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THE EFFECTS OF INCOME SHOCKS ON FEMALE HEADSHIP AND POVERTY IN BRAZIL

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This paper analyzes the effects of income shocks on the households' chances of becoming headed by women and its effects on the female-headed households' poverty vulnerability in the Brazilian metropolitan regions. For that, the unemployment rate was used as an income shock, considering both positive and negative variations in the general economy and the sectors that mostly employ men and women. The results suggest that negative income shocks decrease female household headship, while positive ones cannot always increase them in the Brazilian metropolitan regions. Also, negative and positive income shocks make households headed by women more likely to be poor.

KEYWORDS: Income shocks, Female-headed households, Poverty, Bargaining power.

1. INTRODUCTION

Gender equality and women's empowerment are among the 17 objectives proposed by the United Nations for sustainable world development (UN, 2023). However, according to the annual gender disparity report developed by the World Economic Forum (WEF, 2020), global gender equality will only occur in 99.5 years, *coeteris paribus*. According to the report, when it comes to economic participation and opportunity, access to education, health and survival, and political empowerment, only 68.8% of global gender equality was achieved until 2020.

Intrinsically related to gender disparity in different dimensions is the discussion regarding the feminization of poverty. This phenomenon can be defined as an increase in the proportion of women who are considered poor compared to men or as an increase in the difference in poverty levels of households headed by women compared to those headed by men or by a couple (Medeiros and Costa, 2008; Bradshaw et al., 2017). The significant increase in the number of households headed by women worldwide, particularly in Latin America, since the 1970s (Liu et al., 2017), along with the feminization of poverty hypothesis, makes the debate on this phenomenon of notorious importance. In fact, Brazil has seen an increase of almost 9.55 million female-headed households between 2000 and 2010, going from 22% of all households to 37.3% (IBGE, 2020). Among the households with a spouse's presence, the increase in female headship was 26.9 percentage points in the period, suggesting a strengthening of women's role in nuclear spaces.[1]

The increase in female-headed households can be justified by the enlarged women's participation in the labor market, postponement of marital unions and motherhood, reduction in

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[1] Nuclear households are households with the presence of the head and a spouse or partner.

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marriage rates, and increase in divorce rates and single-person arrangements (Liu et al., 2017). Although advances concerning women empowerment may also mark this phenomenon, households headed by women are still disadvantaged when it comes to income from work. In 2015, 18.5% of female heads received up to a quarter of the minimum wage, against 7.1% of male heads. In contrast, 6.4% had incomes above five minimum wages, against 12% of male heads (Cavenaghi and Alves, 2018).

Therefore, understanding the factors that can, at the same time, impact the likelihood of women's headship and their vulnerability condition is an important research focus. In this regard, the literature addresses the possibility that economic shocks affect men and women differently (Glewwe and Hall, 1995; Berniell et al., 2020; Kosec et al., 2022).

This topic is substantial in Brazil's current context since the country has experienced a significant economic crisis affecting household incomes. It is estimated that from 2014 to 2016, the per capita Gross Domestic Product (GDP) fell about 9%; the economy has slowed down, with the GDP growth rate reaching −3.8% in 2015; and inflation reaching 10.67% in the same year (Barbosa Filho, 2017). In times of crisis, the labor market plays a crucial role in transmitting macroeconomic shocks to households, and as Corbacho et al. (2007) emphasizes, the rigidity of the markets may even increase the breadth of the shocks. Thus, the Brazilian unemployment rate, which went from 7.4% in 2010 to 12% in 2016, served as the primary measure of income shocks' transmission to Brazilian households. In the same period, metropolitan regions' unemployment rate went from 7.04% to 8.28% (IBGE, 2018a).

When considering the labor market to transmit the crisis to households, the possible existence of occupational segregation must be considered, a phenomenon that allocates men and women to market segments considered to be male and female (Macpherson and Hirsch, 1995). In Brazil, the sector with the most extensive male participation is the Industry, with 70.57% of male workers, and the one with the most female participation is Services, with 78.30% of Brazilian women employed in this sector (IBGE, 2018a).

In this context, this paper aims to assess whether income shocks that can be positive or negative, in the whole economy or sectoral, affect the chances of households becoming headed by women and, also, to assess whether such shocks differently impact the vulnerability to poverty in female-headed households in the Brazilian metropolitan regions for the period between 2011 and 2015.

Therefore, this paper seeks to contribute to the discussion on the theme in three main points: i) by assessing not only the impacts of negative income shocks on households but also positive shocks; ii) by making a sectorial analysis of income shocks, thus considering the sectors that employ less or more women and iii) by verifying the role of such shocks in changing the household's structure and vulnerability. This analysis is particularly important for Brazil, which has, at the same time, increased the proportion of female-headed households and has experienced unfavorable economic periods. Thus, the objective here is to provide subsidies for understanding the households' behavior in the face of shocks and, consequently, offer a more up-to-date background to formulate public policies that consider each household's particularities.

In addition to this introductory section, the paper's organization is as follows: The second section provides a brief discussion on the effects of income shocks on some outcomes of households headed by women. Section 3 describes the methodology and data. Section 4 presents and discusses the results. Finally, Section 5 concludes.

2. INCOME SHOCKS AND THEIR EFFECTS ON FEMALE-HEADED HOUSEHOLDS: SOME EVIDENCE

The household response to a shock seems to depend on its nature and the context in which these households are inserted (which defines the means available to mitigate the shocks' ad-

verse effects). Empirical evidence has pointed to many possible effects of such events on household outcomes. McKenzie (2003) assessed the effect of a macroeconomic shock (the 1994 peso crisis in Mexico) and found that households reduced fertility and health care spending and reallocated consumption. Duryea (1998) and Mottaleb et al. (2015) point out the reduction in school attendance and the increase in child labor, mainly by male children, as a consequence of negative income shocks. Sedlacek and Santos (1991), in turn, observed that Brazilian families adjust their job offer to compensate for variations in the income of the household's head, so, according to the authors, adverse changes in the head's income increase the spouse's job offer.

Household responses to adverse income shocks also depend on whether such shocks are considered permanent or temporary. If households are optimistic, reducing consumption is the primary path to mitigate the shock effects. However, in pessimistic scenarios, there is a great chance that the household's response will be through changes in its structure (Christelis et al., 2015; Avalos, 2016). In this context, a general negative income shock may affect the context in which the households are inserted and their expectations regarding the event's duration.

On the other hand, shocks can also exogenously increase income. Haushofer and Shapiro (2013) suggest that a positive income shock increases all household members' physical and emotional well-being. In Brazil, Ramundo Staduto et al. (2013) suggest that an increase in formal urban employment and minimum wages is attractive to young women from rural areas who, by migrating, contribute to increasing the number of female-headed households in the cities. Gonçalves and Menezes-Filho (2015), in its turn, observed that positive income shocks increased the head and the spouse's job offers and reduced their adolescent children's offers in Brazil. However, after a positive and exogenous income shock, the spouse's job offer rises significantly more than the head's job offer, suggesting that such shock raises the spouse's bargaining power within the household (Gonçalves and Menezes-Filho, 2015).

That said, it seems possible to expect that a positive income shock can change the household structure, affecting women's bargaining power (depending on how family members experience the income increase) and increasing the number of households headed by women. Indeed, Carter and Katz (1997), in their theory of conjugal contract, suggest that income shocks, both positive and negative, can change the household structure through bargaining power. However, for this to occur, the shock must reach only one part of the contract. Thus, in this paper, we propose to distinguish between the source of the shock, analyzing, in addition to the general income variation, the shocks that come from sectors that employ mainly women and men.

Autor et al. (2016) also studied household structure changes, but, in this case, the ones made by gender-specific shocks. They evaluated the relationship between unemployment and marriage in the United States and concluded that reductions in the male labor demand diminish the marriage rates. On the other hand, reductions in the demand for female labor raise marriage rates, but mainly through a decrease in the number of divorces rather than an increase in marriages. Bhalotra and Umana-Aponte (2010), in turn, evaluated women's labor supply in the face of economic recessions and found a countercyclical trend, indicating that female participation in the labor market tends to increase during economic downturns and to decrease in economic booms, both for women and men in Asian countries, as well as those in Latin America. However, for African countries, the effect is reversed (Bhalotra and Umana-Aponte, 2010).

Moreover, positive shocks in women's income specifically increase women's empowerment since a positive change in their income raises their bargaining power within the household, increasing both the number of divorces and the number of female household headship and reducing female participation in domestic tasks (Haushofer and Shapiro, 2013; Berniell et al., 2020). Furthermore, these effects occur not only for women living in households that experienced the shocks but also for the neighboring households (Haushofer and Shapiro, 2013).

An unexpected increase in male income can also change the family structure. Canêdo-Pinheiro et al. (2008) sought to assess the economic factors that may affect a couple's decision to divorce in Brazil and noted that a positive shock in male income serves as a stabilizer of marriage while increases in female income raise the likelihood of divorce. Thus, a positive shock in a woman's income gives her more bargaining power to exit the marital contract (Canêdo-Pinheiro et al., 2008).

In addition to the potential effects on household structure, one of the assumptions underlying this study is that different households are affected differently by the same shocks, changing their poverty vulnerability conditions. According to Glewwe and Hall (1995), some characteristics make specific households more vulnerable to shocks than others, such as greater dependence on the country's economy, less diversified household income, having people with less stable jobs, and less educated members. Also, there are two types of vulnerability: structure-induced vulnerability (also called poverty-induced vulnerability), which is related to the country's structure and is driven by the permanent low consumption prospect; and risk-induced vulnerability, which is when there is high volatility in consumption (so that it rises in the face of any shock affecting income) (Günther and Harttgen, 2009).

By differentiating vulnerability to shocks from vulnerability to poverty, Glewwe and Hall (1995) stated that male-headed households are more exposed to the first, while female-headed households are more exposed to the second. However, a household's vulnerability is measured by its poverty condition and exposure to risks (Ligon and Schechter, 2003). According to Ligon and Schechter (2003), vulnerable households have greater current poverty (measured by a poverty line) and higher risk related to household characteristics and shocks' occurrence. Thus, in this paper, we use the measure of vulnerability proposed by Del Ninno and Marini (2005), in which income shocks make the household vulnerable to poverty if that household becomes more likely to be poor when it suffers a shock.

Since vulnerability is affected by the characteristics of each household, female-headed households may face a greater risk since women have lower wages in the labor market, fewer employment opportunities, less assistance as household heads, a higher probability of being in poverty, and still face double working hours (Buvinić and Gupta, 1997; Fuwa, 2000; Klasen et al., 2015; Batista and Costa, 2020).

Empirically, this relationship between poverty and female-headed households has been verified in different countries. African countries with the highest Gross Domestic Product (GDP) have a higher percentage of households headed by women (Milazzo and van de Walle, 2015). Quisumbing et al. (2001), when analyzing a sample of 10 countries, found that both women and the households headed by them are over-represented among the poor, which means that women are more vulnerable than men in any family position. Fisher and Naidoo (2016) expanded the analysis by considering the situation of women in 47 countries. They observed that the disparities between households headed by men and women are spatially heterogeneous, which indicates that in one country, female-headed households may be at a disadvantage in a dimension while being at a disadvantage in an alternative dimension in another country (Fisher and Naidoo, 2016). The female disadvantage, although multidimensional and distinct between countries, persists.

In turn, Barros et al. (1997) pointed out that female-headed households are over-represented among the poorest in Brazil. According to these authors, the main reason for the poverty experienced by them is not the low number of people with income but the low income of those with one. Despite this, Lavinas and Nicoll (2006) observed that the factor contributing most to household vulnerability in Brazil is the presence of a child and not the gender of the head. According to Liu et al. (2017), Brazilian households headed by women are at a disadvantage compared to male-headed households, regardless of family composition and location. Their

findings corroborate the ones of Batista and Costa (2020), who found that households headed by women in Brazil are 24% more likely to be poor than male-headed ones.

In this context, we expect that positive income shocks in the Service sector and negative ones in the Industry, as well as a general positive shock, will increase women bargain within the family and that negative income shocks in the Service sector and positive ones in the Industry will reduce their active voice. Regarding vulnerability, we expect that negative income shocks will make female-headed households more vulnerable to poverty than male-headed ones and that positive income shocks will make them equally vulnerable.

3. EMPIRICAL STRATEGY

3.1. *Definitions: poverty, income shocks, and female household headship*

Although we recognize poverty's multidimensional nature, this paper considers as poor the households with a per capita monthly income below the national poverty line defined by the *Bolsa Família* Program.[2] Therefore, the poor households are the ones with a per capita monthly income equal to or below R$154,00[3] (US$46,23).

It was also considered that the labor market is the primary channel to transmit macroeconomic shocks to households. That said, the unemployment rate was used as a measurement of income shocks, following Duryea (1998), Zhang (2014), and Christelis et al. (2015), who also considered shocks originated from the labor market. Hence, the unemployment rates were calculated in the same way as IBGE (2018b):

$$\text{unemployment rate} = \frac{\text{unnocupied}}{\text{economically active population}}, \tag{1}$$

where unoccupied are the individuals who did not have a job but were actively looking for one, and the economically active population is composed of people from 10 to 65 years old who were classified as occupied or unoccupied.

Another acknowledgment about the income shocks is that it is assumed they can affect both spouses simultaneously. Hence, the sectoral shocks are used to understand the gender-specific shocks' effects and, therefore, the case in which only one spouse is affected by the income fluctuation. These shocks are assumed to mainly affect one of the spouses since the sectors that primarily employ men or women (the Industry and the Service sectors, respectively) are considered.

Moreover, only the Brazilian metropolitan regions were considered in this paper. As a result, a region suffered a negative shock if, in that period, the unemployment rate (general or sectoral) is higher than its historical average (over the period 2011 to 2015) plus a standard deviation. On the other hand, that same region suffered a positive shock when the unemployment rate (general or sectoral) was lower than its historical average, minus a standard deviation.

Finally, it is essential to mention what is understood by female household headship in this paper. According to IBGE (2018a), the household head is the person considered by the other household members as the one responsible for it. However, men are culturally and historically associated with this role due to society's patriarchal heritage (Sabóia et al. 2004). Therefore, a woman tends to be considered responsible for the household, mainly when there is no male spouse, indicating that female headship is not necessarily related to the women's choice (Cavenaghi and Alves, 2018).

[2]The *Bolsa Família* Program is a money transfer program from the Federal Government.

[3]Values from 2015.

However, a woman can also become the household reference person if she has some bargain within it, directly associated with greater female empowerment. In these households, the female head can be associated with "matrifocality," which is when the woman is considered the person of reference in the household because she is the most responsible for decision-making in the home, thus being the person with the most active voice within the household (Carvalho, 1998). The female head can also be associated with economic power, indicating that, in this case, the household would be financially maintained by the woman. In this paper, it is considered that income is necessarily related to the active voice within the home, as suggested by Carter and Katz (1997).

3.2. *Data*

The analysis is conducted with data from the 2011 to 2015 Pesquisa Nacional por Amostra de Domicílio[4] (PNAD) from the Instituto Brasileiro de Geografia e Estatística[5] (IBGE). The sample is restricted to households located in Brazilian metropolitan regions (Belem, Fortaleza, Recife, Salvador, Belo Horizonte, Rio de Janeiro, São Paulo, Curitiba, Porto Alegre, and the Federal District). The analysis at the metropolitan region level was chosen since the data's smaller aggregation makes it possible to get closer to the local labor market's characteristics. Besides, the data limitation does not allow an analysis to be done at the municipality level. Additionally, the sample is restricted to working-age individuals, women between 15 to 60 years old, and men from 15 to 65. This restriction is based on the minimum economically active age established by IBGE and the minimum retirement age established by the Instituto Nacional do Seguro Social[6] (INSS)—60 years for women and 65 for men (INSS, 2018). This definition is vital since this paper aims to assess how income shocks affect households, using shocks that occurred in the labor market. The data for each survey period were stacked to obtain variations in time and cross-section dimensions.

3.3. *Identification strategy*

The income shocks' causal impact identification depends on the assumption that the unemployment rates in a metropolitan region and the shock are exogenous to household outcomes such as female headship and poverty. Two strategies are adopted to ensure that our estimates are as close as possible to the causal effect. The first one is selection on observables, so the regional differences in unemployment rates are due to these regions' observable characteristics, which are, therefore, adequately controlled. The second one is that we consider the unobservable characteristics, which can also determine the differences in unemployment rates and households' vulnerability in these regions, fixed over time. We used a fixed-effects approach at the metropolitan region's level to deal with these unobservable heterogeneities.

So, the first relationship of interest is the effects of income shocks on the probability of a household being headed by a woman, which we identified through the following equation:

$$\begin{aligned} y_{1_{i,s,t}} = {} & \alpha_1 + \beta\,\text{shock}_s + \theta\,\text{shock}_{m_s} + \phi\,\text{shock}_{f_s} + \mathbf{X}'_{1_{i,s,t}}\sigma_1 + \delta_1 C_{i,s,t} + \varphi_1\,\text{YearDummy}_t \\ & + \mu_1\,\text{LocalDummy}_s + \Theta_1\left(\text{YearDummy}_t \times \text{LocalDummy}_s\right) + \varepsilon_{1_{i,s}}, \end{aligned} \tag{2}$$

where $y_{1_{i,s,t}}$ is a binary variable that takes value 1 if the household i, located in the metropolitan region s, in period t, is headed by a woman, and 0 otherwise. The variable shock_s refers to a

[4] i.e. National Household Sample Survey
[5] i.e. Brazilian Institute of Geography and Statistics
[6] i.e. National Social Security Institute

dummy that assumes value 1 if the unemployment rate of the metropolitan region s, in period t, is above the average plus a standard deviation of the entire period (characterizing a negative income shock) or below that same average minus a standard deviation (therefore being a positive shock). Similarly, we also included dummies to indicate sectoral shocks,shock_{m_s} and shock_{f_s}, that may also be positive or negative (defined in the same way as the overall shock mentioned above) in each region's Industry and Service sectors.

The central assumption for the estimates' causal interpretation is that the shocks suffered at the metropolitan region level are exogenous. The idea is that a region's shock should be considered to be random or, at least, randomly conditional on observables. According to de Almeida et al. (2018), the labor market's aggregate conditions can be considered sources of exogenous variations concerning household variables. However, when using such variables as income shocks, we deal with the endogeneity arising from observable and unobservable characteristics at the household level that may be related to the income variation and the possibility of female headship. The endogeneity would be true if the unemployment shocks (positive or negative) are not a result of macroeconomic conditions arising from political or economic instability (or growth) but instead driven by microeconomics variables (such as individual decisions). Our expectation, however, is that this was not the case in the period we analyzed, as Brazil has been through a macroeconomic crisis that increased unemployment.

Nonetheless, to consider that the exogeneity of the income shocks may be conditional on observed and unobserved variables, a vector of observable control variables was included (household size, presence of children under the age of 5, presence of the household head's spouse, presence of retired and pensioner, home arrangement type, the woman's age, her educational level, her race and whether she has a double working day, in the vector $\mathbf{X}'_{1_{i,s,t}}$).

Unobserved heterogeneity was considered to be constant over time, so fixed effects at the level of household heads' birth cohort ($C_{i,s,t}$), the metropolitan region (LocalDummy_s), and year (YearDummy_t) were included. An interaction variable between the year and region fixed effects was also inserted ($\text{YearDummy}_t \times \text{LocalDummy}_s$) to control for the trend observed in metropolitan regions in the period. In sum, we considered that there might be non-observable at three levels: birth cohort, metropolitan region, and year, which may correlate simultaneously with the occurrence of shock in the metropolitan region and the probability of female headship. However, the identification assumption is that these heterogeneities have remained fixed over time.

Standard errors are robust to heteroscedasticity and have been clustered at the metropolitan region level to consider potential spatial correlations in the results between individuals and guarantee greater robustness. The equation was estimated using the Ordinary Least Squares method, which, in this case, represents a linear probability model.

An analogous equation was specified to estimate the relationship between shocks and vulnerability to poverty:

$$\begin{aligned} y_{2_{i,s,t}} = {} & \omega_2 + \varsigma_2 \left(\text{femalehead}_{i,s,t} \times \textit{shock}_{s,t-n}\right) + \vartheta_2 \left(\text{femalehead}_{i,s,t} \times \text{shock}_{m_{s,t-n}}\right) \\ & + \psi_2 \left(\text{femalehead}_{i,s,t} \times \text{shock}_{f_{s,t-n}}\right) + \zeta_2 \,\text{femalehead}_{i,s,t} + \varpi_2 \,\text{shock}_{s,t-n} \\ & + \tau_2 \,\text{shock}_{m_{s,t-n}} + \Omega_2 \,\text{shock}_{f_{s,t-n}} + \mathbf{X}'_{2_{i,s,t}} \rho_2 + \lambda_2 C_{i,s,t} + \xi_2 \,\text{YearDummy}_t \\ & + \Phi_2 \,\text{LocalDummy}_s + \pi_2 (\text{YearDummy}_t \times \text{LocalDummy}_s) + \varepsilon_{2_{i,s}}, \end{aligned} \tag{3}$$

where $y_{2_{i,s,t}}$ is a binary variable that assumes a value 1 if the household i, located in the metropolitan region s, in period t, is below the poverty line, and 0 otherwise. The poverty line considers poor the households with a per capita monthly income equal to or less than R$154,00 (US$46,23).

The variables of interest are the interactions between households headed by women and income shocks ($\text{femalehead}_{i,s,t} \times \text{shock}_{s,t-n}$, $\text{femalehead}_{i,s,t} \times \text{shock}_{f_{s,t-n}}$, and $\text{femalehead}_{i,s,t} \times \text{shock}_{m_{s,t-n}}$), that equals 1 if the household is headed by a woman and was located in a region that suffered a shock in the period $t-n$, and 0 otherwise. The first variable represents the interaction between the female head of household and the shock caused by the overall unemployment rate, while the second and third represent the interaction between the female headship and the specific shocks in the Services and Industry sectors, respectively. In this case, shocks in past periods are considered because it is expected that the household's vulnerability condition does not change immediately after the shock occurrence, so there is an adjustment period after the incidence of income variations (Glewwe and Hall, 1995). Also, shocks such as unemployment can be momentarily mitigated with unemployment insurance, justifying the use of shock in past periods (Christelis et al., 2015). Thus, following Glewwe and Hall (1995), a three-year lag[7] is considered.

The other variables in equation (3) are as shown in equation (2). The equation was also estimated using the Ordinary Least Squares with standard errors robust to heteroscedasticity and clustered at the metropolitan region level.

4. RESULTS

4.1. *Female headship in Brazilian metropolitan regions*

Table I shows the characteristics of women heads of households in the Brazilian metropolitan regions from 2011 to 2015. As can be seen, the number of households headed by women increased, from 40.26% in 2011 to 45.04% in 2015.

While the proportion of white women as heads has decreased over time, black and brown women have increased their headship. The percentage of women who lived with a partner between 2011 and 2015 also increased. However, more than 60% of the female heads of households lived without a partner in 2015. Regarding the type of family arrangement, the proportion of women who headed nuclear households from 2011 to 2015 also increased. Nonetheless, most of them headed single-parent households, suggesting that female headship in the Brazilian metropolitan regions is not necessarily associated with the woman's choice since they mostly head households where there is no presence of a partner with whom to share responsibilities (Sabóia and Soares, 2004; Cavenaghi and Alves, 2018).

As for the educational level, in 2011, most women heads of households had incomplete primary education. In 2015, there was an inversion of this proportion, with most of them having finished high school. There was also an increase in women who have completed higher education. When it comes to age, women heads of households in the metropolitan regions were, on average, 50 years old in 2011, with an increase of 1 year. The average number of people in the households headed by them decreased by 0.07 people from 2011 to 2015.

Regarding time allocation, women heads of households in metropolitan regions devoted on average 38.23 hours per week to paid work and about 28 hours to domestic work in 2011. In 2015, the average number of hours they dedicated to the labor market was reduced to 36.78 hours, possibly due to Brazil's economic crisis. There was also a decrease in the average number of hours dedicated to unpaid work to 25 hours a week in 2015. This reduction may be related to the increase in the number of women heads of nuclear households, who have a greater possibility of sharing household tasks. Although there was a decrease in weekly housework hours,

[7]We considered lags of 1 to 4 years for the shocks variables and the results are all very similar to the three-year lag ones used in this paper. The choice for the three-year lag was made based on the literature.

TABLE I

CHARACTERISTICS OF WOMEN HEADS OF HOUSEHOLD IN BRAZILIAN METROPOLITAN REGIONS, 2011 TO 2015

	2011	2012	2013	2014	2015
Race/Ethnicity (%):					
White	50.6	49.7	49.7	47.5	47.5
Asian and Indian	1.1	1.2	1.0	1.1	1.1
Black and Brown	48.3	49.2	49.3	51.4	51.4
Lives with a partner (%):					
Yes	32.1	34.0	33.4	35.2	35.0
No, but lived once	56.9	55.0	55.7	54.0	54.6
No, never lived	11.0	11.0	11.0	10.8	10.4
Types of home arrangement (%):					
Couple without children	9.0	9.6	9.4	10.4	10.7
Couple with children	22.5	23.9	23.3	24.2	23.6
Mother with children	41.4	39.0	40.4	38.0	38.2
Other types	27.0	27.6	26.9	27.4	27.5
Level of instruction (%):					
No instruction	10.4	8.7	8.9	8.0	8.0
Incomplete primary education	30.7	31.2	28.9	29.7	27.6
Complete primary education	10.9	10.9	10.9	10.3	10.8
Incomplete high school	4.1	4.1	4.3	4.3	4.3
Complete high school	25.8	26.3	27.1	26.9	28.2
Incomplete higher education	3.3	3.6	3.9	4.1	3.9
Complete higher education	14.7	15.0	15.7	16.5	17.0
			Mean		
Age	50	50	51	51	51
Weekly worked hours	38.2	38.5	37.8	37.6	36.8
Weekly homework hours	27.7	25.1	24.9	26.0	24.9
Household size	2.8	2.8	2.8	2.8	2.8
Income	1,369.01	1,486.18	1,617.01	1,805.80	1,782.52
Total of observations	42,358.00 40.3 %	44,235.00 42.3 %	43,981.00 42.5 %	45,216.00 43.8 %	44,989.00 45.0 %

Note: Monetary values of 2015. Source: Own elaboration based on PNAD data.

these data show that women have an extensive double working day, sharing their time between paid and unpaid work (Jones and Kodras, 1990; Fuwa, 2000). Moreover, their average income increased, going from R$1,369.01 in 2011 to R$1,782.52 in 2015.

In summary, these data show women's heads of households profile in the Brazilian metropolitan regions: they are, in their majority, middle-aged black women with complete high school education, single-parent households, and have a double working day.

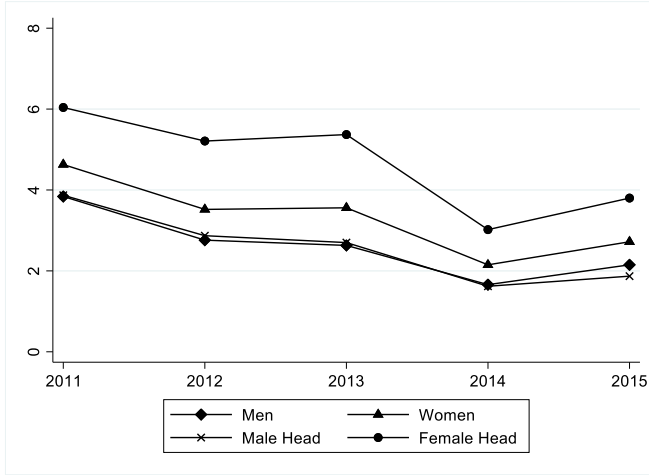

FIGURE 1.—Percentage of poor, by sex, 2011 to 2015, metropolitan areas. Source: Own elaboration based on PNAD data.

4.2. *Poverty and household headship*

Figure 1 shows the proportion of individuals living below the national poverty line for the metropolitan regions between 2011 and 2015, considering all men and women and those heads of households. As can be seen, the proportion of women living below the poverty line is more significant than men's in all years. Also, when comparing women, the heads of households are even poorer.

While in 2011, more than 4% of all women were poor, in 2015, this incidence was 2.72%. 6% of the women heading households were poor in 2011, and almost 4% were poor in 2015. It took four years for the household heads to achieve a similar poverty incidence to the other women. These data suggest that women in Brazil's metropolitan regions are overrepresented among the poorest, corroborating the hypothesis of the feminization of poverty proposed by the literature (Medeiros and Costa, 2008; Bradshaw et al., 2017; Batista and Costa, 2020). Figure 1 shows another interesting fact: even with an overall decrease in poverty, metropolitan Brazil's percentage of poor people increased from 2014 to 2015. This increase can be associated with the economic crisis the country has faced in recent years, and an indication of income shocks happening in the period. According to Vegh et al. (2019), this rise in poverty at times of recession indicates that the economic cycle significantly impacts poverty.

Table II reports some characteristics of the women who are heads of households and are poor from 2011 to 2015. As can be seen, more than 60% of them were black or brown during the entire period. Also, in 2011 only 24.77% of them reported living with a partner, and in 2015 only 24.22%, which is lower than the number of women heads of household (considering poor and non-poor) shown in Table I. This result might suggest that their poverty is strongly related to not having someone to share tasks and financial responsibility within the household (CEPAL, 2004). The type of home arrangement they head provides another indication of this result. Throughout the period analyzed, poor women mainly headed the "mother with all children under 14 years" arrangement, children who demanded more care. Also, adding all the arrangements made by mothers with children, over 50% of poor women head single-parent households. Again, it relates to women not having support as heads of households, as Cavenaghi and Alves (2018) addressed.

TABLE II

CHARACTERISTICS OF POOR WOMEN HEADS OF HOUSEHOLDS IN THE BRAZILIAN METROPOLITAN REGIONS, 2011 TO 2015

	2011	2012	2013	2014	2015
Race/Ethnicity:					
White	33.8	36.3	36.7	28.6	31.5
Asian and Indian	0.8	0.7	0.9	0.9	1.1
Black and Brown	65.5	63.0	62.4	70.4	67.5
Lives with a partner:					
Yes	24.8	19.6	19.0	22.4	24.2
No, but lived once	61.1	64.6	66.5	62.7	63.1
No, never lived	14.1	15.8	14.4	14.8	12.6
Types of home arrangement:					
Couple without children	2.2	3.0	3.0	3.9	5.2
Couple with all children under 14 years old	12.0	8.4	5.5	8.2	7.8
Couple with all children above 14 years old	4.1	2.7	3.2	2.9	4.2
Couple with children under and above 14 years old	5.4	4.1	5.8	6.1	5.3
Mother with all children under 14 years old	23.5	23.6	23.3	26.3	22.0
Mother with all children above 14 years old	19.6	17.7	17.2	17.2	21.9
Mother with children under and above 14 years old	14.4	14.4	12.6	15.0	13.6
Other types	18.8	26.1	29.4	20.3	20.1
Level of instruction:					
No instruction	14.8	12.5	12.4	8.1	11.1
Incomplete primary education	37.2	39.1	38.0	41.0	36.9
Complete primary education	14.2	14.8	11.6	14.1	12.8
Incomplete high school	7.6	6.2	6.8	8.1	8.7
Complete high school	21.7	19.5	24.2	24.7	23.4
Incomplete higher education	1.9	2.9	3.1	1.3	3.2
Complete higher education	2.6	4.7	3.7	2.5	4.1
			Mean		
Weekly worked hours	29.6	29.6	26.5	27.2	16.2
Weekly homework hours	34.3	30.7	29.0	32.1	31.6

Source: Own elaboration based on PNAD data.

Most of these women have incomplete elementary education (just over 35% from 2011 to 2015), and the average number of hours worked per week in the formal job market decreased. Regarding this last variable, Table II shows a sharp decrease of 40.5% between 2014 and 2015. This reduction suggests that Brazil's economic crisis may have affected them in recent years since they went from an average of 29.55 hours worked in 2011 to 16.18 hours in 2015, a drop of 13.37 hours a week. This result indicates that poor women's arrangements are more likely to suffer shocks (Klasen et al., 2015). Even with this decrease, the average number of hours poor women dedicate to unpaid work is higher than that shown in Table I, which indicates that, even with the paid work hours reduction, poor women heading households in the Brazilian

TABLE III

FACTORS ASSOCIATED WITH THE LIKELIHOOD OF WOMEN HOUSEHOLD HEADSHIP, METROPOLITAN REGIONS, 2011 TO 2015

	(1)	(2)	(3)	(4)
Negative income shock	0.00***	–0.02***	0.03***	–0.01***
	(0.00)	(0.00)	(0.00)	(0.00)
Positive income shock	0.03***	0.01***	0.01***	0.01***
	(0.00)	(0.00)	(0.00)	(0.00)
Negative income shock in the Industry			–0.07***	–0.02***
			(0.00)	(0.00)
Positive income shock in the Industry			0.14***	0.00^{NS}
			(0.00)	(0.00)
Negative income shock in the Services sector			0.01***	0.00**
			(0.00)	(0.00)
Positive income shock in the Services sector			–0.05***	–0.01***
			(0.00)	(0.00)
Constant	0.01***	–0.03^{NS}	0.06***	–0.02^{NS}
	(0.00)	(0.02)	(0.00)	(0.02)
R^2	0.03	0.96	0.03	0.96
Control variables	No	Yes	No	Yes
Fixed effects	Yes	Yes	Yes	Yes

Note: *** p < 0,01, ** p < 0,05, * p < 0,1 and ^{NS} p > 0,1. Standard errors in parentheses. Control variables added: household size, presence of children under five years old, presence of a spouse, presence of retired and pensioner, type of home arrangement, age of the woman, her level of education, her race, and whether she has a double workday. Source: Research results.

metropolitan regions still face extensive double working hours—suggesting that these women are also poor in time (Jones and Kodras, 1990; Fuwa, 2000). According to Carloto (2006), the presence of children in the household, which is the reality for more than 50% of poor women heads of households, makes them fragment their time between paid and unpaid work, increasing their domestic workload.

In summary, the poor women heads of households in the Brazilian metropolitan regions are primarily black, from single-parent households, with incomplete elementary education and lacking in the time dimension, facing an extensive double workday.

4.3. *Effects of the income shocks on the likelihood of women's household headship*

Table III shows the effects of different income shocks on the probability of a household being headed by a woman. We explore four different specifications based on equation (2) estimation. Column (1) reports the effects of the general income shocks (positive and negative), including only the relevant fixed effects. In addition to these variables, we included additional control variables in column (2). Columns (3) and (4) show the additional effects of the sectoral income shocks with (3) and without (4) control variables.

The effects of the general income shocks, whether positive or negative, were statistically significant in explaining the households' likelihood of becoming headed by women in the Brazilian metropolitan regions. Including control variables from columns (1) to (2) and (3) to (4) reduced these coefficients and changed the negative income shock sign. These changes might be evidence that the shocks are only conditionally exogenous and highlight that the failure to control for such variables leads to an overestimation of the impacts. For this reason, our main results are in columns (2) and (4).

Results in column (2) suggest that a positive income shock increases the chances of women's household headship in 1p.p., after controlling for household and individual observable charac-

teristics and the fixed effects. This finding is consistent with Haushofer and Shapiro (2013) and Berniell et al. (2020), who found that even a small change in household income can empower women, giving them a more significant active voice within the home, which can lead to changes in the home structure.

Our results also show that a negative income shock reduces the households' chances of becoming headed by women by 2p.p. A possible explanation for this finding is that, culturally, the role of the household head belongs to men (IPEA, 2009; Cavenaghi and Alves, 2018). Besides, according to Zhang (2014), when the household suffers a negative income shock, whether permanent or temporary, there is a transfer of household income to men to mitigate this unexpected reduction in income, which can reduce the female bargaining power within the household and, consequently, the households' chances of becoming headed by a woman.

In column (4), shock variables in the Industry and the Services sector were included, representing changes in income that would mainly affect men and women, respectively. These inclusions did not alter the relationship between the general shocks and the likelihood of female headship. However, there is a decrease in the negative income shock coefficient, suggesting that the effect associated with the general shock reflects sectoral shocks' influences. In this case, a negative income shock in the metropolitan region reduces female headship chances by 1p.p.

When dealing with sectoral shocks, a negative shock in the Industry and a negative shock in the Service sector decrease female headship chances by 2p.p. and 0.1p.p., respectively. These findings indicate that a negative income shock reduces the chances of the households becoming headed by women regardless of whether it affects the male or the female income. The same relationship was found by Christelis et al. (2015) when evaluating the United States. According to the authors, if shocks are perceived as permanent changes in income, the households' primary response is the change in the household structure that occurs through the division of households. However, if the perception of the shock is as a temporary change in income, households respond by reducing consumption (Christelis et al., 2015). This result is different from our initial hypothesis that a negative shock in the Industry would increase the households' chances of becoming headed by women.

Regarding the positive income shocks in the primarily male and female sectors, the results shown in Table III indicate an unexpected finding: a positive shock in the Service sector decreases the households' chances of becoming headed by women. These effects do not align with the conjugal contract model by Carter and Katz (1997). A possible explanation was given by IPEA (2009) when evaluating the impacts of the 2008 crisis on female labor in Brazil. As a response to the crisis, they noted an increase in the number of women employed in the formal labor market, although the strategy of replacing male for female labor was linked to precarious jobs. Since by hiring more women, employers would be able to pay lower wages. The positive shock in this paper represents a situation in which the unemployment rate is below its historical average. So the inverse relationship between the positive shock in the sector that mainly employs women and the probability of female headship may, in this context, be an indication that the increase in female income does not always contribute to elevating their bargaining power within the household. Furthermore, women face reproductive work that imposes longer and more intense working hours, and an increase in female employment is a way to increase this double workload faced by women (IPEA, 2009; Christelis et al., 2015). Adittionally, the Industry's positive shock did not explain the likelihood of the households becoming headed by women, suggesting that a positive income variation in a primarily male sector does not alter the female bargaining power within the household.

The results suggest that negative income shocks, regardless of whether they affect the service sector, the Industry, or the overall economy, reduce the female bargaining power within the household, decreasing female household headship chances in Brazilian metropolitan areas.

TABLE IV

FACTORS ASSOCIATED WITH THE HOUSEHOLDS POVERTY LIKELIHOOD IN THE BRAZILIAN METROPOLITAN REGIONS, 2011 TO 2015

	(1)	(2)	(3)	(4)
Negative income shock × Female head	0.03^{NS}	0.00^{NS}	0.03^{NS}	0.00^{NS}
	(0.02)	(0.02)	(0.02)	(0.02)
Positive income shock × Female head	0.02^{NS}	0.00^{NS}	0.02^{NS}	0.00^{NS}
	(0.03)	(0.03)	(0.03)	(0.03)
Negative income shock in the Industry × Female head			–0.01^{NS}	0.01^{NS}
			(0.02)	(0.01)
Positive income shock in the Industry × Female head			0.01^{NS}	–0.01^{NS}
			(0.01)	(0.01)
Negative income shock in the Services sector × Female head			–0.02^{NS}	–0.03*
			(0.01)	(0.01)
Positive income shock in the Services sector × Female head			0.00^{NS}	–0.01^{NS}
			(0.01)	(0.01)
Female headship	0.12***	0.35***	0.12***	0.36***
	(0.01)	(0.05)	(0.02)	(0.05)
Negative income shock	0.36**	0.24^{NS}	0.35**	0.24^{NS}
	(0.14)	(0.20)	(0.15)	(0.21)
Positive income shock	0.05**	0.05**	0.05**	0.05**
	(0.02)	(0.02)	(0.02)	(0.02)
Negative income shock in the Industry			0.00^{NS}	–0.01^{NS}
			(0.01)	(0.01)
Positive income shock in the Industry			0.01^{NS}	0.01^{NS}
			(0.01)	(0.01)
Negative income shock in the Services sector			0.01^{NS}	0.02^{NS}
			(0.01)	(0.01)
Positive income shock in the Services sector			0.00^{NS}	0.00^{NS}
			(0.01)	(0.01)
Constant	1.21***	1.39***	1.21***	1.39***
	(0.00)	(0.09)	(0.00)	(0.09)
R^2	0.19	0.36	0.19	0.36
Control variables	No	Yes	No	Yes
Fixed effects	Yes	Yes	Yes	Yes

Note: *** p < 0,01, ** p < 0,05, * p < 0,1 and ^{NS} p > 0,1. Standard errors in parentheses. Control variables: household size, presence of children under the age of 5, presence of a spouse, presence of retired and pensioner, if the head of the household has a double working day, their age, years of education, and race. Source: Research results.

Also, positive income shocks cannot always change the household structure by increasing the probability of becoming headed by women.

4.4. *Effects of income shocks on female-headed households poverty's likelihood*

Table IV presents the model's results specified in equation (3). Columns (1) and (2) only consider the overall shocks, and (3) and (4) include the sectoral ones. (1) and (3) do not include additional control variables, while (2) and (4) do.

As shown, including control variables reduces the interest variables' coefficients (interactions between income shocks and female-headed households). However, the results for such variables in Table IV were statistically insignificant. The inclusion of controls only made significant the variable representing female-headed households affected by a negative income shock in the Service sector. Although the inclusion of control variables does not change the shock variables' significance, the specifications in which they are included are considered preferred since they control the households' and household heads' observable characteristics, as suggested by the literature (Barros et al., 1997; Carter and Katz, 1997; Glewwe and Hall, 1995).

The results in column (2) show the non-significance of the interaction between general income shocks and the fact that women head the household. This result suggests that income shocks are irrelevant to explaining the poverty odds of female-headed households relative to male-headed households. It contrasts with Klasen et al. (2015), who found that female-headed households are more exposed to shocks in Thailand and Vietnam than male-headed households. However, even if the shocks do not change the poverty chances of such households, once all their observable characteristics are controlled, female-headed households are about 35 p.p. more likely to be poor than male-headed households, as found by Angel and Tienda (1982) and Glewwe and Hall (1995). Interestingly, this variable's magnitude increases when estimated with control variables, suggesting that the estimation without the controls (shown in (1)) underestimates the household's head's gender effect on their chances of poverty. According to Costa and Magnabosco Marra (2020), this result occurs because, in addition to the household characteristics making female-headed households more vulnerable, there are cultural difficulties associated with women acting as household heads. These cultural difficulties give the household's head's gender more weight when evaluating their chances of being in poverty (Costa and Magnabosco Marra, 2020).

Regarding the shock variables, the negative shock was not significant in explaining the household's chances of poverty. In turn, the positive shock showed a positive relationship with the poverty variable, suggesting that households that suffered a positive income shock three years ago are 5 p.p. more likely to be poor today than households that did not suffer such a shock. This result contrasts with Haushofer and Shapiro (2013) hypothesis that an increase in income reduces the household's vulnerability. Possibly, the households affected by such shock were already in a vulnerable condition. Hence, the positive shock is not making them poorer, but rather its characteristics represent an aggregate risk that affects their vulnerability, as Ligon and Schechter (2003) suggested.

In the results presented in (4), including the sectorial shocks interaction variables did not change the coefficient of the negative and positive income shocks already presented in column (2) nor made them significant. This result suggests that these shocks are not relevant to explaining the female-headed households' poverty probability in Brazilian metropolitan regions. The only interaction that proved to be significant in this model and, therefore, relevant to explain this relationship was the "Negative Shock Services × Female Head," indicating that households headed by women that suffered a negative shock in the Service sector three years ago years have 3 p.p. less chance of being vulnerable today.

Since the Service sector is the sector that mainly employs women, a negative income shock in this sector affects more women's income, which was expected to have a positive relationship with the poverty chances of households headed by them. A possible explanation for this result is that the poverty measure used considers the *Bolsa Família* Program poverty line, which has women as its primary target. Thus, the effects of this negative change in women's income may be mitigated by government assistance. Glewwe and Hall (1995) indicated this could occur after a shock. According to them, after a macroeconomic shock that negatively affects household income, there is a period of household adjustment, mainly through reduced consumption, followed by government assistance (Glewwe and Hall, 1995). In addition, those below the *Bolsa Família* poverty line may not be employed in the formal sector. Otherwise, their income would be higher, as they would receive a minimum wage, as Ulyssea (2006) discussed. Thus, the negative shock in the Service sector that represents an increase in formal unemployment may indicate an increase in informal employment (Jakobsen et al., 2000; Ulyssea, 2006), impacting people below the poverty line (through the reduction of their vulnerability).

Finally, in the estimation presented in column (4), the female-headed household and the positive income shock had a positive relationship with the probability of the household being poor,

which is consistent with the results presented in column (2) already explained before. Also, the negative income shock and the sectoral shocks were not significant. A possible explanation for the coefficients' statistical insignificance is that the considered shock is based on the unemployment rate, which considers the formal labor market. According to Otobe (2011), the large proportion of individuals living in informality in underdeveloped countries indicates that the use of the unemployment rate cannot accurately assess the impacts of a crisis. Thus, an income shock in the economy's formal sector would not impact the poverty probability. Since, possibly, the most vulnerable to becoming poor in the face of a shock are those who do not have a formal job given that the informal work sector provides unstable jobs, with reduced productivity and uncertain gains (Jakobsen et al., 2000).

Furthermore, women are the majority in informality and precarious jobs due to occupational segregation and gender discrimination in the formal labor market (Ulyssea, 2006; Otobe, 2011). Thus, the shock in the formal sectors might not change their poverty probability. It should also be noted that the poverty line used (defined by the *Bolsa Família* Program) is relatively low, and poorer individuals and women are more likely to work in the informal labor market (Ulyssea, 2006). Hence, they may not be directly affected by shocks in the formal sector. To explore this hypothesis, this same model was estimated using the poverty line proposed by Hoffmann (2000), which considers poor the households with an income of less than half a minimum wage per capita. Thus, covering more individuals than the *Bolsa Família* Program poverty line.

The results of this estimation can be seen in Table V. In this table, the columns' definitions are equal to those in Table IV. The estimations without control variables underestimate the effects of the interactions "Negative Shock × Female Head" and "Positive Shock Services × Female Head " and overestimate the effect of the interaction "Positive Shock × Female Head," indicating that the control variables are correlated with these variables. As for the other interactions, the estimation with the control variables did not change their effect on the households' poverty probability.

The hypothesis that a broader poverty line can include more individuals potentially affected by shocks occurring in the formal labor market is confirmed in Table V. In this estimation, the interaction between negative income shock and female headship becomes statistically significant, both for the model without the inclusion of sectoral shocks and for the model with it. The coefficient of "Negative Shock × Female Headship" suggests that households headed by women who suffered a negative income shock three years ago are 1 p.p. more likely to become poor today than female-headed households that have not suffered such a shock and male-headed households. This result is consistent with Del Ninno and Marini (2005), who stated that negative income shocks leave households more vulnerable to poverty. It is also consistent with our hypothesis that negative income shocks leave households headed by women more likely to be poorer than male-headed households in metropolitan Brazil.

Regarding the interactions with sectoral shocks, in this estimation, the only one that proved significant was the interaction between a positive shock in Industry and the female headship. Thus, households headed by women that suffered a positive income shock in the Industry three years ago, a sector that employs men, are 2 p.p. more likely to be poor today than female-headed households that have not suffered such a shock and male-headed households. Similar to the "Negative Shock Services × Female Head" result in the estimation presented in Table IV, people below the poverty line may not work in the Industry (since they do not receive a minimum wage), making so that shocks in the formal labor market do not affect them directly, as suggested by Ulyssea (2006). Then, a rise in industrial employment can affect other individuals living in metropolitan regions, indirectly impacting those below the poverty line and increasing their vulnerability to poverty.

Finally, regarding income shocks, the only ones that proved to be significant in explaining the households' chances of poverty were the general shocks. Hence, households that suffered a

TABLE V

FACTORS ASSOCIATED WITH THE HOUSEHOLDS POVERTY LIKELIHOOD IN THE BRAZILIAN METROPOLITAN REGIONS CONSIDERING THE HALF A MINIMUM WAGE POVERTY LINE, 2011 TO 2015

	(1)	(2)	(3)	(4)
Negative income shock × Female head	0.00^{NS}	0.01***	0.00^{NS}	0.01***
	(0.00)	(0.00)	(0.00)	(0.00)
Positive income shock × Female head	0.02*	0.01^{NS}	0.02*	0.01^{NS}
	(0.01)	(0.01)	(0.01)	(0.01)
Negative income shock in the Industry × Female head			0.00^{NS}	0.00^{NS}
			(0.00)	(0.00)
Positive income shock in the Industry × Female head			0.02***	0.02***
			(0.01)	(0.00)
Negative income shock in the Services sector × Female head			0.00^{NS}	0.00^{NS}
			(0.01)	(0.00)
Positive income shock in the Services sector × Female head			–0.01*	0.00^{NS}
			(0.00)	(0.00)
Female headship	0.07***	0.38***	0.07***	0.38***
	(0.01)	(0.03)	(0.01)	(0.02)
Negative income shock	0.10^{NS}	0.12*	0.10^{NS}	0.12*
	(0.06)	(0.06)	(0.06)	(0.06)
Positive income shock	–0.28	–0.26*	–0.28^{NS}	–0.26*
	(0.17)	(0.14)	(0.17)	(0.14)
Negative income shock in the Industry			0.00^{NS}	0.00^{NS}
			(0.00)	(0.00)
Positive income shock in the Industry			0.00^{NS}	0.00^{NS}
			(0.00)	(0.00)
Negative income shock in the Services sector			0.00^{NS}	0.00^{NS}
			(0.00)	(0.00)
Positive income shock in the Services sector			0.00^{NS}	0.00^{NS}
			(0.00)	(0.00)
Constant	1.20***	1.11***	1.20***	1.11***
	(0.00)	(0.03)	(0.00)	(0.03)
R^2	0.07	0.18	0.07	0.18
Control variables	No	Yes	No	Yes
Fixed effects	Yes	Yes	Yes	Yes

Note: *** p < 0,01, ** p < 0,05, * p < 0,1 and ^{NS} p > 0,1. Standard errors in parentheses. Control variables: household size, presence of children under the age of 5, presence of a spouse, presence of retired and pensioner, if the head of the household has a double working day, their age, years of education, and race. Source: Research results.

negative income shock are 12 p.p more likely to be poor, and households that suffered a positive income shock have a 26 p.p less chance, which is in line with the results found by Del Ninno and Marini (2005) and Haushofer and Shapiro (2013).

In summary, the results of this section showed that the income shocks that occurred three years ago are not significant enough to explain the poverty of female-headed households in metropolitan Brazil. The only exception was the households headed by women that suffered a negative income shock in the Service sector three years ago. In this case, they are less likely to find themselves in poverty. The explanation for this phenomenon is that the poverty variable, defined by the *Bolsa Família* Program, does not cover individuals who work in the formal labor market and would be affected by shocks such as the unemployment rate. When considering a broader poverty line (1/2 minimum wage), two shock variables became significant to explain the poverty chances of households headed by women, as opposed to only one, like in the previous case. Thus, households headed by women who suffered a negative income shock three years ago and a positive income shock in the Industry three years ago are more likely to be vulnerable to poverty. Furthermore, regardless of the occurrence of shocks, female-headed households are significantly more likely to be poor than male-headed households.

5. FINAL REMARKS

The number of female-headed households has increased in Brazil. However, they are still disadvantaged regarding income, support (concerning a spouse's presence), and exposure to shocks. Besides, the country's current unfavorable economic situation raises questions about the response to shocks that alter such households' income. Thus, in this paper, we sought to assess two main issues; If an income shock (general or sectoral, positive or negative) can impact the family structure by changing the chances of female household headship and also if a female-headed household that has suffered such shocks is more likely to be vulnerable.

The identification strategy was based on fluctuations around the average unemployment rate from 2011 to 2015 at the Brazilian metropolitan regions' level as income shocks. A positive income shock is when the unemployment rate is a standard deviation below its historical average, and a negative income shock is when the unemployment rate is a standard deviation above that same average. Additionally, shocks arising from unemployment (or employment) in the Industry and the Service sector were analyzed to consider income shocks that mainly affect men and women.

The main econometric results presented in the paper suggest that negative income shocks, whether general or sectoral, reduce the chances of households becoming headed by women. This probability also reduces with a positive income shock in the Service sector. A positive general income shock, on the other hand, increases the chances of female household headship. These results suggest that, in metropolitan Brazil, reductions in household income act as reducers of female bargaining within households, while income increases do not always lead to a bargaining power growth within the home, which may be related to Brazil's patriarchal inheritance.

As for the households' vulnerability, the results show that female-headed households, even without shocks, are significantly more likely to be poor than male-headed households, indicating an over-representation of these households among the Brazilian metropolitan regions poorest individuals. However, it was also shown that income shocks are not generally relevant to explaining the poverty probability in households headed by women. This outcome is possibly due to the shock from the formal labor market, which does not directly reach those below the poverty line (and possibly outside this market). As female heads and the poorest individuals are more frequent among informal workers, the shock based on the unemployment rate might not affect them directly (but somewhat indirectly through the links between the formal shock and informal activity).

In order to further explore the relationship between income shocks and the poverty probability, a second poverty line was evaluated. In this case, the variable representing households headed by women who suffered a negative income shock became significant, indicating that a broader poverty line can cover more people directly affected by changes in the formal labor market. This result suggests that households headed by women who suffered a negative income shock three years ago are likelier to be below the poverty line than those who did not suffer such a shock or those headed by men.

Given the recurrent income shocks in developing countries, understanding how households behave in these situations is relevant to supporting public policies. Thus, the results found in this paper suggest that actions aimed at women's empowerment and independence and assisting them as heads of households are beneficial in helping these households to deal with macroeconomic shocks since negative changes in household income reduce their bargaining power and positive changes in household income do not increase their power in the same proportion.

Finally, this paper analyzes the metropolitan region level. However, a known Brazilian feature is the heterogeneity in its extensive territory, making it difficult to generalize the results found for the smaller municipalities and rural areas (where women may be worst off)—

representing both a limitation of the paper and an opportunity for future research. Furthermore, we used an objective and unidimensional poverty measure based on income. However, it may be interesting to consider that income shocks also affect the different poverty dimensions.

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