UNEMPLOYMENT AND DEMOGRAPHIC BONUS: AN ANALYSIS FOR SELECTED METROPOLITAN REGIONS IN BRAZIL

Abstract

The present study aims to verify if there are relationship between the demographic bonus, unemployment rate and population growth rate. To do this, was estimated the dependency ratio and a log-linear regression model of unemployment rate with population growth rate for selected Brazilian Metropolitan Regions (Belo Horizonte, Fortaleza, Porto Alegre, Recife, Salvador and São Paulo). As a result, there is the predominance of the potentially active population against inactive ones, as well as the inversely proportional ratio between the unemployment rate and the population growth rate. Therefore, it can be inferred that the demographic bonus is unharnessed. After, it was structuring a CGE model in order to see what happen with the economy when there are levels of unemployment. As all economic theory says, the unemployment causes increase in prices and decrease in welfare.

Key words: Demographic bonuses. Unemployment rate. Population growth rate. Dependency ratio.

Introduction

The labor market has been the target of several studies with different purposes in last decades. Concern for the insertion of youngers were discuss in the surveys of Camarano et al. (2005), Muniz (2013) and Silva & Kassoulf (2013), as well the woman participation in the labor market target of Abraham (2000) and Hoffmann & Leone (2009) study. Moreover, in the past 2016 through 2018 with the political and economic crisis in Brazil the currently labor market deserves some attention for the prominence unemployment.

The growing of unemployment rate, exceeding 25%[1] for some Brazilian metropolitan regions, as indicated by the Employment and Unemployment Survey (PED) of Department of Statistics and Socio-economic Studies (Dieese, 2016) denotes an importance for the national economy because the labor force is a primary factors production for all sectors. This fact gains

[1] Given for the month of August 2016.

more importance when starts to correlate the employment and unemployment with the window opportunity generates by demographic bonus in which Brazil is located.

Inside this context, the present work aims to analyze the unemployment rate and the demographic bonus in selected Brazilian metropolitan regions and furthermore explore the impacts of the unemployment rate for the Brazilian economy. To fulfil this main objective, to methodology will be use for the analyses: a regression model and a general equilibrium model.

To analyses the demographic bonus and unemployment rate was selected six regions of Brazil – Belo Horizonte (RMBH), Fortaleza (RMF), Porto Alegre (RMPA), Recife (RMR), Salvador (RMS) and São Paulo (RMSP) – which will take the regression model to correlate both variables. In addition, a computable general equilibrium will the structure to analyses the impact of unemployment in all five Brazilian macro-regions – North, Northeast, Midwest, Southeast and South.

To reach purpose objective this work is based in a descriptive research of quantitative nature, taking part of secondary data on the resident population, economically active population (PEA), age of active population (PIA) and unemployment rate.

Thus, this work is divided into five main parts, including the introduction one. The second part will bring and brief overview and references on the unemployment rate and the demographic bonus. The third session will introduce the analytical referential such the regression model and general equilibrium model. The fourth part will be presenting the results and for the fifth and least session is the final remarks for this work.

Demographic bonuses and unemployment rate

The demographic bonus became the object of study by researchers motivated with the advent of population ageing and the decrease of birth rates in the world. Also known as a demographic window opportunity or demographic dividend, the concept derives from a demographic transition process bypass the population of a country (ALVES, 2006; ALVES, 2008; ALVES, VASCONCELOS & CARVALHO, 2010; REICHERT & MARION FILHO, 2015).

For Alves (2006, 2008) the demographic bonus is characterized by the income growth allied with labor increase. The demographic bonus, when appropriate harnessed, can lead to an improvement in the population welfare, provided that the absorption of the labor force available and incentives an increase production and productivity of all economic sectors. In this sense, the demographic bonus can be used by the demographic transition:

> (...) the combination of a demographic structure and a social structure that enhances a proportion of the age population where the social and economic return of people is greater. This fact favors savings and investment, both in families and in society. In summary, the population is not a barrier, but rather a driving factor in the take off the development (ALVES, 2004, p. 6).

In its turn, Lee and Mason (2006) indicate that the demographic bonus is provoked by some demographic transition that considers factors such as industrialization, large rural populations, fertility and mortality rates. The authors still divide the use of the demographic bonus in two moments: (i) increased of workforce, causing a welfare and resources accumulation for investments and economic development; and (ii) greater number of people in advanced age, across the active aged, postponing retirement.

In another study, Mason & Lee (2006) Discuss the format of a demographic transition to under developing countries, where the concentration of the population at an active age (from 20 to 64 years) and labor force accumulation indicates a higher possibility for economic development in a region. Thus, the middle age pyramid, should be prominent and predominate in relation of the top and base of the pyramid. This kind of population behavior repeats in several developing countries like China, India and some of African countries as demonstrated through Fang (2010), Bloom *et al.* (2007) and Chandrasekhar, Ghosh & Roychowdhury (2007) studies.

With that type of conjuncture Alves (2006) and Lee & Mason (2006) subscribes that the demographic bonus is based on the growth of the workforce for the, in addition to sustaining the base of the age pyramid, dependent on the working population.

In Brazil, Reichert & Marion Filho (2015) studied the demographic bonus and concluded that the first dividend demographic occurred in 1999 with a higher active age population and favorable unemployment and productivity levels. However, from 1980 to 2000 the use of workforce available was not decisive for took advantage of demographic bonus due to a longer time need for improve technical qualification required for younger people.

For Muniz (2013) unemployment rate of the young population, between 15 to 19 years old, in the metropolitan areas have greater sensitivity to increase population for a 1982 to 2000 period, since unemployment grows within increasing population. The same happens to another group age, 20 to 24 years, and occasionally increases the unemployment rate for youngers.

In turn, Paiva & Wajnman (2005) commented that Latin America, including Brazil, is in a demographic transition phase which it is possible to take advantage of the reduction in the dependency rate, an increase in the active age population in front of an inactive, having a positive effect on economic growth, as well as taking advantage of time to define public policies

helping growth and improve income distribution. Although, with these treatments it would be possible to improve welfare for all ages.

Reichert & Marion Filho (2015) still emphasize the moment cares new demands and arise from difficulty of harnessing the demographic bonus in Brazil. The need for increased productivity, resulting from efforts of physical and human capital, to sustain a growing portion of dependents, whether children, young or elderly people, whose need care.

Given the characteristics presented by the demographic bonus, its relationship with employment and unemployment becomes narrow. The use of the demographic bonus for the development and economic growth of a country depends, among other factors, on the generation of employment for the absorption of labor from the increase of the active age population. Therefore, the unemployment rate should be low in order to face transitions and prevent negative effect on economic growth (increase in prices or welfare decreases), since the demographic bonus is not eternal, as well as its dividends depend on the capacity of regional economies to create jobs (Commission For Latin America and Caribbean, 2005; PAIVA & WAJNMAN, 2005; ALVES, 2008, 2015; KIELING & DATHEIN, 2010; REICHERT & MARION FILHO, 2015; AVILA & MACHADO, 2015).

Therefore, understanding the demographic bonus with the unemployment rate becomes a matter of interest once the current Brazilian economic and politic circunstances is experiencing with instability and increasing levels of unemployment.

Analytical referential

To relate the unemployment rate and the demographic bonus will be estimated the dependency ratio (RD) for the Brazilian metropolitan regions. With RD, will be possible to identify how much of the inactive population should be sustained by the potentially active population, indicating the window of opportunity of demographic bonus in analyzed regions.

Studies such as Alves (2006, 2008) and Alves, Vasconcelos & Carvalho (2010) applying RD to sustain the emergence of the demographic bonus by the demographic transitions of the Brazilian population. As the population passes for a more adult profile into age structure, there is a reduction in RD, allowing some resources gathering due to the largest productive contingent, as well as the increase in savings that becomes investment and, consequently, a greater development of the country.

The calculation of the RD can be described by Equation 1.

$$RD = \frac{Potentially\ inactive\ population}{Potentially\ active\ population} \times 100 \quad (1)$$

Where:

Potentially inactive population: aged from 0 to 14 years and above 65 years; and

Potentially active population: population between 15 and 64 years old.

The RD was estimated for RMBH, RMF, RMPA, RMR, RMS and MRSP across 2000 through 2010, with the demographic census as a data source. With this it will be possible to infer which of the regions suffers a greater influence of unemployment and interfering in the demographic bonus.

To check if there is a tendency in the evolution of the unemployment rate in face of population growth, influencing the window of opportunity, a “log-linear” regression model will be structured with data from projections and estimates for Brazilian population, based on Brazilian Institute of Geography and Statistics (IBGE) dataset and the unemployment rate is obtained for Department of Statistics and Socio-economic Studies (DIEESE) between 2000 to 2015.

The regression model used in this work is given by Equation 2.

$$Y_d = \varphi e^{\theta P} \quad (2)$$

Where:

Y_d: dependent variable, estimated value of unemployment rate.

φ and θ: estimated parameter by the regression model.

P: population growth rate.

Transforming the regression model described in Equation 2 into a log-linear model like Equation 3.

$$lnY_d = ln\varphi + \theta P \quad (3)$$

In this case, the estimated parameters of the elasticities can confirm some tendency towards the evolution of the unemployment rate based on the population growth rate. If the parameters estimated by the regression have the same positive sign, the population growth rate directly influenced by unemployment, if it is a negative sign, unemployment is not directly

influenced by the growth of the population itself. For the validity of this model, the test will respect 95% of significance, in addition to the coefficient R^2.

The use of the regression technique was use into similar studies that aimed to relate the employment with other demographic variables, as in Souza, Nascimento & Staduto (2011) and Muniz (2013).

As a way of complementing those proposed analyzes, a model of computable general equilibrium (CGE) will be structure focusing in unemployment rate. This model has a purpose investigate what happen with the entire Brazilian economy with different levels of unemployment.

The CGE model use in this study is the General Equilibrium Analysis Project for the Brazilian Economy (PAEG) which is a is a static, multi-regional and multi-sector model, structured for represent the Brazilian economy and its interactions with other economies around the globe. According to Gurgel et al. (2011) each region presents in the model is represented by a final demand structure and each players, producer and consumer, act to maximize their welfare subject to their budget constraint, considering fixed investment, capital flow and public-sector production.

Choose from PAEG model was because of the ability to represent all five Brazilian macro-regions, which will enable to understand de impact of unemployment in each region and it will possible to see changes in Gross Domestic Product (GPD) and welfare.

PAEG's CGE model is based on nonlinear complementarity problem in the General Algebraic Modeling System (GAMS) developed by Brooke et al. (1998) that uses Modeling Programming System for General Equilibrium syntax (MPSGE) and is structure on GTAPinGAMS (Rutherford & Paltsev, 2000; Rutherford, 2005).

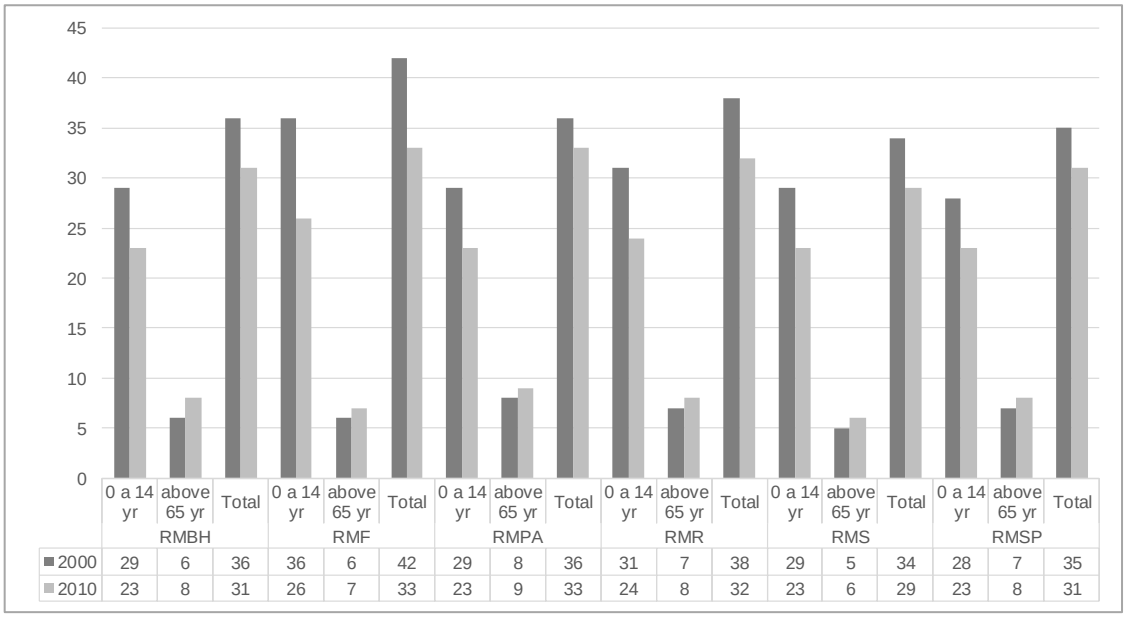
For the specific purpose of this study, an unemployment rate, same estimated by the regression, Y_d, will be considered into the CGE model. To insert this kind of rate, the original structure will be modified in order to distinguish the primary factors (labor and capital) as describe in exercise 16 in Teixeira et al. (2013). However, the entire model structure is present in Gurgel et al. (2011) and Teixeira et al. (2013).

Thus, through those two methodologies the present work will relate unemployment rate and the demographic bonus to the metropolitan regions and the impact of unemployment for Brazilian economy, divided into five macro-regions.

Impacts of unemployment in Brazilian economy

As mentioned, the use of the demographic bonus is conditioned to creation and absorption of workforce by allowing the accumulation of resources, thus with the estimate calculated by RD, it is possible to infer the weight of the inactive population in the active population, which demonstrate some evolution of dependence degree on economy in a certain range.

By meaning, if the RD raises, a larger portion of the population in active age should sustain another portion of dependents, most part of in inactive age. The Graphic 1 shows a estimated RD comparison between 2000 and 2010 for regions of RMBH, RMF, RMPA, RMR, RMS, and RMSP.



	RMBH			RMF			RMPA			RMR			RMS			RMSP		
	0 a 14 yr	above 65 yr	Total	0 a 14 yr	above 65 yr	Total	0 a 14 yr	above 65 yr	Total	0 a 14 yr	above 65 yr	Total	0 a 14 yr	above 65 yr	Total	0 a 14 yr	above 65 yr	Total
2000	29	6	36	36	6	42	29	8	36	31	7	38	29	5	34	28	7	35
2010	23	8	31	26	7	33	23	9	33	24	8	32	23	6	29	23	8	31

Graphic 1. Estimated RD for RMBH, RMF, RMPA, RMR, RMS, and RMSP.
Note: Data obtained from the demographic census of 2000 and 2010.

Through Graphic 1 it is possible to notice a decrease in the population between the age range from 0 to 14 years in all metropolitan regions where RD was estimated for 2000 and 2010. The opposite movement occurs for the population over 65 years that has undergone an increase. This fact conditions indicates a predominance of the potentially active population front an inactive one. Whose average variations in the population of 0 to 14 years for these metropolitan regions decayed about 21.71%, while the population above 65 years varied positively in 18.51%.

Table 1 illustrates the variation by age group in each metropolitan region.

Table 1. Percentage variation of RD for regions RMBH, RMF, RMPA, RMR, RMS, and RMSP.

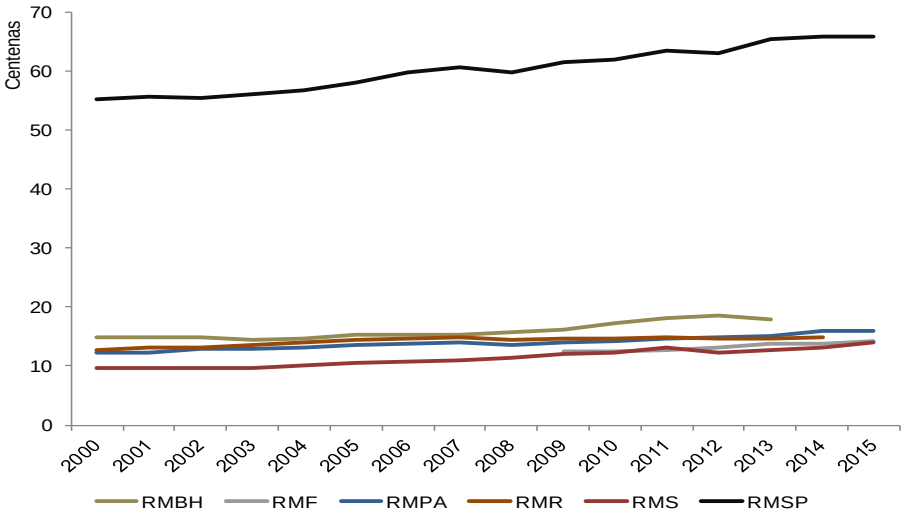
Metropolitan Region	Age Range	Variation between 2000 years and 2010
RMBH	0 to 14 years	-20.69%
	65 years or older	33.33%
RMF	0 to 14 years	-27.78%
	65 years or older	16.67%
RMPA	0 to 14 years	-20.69%
	65 years or older	12.50%
RMR	0 to 14 years	-22.58%
	65 years or older	14.29%
RMS	0 to 14 years	-20.69%
	65 years or older	20.00%
RMSP	0 to 14 years	-17.86%
	65 years or older	14.29%

Note: Data obtained from the demographic census of 2000 and 2010.

It is also noted that the behavior of RMBH, RMPA, RMS and RMSP are similar for the age group from 0 to 14 years, while for the age group above 65 years, the behavior is similar for RMF, RMR and RMSP.

In the meantime, to take advantage of workforce accumulation, the economy should be able to generate jobs to absorb workers. The difference between PIA and PEA may be indicative of job generation, the lower this difference, the better the absorption of the available workforce, since there will be a smaller portion of the active age population without occupation or in informality. This difference is shown in Graphic 2[2].

[2] Due a lack of dataset it was not possible to find the difference between PIA and PEA for RMF.



Graphic 2. Calculated difference between PIA and PEA for Rmbh, RMF, Rmpa, RMR, RMS and Rmsp Between the years 2000 to 2015
Note: Data obtained from the Employment and Unemployment Survey 2015 (PED).

Given the difference shown in Graphic 2 there is the indicative that the economy is not being able to absorb the labor of PIA in the last 15 years, fact what conditions the best use of the demographic bonus generated by the increase in the potentially active population. This lower use of PIA can be derived from higher unemployment rate.

Within this context, the regression based on unemployment rate per growth rate should indicate which type of relationship between them and the influence they exert on each other. The estimated parameters of the regression elasticities for Brazilian metropolitan regions are presented in Table 2.

Table 2. Result of regressions to the regions of RMBH, RMF, RMPA, RMR, RMS and RMSP.

Metropolitan region	Estimated parameters	Values
RMBH	φ	-22.983
	θ	-4.269
	R^2	0.547
	To t	0.003
RMF	φ	-1.124
	θ	0.385
	R^2	0.002
	To t	0.941
RMPA	φ	-8.926
	θ	1.201
	R^2	0.105
	To t	0.238
RMR	φ	-17.589
	θ	-3.076
	R^2	0.105
	To t	0.257
RMS	φ	-7.086
	θ	-0.879
	R^2	0.124
	To t	0.198
RMSP	φ	-8.493
	θ	-1.272
	R^2	0.138
	To t	0.172

Note: The regression for Rmbh, Rmpa, EME, RMS and Rmsp was made for the period 2000 to 2015. The RMF regression was fair for the years 2010 to 2015, according to the availability of the data.

The estimated parameters,φ and θ, have both positive signal it indicates that an unemployment rate is influenced by population growth rate. While, if they're both have different signal is because neither variable influences each other. At this point, only RMF and RMPA the unemployment is not influenced by growth in population, all other metropolitan region the unemployment was directly influence by population growth.

The influence observed in most metropolitan regions can be classified as a negative influence means that the variables of unemployment rate and population growth rate are inversely proportional, that is, for this work, the greater the population growth rate, the lower the unemployment rate. This condition can be considered as ideal for the use of the

demographic bonus, and the best use of the potentially active population (indicative of population growth).

However, when analyzing the coefficient R ² and significance of T-Test in order to validate the estimated regression parameters the low value indicates that those parameters are not statistically significant. Although it does not mean that the result can be neglected, only after an alert that the variables can be explained by others not considered in the regression.

Therefore, by relating the RD with the regression, it can be inferred that the demographic bonuses are not being used for RMBH, RMF, RMPA, RMR, RMS, and RMSP because the higher the value of the population's growth rate, the greater the unemployment, besides the ageing population calculated by RD.

As a way to understand the impacts of different levels of unemployment and how underutilization of the demographic bonus a CGE model estimated the GDP and welfare for Brazil. All results are presenting in Table 3.

Table 3. Estimated CGE scenarios with unemployment rate (%).

	Unemployment rate	GDP	Welfare	Price index
North	13.10	-5.15	-6.52	1.02
Northeast	14.11	-6.94	-7.33	1.65
Midwest	13.10	-6.62	-7.58	1.09
Southeast	7.44	-4.09	-4.57	0.98
South	4.79	2.55	3.28	0.55

Note: Unemployment rate for North and Midwest was the average unemployment rate form Brazil given by IBGE (2017) 13.1%, the Northeast rate was the average of Y_d of RMS, RMR and RMF. For South the unemployment rate was the Y_d for RMPA and for Southeast was an average between RMSP and RMBH.

By meaning the PAEG's model has an assumption of full employment. When the unemployment factor is introduced through the model, some changes were made to fit a new equilibrium in economy, those changes are basically in price index, welfare and GDP change. Extrapolating the metropolitan unemployment rate for the entire macro-region may not be an ideal scenario, but for this work the importance is to notice some tendency with different levels of unemployment in different regions and its implications for Brazilian economy.

With that say, GDP, welfare and price index has negative impact with unemployment rate for all analyzed regions. It was expected once the labor is important as a primary production factor necessarily to maintain the production level in all economic sectors. Higher unemployment rate such as observe in North, Northeast and Midwest cause more economic impact than lower rates as expected. A part form South region, the unemployment had a

positive impact for GDP and welfare. Therefore, it is observed in this scenario, the proof of the economic theory described by Friedman (1985).

However, is important to correlate the level of unemployment and its impacts with the region and how GDP is distributed. For example, in the North and Northeast part of Brazil there are more primary sector which needs more workforce, if the unemployment rate is higher in those regions that can be infer a lack of labor absorption which may be caused by too much increase in the local population or even newcomer (like immigrants for other South America Countries). This type of causality should be further investigated in future work.

Thereby, there are relationships between unemployment and demographic bonus and its important to developing a region or a country. If the demographic bonus is well used the economy suffer an positive impact, thus, in currently Brazil's cases is unharnessed. In addition, the lack of use of the demographic bonus coupled with the high level of unemployment in some regions causes negative impact for Brazilian economy, as proven by simulating scenarios (Table 3).

Final remarks

The present work aims to relate the unemployment rate and the demographic bonus in selected metropolitan regions from Brazil – Belo Horizonte, Fortaleza, Porto Alegre, Recife, Salvador and São Paulo – seeking to infer if the use of the demographic bonus is positive or negative, relating with the unemployment rate. To analyze this relationship, were estimate a dependency ratio, a log-linear regression model and a CGE model.

The calculation of the dependency ratio showed a decrease in the population between 0 and 14 that indicates an ageing population, in which children become young in active age, or becoming part of the potentially active population. Also happen an increase in the population above 65 years old, which induces an ageing population of Brazil.

A decrease of the dependency ratio indicates, some concentration of workforce, a condition for the creation of a demographic bonus, according to the notes of Paiva and Wajnman (2005), Lee & Mason (2006), Mason & Lee (2006), Alves (2006, 2008, 2015) and Reichert & Marion Filho (2015). Given existence favorable condition to the demographic bonus, there could be accumulations of resources, however, with the analysis, the demographic bonus has not been tapped.

In some cases, bonus, unemployment rate and population growth were inversely proportional, except for a Metropolitan Region of Fortaleza and Porto Alegre. A brief possible

explanation for this fact is the non-absorption of the labor available by the economy, in any sector of the economy.

When it comes to observing the effects of unemployment on the economy, it is proved the basic assumptions: unemployment causes increase in prices and decreases in GDP and welfare. Meanwhile, some inconsistences were present by the CGE model, like the positive variation in GDP and welfare for the south part of Brazil, probably because of the industry structure in this region.

In short, with the negative impact of unemployment rate in economy and failure to take advantage of the demographic bonus some public polices can help, and Brazilian government had been done specially to introduce youngers into a market as indicated by Reis & Camargo (2017).

As future research suggests an analysis that includes beyond metropolitan regions, like a nationwide coverage or the inclusion of new variables for metropolitan regions. Those could be accomplished for possible comparison, as the region's profile differs from each other and may help some future public policies.

References

Abramo, L. (2000). A situação da mulher latino-americana: o mercado de trabalho no contexto da reestruturação.**Mulher e trabalho: experiências de ação afirmativa** São Paulo: Term, p. 111-134.

Alves, J. E. D. (2004). **O bônus demográfico e o crescimento econômico no Brasil**. Rio de Janeiro: Federal University of Rio de Janeiro – UFRJ.

Alves, J. E. D. (2008). **A transição demográfica e a janela de oportunidade.** Fernand Braudel Institute of World Economy, São Paulo.

Alves, J. E. D. (2015). O fim do bônus demográfico e o processo de envelhecimento no Brasil. **Revista Portal de Divulgação**, N. 45.

Alves, J. E.; Vasconcelos, D. S; Carvalho, A. (2010). **A Estrutura etária, bônus demográfico e população economicamente ativa no Brasil:** cenários de longo prazo e suas implicações para o mercado de trabalho. Brasília, DF: Comissão Econômica para América Latina - CEPAL. Escritório no Brasil/IPEA.

Avila, R. I; Machado, A. L. M. (2016). Oportunidades na educação e desafios no mercado de trabalho face à transição demográfica brasileira. **Indicadores Econômicos FEE**, v. 43, N. 3, p. 111-124.

Bloom, D. E; Canning, D; Fink, G; Finlay, J. (2007). **Realizing the demographic dividend: Is Africa any different**. Program on the Global Demography of Aging, Harvard University, p. 1-23.

Brooke, A; Kendrick, D; Meeraus, A., Raman, R; America, U. (1998). The general algebraic modeling system. **GAMS Development Corporation**, 1050.

Chandrasekhar, C. P; Ghosh, J; Roychowdhury, A. (2006). The'demographic dividend'and young India's economic future. **Economic and Political Weekly**, p. 5055-5064.

Camarano, A; MELLO, J. L; Pasinato, M. T; Kanso, S. (2005). Caminhos para a vida adulta: as múltiplas trajetórias dos jovens brasileiros. **Última década**, v. 12, N. 21, p. 11-50, 2005.

Comissão Economica para América Latina e o Caribe (CEPAL). (2005). **Proyecto Regional de Población Centro Latinoamericano y Caribeño de Demografía (CELADE)**. Serie Población y Desarrollo. Santiago, Chile.

Departamento Intersindical de Estatística e Estudos Socioeconômicos (DIEESE). (2015). **Pesquisa de Emprego e Desemprego (PED):** Balanço anual. São Paulo: DIEESE.

Fang, C. (2010). Demographic Transition, Demographic Dividend, and Lewis Turning Point in China.**Economic Research Journal**, v. 4, p. 4-13.

Friedman, M. (1985). Inflação e desemprego: a novidade da dimensão política. **Literatura Econômica**, 7(3), 381-408.

Gurgel, A. C; Teixeira, E. C; Pereira, M. W. G. (2011). **A estrutura do PAEG**. Technical Paper No.1. Universidade Federal de Viçosa.

Hoffmann, R; Lion, T. (2009). Participação da mulher no mercado de trabalho e desigualdade da renda domiciliar per capita no Brasil: 1981-2002. **Nova economia**, v. 14, N. 2.

Instituto Brasileiro de Geografia e Estatística (IBGE). (2000). **Censo. Características da população e dos domicílios.** Brasília: IBGE.

Instituto Brasileiro de Geografia e Estatística (IBGE). (2010). **Censo. Características da população e dos domicílios.** Brasília: IBGE.

Instituto Brasileiro de Geografia e Estatística (IBGE). (2016). **Projeções e estimativas da população do Brasil e das Unidades da Federação.** Brasília: IBGE.

Instituto Brasileiro de Geografia e Estatística (IBGE). (2017). **Pesquisa mensal de emprego.** BRASILIA: IBGE.

Kieling, R. To Dathein, R. (2010). A dinâmica populacional brasileira e o debate sobre as políticas públicas para o aproveitamento da janela de oportunidade demográfica. **Revista Economia Ensaios**, v. 24, N. 2.

LEE, R; MASON, A. (2006). What is the demographic dividend?.**Finance and Development**, v. 43, N. 3, P. 16, 2006.

MASON, A; LEE, R. (2006). Reform and support systems for the elderly in developing countries: capturing the second demographic dividend. **Genus**, p. 11-35, 2006.

MUNIZ, J. O. (2013). Do demographic discontinuities exert effects on the young people's metropolitan labour market? **Brazilian Journal of Population Studies**, v. 19, N. 2, p. 65-98.

Paiva, P. T. A; Wajnman, S. (2005). Das causas às consequências econômicas da transição demográfica no Brasil. **Revista brasileira de estudos populacionais**, v. 22, N. 2, P. 13-15.

Silva, N. D. V; Kassouf, A. L. (2013). A exclusão social dos jovens no mercado de trabalho brasileiro. **Revista Brasileira de Estudos de população**, v. 19, N. 2, p. 99-115.

Souza, M; Nascimento, C. A; Staduto, J. A. R. (2011). Análise das formas de ocupação e rendimentos de homens e mulheres nas áreas rurais do Estado do Rio Grande do Sul no período 2001-2007. **Análise Econômica**, v. 29, N. 55.

Reichert, H; Marion Filho, P. J. (2016). O Brasil no bônus demográfico: uma janela de oportunidades e desafios. **Revista Econômica do Nordeste**, v. 46, N. 3, p. 171-184.

Reis, M. C., & Camargo, J. M. (2007). Desemprego dos jovens no Brasil: os efeitos da estabilização da inflação em um mercado de trabalho com escassez de informação. **Revista Brasileira de Economia**, 61(4), 493-518.

Rutherford, T. F. (2005). **GTAP6inGAMS: The dataset and static model**.

Rutherford, T. F. & Paltsev, S. V. **GTAPinGAMS and GTAP-EG: global datasets for economic research and illustrative models**. Working Paper, Department of Economics, University of Colorado.

Teixeira, E. V. Gurgel, A. C; Pereira, M. W. G. (2013). **A Estrutura do PAEG**. Universidade Federal de Viçosa.