al.* (2012b), implementing a discontinuity model using German data from

workers aged 40 to 49 years, found that for each additional month of reduction of Unemployment Insurance, the duration of unemployment increases by an average of 0.10 and 0.13 months.

Using policy reform in Hungary as an RDD identification strategy, Lindner and Reizer (2016) found that reducing the unemployment benefit dynamically, while keeping the overall benefit amounts constant, decreases the duration of unemployment, and increases the rate of reinsertion into the job market.

Teixeira and Balbinotto Neto (2016), on the other hand, while researching the topic for Brazil, found that the national program was not enough to influence the reinsertion wages of the beneficiaries.

In the following section, the methodology, data and empirical strategy necessary to achieve the research objective are presented.

## 4. Methodology, Data and Empirical Strategy

Based on the objective of this research, using the terminology featured in Gil (2002) and Pereira et al. (2018), this work is classified as an exploratory research, as it provides greater familiarity with the problem analyzed, and also involves a bibliographic survey. Furthermore, it is also a quantitative and explanatory research, since it is concerned with econometrically identifying whether there is an effect of an unemployment benefit on reinsertion wages, and if there is a positive relationship between those two variables, based on the theoretical framework of human capital theory and on the models of human capital job search, as mentioned in the previous sections.

The Regression Discontinuity Design strategy is widely used in economics, political science and many other social sciences, as Calonico *et al.* (2018) highlights. Its main feature is the existence of a score, index or control variable for each sample unit, which determines the allocation of treatment by means of a hard-thresholding. In the current academic literature, several authors, such Imbens and Lemieux (2008), Lee and Lemieux (2010), Cattaneo and Escanciano (2017), Cattaneo, Idrobo and Titiunik (2018), note that all observations that are above a known cutoff point are considered to be treatment, while all observations that are below this cutoff are considered to be the control. Thus, identification, estimation and inference occur by comparing the individuals of the units near the cutoff point.

Nonparametric identification of the RD treatment effect typically relies on continuity assumptions, which motivate nonparametric local polynomial methods tailored to flexibly approximate, above and below the cutoff, the unknown conditional mean function of the outcome variable given the score. In practice, researchers often choose a local linear polynomial and perform estimation using weighted linear least squares, giving higher weights to observations close to the cutoff. These estimates are then used to assess whether there is a discontinuity in levels, derivatives, or ratios thereof, at the cutoff. If present, this discontinuity is interpreted as some average response to the treatment (assignment) at the cutoff, depending on the setting and assumptions under consideration (Calonico *et al*., 2018).

Calonico *et al.* (2018) also affirm that weighted least squares estimation is generally used with predetermined covariates, demographic or socioeconomic characteristics being some examples highlighted by the authors.

In this section, we present the fundamental characteristics of the Regression Discontinuity Design (RDD) model, based on the discontinuity determined by the eligibility criteria of the Brazilian Unemployment Insurance Program. Next, the entropy balancing method is highlighted as a criterion of robustness and, lastly, the source and characteristics of the data are presented and discussed.

**4.1 Variable of impact and participation in the program: definition and causal relation**

In order to identify if the *Programa Seguro-Desemprego* insurance unemployment program is having any influence on the reinsertion wages of the insured, we use the method of regression discontinuity design (RDD) with added covariates, and the application of the local average treatment effect (LATE), in addition to the entropy balancing.

The definition of causal effects used here follows the Neyman-Fisher-Rubin causal model[11]. As proposed by Hahn, Toddi and van der Klaauw (2001), $D_i = \in \{0,1\}$ is defined as a binary treatment variable, $Y_i^0$, $Y_i^1$ are the potential results and $Y_i^1 - Y_i^0$ the effect of individual treatment. The potential results, as well as the treatment results, $Y_i^1 - Y_i^0$ allows for the variations among individuals, *i.e.*, no constant treatment effect is assumed. $Z_i$ is a variable which influences the treatment variable in a discontinuous manner.

The literature presents two distinct designs, however, this work only focuses on one case, the sharp model, where $D_i$ is the participation criterion in the unemployment insurance program, in a known threshold $z_0$, which changes for all individuals, in this case, $z_0 = 6$. In the sharp design, Trochim (1984) states that participation status is given by a deterministic function of $Z$ such as:

$$D_i = 1[Z \geq 6\ months] \tag{19}$$

This implies that all individuals change their program participation status exactly in $z_0$. Hahn, Todd and van der Klaauw (2001) consider the assumption of identification as:

$$Y_i^1 - Y_i^0 \perp D_i | Z_i \tag{20}$$[12]

Consider also that $Y$ is the variable of interest, the reinsertion wage, and $Z$ is the variable with a known threshold $z_0$ in which the probability of treatment Pr $(D = 1|Z)$ is unknown. There are several motivations to include covariates, denoted by $K$. First, decreasing the variance, which is well established in the parametric case. Accuracy gains can also be achieved in the non-parametric model, since including covariates and comparing them appropriately reduces the asymptotic variance of the estimated treatment effect.

Equation (20) can then be rewritten including the covariates $X$:

$$Y_i^1 - Y_i^0 \perp D_i | X_i, Z_i \tag{21}$$

Allowing to identify the treatment effect as:

$$E[Y_i^1 - Y_i^0 | Z = z_0] = \int (E[Y|D = 1, X = x, Z = z_0] - E[Y|D = 0, X = x, z = Z_0]) \frac{f^+(x|z_0) + f^-(x|z_0)}{2} dx, \tag{22}$$

In which $E[Y|D, X, Z = z_0]$ can be estimated by a combination of the left and right sides of the limits. Following Calonico *et al.* (2018), the new contribution is the presence of added covariates, collected in the random vector $Z_i \in R^d$, which can be continuous, discrete or mixed. Considering $Z_i = Z_i(0)(1 - T_i) + Z_i(1)T_i$, where $Z_i(1)$ and $Z_i(0)$ potential covariates for each side of the cutoff point. According to Calonico *et al.* (2018), it is natural to assume that some features of the marginal distributions of $Z_i(1)$ and $Z_i(0)$ are equal near the cutoff or, more generally, that $Z_i(1) =_d Z_i(0)$, which is implied by the definition of a "pre-treatment", or "pre-determined" covariate in the causal inference literature.

In the sub-section below, the entropy balancing is presented as a way, besides the addition of covariates, of assuring the robustness of the results.

**4.2 Entropy balancing**

Entropy balancing is suggested by Hainmueller (2011) as a method of pre-processing data to achieve the covariable equilibrium in observational studies with binary treatments. The method consists in rebalancing the unit weights so that the reweighted treatment and the control group satisfy a set of pre-specified conditions that incorporate information on known sample moments. The entropy balancing exactly matches the inequalities in the representation relative to the first, second, and possibly larger moments of the covariate distributions.

Sehkon (2009) discusses the importance of balancing arguing that it can reduce the dependence of the model for the subsequent estimation of the treatment effects, as well as ensuring that the balance improves at all times of the covariates included in the reweighting. In addition, it eliminates the need for a continuous balance check and iterative search on propensity score models that can stochastically balance the moments of the covariates.

Next, the variables and the database that will be used in this work are presented.

**4.3 Data**

The data used in this work come from the National Household Sample Survey (*Pesquisa Nacional de Amostra por Domicílio* - PNAD) for the year 2015. The database provides important and specific information related to workers that were dismissed or left work in the period of one year. The employment question in the survey is also divided into two more queries: the number of months that the individual remained in their previous work, with expected responses to be between one month to eleven months, and, if the individual received unemployment insurance after he or she left that previous job. This is important to highlight, since the interest here is to evaluate the treatment effect on people who are in proximity of the minimum period required by the unemployment insurance program.

As the PNAD uses a probabilistic sampling method for households, adopting a stratified and conglomerate plan, with up to three stages of selection, it can be characterized, thus, as a complex sample. In addition, the survey adjusts the weights of the sample units for calibration with the known population totals. When implementing the calibration, the sample of this study features, then 1,024,377 individuals. However, the estimation of a non-parametric model with this sample size depletes the capacity of any personal computer. Thus, to obtain a sample capable of generating consistent estimates and allowing the estimation of the proposed econometric model, a random subsample with 100,000 individuals is extracted.

For a better assessment of the possible effects of the program on the treated, this work uses different approaches; initially, considering Brazil as a whole, but also, considering the rural and urbans areas of the country separately[13], because given the specificities existing in those areas, not taking such differences into account would probably lead to dubious results.
Chart1 below presents information about the variables used in this work, as well as the covariates.

**Chart 1 -** Description of the Covariates Used.

| Variable | Description |
|---|---|
| Reinsertion wage (reinswage) | Value in Brazilian Reais, referring to the wages that the worker received in the new job |
| Time spent in previous work (tpta) | Number of months the individual stayed in previous work in the 358 day period |
| Treatment dummy (d) | Deterministic decision rule |
| Interaction variable (tptasd) | Interaction between length of stay in previous work and treatment dummy variable |
| Experience (exp) | Worker experience time |
| Experience squared (exp2) | Worker experience time squared |
| Race dummy (white) | If white =1; 0 otherwise |
| Gender dummy (gender) | If male=1; 0 otherwise |
| Number of children (n_children) | Number of children in the household |
| Main work activity (mainwork) | Referring to area of main work activity<br>Agriculture=1<br>Industry=2<br>Construction=3<br>Commerce=4<br>Services=5 |
| Income range (incrange) | Monthly income in income groups (R$) |
| Northeast region dummy (rnortheast) | If Northeast region =1; 0 otherwise |
| Southeast region dummy (rsoutheast) | If Southeast region =1; 0 otherwise |
| Center-west region dummy (rcenterwest) | If Center-west region =1; 0 otherwise |
| South region dummy (rsouth) | If South region region =1; 0 otherwise |

Source: Prepared by the authors.

## 5. Results and Discussion

In order to evaluate the impact of the Unemployment Insurance Program on the reintegration wage of the beneficiaries, an entropy balancing of the covariates used was carried out first, as well as an analysis of the difference between means comparing the workers who received the aid when they left their jobs and those workers who did not have the minimum time required to receive the unemployment benefit.

Chart 2 below shows the covariates which are common to the two data groups and their mean values, variance and asymmetry, before and after the entropy pairing. The entropy balancing scheme allows the inclusion of continuous and categorical data, taking advantage of all available common information.

**Chart 2 –** Differences in observable characteristics before and after pairing.

| Preweighting | | | | | | |
|---|---|---|---|---|---|---|
| Covariates | Treatment | | | Control | | |
| | Mean | Variance | Asymmetry | Mean | Variance | Asymmetry |
| Exp | 16.75 | 208.3 | 0.9086 | 17.35 | 198.8 | 0.7533 |
| Exp2 | 488.80 | 506092 | 2.222 | 499.81 | 453073 | 1.87 |
| white | 0.4595 | 0.2484 | 0.1626 | 0.3467 | 0.2265 | 0.6442 |
| gender | 0.6249 | 0.2344 | -0.5158 | 0.5823 | 0.2432 | -0.3339 |
| mainwork | 3.3877 | 1.948 | -0.9444 | 3.631 | 2.223 | -0.6714 |
| incrange | 4.371 | 2.348 | 0.03537 | 3.866 | 2.198 | 0.8243 |
| Rnortheast | 0.2733 | 0.1986 | 1.018 | 0.3224 | 0.2185 | 0.7599 |
| Rsoutheast | 0.3834 | 0.2364 | 0.4796 | 0.3977 | 0.2395 | 0.418 |
| Rcenterwest | 0.1414 | 0.1214 | 2.059 | 0.08296 | 0.07608 | 3.024 |
| Rsouth | 0.1357 | 0.1173 | 2.127 | 0.1154 | 0.1021 | 2.407 |
| N_children | 1.336 | 1.347 | 0.8088 | 1.528 | 1.705 | 1.076 |
| Postweighing | | | | | | |
| Covariates | Treatment | | | Control | | |
| | Mean | Variance | Asymmetry | Média | Variance | Asymmetry |
| Exp | 16.75 | 208.3 | 0.9086 | 16.75 | 208.3 | 0.8728 |
| Exp^2 | 488.8 | 506092 | 2.222 | 488.9 | 493121 | 2.068 |
| white | 0.4595 | 0.2484 | 0.1626 | 0.4593 | 0.2483 | 0.1633 |
| gender | 0.6249 | 0.2344 | -0.5158 | 0.6248 | 0.2344 | -0.5158 |
| mainwork | 3.877 | 1.948 | -0.9444 | 3.876 | 1.864 | -0.9457 |
| incrange | 4.371 | 2.348 | 0.0537 | 4.37 | 2.215 | 0.1174 |
| Rnortheast | 0.2733 | 0.1986 | 1.018 | 0.2734 | 0.1986 | 1.017 |
| Rsoutheast | 0.3834 | 0.2364 | 0.4796 | 0.3834 | 0.2364 | 0.4797 |
| Rcenterwest | 0.1414 | 0.1214 | 2.059 | 0.1413 | 0.1213 | 2.059 |
| Rsouth | 0.1357 | 0.1173 | 2.127 | 0.1357 | 0.1173 | 2.128 |
| N_children | 1.336 | 1.347 | 0.8088 | 1.337 | 1.383 | 0.942 |

Source: Prepared by the authors using data from the 2015 PNAD.

Table 1 below shows the values of the tests between means for Brazil as a whole, and the urban and rural areas of Brazil separately, in real mean values, using values for the year 2015. It is possible to observe that the difference of means between groups test was statistically significant for Brazil, with 95% confidence, even when disaggregating by census area. This means that there are wage differences that can be captured by the test of difference of means between workers receiving unemployment insurance (treated) and those who do not receive the benefit (control), with a probability of error of 5%.

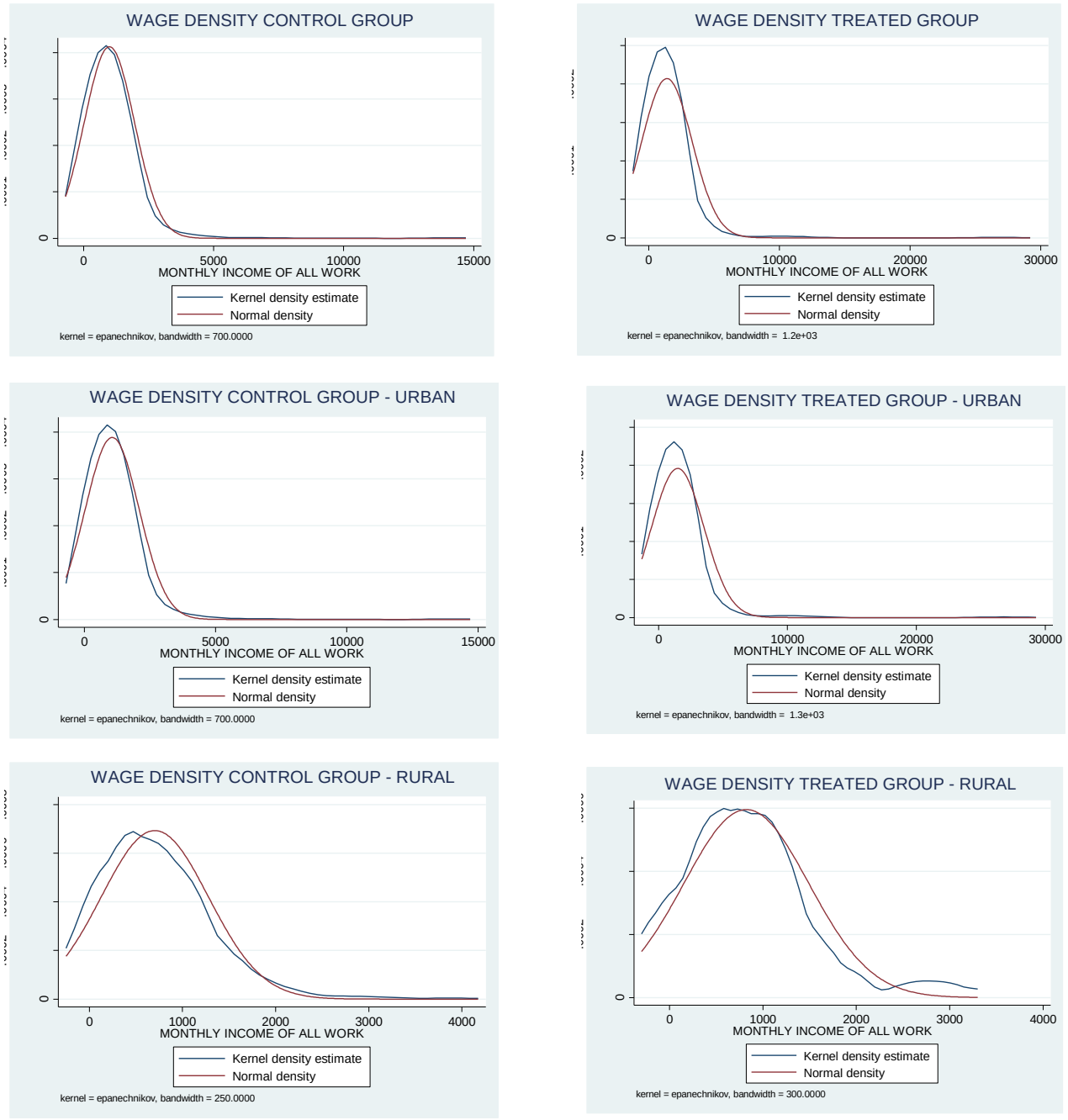
**Table 1 –** Simple test of mean wages, for Brazil as a whole, and considering Urban and Rural Areas – 2015.

| **Área** | **Brazil** | | **Urban** | | **Rural** | |
|---|---|---|---|---|---|---|
| **Group** | **obs** | **(R$) Mean** | **obs** | **(R$) Mean** | **obs** | **(R$) Mean** |
| **Control** | 82,076 | 988,51<br>(3.37) | 66,082 | 1057,59<br>(3.99) | 15,994 | 703.06<br>(4,55) |
| **Treated** | 17.924 | 1398.49<br>(14,39) | 15,595 | 1484,54<br>(16.30) | 2,323 | 822.27<br>(13.88) |

Source: Prepared by the authors using data from the 2015 PNAD.

Still in the intent to verify if there is a wage difference between the groups, we analyzed the Kernel density function of the sample wage distribution, since it can indicate possible density differences in the different groups of income range. In analyzing Figure 1 below, it can be observed that there is a higher density among workers who earn around a minimum wage in all distributions, except for the rural area of Brazil, which has a flatter distribution, but also showing an indication that there is no other wage density between the groups.

**Figure 1 -** Kernel estimation of the sample wage density - Brazil, urban and rural.




Source: Prepared by the authors.

However, in order to identify a possible discontinuity in wages among the different groups of workers, non-parametric equations with and without added covariates were estimated, and also estimated using the entropy pairing technique. The non-parametric equations presented in Table 2 below are similar to the means test portrayed in Table 1. However, with this type of instrument, it is possible to quantify the variation of the mean wage between the groups, controlling for different periods of time spent in the individual's last place of work.

**Table 2 -** Non-parametric regressions.

| BRAZIL | | | | |
|---|---|---|---|---|
| Coefficient without covariates | | Coefficient with covariates | | Obs. |
| with entropy | without entropy | with entropy | without entropy | |
| 31.55 | 350.56*** | 139.16*** | 99.55*** | 100,000 |
| (54,064) | (28,347) | (37,696) | (49,789) | |
| URBAN | | | | |
| 60.55 | 361.8*** | 150.48*** | 133.56*** | 81,677 |
| (60,245) | (32,452) | (41,821) | (22,467) | |
| RURAL | | | | |
| 250.37*** | 377.75*** | 40.85** | -0.71 | 18,323 |
| (45,694) | (33,872) | (18,449) | (10,509) | |

Note: As the cutoff used in this work is equal to six (6) months, the periods used were of 5 and 7 months in order to guarantee the robustness of the model. *** p <0.01, ** p <0.05.
Source: Prepared by the authors.

This work focuses on the periods of 5 and 7 months, which are those workers who remained for a period which is in proximity to the limit for the request of the unemployment benefit, which is 6 months. The results of the estimates indicate that, among those workers who were in the vicinity of the cutoff point within one month, the average wages in Brazil and the urban area of the country for those who received the aid were higher, respectively, in R$ 31.55 and R$ 60.55; however, these results were not statistically significant after entropy balancing. The Brazilian rural area presented an unprecedented result from the rest of Brazil, with a higher average wage for those who received the unemployment benefit of R$ 250.37, being statistically significant, showing, after the estimation with the covariates presented in Table 1, a mean wage of R$ 40.85.

The non-parametric model of covariates in part refutes the hypothesis of this work, and confirms that for Brazil as a whole and its urban areas, the Brazilian unemployment insurance program does not generate a difference in income, but rather a set of other factors, such as the main activity, the region the person resides in, and even the race and gender of the individual. On the other hand, the rural environment and its agents with their peculiarities, absorb the unemployment insurance component in a positive way, generating high average earnings.

Table 3 below shows the estimates of the variable reinsertion wage in R$ for Brazil as a whole, and the urban and rural areas, with added covariates and entropy balancing.

**Table 3 –** Local Linear Regressions.

| Variables | BRAZIL | | URBAN | | RURAL | |
|---|---|---|---|---|---|---|
| | Without Entropy | With Entropy | Without Entropy | With Entropy | Without Entropy | With Entropy |
| | n=25,922 | n=25,922 | n=22,350 | n=22,350 | n=3,572 | n=3,572 |
| R2 | 53.83% | 54.97% | 53.64% | 54.75% | 91.08% | 91.56% |
| d | 323.01*** | 306.18 | 602.42*** | 838.02 | 140.51** | 108.03* |
| | (82,007) | (86,392) | (90,309) | (93,488) | (61,679) | (61,499) |
| Tptasd | -44.30*** | -39.68 | -91.26*** | -78.61 | 23.17** | 19.19* |
| | (12,714) | (13,339) | (14,050) | (14,493) | (10,010) | (9,938) |
| Exp | -0.33 | -1.223 | 3.12*** | -0.202 | 0.37 | -0.93** |
| | (0,846) | (0,910) | (1,081) | (1,173) | (0,443) | (0,469) |
| Exp2 | 0.01 | 0.05*** | -0.107*** | 0.01 | -0.01 | 0.01 |
| | (0.015) | (0.016) | (0.021) | (0.022) | (0.007) | (0.007) |
| white | 41.55*** | 44.34*** | 36.66** | 43.04*** | 119.86*** | 97.22*** |
| | (13,322) | (13,038) | (14,381) | (14,084) | (10,231) | (10,379) |
| gender | -110.54*** | -112.35*** | -106.91*** | -102.50*** | -21.82*** | -18.22** |
| | (12,493) | (13,078) | (13,492) | (13.892) | (6.787) | (7.603) |
| mainwork | 33.63*** | 34.40*** | 65.73*** | 61.12*** | -23.88*** | -21.59*** |
| | (3,304) | (3,301) | (4,454) | (4,345) | (1,525) | (1,592) |
| incrange | 586.26*** | 608.08*** | 621.24*** | 640.75*** | 344.07*** | 347.80*** |
| | (6,463) | (6,582) | (7,282) | (7,347) | (3,893) | (3,999) |
| Rnortheast | 161.61*** | 183.08*** | 277.21*** | 290.29*** | 8.32 | 22.81*** |
| | (12,505) | (13.775) | (15,821) | (17.499) | (11,572) | (7,109) |
| Rsoutheast | -75.78*** | -109.92*** | 2.84 | -42.72*** | 134.28*** | 152.28*** |
| | (10,699) | (12,645) | (11,834) | (13,839) | (11,572) | (11,429) |
| Rcenterwest | 42.31** | 55.67*** | 207.26*** | 236.10*** | -4.21 | 48.02*** |
| | (17,664) | (19,097) | (22,566) | (26,018) | (10,417) | (10,470) |
| Rsouth | 180.98*** | 150.21*** | 276.36*** | 231.03*** | -21.27** | 21.53** |
| | (27,167) | (25,885) | (31,474) | (29,713) | (8,638) | (8,907) |
| N_children | -89.66*** | -103.23*** | -114.19*** | -122.23*** | 28.86*** | 32.61*** |
| | (4,612) | (4,975) | (5,557) | (5,792) | (2,011) | (2,082) |

Note: The variables: North, Female and Black were used as the basis for the other variables. Estimates were performed in the robustness against heteroscedasticity mode. *** p <0.01, ** p <0.05, * p <0.1.
Source: Prepared by the authors.

Evaluating the results found in the model, it is possible to identify that the variables - received unemployment insurance and length of stay in the previous workplace - were not statistically significant for the reinsertion of workers into larger wage ranges, except for rural areas, where individuals had a favorable wage differential of R$108.03 and R$140.51, respectively, with and without entropy. In all estimates, a period of a one-month difference was used, above and below the period needed to receive the unemployment benefit.

The interaction between the length of stay in the previous job and the receipt of unemployment insurance presents a rectilinear and negative behavior for Brazil as a whole and the urban area of the country, indicating that individuals who participated in the Program and had more time in their previous job are subject to receive lower wages in reinsertion, possibly because they are restricted to higher quality jobs, while for the rural area the reinsertion wage will be positive for individuals with the same characteristics.

When analyzing the OLS model with and without the use of entropy, it was verified that the variables related to the experiment were not statistically significant. The difference was also significant for white workers when compared to non-white workers, ranging from R$ 36.66 to R$ 119.86 for urban and rural areas. Regarding the gender of the individual, the results indicate that the reinsertion wage of males is lower than that of females, with a less expressive gap for the rural environment (R$ 18.22).

The number of children in the family generates contrary effects within Brazil. In urban areas, the increase in the number of children entails a negative differential, while in rural areas, the differential is positive. The main work activity alongside the range of income that the individual is placed in, have been very expressive for Brazil as a whole and its urban area, with a positive differential, but for the rural environment, if one has as their main work activity a job position in one of the major sectors of the economy, then that generates an impact in the reinsertion wage.

As for the different regions of the country, individuals residing in the Northeast region have higher differentials in reinsertion wages, R$ 183.08 and R$290.29, considering respectively Brazil as a whole and its urban areas separately. The Brazilian Southeast region, more frequently associated with non-agricultural work, stands out with the differences related to the rural environment of R$152.28.

## 6. Concluding Remarks

This work sought to empirically evaluate the influence of the Brazilian Unemployment Insurance Program (*Programa Seguro-Desemprego*) on the reinsertion wages of its beneficiaries using the Regression Discontinuity Design (RDD), with added covariates and entropy balancing. The theoretical basis comes from the Theory of Human Capital and Job Search models, where there is the perception that unemployment insurance programs can influence the reinsertion wages of its beneficiaries.

As mentioned above, in order to empirically identify whether the reinsertion wage is influenced by the unemployment insurance program, a regression with discontinuity was used, which is appropriate to evaluate impacts in which the treatment effect is identified by a well-defined decision rule, such as the case of the program. In addition to the RDD, which estimated the local average treatment effect, added covariates and entropy balancing were applied in order to estimate the mean treatment effect to add robustness to the RDD estimates.

The results suggest that the Brazilian unemployment insurance program does not exercise any significant change in the reinsertion wages of its beneficiaries, except for workers in the rural environment. This can be explained by the fact that the program does not comprehensively aggregate a significant level of human capital to the workers who use it; on the other hand, in rural areas, the agents use their "idle" time in quick courses to learn new techniques, necessary to monitor rural technological progress.

In addition to analyzing the influence of the program, it was possible to verify that males receive less than females in relation to the reinsertion wage, in the national, urban or rural job markets. It was also found that the Northeastern region of the country has the highest reinsertion wages, possibly because those workers may be returning migrants, which have acquired human capital and returned to their region with new qualifications, or migrants from flooded regions, where they cannot be absorbed by the job market.

Thus, it is suggested that the format of the Brazilian unemployment insurance program be designed and structured in such a way as to generate higher levels of job market information to which the agents meet, as well as to add some type of human capital accumulation for those workers through qualification courses, training and retraining programs, since it is from this point that workers will be able to re-enter the job market in a faster and more stable manner, and with higher wages.

It would be interesting, as a future extension of this work, to update the dataset from 2015 onwards, using the same methodology, particularly to analyze reinsertion wages before and after the covid-19 pandemic. Furthermore, another possible analysis is to research regional characteristics of reinsertion wages, by focusing on each of the five regions of Brazil, to determine how unemployment insurance impacts wages in regions with such distinct features.

## Endnotes

[1] The RDD with added covariates is further discussed in the empirical strategy section.

[2] Following the model presented by Pollak (2005), individuals do not abandon work under any condition.

[3] In addition to the work of Fitzgerald (1998), we used the work of Sargent (1987), which provides a more advanced overview of job search theory.

[4] For Fitzgerald (1998) the assumption that workers maximize the expected lifetime income can be interpreted in a number of ways: 1) workers are risk neutral, so they do not mind smoothing consumption; 2) workers are able to secure themselves perfectly against any risk of idiosyncratic income, so that the worker first maximizes the expected income and then organizes his flow of consumption in order to maximize utility.

[5] Defining waiting or reservation wage as the Unemployment Insurance Program benefit.

[6] Consider $s = [\frac{1}{(1-\beta(1-\alpha)}]$.

[7] See Castro and Souza (1985) and Fishlow (1986).

[8] Which states: Provide temporary assistance to the unemployed worker by virtue of dismissal without just cause, including indirect, and to the worker who has been proven to have been rescued from forced labor or from a condition analogous to that of a slave.

[9] Which states: assist workers in the search or preservation of employment, promoting, for this purpose, integrated actions of orientation, relocation and professional qualification.

[10] Europe excluding the United Kingdom, the Isle of Man, Ireland and Iceland.

[11] Neyman (1923), Fisher (1935) and Rubin (1978).

[12] $For\ Z_i\ in\ proximity\ of\ z_0$.

[13] Regarding the situation of the household and classification of the population being urban or rural, the definition adopted by the PNAD in its methodological notes was used, considering the urban areas corresponding to the cities (municipal headquarters), the villages (district headquarters) or the isolated urban areas. The rural situation covers the entire area lying outside these boundaries.

## References

Addison, J., & Blackburn, M. (2000). The Effects of Unemployment Insurance on Post-Unemployment Earnings. *Labour Economics*, 7, 21-53. Https://Doi.Org/10.1016/S0927-5371(99)00026-3

Atkinson, A., & Micklewright, J. (1991). Unemployment Compensation and Labor Market Transitions: A Critical Review. *Journal Of Economic Literature*, 29(4), 1679-1727.

Balbinotto Neto, G., & Zylberstajn, H. (2002). Uso Repetido do Seguro-Desemprego: Teorias E Evidências. In: Chahad, José P. Z, Fernandes, Reynaldo (Orgs.). *O Mercado De Trabalho No Brasil: Políticas, Resultados e Desafios*. Mte/ Fipe/ Depto. De Economia Fea/Usp, São Paulo.

Balestro, M. V., & Marinho, D. C. N. (2010). Programa Seguro Desemprego: o Desafio Para Equilibrar Proteção Social E Eficiência Econômica. *Revista De Políticas Públicas*, 14(1), 193-201.

Barros, R. P., Corseuil, C. H., & Foguel, M.. (2000). Os Incentivos Adversos E A Focalização Dos Programas De Proteção Ao Trabalhador No Brasil. *Planejamento E Políticas Públicas.* Ipea, 22, 4-45.

Brasil (1965). Presidência Da República. Lei 4.923, de 23 de Dezembro de 1965.

Brasil (1986). Presidência Da República. Lei 2.284, de 10 De Março de 1986.

Calonico, S., Cattaneo, M., Farrell, M., & Titiunikm, R. (2018). Regression Discontinuity Designs Using Covariates. *Political Analysis*. 20, 25-46. Https://Doi.Org/10.1162/Rest_A_00760

Camargo, J. M. (2004). Política Social No Brasil: Prioridades Erradas, Incentivos Perversos. *São Paulo em Perspectiva*, São Paulo, 18(2), 68-77. Http://Doi.Org/10.1590/S0102-88392004000200008

Card, D., Chetty, R., & Weber, A. (2007). Cash-On-Hand and Competing Models of Intertemporal Behavor: New Evidence from The Labor Market. *The Quarterly Journal Of Economics*, 122(4), 1511-1560.

Card, D., & Levine, P. (2000). Extended Benefits and the Duration of Ui Spells: Evidence from the New Jersey Extended Benefic Program. *Journal of Public Economics*, 78, 107-138.

Carling, K., & Holmlund, B., Vejsiu, A. (2001). Do Benefit Cuts Boost Job Findinf? Swedish Evidence from the 1990s. *The Economic Journal*, 111, 766-790. Https://Doi.Org/10.1111/1468-0297.00659

Castro, A. B. De, & Souza, F. (1985). *A Economia Brasileira Em Marcha Forçada*. São Paulo: Paz E Terra. Http://Doi.Org/10.1590/S0101-31572008000100002

Cattaneo, M., & Escanciano, J. (2017). Regression Discontinuity Designs: Theory and Applications. *Advances in Econometrics*. V. 38.

Cattameo, M., Idrobo, N., & Titiunik, R., (2018). *A Pratical Introduction To Regression Discontinuity Designs: Volume I,* Cambridge Elements: Quantitative And Computational Methods For Social Science, Universidade de Cambridge.

Chahad, J. P. Z. (2003). O Seguro-Desemprego No Contexto do Sistema Público de Emprego e o seu Papel no Combate à Pobreza no Caso Brasileiro. In. *Desigualdade E Pobreza No Brasil.* Cap. 20. São Paulo, Usp.

Chetty, R., & Finkelstein, A. (2013). Social Insurance: Connecting Theory to Data. *Handbook of Public Econommics*, 111-193.

Fisher, R. Design Of Experiments. Oliver E Boyd, Edinburgh, 1935.

Fishlow, A. (1986). A Economia Política Do Ajustamento Brasileiro aos Choques do petróleo: Uma Nota Sobre o Período de 1974/84. *Pesquisa E Planejamento Econômico*, 16(3), 507-550.

Fitzgerald, T. J. (1998). Introduction to the Search Theory Of Unemployment. *Feredal Reverve Bank of Cleveland, Economic Review*, 34(3), 02-15.

Gil, A. C. (2002). *Como elaborar projetos de pesquisa*. (4a ed.), Editora Atlas.

Hahn, J., Todd, P., & Van Der Klaauw, W. (2001). Identification and Estimation of Treatment Effects with a Regression-Discontinuity Design. *Econometrica.* 69, 201-209. Https://Doi.Org/10.1111/1468-0262.00183.

Hainmueller, J. (2011). Entropy Balancing for Causal Effects: A Multivariate Reweighting Method to Produce Balanced Samples In Observational Studies. *Political Analysis.* 20, 25-46. Https://Doi.Org/10.1093/Pan/Mpr025

Han, T. (2018). Assessing the Effects of Reemployment Bonuses on Job Search: a Regression Discontinuity Approach. *Journal of Public Economics*, 165, 82-100. Https://Doi.Org/10.1016/J.Jpubeco.2018.07.003.

Imbens, G., & Lemieux, T. (2008). Regression Discontinuity Designs: A Guide to Practice. *Journal of Econometrics.* 142, 615-635. Https://Doi.Org/10.3386/W13039

Lalive, R. (2008). How Do Extended Benefits Affect Unemployment Duration? A Regression Discontinuity Approach. *Journal of Econometrics*, 142(2), 785-806.

Lee, D., & Lemieux, T., (2010). Regression Discontinuity Designs in Economics. *Journal of Economic Literature.* 48, 281-355. Https://Doi.Org/10.3386/W14723

Lee, D. (2008). Randomized Experiments from Non-Random Selecion In U.S. *Journal of Econometrics.* 142, 675-697. Https://Doi.Org/10.1016/J.Jeconom.2007.05.004

Lindner, A., & Reizer, B. (2016). *Frontloading the Unemployment Benefit: Na Empirical Assessment.* Institute of Economics, Centre For Economic And Regional Studies, Hungarian Academy Of Sciences.

Neyman, J. (1923). On the Application Of Probability Theory to Agricultural Experiments. *Statistical Science.* 5, 463-480. Https://Doi.Org/0.1214/Ss/1177012032

Pedersen, P., & Westergard-Nielsen, N. (1993). Unemploument: A Review of The Evidence From Panel Data. *Oecd Economic Studies*, 20, 65-114. Https://Doi.Org/10.25428/1824-2979/201802-231-248

Pereira, A. S., Shitsuka, D. M, Parreira, F. J., & Shitsuka, R. (2018). *Metodologia da Pesquisa Cientifica*. UFSM *https://repositorio.ufsm.br/bitstream /handle/1/15824/Lic_Computacao_Metodologia-Pesquisa-Cientifica.pdf?sequence=1*

Pissarides, C. (1992). Loss of Skill During Unemployment and The Persistence of Employment Shocks. *Quarterly Journal of Economics*, 7(4), 1371-1391. Https://Doi.Org/10.2307/2118392

Pollak, A. (2005). Estimating A Life Cycle Model with Unemployment and Human Capital Depreciation, *European Economic Review*, Elsevier, 51(8), 2029-2053.

Rubin, D. (1978). Bayesian Inference Ofr Causal Efects: The Role of Randomization. *Annals of Statistics*. 6(1), 34-58. Https://Doi.Org/10.1214/Aos/1034276631

Schmieder, J., Von Wachter, T., & Bender, S. (2012). The Long-Term Effects of Unemployment Insurance Extensions on Employment. *American Economic Review: Papers & Proceedings*, 102, 514-519.

Schmieder, J., Von Wachter, T., & Bender, S. (2012). The Effects of Extended Unemployment Insurance Over the Business Cycle: Evidence from Regression Discontinuity Estimates Over 20 Years. *The Quarterly Journal of Economics*, 127(2), 701-752.

Sehkon, J. (2009). Opiates for The Matches: Matching Methods for Causal Inference. *Review of Political Science*. 12, 487-498. Https://Doi.Org/10.1146/Annurev.Polisci.11.060606.135444

Tatsiramos, K., & Ours, J. V. (2014). Labor Market Effects of Unemployment Insurance Design. *Journal of Economic Surveys*, 28, 284-311. Https://Doi.Org/10.1111/Joes.12005

Teixeira, G., & Balbinotto Neto, G. (2016). Seguro-Desemprego Brasileiro E Salário De Reinserção: Análise Empírica Com Regressão Com Descontinuidade E Propensity Score Matching. *Nova Economia*, Belo Horizonte, 26(3), 943-980. Http://Doi.Org/10.1590/0103-6351/2215.

Trochim, W. (1984). Research Design for Program Evaluation: The Regresion Discontinuity Approach. *Journal of The American Statistical Association*. 81. Http://Doi.Org/10.1177/0741932507309712

Uusitalo, R., & Verho, J. (2010). The Effect of Unemployment Benefits on Re-Employment Rates: Evidence From The Finnish Unemployment Insurance Reform. *Labour Economics*, 17(4), 643-654. https://Doi.Org/10.1016/J.Labeco.2010.02.002