The impact of early pensions on the production and productivity of Brazilian workers

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ABSTRACT

Length-of-contribution pension is one sort of benefit of Brazilian social security where no age limit is required. It allows people to qualify for a pension in their 50s and also to accumulate a pension and wages without any restriction. This paper shows that there is an impact of early pensions on production and productivity in Brazil and measures this impact. The database is the National Household Sample Survey (PNAD) executed by the Brazilian Institute of Geography and Statistics (IBGE). Quasi-experimental policy evaluation methodology, considering a comparison group (those not receiving early pensions) and treatment group (those receiving early pensions), was conducted. Three econometric models were used: on the one hand, a logistic one in order to measure the effect of pensions on employment; on the other hand, a Blinder-Oaxaca decomposition model and propensity score weighting in order to measure the impact on working hours and productivity. The employment rate of the early pensioners would increase from 38.9% to 86.6% if they were not receiving a pension. This effect amounts to 0.5% of GDP. The Blinder-Oaxaca decomposition technique and Propensity Score Weighting indicate that early pensions reduce the productivity of those who receive such a benefit and continue working, which implies a reduction of 0.1% of GDP.

Keywords: Early Pensions; Production; Productivity.

JEL Classification: H55, J21, J14.

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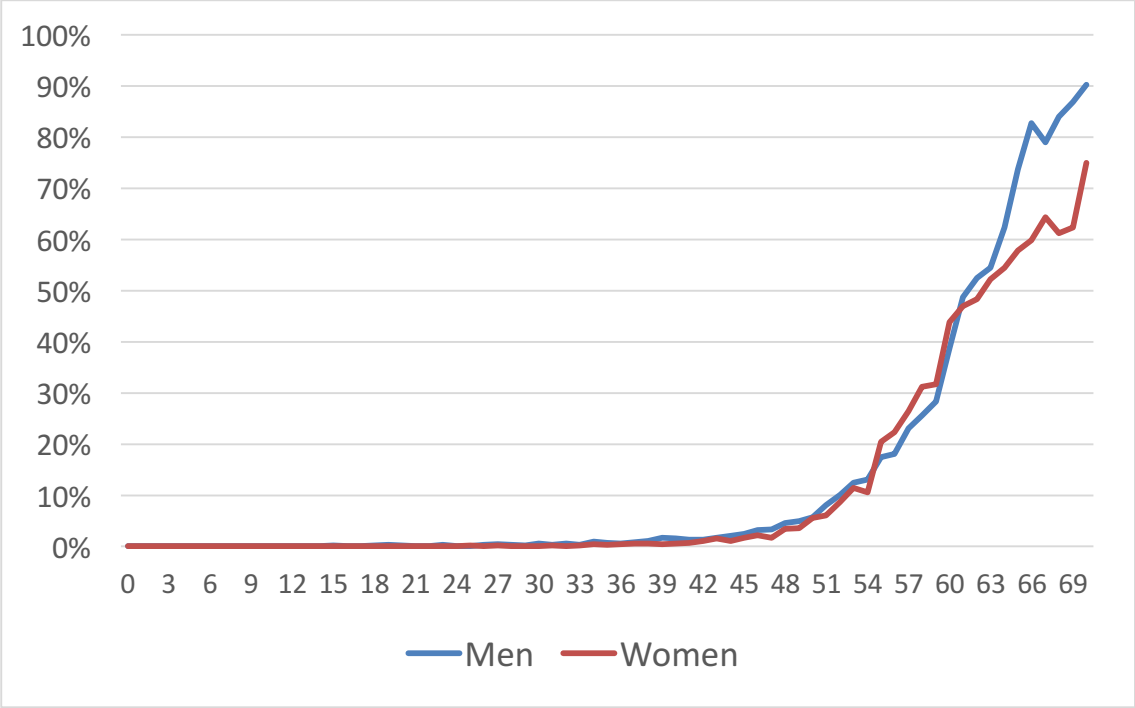
1. Introduction

The purpose of this paper is to measure the impact of Brazilian length-of-contribution pensions on the production and productivity of workers, as this type of pension allows them to retire early. A length-of-contribution pension is one sort of benefit where no age limit is required. It suffices for a man/woman to complete 35/30 years of contributing to the pension system in order to receive the benefit. As a consequence of these lax conditions, the average age of the inflow of new length-of-contribution pensions was 55/52 years old for men/women, respectively, in 2014. There is another pension benefit which demands age limits - 65/60 years for men/women- jointly with a lower level of contributions - 15 years for both genders. Brazil is one of 13 countries in the world which allow length-of-contribution pensions regardless of age limits.

Length-of-contribution pensions lead to early retirement. About 30% of Brazilians declared themselves to be retired by the age of 59.

Figure 1 – Percentage of Population Which Receives a Pension Distributed by Age

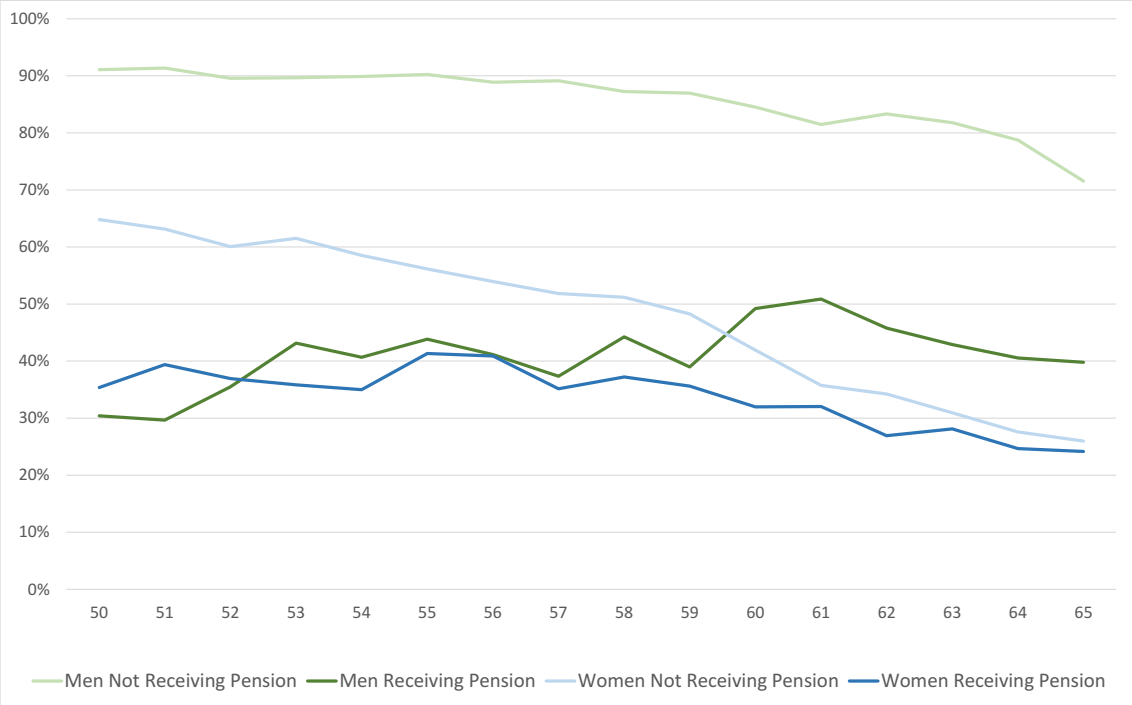


Source: PNAD/IBGE 2014. Elaboration: authors.

In Brazil it is possible to work in the formal labor market and receive a pension simultaneously. It is even possible to continue to work in the same job in which the pension was required. In this sense, the impact on production and productivity is not determined by law. However, descriptive statistics show that employment among those who receive a pension is substantially smaller compared to those who are not pensioners, even considering

the age range of the 50s in which it should be expected to find high levels of participation. Figure 2 shows that pensioners supply less labor than non-pensioners.

Figure 2 – Employment as a proportion of active population by gender and age



Source: PNAD/IBGE 2014. Elaboration: authors.

This paper will show that there is an impact of early pensions on production and productivity in Brazil and will measure it. The database is the National Household Sample Survey (PNAD) conducted by the Brazilian Institute of Geography and Statistics (IBGE). Quasi-experimental policy evaluation methodology considering a comparison group (those not receiving early pensions) and treatment group (those receiving early pensions) will be conducted. Three econometric models are used: a logistic one in order to measure the effect of pensions on employment, and Blinder-Oaxaca decomposition models and propensity score weighting in order to measure the impact on working hours and productivity.

In this sense, this is a study on how pensions affect economic efficiency, and it complements better-established analyses on the impacts of pensions on poverty and income distribution (Caetano & Monasterio, 2014; Medeiros & Souza, 2013; Hoffmann, 2009), as well as on fiscal sustainability (Giambiagi & Porto, 2013; Tafner et. al, 2015).

The paper is divided as follows: section 2 reviews the literature on the impact of pensions on labor supply. Section 3 presents the database, econometric models and a brief descriptive analysis. Section 4 examines the results and the final section concludes the paper.

2. Literature review

Some reasons explain why early retirements are problematic. In efficiency terms, there are fewer people working, which implies less production and income. From a fiscal point

of view, it generates a burden on public finances, as there are fewer people contributing and more of them are getting their pensions.

The fiscal burden is significant. According to PNAD, there were 1.9 million early pensions (defined as those that started to get their pensions before the age of 60/55 for men/women) receiving BRL 1,660 (approximately USD 415) in September 2014, which implies an annual expenditure as of BRL 41.1 (USD 10.3 billions) or 0.7% of Brazilian GDP.

However, one should consider that it is usual in Brazil to work and receive a pension at the same time. Many reasons can explain the motivation for this behavior. The main point is that Brazilian law allows this attitude, which stimulates pensions at early ages.

In this way, one can add a third problematic point related to early pensions: even if some early pensioners keep working, they can opt to engage in lower productivity and less demanding and tiring jobs as they already get a permanent income from their pensions. In middle-income countries like Brazil, where informal labor markets are big, the transition to smaller productivity can also mean a transition to informality.

Many papers observed a relation between pensions and labor supply. Leme and Malaga (2014) study the employment choice behavior of the elderly due to pension reforms. The authors show that the guarantee of a permanent income can increase the reservation wage of the elderly and make some jobs unattractive. They also point out that early retirement is costly since workers do not use their full human capital potential. This behavior impoverishes the entire nation.

This sort of reasoning is reinforced by Liberato (2003) in a study which associates the reduction of the ceiling of pensions from the 1980s to 1990s with the expansion of labor supply among pensioner men aged between 40 and 80 from 25% to 33%, i.e., an inverse relation between the value of the pension and labor supply.

Queiroz and Ramalho (2009) use a multinomial logit model in order to analyze the labor supply of the elderly by different categories of occupation. Their results suggest that the probability of getting a job as a self-employed worker or as an employee in the informal labor market increases with age. On the other hand, a higher level of education is associated with a higher probability of getting a job in the formal labor market. This paper also shows that people receiving a pension have a higher probability of working in informal labor markets with smaller wages than those offered in the formal labor market. In sum, people who receive a pension and work tend to get lower wages compared to their previous job, but their total income is higher as they accumulate wages and pension.

Considering OECD countries, especially European ones, the major concern is for the retirement decision –which can mean leaving the labor market- since there are many restrictions in accumulating pension and wages (Sundén, 2006). This is distinct from the

Brazilian case, where studies tend to analyze the impact on the labor supply of those who receive a pension.

Duval (2003) examines the impacts of pension systems and other sorts of income transfers on retirement decision for men aged at least 55 in the OECD. The study shows that higher taxation of labor income stimulates early retirement. Besides, considering the age range of 55 to 59, the generosity of unemployment insurance and of sickness benefit creates incentives for early retirement.

Gruber and Wise (1999, 2004 and 2007) establish some stylized facts for the OECD. Firstly, just a small fraction retires at the normal retirement age (which is 65 for the majority of the countries in their sample), while the majority opt for some scheme to retire younger than normal retirement age, which creates the problem of early retirement in the OECD. Secondly, they show a relationship between incentives and retirement decisions. Some simulations considering changes in eligibility criteria and benefit formula show that the average age of retirement is increasing, as is the labor market participation of those aged 56 to 65.

Even if many authors see early pensions as a problem both for public finances –as they increase expenditures and diminish revenue- and for the individual –as he/she does not take the full benefit of his/her human capital or continues to work in worse-paid jobs- such problems have not been quantified yet. This is the challenge that this paper faces.

3. Database and models

3.1. Database

Data for the econometric tests were extracted from the National Household Sample Survey (PNAD) conducted by the Brazilian Institute for Geography and Statistics (IBGE) in the year of 2014. The questionnaire of PNAD has been applied every year in the month of September since 1976. The questionnaire has been basically the same since 1992. PNAD has covered the entire country since 2004. The sample is composed of 120,000 households and 360,000 individuals. PNAD gathers information on education, fertility, migration, working conditions, income from different sources, gender, age and race, as well as characteristics of the household.

3.2. Models

Three models were used in this paper. Firstly, a logistic one in order to measure how early pension decreases the probability of continuing working. It is important to note again that Brazilian law allows the joint receipt of pension and wage. It is even possible to continue working at same post that was being occupied when there was the application for the pension. In this sense, it could be possible for a pension to have no effect on labor supply and productivity.

Early pensions are defined in this paper as those that have taken place before the ages of 60/55 for men/women. Taking into consideration that the average ages for the new inflow of length-of-contribution pensions are 55/52 years old for men/women, early pensioners were defined as those aged 59/54 as an upper limit and 53/50 years old as a lower limit for men/women respectively. The rationale for these limits is arbitrary. The upper boundary is established as one year less than the minimum age for a rural pension. The lower one is arbitrarily defined as two years lower than the average age of the inflow of length-of-contribution pensions.

The logistic model is defined by the following equation.

$$P(Y) = \frac{1}{1+e^{-(b_0 + b_1X_{1i} + b_2X_{2i} + \ldots + b_nX_{ni})}}$$

Where P(Y) is the probability of an individual being in work, and *e* is the base of the Napierian logarithmic. There is a set of coefficients *b* associated with a linear combination of independent variables X. These variables can be correlated to the probability of being employed. One crucial item for the current analysis is whether the individual receives a pension.

An early pension can lead to distinct sorts of behavior, besides the option not to work. For instance, early pensioners can opt for part-time jobs or occasionally for some less productive job. Earnings will be treated as a proxy for productivity in this paper.

Two strategies were adopted in order to measure the impact of early pensions on productivity and working hours. In both of them, the set of men aged between 53/59 and women aged between 50/54 were divided into two groups: those who receive a pension (the early pensioners) and those who not receive a pension.

The first strategy used the Blinder-Oaxaca decomposition technique (taken from Blinder (1973) and Oaxaca (1973)) applied to average earnings for early pensioners and non-early pensioners. Linear regression models were run for early-pensioners (u) and non-early pensioners (i). Dependent variable (Y) is the labor earnings adjusted to 40 hours working hours per week. Blinder-Oaxaca decomposition is a combination of characteristic effects (or explained variation) associated with the independent variables X and coefficient effects (or unexplained variation) associated with coefficients bs.

$$Y_i = b_{0i} + b_{1i} X_{1i} \quad (1)$$

$$Y_u = b_{0u} + b_{1u} X_{1u} \quad (2)$$

If early-pensioners' characteristics (u) were valued as non-early pensioners characteristics (i), the earnings would be

$$Y_u = b_{0i} + b_{1i}X_{1u} \quad (3)$$

Adjusted earnings differences for these two groups would be

$$Y_u - Y_i = [b_{0u} + b_{1u}X_{1u}] - [b_{0i} + b_{1i}X_{1i}] \quad (4)$$

By adding and subtracting (3), one gets:

$$Y_u - Y_i = [b_{0u} + b_{1u}X_{1u}] - [b_{0i} + b_{1i}X_{1i}] + [b_{0i} + b_{1i}X_{1u}] - [b_{0i} + b_{1i}X_{1u}]$$

$$= [b_{0u} - b_{0i} + b_{0i} - b_{0i}] + [b_{1i}X_{1i} - b_{1i}X_{1u}] + [b_{1i}X_{1u} - b_{1u}X_{1u}]$$

$$= [b_{0u} - b_{0i}] + b_{1i}[X_{1u} - X_{1i}] + [b_{1u} - b_{1i}]\, X_{1u} \quad (5)$$

The second term of equation (5), $(b_{1i}[X_{1u} - X_{1i}])$, is the characteristics effect. In other words, how differences in independent Xs explain differences in earnings. The sum of the first and last term of equation (5) ($[b_{0u} - b_{0i}] + [b_{1u} - b_{1i}]\, X_{1u}$) is the coefficient effect. This effect measures earnings differences that are not explained by distinctions in the dependent variables, but instead by differences in the coefficients of earnings equations for early-pensioners and non-early pensioners. The present paper used differences in average earnings -adjusted to 40 working hours per week- between the two groups (early and non-early pensioners) in order to measure both effects of Blinder-Oaxaca decomposition.

The second strategy was to make both groups (early pensioners and non-early pensioners) more comparable by the usage of "propensity score weighting" (PSW) (Hirano, Imbens & Ridder, 2003). Adjusted earning is the independent variable, as in the first strategy.

The adoption of PSW can be described as a way to make comparison (non-early pensioners) and treatment (early pensioners) groups more similar to each other in quasi-experimental designs. The first step is to calculate the probability of each individual to belong to the treatment group. This probability creates weights that are assigned to the individuals of the comparison group. Individuals of the comparison group with a low probability of belonging to the treatment group will get smaller weights, whereas those with a high probability of belonging to the treatment group will receive a bigger weight.

By attributing higher weights to those individuals in the comparison group whose characteristics are closer to those in the treatment group, it is expected that the groups will become more similar to each other considering observable characteristics.

PSW has an advantage compared to the more commonly employed "propensity score matching"(PSM) when dealing with sample data as in the PNAD case. It allows researchers to continue working with the sample weights. These weights are essential to estimate the "average treatment impacts on the treated" (ATT) that are representative of the treated population.

In formal terms, PSW can be described as follows. Consider Y_t^1 as the result achieved at time t by an early pensioner and Y_t^0 as the result achieved at time t by a non-early pensioner. D is an indicator that is equal to 1 if the individual is an early-pensioner and 0, otherwise. The impact of early pension can be described as:

$\Delta = Y_t^1 - Y_t^0$.

The number that is intended to be estimated is the difference between the earnings that an early pensioner is expected to get and the earnings that a non-early-pensioner would receive if he were receiving a pension, considering a set of X observable variables at the individual level.

$ATT = E(\Delta \mid X,D = 1) = E(Y_t^1 - Y_t^0 \mid X,D = 1) = E(Y_t^1 \mid X,D = 1) - E(Y_t^0 \mid X,D = 1)$.

The problem is that $E(Y_t^0 \mid X,D = 1)$ is non-observable, since by definition there is no Y_t^0 associated to early pensions. It is thus necessary to construct a comparison group among non-early pensioners (D=0) and adjust it in such a way as to be comparable with the treatment group. PSW is a way of doing this, based on observable variables X.

The basic procedure was to establish probabilities of an individual being an early pensioner for both comparison and treatment groups via a logistic regression. “Propensity score weight” (W) for each individual of the comparison group is given by:

W = P/(1-P)

Where P is the probability estimated by the logistic model. As it is also necessary to take into consideration the sample weights from PNAD, Ws can be adjusted by multiplying them to the sample weights of the comparison group.

Members of the comparison group whose characteristics are closer to those of the treatment group obtain a greater W by this procedure. In contrast, members of the comparison group with distinct characteristics from those of the treatment group get W inferior to 1 and, then, are considered as less important. In sum, the purpose of this procedure is to reduce the observable differences between the two groups.

The main disadvantage of PSW is the tendency to increase standard errors and then to increment the probability of type II error, where actual differences between the two samples can be regarded as non-significant from a statistical point of view.

Coefficient effects achieved by Blinder-Oaxaca decomposition can be interpreted as ATT (Fortin et al., 2010). In this sense, running both Blinder-Oaxaca decomposition and PSW is a way to accomplish the robustness of the results.

3.3. Descriptive analysis

Men/women aged in the range 53-59/50-54 were allocated between treatment (early pensioners) and comparison (non-early pensioners) groups. 1.9 million people were in the treatment group and 11.7 million in the comparison group.

The profile of these two groups is quite distinct (see Table 1). The proportion of men (70.9% vs. 47.9%) and white (59.0% vs. 47.9%) is bigger in the treatment group.[1] Early-pensioners tend to be regarded more as the reference person in the PNAD questionnaire compared to those in the comparison group (69.6% vs. 57.2%). Single mothers are less present in the treatment group (7.5% vs. 12.9%). The percentage of those in the treatment group who live in the Northeast region (the poorest in Brazil) is smaller (15.1% vs. 25.8%). Early-pensioners also tend to be more urban (90.9% vs. 84.4%) and to migrate less (18.8% vs. 23.5%). Their income tends to be higher; their houses tend to have more bathrooms, their sewage tends to be better collected, and the probability of owning a computer is also greater. They are also more educated. Both groups present similar numbers regarding the ownership of a mobile phone.

Members of the comparison group tend to participate more in the labor market, which points to a significant effect of early pensions on the decrease in labor supply.

Table 1 – Profiles of Comparison and Treatment Group

	Comparison Group	Treatment Group
Male	47.9%	70.9%
White	47.9%	59.0%
Person of Reference	57.2%	69.6%
Member of a Single Mother Family	12.9%	7.5%
Northeast	25.8%	15.1%
Urban	84.4%	90.9%
Migrated from one state	23.5%	18.8%
Access to electricity, water, sewage and garbage collection	69.3%	81.0%
Mobile phone	79.4%	82.4%
Computer	51.7%	64.1%
Participation in the labor market	77.0%	40.9%

[1] Asians were considered as whites due to their small participation in the Brazilian population. All other racial categories, including mixed ethnicities, were considered as non-whites.

Employed/Population	74.8%	39.7%
Earnings of the main job*	1,780.78	2,369.84
Earnings adjusted to a 40 working hours per week*	2,252.14	2,692.46
Average age	53.7	55.2
Average years of schooling	7.0	8.3

*Just for those employed

Source: elaborated by the authors based on data from PNAD 2014.

4. Results

4.1. Logistic model for employment

The logistic model for employment was adjusted for treatment and comparison groups as defined in section 3. Independent variables consider characteristics of the individual (years of education and dummies for gender and race), of the family (dummies for person of reference and being member of a single mother family), of the geography (dummies for big regions, and rural or urban), of migration (dummy if the individual has ever migrated from one state to another), of socio-economic condition (dummies for ownership of goods –mobile phone and computer- and characteristics of the household - access to electricity, water, sewage and garbage collection), and of the receipt of a pension benefit (dummy considering whether the individual is a pensioner). The only iteration between variables used was with the dummies' gender and pensioners, due to the expectation that a pension can have more effects on the labor market participation of men compared to women (Schwarzer and Paiva, 2003).

Table 2 presents the results, while Table 3 shows the characteristics of the average individual of each group. The model estimates employment levels that are quite close to those actually observed. Taking into consideration the average characteristics of an entire set of individuals, the model estimates an employment level of 75.0%, which is a little bit higher than the observed one (69.9%). Employment for the treatment group is estimated to be at 38.8% vs. an observed number of 39.7%. On the other hand, employment for the comparison group is estimated to be 79.4% against an actual figure of 74.8%.

Table 2 – Logistic Model For Employment

	B	SE B	Nagelkerke R^2	Cox and Snell R^2
Model			0.282	0.199
Constant	1.735	0.021**		
Age	-0.032	0.000***		
Gender (Male =1)	1.662	0.002***		

Race (white =1)	0.028	0.001***		
Years of schooling	0.063	0.000***		
Position in the household (Person of Reference = 1)	0.501	0.002***		
Type of Family (Single mother family = 1)	0.090	0.002***		
North region	-0.008	0.003***		
Northeast region	-0.047	0.002***		
South region	0.223	0.002***		
Midwest region	-0.034	0.003***		
Urban or rural (Urban = 1)	-0.957	0.003***		
Migration (Moved from one state to another = 1)	0.033	0.002***		
Access to electricity, water, sewage and garbage collection	-0.074	0.002***		
Ownership of mobile phone	0.648	0.002***		
Ownership of a computer	0.280	0.002***		
Receipt of a pension	-1.383	0.003***		
Receipt of survivor benefit	-1.169	0.003***		
Gender#Receipt of a pension	-1.332	0.004***		

Observation: *** significant at 1%; ** significant at 5%

Source: elaborated by the authors based on data from PNAD 2014.

Table 3 Average Values of the Variables

	Two Groups	Treatment Group	Comparison Group

Employed*	.699	.397	.748
Age	53.9	55.2	53.7
Gender (Male =1)	.511	.709	.479
Race (white =1)	.494	.590	.479
Years of schooling	7.1	8.3	7.0
Position in the household (Person of Reference = 1)	.590	.696	.572
Type of Family (Single mother family = 1)	.121	.075	.129
North region	.065	.028	.071
Northeast region	.243	.151	.258
South region	.168	.259	.153
Midwest region	.070	.051	.074
Urban or rural (Urban = 1)	.853	.909	.844
Migration (Moved from one state to another = 1)	.229	.188	.235
Access to electricity, water, sewage and garbage collection	.709	.810	.693
Ownership of mobile phone	.798	.824	.794
Ownership of a computer	.535	.641	.517
Receipt of a pension	.140	1.000	.000
Receipt of survivor benefit	.047	.022	.051
Gender#Receipt of a pension	.099	.709	.000

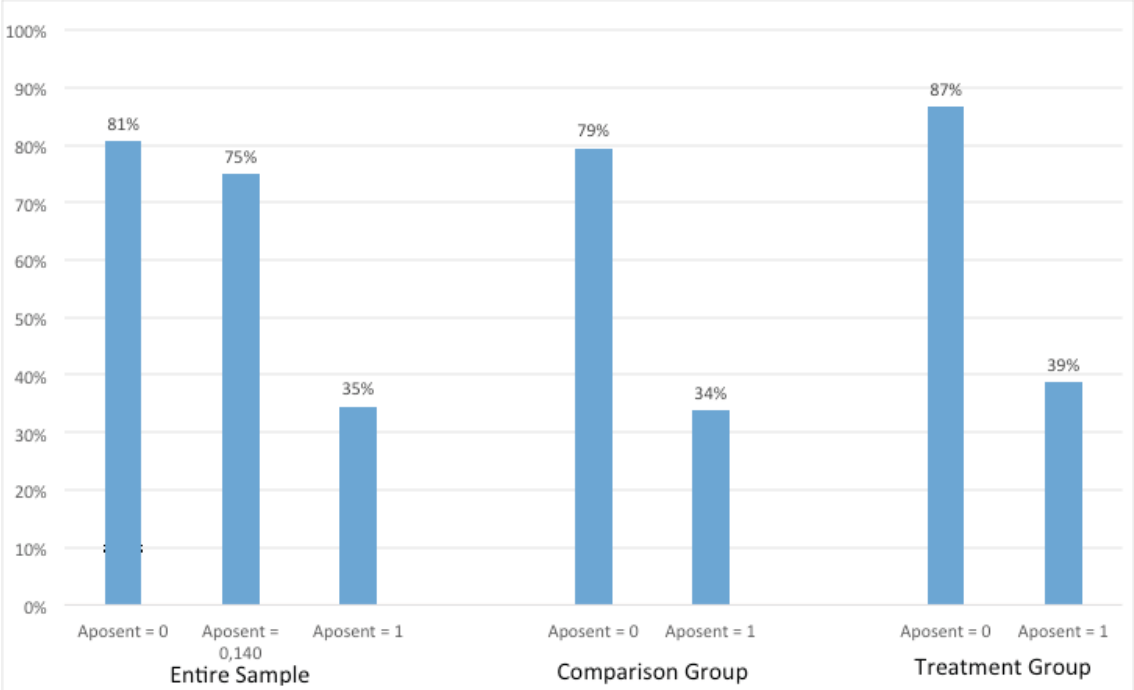
Employment as a proportion of the population

Source: elaborated by the authors based on data from PNAD 2014.

The main question is what would happen to the employment of the treatment group if its members were not receiving a pension. In this question, the average characteristics of the treatment group are taken into account.

Figure 3 shows the answer. It brings the probabilities estimated by the logistic model, considering average characteristics of the entire sample and of the treatment and comparison group.

Figure 3 – Estimated Probability of the Employment Rate



Source: elaborated by the authors based on data from PNAD 2014.

Observation: Aposent = 0 means not receiving a pension; Aposent = 1 means receiving a pension

The employment rate of early-pensioners would increase from 38.8% to 86.7% if they were not receiving their pensions, which means keeping about 900,000 people in the labor market with average monthly earnings of BRL 2,400 (USD 600) and yearly earnings of BRL 28,400 (USD 7,100). Assuming that the productivity of these people will have the value of at least their labor income, then early pensions diminish Brazilian GDP by BRL 26 billion (USD 6.5 billion) or 0.5% of Brazilian GDP (see Table 4).

Table 4 – Estimation of the Loss in Productivity Due to the Non-Employment of Early-Pensioners (Treatment Group)

	Aposent = 1	Aposent = 0
Number of people in treatment group	1,904,868	1,904,868
Estimated Probability of Being Employed	38.8%	86.7%

Estimated Employed Workers	738,316	1,650,701
Difference (A)		912,386
Average Monthly Earnings		BRL 2,370
Average Yearly Earnings (B)		BRL 28,438
Wage Bill of the Difference (A) * (B)		BRL 25,946,478,735
GDP 2014 at current prices		BRL 5,687,310,000,000
(A)*(B)/GDP		0.5%

Observation: Aposent = 0 means not receiving a pension; Aposent = 1 means receiving a pension

Elaboration: authors

4.2. Blinder-Oaxaca Decomposition

Linear models for labor earnings of the main job (adjusted to a 40 working hours per week) were run separately for the employed individuals of both treatment and comparison groups. Independent variables were: personal characteristics (years of schooling, age and dummies for gender and race), household characteristics (dummies for person of reference and single mother family), employment variables (dummies for formal labor market and for distinct sorts of occupation), geographic variables (dummies for big regions and urban/rural), migration (dummy if the individual has ever migrated from one state to another), and receipt of a survivor benefit (dummy).

Table 5 shows descriptive statistics for employed individuals of both groups.[2] As in Table 1, the treatment group has a higher income than the comparison group. Early pensioners are majorly men (73.4 vs. 57.0%), white (66.9% vs. 48.7%), tend to be the person of reference of the questionnaire of PNAD (72.8% vs. 62.7%) and tend to be less common in North (2.2% vs. 7.2%) and Northeast region (12.6% vs. 25%). In sum, they share characteristics of the high incomers.

Table 5 – Descriptive Variables for Employed Individuals of Comparison and Treatment Groups

	Comparison	Treatment
Age	54.05	55.31
Gender (Male =1)	57.0%	73.4%
Race (white =1)	48.7%	66.9%
Years of schooling	7.31	8.89
Position in the household (Person of Reference = 1)	62.7%	72.8%

[2] Data from Table 5 is different from Table 1, since the former considers solely employed individuals of both groups.

Type of Family (Single mother family = 1)	11.7%	5.5%
Formal employment	46.8%	50.2%
Agriculture Occupation	18.4%	16.4%
Industrial Occupation	10.3%	18.3%
Construction Occupation	9.7%	7.7%
Public Administration Occupation	6.8%	5.2%
Other Occupation	19.2%	16.4%
North region	7.2%	2.2%
Northeast region	25.0%	12.6%
South region	15.8%	31.1%
Midwest region	7.5%	3.4%
Urban or rural (Urban = 1)	83.1%	87.2%
Migration (Moved from one state to another = 1)	23.8%	18.5%
Receipt of survivor benefit	3.0%	2.3%

Source: elaborated by the authors based on data from PNAD 2014.

Average earnings of the main job of the treatment group, taking into consideration a 40-hour working week, are 19.4% higher than those of the comparison group (BRL 2,692 vs. BRL 2,254). It is important to envisage how characteristics and coefficient effects explain this difference.

Table 6 indicates that the effect of characteristics increases earnings by BRL 743 (USD 186) monthly, whereas the coefficient effect reduces wages monthly by BRL 305 (USD 76).

Table 6 – Blinder-Oaxaca Decomposition of Earnings Between Control and Comparison Groups (in BRL)

Comparison Group	2,254
Treatment Group	2,692
Difference	438
Coefficient Effect	-305
Characteristics Effect	743

Source: elaborated by the authors based in data from PNAD 2014.

Despite the fact that labor earnings of early-pensioners are higher than those of the non-early pensioners, they are not as high as the difference in the characteristics of the two groups would suggest. This means that pensions induce those who continue working while receiving a pension to opt for a less productive job.

4.3. PSW

As seen in section 3.2, the main challenge to measure the effect of early pensions on labor income is that treatment and control groups are quite distinct from each other. If individuals with very similar characteristics formed both groups, it could be possible to attribute the differences to early pensions.

Table 5 showed the two groups are relatively distinct. The treatment group is older, better educated, more biased to male, white, heads of the household, living in either the South or Southeast region, than the comparison group.

The purpose of using PSW is to approximate the two groups in such a way that would make it possible to attribute differences in the dependent variable (labor income adjusted to a 40-hour working week) to the independent variable that is the object of analysis (early pension, in the current case).

Logistic regression - which originated the propensity score weights - used pension receipt as the dependent variable and, as independent variables, those listed in Table 5. The probabilities that the regression estimated for pension receipt were used to build the propensity score weights (Ws). Afterwards, these Ws were multiplied by the sample weights of PNAD.

These new weights approximate the observable characteristics of the two groups in such a way that differences between the two almost disappear.

Table 7 – Descriptive Statistics for Employed Individuals of Comparison and Treatment Group

	Before PSW				After PSW		
	Comparison	**Treatment**	**Difference**		**Comparison**	**Treatment**	**Difference**
Age	54.05	55.31	1.26		55.32	55.31	- 0.01
Gender (Male=1)	57.0%	73.4%	16.4%		73.5%	73.4%	-0.1%
Race (white = 1)	48.7%	66.9%	18.2%		66.9%	66.9%	0.0%
Years of schooling	7.31	8.89	1.58		8.91	8.89	- 0.03
Position in the household (person of reference = 1)	62.7%	72.8%	10.1%		72.9%	72.8%	-0.1%
Type of family (single mother family = 1)	11.7%	5.5%	-6.2%		5.5%	5.5%	0.0%
Formal employment	46.8%	50.2%	3.4%		49.9%	50.2%	0.3%
Agriculture sector	18.4%	16.4%	-2.0%		16.7%	16.4%	-0.3%
Industrial sector	10.3%	18.3%	7.9%		18.3%	18.3%	0.0%
Construction sector	9.7%	7.7%	-1.9%		7.6%	7.7%	0.1%
Public administration	6.8%	5.2%	-1.6%		5.2%	5.2%	-0.1%
Other sectors	19.2%	16.4%	-2.8%		16.3%	16.4%	0.1%
North Region	7.2%	2.2%	-5.0%		2.2%	2.2%	0.0%
Northeast Region	25.0%	12.6%	-12.4%		12.6%	12.6%	0.0%
South Region	15.8%	31.1%	15.3%		31.4%	31.1%	-0.3%
Midwest Region	7.5%	3.4%	-4.1%		3.4%	3.4%	0.0%
Urban area	83.1%	87.2%	4.1%		86.8%	87.2%	0.4%
Migration (moved to a different State = 1)	23.8%	18.5%	-5.3%		18.3%	18.5%	0.1%
Receives survivor benefit	3.0%	2.3%	-0.6%		2.3%	2.3%	0.0%

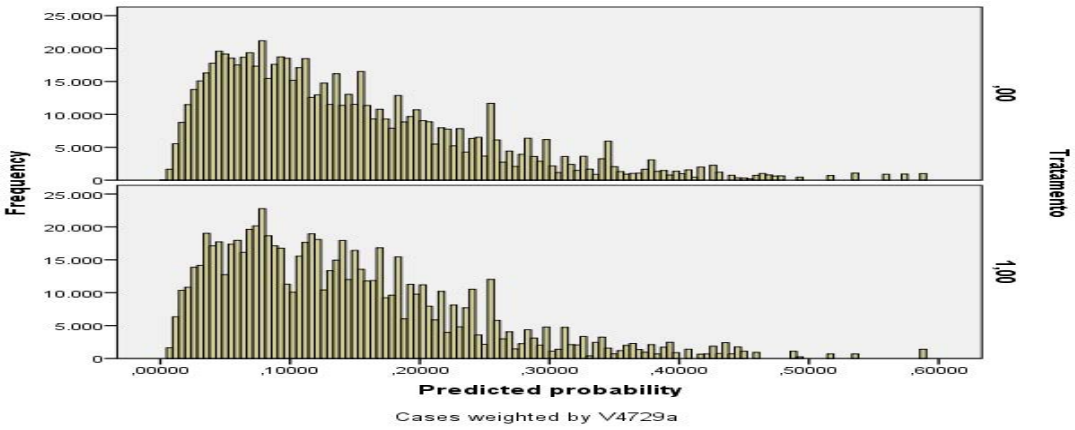
Source: elaborated by the authors based on data from PNAD 2014.

Frequency distribution of being an early pensioner for both groups before and after the application of PSW is another way to check how the two groups became close to each

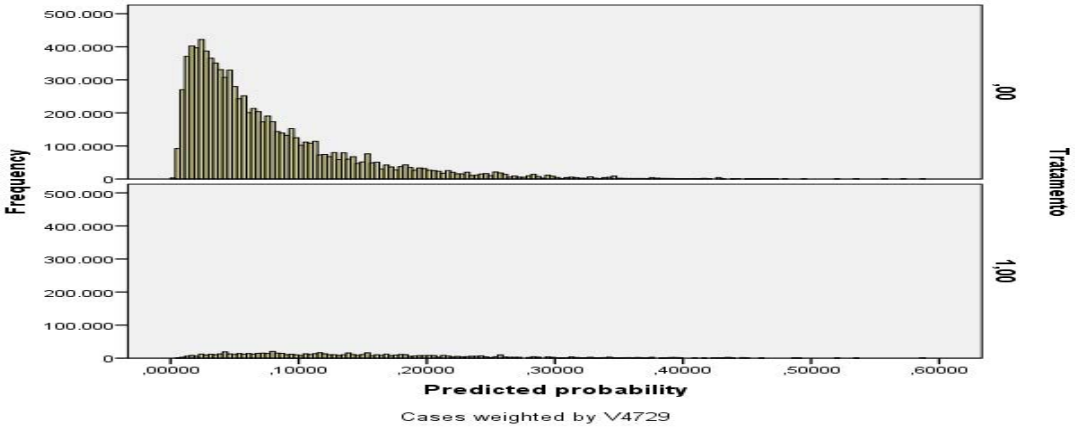
other (see Figure 4). Frequency distribution acquires a very similar shape for treatment and comparison groups after PSW.

Figure 4 – Frequency Distribution of the Probability of Being an Early Pensioner for Control (0) and Treatment (1) Group Before and After PSW.

After PSW



Before PSW



The impact of early pensions on earnings -and supposedly on productivity- is given by the estimated earnings of the employed members of the comparison group after the adoption of propensity score weights. Table 8 shows that the results after the adoption of PSW are close to those found via the Blinder-Oaxaca decomposition technique (see Table 6). While the coefficient effect was estimated at BRL 305, the average treatment effect reached BRL 348.

Table 8 – Earnings of the Main Job Adjusted to a 40-hour working week of Comparison and Treatment Groups Before and After PSW (in BRL)

	Comparison	Treatment	Difference
Before PSW	2,252	2,692	440

After PSW	3,040	2,692	-348

Source: elaborated by the authors based in data from PNAD 2014.

There are two ways to estimate the loss of productivity due to early pensions. In the first one, it will be taken into account the 757 thousands people that were considered as employed in the treatment group according to PNAD 2014. If this number were multiplied by the most conservative impact on monthly earning as shown in Table 6 (BRL 305), the yearly impact on reduction of productivity would be BRL 2.8 billions (USD 0.7 billion) or 0.05% of Brazilian GDP (1/10 of the estimated effect on employment as shown in Table 4). The second alternative takes the number of people that would be employed if they were not receiving a pension (1.65 million according to Table 4) times the coefficient effect (BRL 305), which implies a total loss in productivity as of BRL 6.0 billions (USD 1.5 billion) or 0.11% of Brazilian GDP.

Table 9 – Estimation of the Loss in Productivity Due To Early Pensions

	Observed	Estimated Without Early Pensions
Treatment Group	756,752	1,650,701
Coefficient Effect	BRL 305	BRL 305
Loss in Productivity per Year	BRL 2,768,075,042	BRL 6,037,995,186
GDP 2014 (current prices)	BRL 5,687,310,000,000	BRL 5,687,310,000,000
Loss as Share of GDP	0.05%	0.11%

Source: elaborated by the authors based on data from PNAD 2014.

5. Conclusion

Brazil is one out of 13 countries where no age limit is requested as a qualifying condition to be eligible to receive a pension. Besides, the law allows one to work and receive a pension without any restriction. As a consequence, people in Brazil qualify for a pension early. Average age of the inflow of length-of-contribution pension was 55/52 for men/women.

Considering this institutional benchmark, the purpose of this paper was to answer two questions. Firstly, how pensions affect the labor supply or employment of the early pensioners. Secondly, as it is possible to receive pension and labor earnings with no law restrictions, how pensions affects wage and labor productivity of the early pensioners.

In order to answer these questions the paper adopted a quasi-experimental evaluation design in which the treatment group was composed of pensioners aged from 53 to 59 if men and 50 to 54 if women. Non-pensioners of the same age range composed the comparison group. The database for the statistical procedures was National Sample Household Survey (PNAD) of 2014, which is administered by the Brazilian Institute for Geography and Statistics (IBGE).

Three methodological strategies were adopted. Firstly, a logistic model in order to measure the impact of early pensions on employment. Secondly, the Blinder-Oaxaca decomposition technique on the earnings of comparison and treatment groups in order to estimate the impact on earnings and productivity. Thirdly, propensity score weighting in order to make control and treatment group closer to each other.

The logistic model showed that the employment rate of the early pensioners would increase from 38.8% to 86.7% if their characteristics remained the same except for the fact that they were not receiving a pension. A conservative estimate indicates that this effect amounts to 0.5% of GDP.

The Blinder-Oaxaca decomposition technique presented a characteristic effect showing that average earnings of the treatment group would be BRL 743 greater than the comparison group. However, the coefficient effect was a negative BRL 305, which implies that early pensions reduce the productivity of those who receive them.

Finally, PSW allowed the construction of a comparison group with observable characteristics similar to the treatment group. By this technique, the average effect of an early pension on those who continue working is a reduction in monthly earnings of BRL 348.

Using the results with the smallest impacts on earnings or productivity, one notes that the total annual impact of early pensions on productivity implies a reduction of approximately 0.1% GDP.

In sum, early pensions reduce GDP by 0.6%, either by diminishing labor supply or by reducing the productivity of those who receive an early pension.

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