

Can Work Sharing Sustain Employment During Economic Downturn? Evidence from Brazil

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Abstract

Work sharing policies seek to reduce the work schedule of individuals as a means to preserve their jobs. This paper assesses the impact of the short-lived Employment Protection Program (EPP), the Brazilian work sharing program that was active between 2015 and 2018, on employment. Using administrative data of the program, the results show that establishments that participate in the program present higher employment levels than non-participant establishments after the program. Furthermore, the effect of EPP on employment is not immediate and increases overtime.

Resumo

O presente artigo faz uma avaliação do impacto do Programa de Proteção ao Emprego (PPE) sobre o nível de emprego no período de 2015 a 2018. Esse programa foi criado com o objetivo de preservar os empregos durante a recessão que teve início em 2014 por meio da redução da jornada de trabalho. Fazendo uso de dados administrativos do PPE e da Relação Anual de Informações Sociais (RAIS), o efeito é estimado a partir do uso de um modelo de diferença em diferença. Os resultados mostram que os estabelecimentos que participaram do programa apresentaram níveis mais altos de emprego após o término do programa ao ser comparado com os estabelecimentos que não participaram do PPE. Além disso, o efeito do programa no emprego não é imediato e aumenta a partir do segundo ano após o início do programa.

Keywords: Employment, work sharing policies, short-time work, wage subsidies.

JEL Classifications : J23, J38, L20.

Palavras-chave: Emprego, redução da jornada de trabalho, subsídio ao salário.

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Introduction

Work sharing policies often reduce wages and the work schedule of workers as a means to distribute them among a greater number of workers during economic crises (McCarthy and Rosenberg, 1981). Temporary work-sharing measures allow businesses to minimize firing and rehiring costs in order to retain employees while keeping their morale afloat in tough times (Messenger and Ghosheh, 2013). Work sharing enables businesses to keep plants open while adapting their business to economic downturns. It also shares the burden of an economic downturn between employers, workers and government.²

Work-sharing schemes first emerged in Europe and North America during the Great Depression in the 1930s, reviving again in the Great Recession of 2008–09. Some authors argue that Germany saved 400,000 jobs, Japan retained 370,000 while Turkey saved 100,000 posts and the United States retained 165,000 jobs due to work sharing schemes (Messenger and Ghosheh, 2013). During the Great Recession, 25 OECD countries implemented work-sharing schemes, yielding positive results in preserving jobs (Hizjen and Martin, 2013).

There was a great adoption of work-sharing policies following the Great Recession in 2008-2009.³ Hizjen and Venn (2011) summarize the work-sharing policies implemented in 24 OECD countries, describing their main differences in detail. Differences were identified in the minimum and maximum hours that can be reduced, eligibility criteria, benefit conditionality and costs for companies for hours not worked.⁴ Regardless of the design, Hizjen and Venn (2011) concludes that there is consensus on the existence of advantages for companies and workers under work-sharing programs.

For companies, although hiring and firing costs are considered in decisions to use labor, there are other reasons that contribute for the adjustment to be made through hours worked. For example, small businesses are usually more credit constrained and work-sharing program would contribute to keep vital employees in the company (Boeri and Bruecker, 2011). Firm-specific human capital is another factor to be considered as workers are seen as a valuable asset after learning skills that are specific to the firm through formal and on-the-job training (Bruhn, 2016; Giupponi and Landais, 2018). Thus, in addition to the costs of hiring and firing, the end of an employment relationship might generate losses for the firm on investments made in training to qualify workers.

Workers also have incentives to adhere to work-sharing schemes. One of the incentives is the protection of their own income. When a worker loses its jobs in times of recession, it can take a long time before finding a job and reach the income level observed prior to dismissal (Giupponi and Landais, 2018). Participating in a work-sharing program allows the worker to preserve its

² Work-sharing policies are also known as short-time work (STW) and short-time compensation (STC) in the US when unemployment insurance benefits are used in work sharing schemes.

³ In many countries such as Germany, Italy and France, work-sharing programs already existed but required adjustments due to the different context of the crisis.

⁴ The minimum reduction in hours worked varies from 40% in Norway to 10% in Switzerland, Austria, Germany and the Slovak Republic. Some countries require a minimum number of workers to participate in working-sharing policies such as Canada, Denmark, Hungary, Korea, Switzerland and the United States. Eligibility criteria usually requires that companies present a justification of the economic need for their use. It is also common for the union to be required to agree to a reduction in hours worked and wages. The conditionality requirements establish behavioral requirements for the company and for the workers participating in the program. For example, during the program's duration, companies cannot fire workers. It is also common to find programs in which workers are required to attend qualification courses as in Portugal and the Netherlands and other countries.

job and secure part of its income.⁵ Another incentive is associated with the benefits and externalities that the worker receives from remaining employed. For instance, the company may include a good health plan as part of the benefits that can be cancelled upon dismissal, forcing the worker to use the public health system, whose coverage and quality, particularly in developing countries, may be precarious compared to the private system.

Even though work-sharing policies seem to bring benefits to companies and workers, loss in the cost effectiveness may occur during the implementation of these policies. Companies might use the work sharing program to pay workers that they did not intend to dismiss. According Hijzen and Venn (2011), when this situation occurs, the program becomes a transfer of resources to employers and is not effective in reducing the loss of jobs that would not happen in the absence of the program. Programs might also reduce their cost effectiveness in countries that expand the scope of working-sharing policies in periods of economic recovery. In this case, companies can use the salary subsidy to keep workers with low productivity (Hijzen and Venn, 2011).

In the Great Recession of 2008-2009, working-sharing policies were used in large scale in countries such as Germany, Italy, France and Belgium.⁶ In Belgium, about 7% of workers benefitted from these policies. In Germany the share of workers who received the benefit reached 5%. In France it reached 4% and in Italy this proportion was 4.6% (Giupponi and Landais, 2018). The case of Germany draws particular attention to the effectiveness of such policies as the country experienced a significant drop in the GDP without a substantial rise in unemployment. This result has been attributed both to a pre-existing labor market flexibility and labor market measures such as short-time work (Balleer et al., 2015). Furthermore, Balleer et al. (2016) show that the impact of the short time work (STW) program on unemployment is due to the effect of the rule-based component of STW (i.e. automatic stabilization effects) rather than the discretionary component (i.e. frequent changes of specific characteristics, such as the eligibility criteria). The automatic component has prevented an increase in unemployment of 1.29 percentage points.

The nationwide effect of a work-sharing policy may vary in countries such as the United States where policies are implemented at the state level. Abraham and Houseman (2013) find that jobs saved due to Short-Time Compensation (STC) were significant in certain sectors that used the program extensively. However, the scale of the program was too small to compensate for the aggregate job losses in the recent recession. The expansion of the program is thus necessary for STC to be a more effective counter-cyclical tool at a large scale.

Favorable evidence on the effectiveness of work sharing policies is still scarce, when compared to evidence from other active employment policies such as unemployment insurance, despite the broad implementation of countries during the 2008-2009 recession (Boeri and Bruecker, 2011; Hijzen and venn, 2011; Cahuc, Kramarz and Nevoux, 2018). The scarcity of administrative records of firms and workers on WSP is a challenge for researchers looking to carry out an impact assessment for this policy at micro level, leading the analysis to be done with aggregated data. This is the case of Hijzen and Venn (2011) and Cahuc and Carcillo (2011) who carried out a cross-

⁵ In some countries the application to a work-sharing program can be done at firm but also at employee level.

⁶ An analysis of the role of work sharing policies in 19 OECD countries can be found in Hijzen and Venn (2011) and Cahuc, Kramarz and Nevoux (2018).

country analysis for OECD countries and found a positive effect of this policy on the maintenance of employment levels.⁷

Even with the availability of administrative records of firms and workers on the WSP for some countries, the challenge has been to find an appropriate identification strategy to isolate the treatment effect of the WSP (Giupponi and Landais, 2018). Although some studies use instrumental variables to study WSP, the results found do not yet have a consensus in the literature. For instance, the studies by Boeri and Brücker (2011) and Hijzen and Martin (2013) used the firm's previous experience with the program as an instrument to evaluate WSP, however the results found were somewhat conflicting. More recently and using different instruments, Cahuc, Kramarz and Nevoux (2018)⁸ and Giupponi and Landais (2018)⁹, find similar results suggesting positive effects of the WSP in maintaining jobs for France and Italy.

The use of WSP was not restricted to OECD countries. Middle income countries, such as Argentina, Chile, Mexico, Uruguay and Brazil, also implemented work-sharing initiatives in recent crises (Messenger and Ghosheh, 2013). However, limited evidence is available for these countries. Among the few studies, Sánchez (2013) in Chile assesses a reduction in weekly working hours from 48 to 45 intending to generate the need for new hires. The results showed gains in hourly wages but no significant effects on employment creation. Bruhn (2016) examined the intent to treat effect of a work sharing program in Mexico that provided subsidies to firms in eligible industries which agreed to keep employees on reduced wage and work schedules. While results show no effect on employment during program duration, employment recovers faster after the program ends.

In Brazil, the 2008-2009 great recession was not deep as in the developed world. The government made use of countercyclical credit policies, investment growth public services, expansion of agenda transfers and a minimum wage appreciation policy (DIEESE, 2016). Furthermore, the return of the capital inflows to emerging economies in 2010 and the recovery of the Chinese economy, the largest country trade partner, contributed to the recovery (Haines et al, 2020). However, in the second quarter of 2014, the country began to face a new economic recession, in which the Brazilian government decided to implement some flexibilization measures and propose a mechanism to adjust the demand for labor by reducing the work schedule and hours worked.

Brazil launched in 2015 the Employment Protection Program (EPP) to preserve jobs during the recession. The program allowed companies and unions to negotiate a temporary and proportional reduction in working hours and wages, partially compensating workers for lost income. The expectation was that adjustments in the establishment's demand for labor would be carried out through hours worked and not through layoffs (DIEESE, 2016). Thus, employment levels in the establishments would be preserved.

⁷ Hijzen and Venn (2011) find positive results only for workers who have a permanent contract. Germany and Japan were the countries with greatest number of workers saved by WSP.

⁸ Cahuc, Kramarz and Nevoux (2018) employ a causal identification strategy based on instruments: the first is based on the geographical proximity of a company to another that joined the WSP before the recession; the second uses the time needed by the 95 department regions to analyze the application requesting the approval for participating in the WSP in France.

⁹ Giupponi and Landais (2018) use data from the Italian Social Security Administration (INPS), which includes information on the eligibility, requests and authorizations of WSP at firm and workers levels for the period from 2005 to 2015. To instrumentalize the adherence to WSP. They use the probability of using the WSP that is estimated based on the size of the company and the INPS code.

The program allowed companies to reduce working hours and workers' wages by up to 30%, provided that a specific collective labor agreement (ACTE) was signed for this purpose. Reduction in workers' wages were compensated by 50%, being limited to 65% of the maximum amount of the unemployment insurance portion. Establishments could initially apply for a period up to six months but participation in the program could be extended up to 24 months. The program was financed through the Workers' Assistance Fund (FAT).

A striking feature of the Brazilian labor market is its complex and rigid framework Labor Law Code - CLT, which regulates labor relations between companies and workers. Hence, the implementation of the EPP in 2015 was a major innovation in the Brazilian context. Inspired by the success of working sharing policies in Germany, particularly after 2008-2009 crisis, the interaction between companies, labor unions and government generated consensus on the rules that would govern the program to deal with the recession that started in the second quarter of 2014 in Brazil, with unemployment rate peaking at 13.7% in the first quarter of 2017.

Following the efforts made in the structuring of the EPP framework and its implementation, a detailed analysis of the impacts on the employment of the firms that joined the program is still pending. Unlike the studies by Boeri and Brücker (2011), Hijzen and Martin (2013), Cahuc, Kramarz and Nevoux (2018) and Giupponi and Landais (2018) that analyzed the impact of WSP on employment using instrumental variables where baselines are not well-defined, the analysis for Brazil in this paper is conducted for a program that has a well-defined baseline with data available before and after its implementation. This allows for the use of matching methods in the construction of control and treatment groups to estimate the impact of the program on firms.

Initial efforts to assess the program were made by qualitative studies from Scherer and Oliveira (2017) and DIEESE (2016). The results show support from employers, labor unions and workers and recommend the project to be permanent and more flexible in certain eligibility criteria to ensure broader participation in the program. This paper builds on qualitative evidence and contributes to the debate of work share in developing countries. It employs administrative data from the program at establishment level from 2014 to 2018 while using a combination of propensity score matching with difference-in-difference estimator to assess the effect of EPP on employment at establishment level during and after participation in the program. The research follows a similar strategy as in Bruhn (2016) but differs as her paper evaluates the intent to treat and this paper is able to evaluate the treatment effect. Results show that EPP had a positive impact on employment of establishments after the participation in the program and the effect increases over time.

The rest of the paper is organized as follows. Section 2 presents a brief description of the EPP program. Section 3 shows the unique dataset used in the paper. Section 4 provides the empirical strategy. Section 5 that presents the results and Section 6 provides further discussions. The section 7 concludes.

2- The Employment Protection Program (EPP)

The Employment Protection Program (EPP) was created by provisional measure nº 680 in July of 2015 and was regulated by the Decree 8.479 and the Law nº 13.189 from November 2015. The aim of the program was preserved formal employment during the economic recession that

began in the second trimester of 2014.¹⁰ The program would initially run until December 2016. However, the provisional measure No 761 from December 2016 extended enrollment into the program until the end of 2017 under the new name of Employment Insurance Program (EIP).

Inspired by the German experience with work-sharing program, the EPP was regarded as an innovation in Brazil in terms of labor demand adjustment as it was the first program that required employment maintenance during participation in the program. The dialogue between corporate leaders, trade unions and the government generated a consensus on the design and rules of the program.¹¹ The employment adjustment mechanism would be through hours worked. The establishments would be able to proportionately reduce the number of hours worked and workers' wage up to 30%. The temporary reduction in the number of hours should cover all workers in the department or sector indicated by the establishments (Provisional Measure nº 680 from 2015).

The program reduces the number of hours worked and wages proportionally. The Decree nº 8.479 and the Law 13.189 from 2015 established a reduction of up to 30% in the number of hours worked. The national workers protection fund (FAT in Portuguese) then compensates for 50% of the monthly wage loss due to the reduction in the number of hours worked, up to 65% of the maximum monthly UI payment for up to 6 months, extendable for 6 months with a maximum period of 24 months, limited to the final date of the program.¹² The program forbids companies from dismissing their employees while they are in the program plus a further extra one-third of program duration after the last payment (Scherer and Oliveira, 2017).

To be eligible in the program, establishment must meet the following criteria: i) need to be formal entities for at least two years; ii) cannot have any fiscal, social security or severance fund debt; iii) must be undergoing economic strain based on the that would be verified by a net indicator of labor (ILE) with variation equal or below 1%¹³ and iv) have a specific collective bargaining agreement (ACTE) celebrated for the purpose of participating in the EPP.¹⁴

The eligibility conditions were designed so that the program could serve employees of the establishment that are in temporary financial difficulties. This indicator used in EPP is measured by the ratio between the difference in separation and hiring of workers in the last 12 months by the stock of employment in the establishment. The calculation is done monthly based on information from administrative records of CAGED and RAIS. According to DIEESE (2016), in October of 2015, only 17 of 87 sectors CNAE were not eligible according to this indicator. Furthermore, when considering the manufacturing sector, 96% of sub-sectors at 2-digit level had the aggregate indicator below 1%, suggesting that the use of ILE would not be an obstacle to the broad adhesion of the program.

¹⁰ According to the classification of the Brazilian Business Cycle Dating Committee (CODACE) of the Brazilian Institute of Economics (IBRE), the most recent recession period lasted from the second quarter of 2014 until the fourth quarter of 2016 (CODACE, 2017). Unemployment reached 13.7% in the second quarter of 2017.

¹¹ The design of EPP included interactions between stakeholders and a study trip to Germany to understand the German experience. See more details on this process on Scherer and Oliveira, 2017 and DIEESE 2016.

¹² Please refer to the following link for more details on FAT:

<https://www.bndes.gov.br/wps/portal/site/home/transparencia/fundos-governamentais/fundo-de-amparo-ao-trabalhador-fat>.

¹³ The Net Employment Indicator (ILE) is given by the difference between hiring and separation in the last 12 months over the stock of employment. In August 2015, only 17 out of 87 CNAE sectors were not eligible according to this indicator.

¹⁴ For the micro and small companies within the same economic sector would be required a specific multiple collective labor agreement.

The inclusion of a conditionality criterion in the EPP was an important factor to preserve Jobs and differs from the existing mechanisms for adjusting the demand for work in the context of a recession. When joining the program, establishments were prohibited to layoffs workers under the EPP scheme for the period of time the government contribution was being paid and for a further one-third of period of the benefit payment. By imposing this conditionality, the government expected establishments that joined the EPP to be most likely to recover the level of production during the reversal of the business cycle. This was intended to avoid additional costs from companies that would not be able to get through the economic crisis even with the EPP support. The prohibition of layoff during the participation in a work-sharing programs was also a characteristic of these programs in the Netherlands, Hungary, Austria, France, New Zealand and Poland (Hijzen and Venn, 2011).

The replacement rate of the program, defined by the proportion of the remuneration that the worker preserved when entering the program, was relatively high, it ranged between 100% for the worker who received a minimum wage and a minimum of 70%.¹⁵ Thus, there would be a guarantee of the payment of at least one minimum wage by the employer. This, in turn, made the monetary compensation limit no higher than 65% of the unemployment insurance ceiling.¹⁶ The cost of the hours worked for the company increased, as there would be charges on the monetary compensation. According to DIEESE (2016), for a reduction in wages of up to 30%, the tax collection is reduced by 15%, which increases the hourly cost by 5.53%.¹⁷

The fiscal impact of the program played an important role in its adoption and implementation. Because establishments cannot dismiss workers, tax revenue from payroll contributions would be partially maintained. In addition to payroll contributions, the spending on unemployment insurance and labor intermediation system would be avoided. This was a decisive aspect for the EPP to be implemented by the government in Brazil.

3- Data and descriptive statistics

Data

Two sources of data were used to build the longitudinal database used in assessing the impact of EPP on job maintenance: the Annual Report of Social Information (RAIS) and administrative data from the Ministry of Labor and Employment with the records of establishments and workers who participated in the program between 2015 and 2018.

RAIS: A RAIS is administrative data collected annually by the Ministry of Labor. Every year, all formal businesses are required to by law to report on their business and employees to the Ministry of Labor. If an establishment fails to provide the annual RAIS declaration, it faces automatic fines proportional to the length of the delay and the number of declarations omitted. Severance payments are based on RAIS records; thus employers and workers have a strong

¹⁵ The generosity of the subsidy is probably one of the most important aspects that justify the enrolment of the companies into work sharing policies.

¹⁶ In 2016, 65% of the ceiling of the unemployment insurance was equivalent to R\$ 1,002.45 Brazilian Reais. For instance, for a monthly salary of R\$ 6,683.00 with a 30% reduction in hours worked, the worker would receive the maximum possible benefit (R\$ 1.002,45). For wages above that value, the replacement rate is decreasing.

¹⁷ The DIEESE Report (2016) presents an example for a salary of R\$ 4,165.00, which was reduced by 30%. The hourly cost of reduced wages compared to original wages, increased by 8.92%. When the reduced salary plus the supplement was considered, this cost increased to 13.48%.

incentive to submit the annual RAIS declaration. The Ministry of Labor estimates that this coverage represents about 97% of the formal sector.¹⁸

The rich RAIS data provides us with an array of establishment level information, such as sectoral classification (CNAE 2.0), location (municipality), stock of employment, wages, and date of establishment opening. Importantly, RAIS is a linked employer-employee matched dataset that includes a unique establishment identification number (CNPJ) and allows researchers to construct a longitudinal dataset tracking establishments throughout the period of analysis. RAIS also allows to track workers using the PIS or CPF unique identification number. This increases the potential for using this employer-employee microdata for analysis. For the present study, we combine information at establishment level using CNPJ and at employee level using PIS to build a longitudinal data at monthly frequency similar to that created by Cravo et al (2018).

EPP administrative data: We use the EPP administrative data to identify the establishments that participated in the program. The database from the Ministry of Labor contains records of establishments and workers registered in the program between 2015 and 2018. The information includes tax ID (CNPJ), the location of establishments, economic activity and number of workers. This database also reports program information such as registration date, duration of wage reduction, original salary, compensation wage and the salary effectively paid during the program.

The data used in this paper is slightly different from the EPP data used by Scherer and Oliveira (2017). They used files from the employers' application to the program while we used the payment instructions with employers and employee's information sent from the Ministry of Labor to the banking system for transferring the wage subsidies to workers.

The main advantage of using the information on payment instructions is the correct identification of the companies that met the eligibility criteria to participate in the program and effectively received the benefit. Tables 1, 2 and 3 present information generated from this administrative record generated by the Ministry of Labor and provides an idea about the profile of the establishments in the program.

Table 1: Establishments and Workers Enrolled in the EPP Program (balanced)

year	Establishments enrolled	Number of employees in the program	Average employees per Establishment	Program payments per month(US\$)*	Program payments per month per employee (US\$)*
2015	34	25,574	752.18	3,030,982.90	118.52
2016	70	17,587	251.24	1,693,264.59	96.28
2017	14	5,140	367.14	722,931.26	140.65
Total	118	48,301	409.33	5,447,178.75	112.78

Source: Authors' calculations based on administrative data.

Note: *Conversion using the nominal exchange rate of December 2017 when US\$ 1 = R\$ 3.31.

The number of establishments and workers enrolled in the EPP during the period between 2015 and 2017 are shown in Table 1. Over the 3 years of EPP existence, 125 establishments were approved to participate in the program with 118 establishments appearing in all years of the data used in this evaluation. The majority of establishments entered the program in 2016 and the volume of resources of the program exceeds US\$ 5 billion, benefiting more than 48,000

¹⁸ According to IBGE (2016), only 50% of workers in Brazil are formally registered; however, this aspect is not as pronounced in the manufacturing sector, which employs around 70% of the workers in the formal sector.

registered workers who received an average of US\$ 112.75 (R\$ 373.29) monthly as the government compensation within the program framework.

The geographic distribution of establishments that were enrolled in EPP can be seen in Table 2. Sao Paulo (SP) state encompasses nearly 60% of the establishments registered in the program and 70% of the workers enrolled. Ten out of 27 states had at least one establishment participating though most establishments are from the south and southeast region of the country, the richest and most industrialized areas in the country.

Table 2: Establishments Enrolled by States 2015-2017

State – Region	Establishments registered	Establishments registered (%)	Employees	Employees(%)
SP – South east	69	58.47%	35,101	72.67%
SE – North east	16	13.56%	2,176	4.51%
SC – South	12	10.17%	3,595	7.44%
RS – South	7	5.93%	1,510	3.13%
RJ – South east	5	4.24%	971	2.01%
PR – South	4	3.39%	3,317	6.87%
PE – North east	2	1.69%	574	1.19%
MG – South east	1	0.85%	935	1.94%
GO – Center west	1	0.85%	39	0.08%
AM – North	1	0.85%	83	0.17%
Total	118	100.00%	48,301	100.00%

Source: Based on administrative data of Ministério do Trabalho e Emprego.

Table 3 shows the distribution of establishments and workers enrolled in the EPP by sector. The workers and payments are concentrated in the manufacturing sector, specifically of vehicles and machinery, which accounts for 41% of the establishments in the program. One possible reason for this concentration is the EPP's requirement of a specific collective labor agreement (ACTE) to be signed for the purpose of entering the program. The EPP provisional measure, by including this conditionality, may have benefited those sectors that are known to be more organized and that are located in the southeastern and southern regions of Brazil, which historically have active and more sophisticated labor unions. These sectors are characterized by a well-defined production chain with a large volume of employed workers.

Table 3 – Establishments and Workers Enrolled in the EPP by Sector

CNAE	Workers	Establishments
29 – Manufacture of motor vehicles, trailers and semi-trailers	34277	49
28 – Manufacture of machinery and equipment	7396	19
82 – Office administrative, office support and other business support	1442	2
25 – Manufacture of fabricated metal products, except machinery and	1358	5
30 – Manufacture of other transport equipment	613	2
24 – Manufacture of basic metals	568	6
26 – Manufacture of computer, electronic and optical products	431	2
49 – Land transport	404	1
22 – Manufacture of rubber and plastics products	334	4
13 – Manufacture of textiles	201	2
71 – Architectural and engineering activities; technical testing and	193	3
85 – Education	183	1
33 – Repair and installation of machinery and equipment	119	1
19 – Manufacture of coke and refined petroleum products	109	1
27 – Manufacture of electrical equipment	92	1

78 – Employment activities (selection, management)	79	2
32 – Other manufacturing	65	1
64 – Financial service activities	63	1
20 – Manufacture of chemicals and chemical products	62	1
47 – Retail trade, except of motor vehicles and motorcycles	51	1
41 – Construction of buildings	46	1
45 – Wholesale and retail trade and repair of motor vehicles and	43	2
73 – Advertising and market research	39	1
58 – Publishing activities	38	2
46 – Wholesale trade, except of motor vehicles and motorcycles	26	2
70 – Activities of head offices; management consultancy activities	24	1
94 – Other services, activities of membership organizations	21	1
68 – Real estate activities	11	1
42 – Civil engineering	9	1
17 – Manufacture of paper and paper products	4	1
Total	48301	118

Source: Based on administrative data of Ministério do Trabalho e Emprego.

Sample: The database used in the EPP’s impact evaluation on employment is the result of the combination of RAIS database from the Ministry of Labor and the records of the companies that joined the program that was also provided by the Ministry of Labor. This was possible because the two databases have the information of an identifier (CNPJ) for each company allowing their merging. Thus, the constructed database includes a balanced panel data with information at the company level for the period from 2013 to 2018.

To capture EPP’s impact on employment, the variable denoted by EPP_i will be used. This variable indicates whether the company is part of the treatment group. This variable assumes the value of 1 for the company that joined the program and zero otherwise (control group). The EPP established a conditionality to protect workers in which workers of the companies that joined the program would be prohibited to dismiss workers unfairly during the period in which the companies receive compensation from EPP plus a period equivalent to one third of the program duration after the last payment. Therefore, to capture the effect of this conditionality, the *During* variable was created and assumes a value of 1 during the period in which the company cannot dismiss workers, which includes the period of one third of the program duration after the last payment.

The outcome variable used in the evaluation will be the stock of workers in the companies that participated in the EPP (treatment group) and companies that did not participate in the program (control group). This will be possible by using the methodology proposed in Cravo et al (2018) which used RAIS information to create a monthly employment stocks at establishment level.

To create the employee stock variable at establishment level, an interesting feature of RAIS is used, which is the information about the month of separation and hiring of an individual worker. If a worker has a record with two jobs in a given year, that worker appear twice in the RAIS records with the respective month of separation and hiring related to each job. With this information it is possible to create the monthly stock of workers for each company, from January 2013 to December 2018. Thus, the result is a longitudinal panel at monthly frequency built from employer’s microdata. This information is useful to the extent that it is possible to correctly evaluate the EPP since its inception.

4- Empirical strategy

We use propensity score matching and difference in differences estimates to evaluate the impact of EPP on the stock of workers during and after the program. The combination of these two methods reduces selection bias based on unobservable characteristics and minimize possible bias due to the distribution of observable characteristics.

The identification challenge is to compare establishments that participated in the program with those that did not, as we do not observe the outcome for participants had they not participated in the program. To that end, we use PSM to construct a comparison group for the treated using non-participants who have a similar pre-treatment probability of receiving a treatment.

The PSM is estimated by a probit model where the probability of program participation is a function of the characteristics of the establishments, including establishment age, job tenure of workers, their average age, the logarithm of average salary, proportion of white workers, and share of workers with completed high-school. It also includes dummies for sectors at 2 digit-level, state dummies and quarterly values of labor stock prior to the program.¹⁹²⁰ We estimates two PSM models, with 10th nearest neighbors providing a better match. The test for differences in mean before and after the matching is used to assess the quality of the matching.

The estimations rely on the assumption that treated and control establishments exhibit the same trends prior to the programs for the outcome. The matching generates a similar control group that exhibits very similar pre-trend pattern, a further indication about the quality of the matching. The estimates difference-in-difference models to formally evaluate the impact of EPP on stock of workers as follows:

$$Y_{it} = \varphi_i + \alpha EPP_i + \gamma EPP_{it} * During_{it} + \delta EPP_i * Post_t + \mu_t + \varepsilon_{it} \quad (1)$$

where Y_{it} stands for employment for establishment i and time t . The term φ captures establishment fixed effects. PPE is a dummy variable indicating EPP enrollment, and $During$ takes the value of one during the treatment, including the period after the last payment of the program in which the workers cannot be dismissed. The term γ , the coefficient of interest, measures the difference in the outcome variable between the treated and control establishments before and after enrollment at EPP limited to the duration of the program. Similarly, the term δ , measures the difference in the outcome variable between the treated and control establishments before and after enrollment at EPP after the duration of the program that is indicated by the dummy $Post$. μ_t are the monthly dummy variables.

Following Bruhn (2016), we also calculate the effect of EPP for each year after the start of the program by estimating the equation (2):

$$Y_{it} = \varphi_i + \alpha EPP_i + \psi EPP_i * D2015_t + \phi EPP_i * D2016_t + \lambda EPP_i * D2017_t + \pi EPP_i * D2018_t + \mu_t + \varepsilon_{it} \quad (2)$$

where the terms ψ , ϕ , λ and π measure the difference in the outcome variable between the treated and control establishments year by year. Equation (2) thus provides an indication on how the program affects employment over the years. Alternative estimates of equations 1 and

¹⁹ Stock of workers in 04/2014, 08/2014, 12/2014, 04/2015 and 08/2015 where used where the latter being the month prior to the first enrollment in the program.

²⁰ Table A.1 describes the construction of the other variables that will be used in the analysis.

2 based on the nearest neighbor and entropy matching (Hainmueller, 2012) are used to verify the robustness of the results.²¹

5- The impact of EPP on the stock of workers

Table 4 shows the descriptive statistics pre and post matching considering the criterion of the 10th nearest neighbor. Before the matching in 2015, the difference in means between the control variables for the observable characteristics between the treatment and control group is visible. This difference was reduced to close to zero after matching, as shown in the column of the difference in means. These results suggest that the participant and non-participant groups are well balanced.

Table 4. - Descriptive Statistics Pre- and Post - Matching - August 2015 (10th nearest neighbor)

Variable	Before/After PSM	Treated/Control	N	Mean	Diff-in-means	Bias reduction
Age of establishment	pre-psm	Control	295853	18.58		
Age of establishment	pre-psm	Treated	111	24.96	6.38	
Age of establishment	post-psm	Control	904	25.61		
Age of establishment	post-psm	Treated	111	24.96	-0.64	0.91
Avr. Worker's age	pre-psm	Control	295853	36.20		
Avr. Worker's age	pre-psm	Treated	111	35.87	-0.33	
Avr. Worker's age	post-psm	Control	904	36.03		
Avr. Worker's age	post-psm	Treated	111	35.87	-0.16	0.33
Avr. Job_tenure	pre-psm	Control	295853	48.67		
Avr. Job_tenure	pre-psm	Treated	111	78.27	29.60	
Avr. Job_tenure	post-psm	Control	904	78.88		
Avr. Job_tenure	post-psm	Treated	111	78.27	-0.61	0.98
Log wage	pre-psm	Control	295853	7.38		
Log wage	pre-psm	Treated	111	8.09	0.71	
Log wage	post-psm	Control	904	8.04		
Log wage	post-psm	Treated	111	8.09	0.05	0.94
% male	pre-psm	Control	295853	0.58		
% male	pre-psm	Treated	111	0.79	0.21	
% male	post-psm	Control	904	0.76		
% male	post-psm	Treated	111	0.79	0.03	0.80
% semiskilled	pre-psm	Control	295853	0.73		
% semiskilled	pre-psm	Treated	111	0.67	-0.07	
% semiskilled	post-psm	Control	904	0.67		
% semiskilled	post-psm	Treated	111	0.67	0.00	0.97
Stock of workers	pre-psm	Control	295853	34.95		
Stock of workers	pre-psm	Treated	111	520.24	485.29	
Stock of workers	post-psm	Control	904	701.17		
Stock of workers	post-psm	Treated	111	520.24	-180.93	0.77
% white	pre-psm	Control	295853	0.66		
% white	pre-psm	Treated	111	0.64	-0.02	
% white	post-psm	Control	904	0.63		
% white	post-psm	Treated	111	0.64	0.01	0.48

Fonte: Authors' calculations based on administrative data.

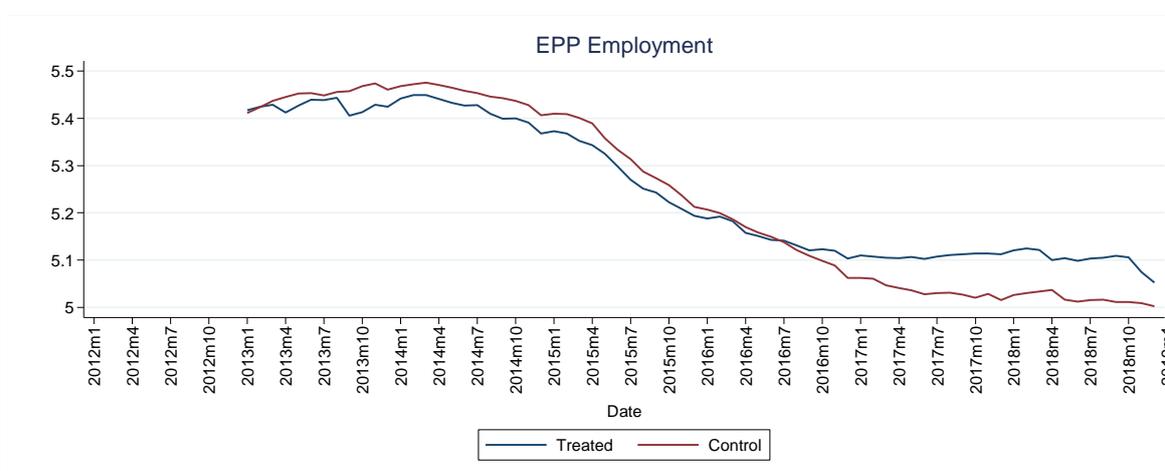
For instance, the variable stock of workers before matching shows an average value much lower for the control group when compared to the treatment group. When controlling for the observable characteristics in the PSM, the difference that existed for the pre-matching period fell significantly. Although there is still a difference between the control and treatment group

²¹ According to Hainmueller (2012), entropy balancing eliminates problems common to traditional matching methods by doing a pre-processing in which the balancing of covariates is directly incorporated into the weighting function used to adjust the control group.

for this variable, the important aspect is that the evolution for both groups presents a common trend in the pre-treatment period. This parallel trend can be observed in Figure 1.

Difference-in-difference estimations rely on the assumption that treated and control establishments exhibit the same trends prior to the programs for the outcome. Figure 1 shows the evolution of the stock of workers variable for the treatment and control groups for the period from 2013 to 2018. The inspection of this graph shows that the matching generates a similar control group that exhibits very similar pre-trend pattern, a further indication about the quality of the matching. Figure 1 below show the evolution of the monthly employment stock before and after EPP. Interestingly, the pattern clearly changes after the program from 2016 onwards. Establishments that enrolled to EPP present a higher employment level compared to non-participants, providing a visual indication that EPP helps to sustain employment levels.²²

Figure 1- Stock of workers for treated and control groups



Note: Control group constructed using the 10th nearest neighbors

Table 5 shows the impact estimates of the EPP on employment. Column one presents the effect of the program on employment during and after the program. The coefficient that estimates the impact of EPP on employment level during the program, *EPP*During*, is not statistically significant, suggesting that the level of employment would be the same in the absence of the intervention. This result indicates that EPP did not have an immediate effect on employment.

Interestingly, results show that the effect of EPP on employment after the program is positive and significant. Establishments that participate in EPP had 11.5% higher employment level than similar establishments after their participation. This result suggests that businesses that keep their employees are better prepared to sustain higher employment after the program.

To further investigate the effect of EPP over time, column two presents the results of estimates for each year after the program was launched. The results hint that the effect of EPP on employment is not immediate the year the program starts but increases over time. The estimated coefficient of the impact of the program in 2015 is not significant, suggesting that EPP did not affect employment level in the year the program was launched. From 2016 onwards, however, EPP starts to impact employment levels. Establishments that participate in the program had 4% higher employment than similar establishments. The effect of EPP increases to 11% in 2017, and to 13% in 2018, three years after program onset. Alternative estimates based

²² The alternative entropy matching provides a similar pattern (see Figure A.1 in the annex).

on the nearest neighbor and entropy matching (Hainmueller, 2012) are used to verify the robustness of the results and provide similar results when compared to the results of **Table 5**, see Table A.3 in the annex.

Table 5 – The Effect of EPP on Employment

VARIABLES	(1) Employment Stock(ln)	(2) Employment Stock(ln)
Treated (EPP)	0.000213 (0.00392)	-0.0544*** (0.00974)
<i>EPP * During</i>	0.00931 (0.0106)	
<i>EPP * Post</i>	0.115*** (0.00783)	
<i>EPP * 2015</i>		-0.00378 (0.0121)
<i>EPP * 2016</i>		0.0385*** (0.0115)
<i>EPP * 2017</i>		0.108*** (0.0120)
<i>EPP * 2018</i>		0.130*** (0.0157)
R-squared	0.151	0.150
Observations	60,814	60,814

Notes: i) Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Diff-in-diff estimations based on the PSM using the 10th nearest neighbors. ii) Authors' calculations based on administrative data.

6- Discussion

The EPP was designed as an active labor market policy in which the employment adjustment mechanism worked via the reduction in the number of hours worked during the economic recession. Thus, companies could proportionally reduce their working hours and workers' wages. The reduction in working hours of up to 30% was temporary and should cover all workers.²³ Furthermore, the establishment was prohibited to dismiss workers during the term of the program.

An important aspect about EPP is the period in which establishments receive payments and the period in which establishments cannot dismiss workers. During the period in the EPP was active, establishments could have joined the program at any time as long as the eligibility criteria was met. Establishments could apply for participation in the program for up to 6 months that could be extended for equal periods up to a maximum total period of 24 months. This generates heterogeneity associated with the month in which establishments entered the program as well as the length that establishments remain in program. This heterogeneity determined the manner in which we construct the variable that captures the effect of the during (*EPP*During*) and after the program (*EPP*Post*) to capture the effectiveness of the program.

The results described in Table 5 show that the coefficient associated with the *EPP*During* was not statistically significant, suggesting that there was no impact of the program on the stock of workers during the period in which companies cannot dismiss workers. It is plausible to imagine

²³ All employees in the department under the program must be part of the program.

that companies that joined the EPP would not carry out layoffs of workers even in the absence of the program. This can be partially confirmed by checking the records of the Ministry of Labor that shows heterogeneity in the percentage reduction in working hours, which varied between 10 to 30% and the length of stay in the program. Therefore, it is possible that the companies that joined the EPP adopted this strategy in order to avoid the costs associated with dismissal and the future hiring of workers considered valuable from the point of view of having a specific human capital for the company that would be difficult to find available in the labor market.

It is also possible that Companies that did not apply to the EPP, perhaps due to the absence of having a specific collective labor agreement signed with the unions, which was an eligibility criteria for joining the program, adopted the strategy of retain their employees, particularly the most qualified, as much as possible. However, due to the length of the recession and problems with financial liquidity, companies were forced to dismiss workers and deepen the adjustment process. Therefore, these two strategies carried out by companies that are part of the treatment and control group may have contributed to the absence of an immediate impact on employment levels as suggested in the results shown in Table 5.

An interesting result from Table 5 concerns the effectiveness of the program, which can be seen by the statistical significance of the coefficient associated with the *EPP*Post* variable. The result suggests that companies in the treatment group had 11.5% higher employment level than similar establishments after their participation. Assuming that the companies in the control and treatment group had the same average number of workers in the pre-program period, a rough estimate indicates that EPP prevented dismissal of 6437 workers. If we consider the total cost of the program described in Table 1, the cost of preventing each dismissal is approximately US\$ 847.00. This cost can be considered low if we take into account that the worker who could be dismissed has accumulated a specific human capital for the company that would hard to be found in the job market.

The results in column 2 of Table 5 suggest a lagged effect in line to that of column 1. Establishments that did not join the program adjusted their level of employment over time into the recession. This is because they may have postponed layoffs at the beginning of the crisis, but were unable to keep workers for a long time and were forced to adjust their stock of workers and labor costs. For companies that joined the EPP, receiving the subsidy prevented financial difficulties, allowing them to maintain employment levels for longer. This can be seen by the statistical significance of the coefficients associated with the EPP variable interacting with the dummies for the years 2016, 2017 and 2018. This result illustrates a very important aspect associated with the effect of the program, the average impact is not immediate and seems to increase after the second year from the implementation of the program. From the public policy point of view, this result supports the maintenance and improvement of the program the program.

Therefore, the EPP played an important role in being effective in protecting employment in establishments. It is possible that the requirement of the specific collective labor agreement (ACTE) contributed to the fact that only companies and sectors that had a more organized labor union took the advantage of the program.²⁴ Thus, poor take up may have prevented the results from being even more significant.

Finally, the channels through which EPP impact the labor markets should be further explored. The dismissal restriction or savings in the process of re-hiring and training of new workers are also possible explanations for the effectiveness of the program. Understanding the channels

²⁴ This point is also made by Scherer and Oliveira, 2017

through which the effects of EPP operate is important to design more effective policies that mitigate job losses in recessions. This impact evaluation presents results for the effect of the program shortly after the program ceased to exist, further evaluations assessing the long-run effects are important to fully understand its impact on establishments and workers.

7. Conclusion

Governments in developed and developing countries alike are designing work sharing programs to prevent job losses during recessions. Nevertheless, most evidence on the impact of work sharing schemes continue to be from developed countries. This paper contributes to better inform policy design for work sharing schemes in Brazil and other developing countries as it provides the first impact evaluation of this major labor intervention in Brazil.

The findings suggest that the Brazilian work sharing program achieves the objective of sustaining employment levels during recession and can be an effective countercyclical policy to fight unemployment. However, the impact of the program is not immediate and is more evident over time after program participation.

The effectiveness of EPP suggests that this was an innovative program in the Brazilian context in which policy makers could consider the extension and further adjustments to allow such program to expand the number of beneficiary establishments. For instance, the conditionality on specific collection labor agreement could be removed allowing more establishments and workers to join the program.

Further research is needed to examine the long run effect of the intervention and whether the channels through which the program affects employment levels are related to costs of re-hiring and training of new workers. In this case, work sharing programs can be more effective if they are designed in coordination with the labor intermediation and vocational training policies.

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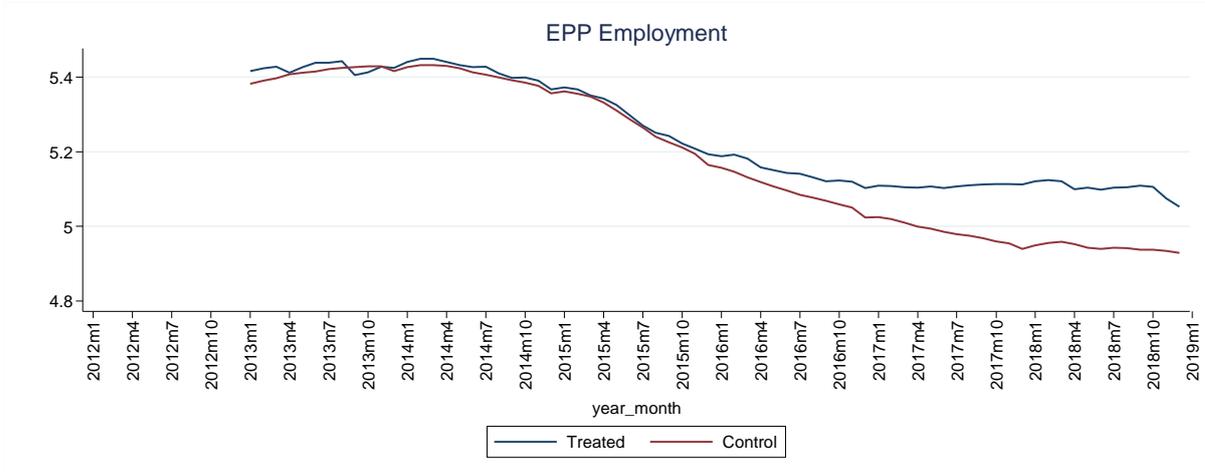
Annex

Table A.1 describes the construction of the other variables that will be used in the analysis.

Table A.1: Description of other variables

Variable	Description
EPP	
EPP_i	Binary variable that takes the value one if the establishment is a beneficiary of the program, and zero otherwise.
$During_t$	Binary variable that takes the value of 1 during the period under the program, including the extra one third of that period after the last payment of the program.
$After_t$	Binary variable that takes the value of 1 after the period under the program that includes the extra one third of that period after the last payment of the program.
Workers characteristics	
Age	Continuous variable that indicates the average age of the worker in the establishment.
Wage	Continuous variable that indicates the average salary of the worker in the establishment.
Male	Continuous variable that indicates the percentage of male workers in the establishment.
White	Continuous variable that indicates the percentage of white workers in the establishment.
Tenure	Continuous variable that indicates the average job tenure of workers in the establishment.
Establishment characteristics	
Age of Establishments	Continuous variable that indicates the age of the establishment.
Stock of workers	Continuous variable that indicates the total number of workers in the establishment.
Semiskilled	Continuous variable that indicates percentage of worker with high school diploma.

Figure A.1 - Stock of workers for treated and control groups



Note: Control group constructed using the entropy matching

Table A.2 - The Effect of EPP on Employment

VARIABLES	(1) Nearest neighbor Employment Stock(ln)	(2) Nearest neighbor Employment Stock(ln)	(3) Entropy balance Employment Stock(ln)	(4) Entropy balance Employment Stock(ln)
<i>EPP*Dummy 2015</i>		-0.00200 (0.0195)		-0.000885 (0.0113)
<i>EPP *Dummy 2016</i>		0.0540*** (0.0179)		0.0405*** (0.0109)
<i>EPP*Dummy 2017</i>		0.121*** (0.0194)		0.113*** (0.0112)
<i>EPP*Dummy 2018</i>		0.0856*** (0.0224)		0.154*** (0.0616)
<i>EPP* During</i>	0.0145 (0.0124)		0.0119 (0.0105)	
<i>EPP * Post</i>	0.101*** (0.0116)		0.126*** (0.00739)	
Treated (<i>EPP</i>)	0.0000239 (0.00575)	-0.0518*** (0.0158)	0.000172 (0.00370)	-0.0610*** (0.00917)
Constant	-0.0000239 (0.00470)	5.303*** (0.0212)	-0.000172 (0.00166)	5.140*** (0.00567)
Observations	13,319	13,319	17,186,768	17,186,768
R-squared	0.172	0.172	0.152	0.152

Notes: i) Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Diff-in-diff estimations based on the PSM using the 1st nearest neighbor and entropy matching. ii) Authors' calculations based on administrative data.