



**The added worker effect in Brazil:  
wife response to the head of household's unemployment (2012 to 2017)**

*O efeito do trabalhador adicional no Brasil:  
Resposta da esposa ao desemprego do chefe da família (2012 até 2017)*

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**Abstract:** When the principal responsible for the household loses his or her job, it is hoped that, in attempting to maintain the level of household income, another member of the family will become part of the workforce; when this occurs, it has an added worker effect. Thus, the objective of this work is to test the hypothesis of the presence of the additional worker effect for the wife when confronting the unemployment of the head of household in Brazil. Therefore, we used continuous Pnad information from 2012 to 2017 and variations in the specifications of models' logit for the wife's transitions into the job market. It was found that the loss of the job of the head of household has a strong effect on the labour supply of the spouse, mainly in the transition from inactivity to unemployment. It was also found that, in addition to the unemployment of the head of household, there are other factors that explain the transitions of the spouse in the labour market, particularly when small children are present in households. These factors indicated that the lower the age of these children is, the lower the likelihood of wives participating in the labour market.

**Keywords:** Added worker effect. Unemployment. Brazil.

**Resumo:** Quando o principal responsável pelo domicílio perde seu emprego, espera-se, na tentativa de manter o nível de rendimento domiciliar, que outro membro da família passe a fazer parte da força de trabalho, então, quando isso ocorre, tem-se o efeito trabalhador adicional. Diante disso, o objetivo deste trabalho é testar a hipótese da presença do efeito de trabalho adicional da mulher cônjuge frente ao desemprego do chefe do domicílio no Brasil. Para tal propósito, utilizaram-se informações da PNAD contínua de 2012 a 2017 e variações de especificações de modelos logit para as transições da mulher cônjuge no mercado de trabalho. Verifica-se que a perda do emprego do chefe da família tem forte efeito sobre a oferta de trabalho do cônjuge, principalmente na transição da inatividade para o desemprego. Constata-se, ainda, que, além do desemprego do chefe do domicílio, existem outros fatores que explicam as transições do cônjuge no mercado de trabalho, principalmente a presença de filhos pequenos nos domicílios, a qual indicou que, quanto menor a idade desses, menor a probabilidade de os cônjuges mulheres participarem do mercado de trabalho.

**Palavras-chave:** Trabalhador adicional. Desemprego. Brasil.

**JEL Classification:** C39; J22; J23.

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## 1 INTRODUCTION

In an economic recession, paid work can be penalized; however, domestic work does not have its productivity affected. Therefore, once a family member loses his job, to maintain the family's utility level, whoever worked in the home can enter the job market. Thus, the previously inactive member becomes part of the economically active population; at this time, we have an additional worker (EHRENBERG; SMITH, 2009). Thus, it can be said that, confronted with a fall in the family utility, the tendency is that there is an increase in the number of family members who become part of the labour market, seeking to maintain the level of family income.

Works that are dedicated to analysing this familiar behaviour are part of the collective rationality models. Chiappori (1988, 1992) stated that family choices should be based on individual preferences, and the information of each member is important in making a family decision. Thus, a member's behaviour affects the behaviour of others. Accordingly, Lundberg (1981) argues that the effects of unemployment on family income and the size of the workforce are basically the result of individual families' decisions regarding the unemployment among their members. Subsequently, works at the international and national levels were used to analyse the effect of the additional worker.

In the international literature, there is a predominance of works that confirm the hypothesis of the added worker as in Lundberg (1981, 1985) and Long (1953, 1958). However, there is evidence contrary to this hypothesis, such as Maloney (1987), Spletzer (1997), and Ortigueira and Siassi (2013). In turn, there are still those authors who analysed the added worker effect and discouragement, such as Filatriau and Reynès (2012). In Brazil, certain studies have obtained favourable evidence for the added worker effect, as in Fernandes and Felício (2002), Oliveira and Jacinto (2010), Oliveira, Rios-Neto and Oliveira (2014), and Silva (2016). However, these works were based on Monthly Employment Survey – PME, from Brazilian Institute of Geography and Statistics – IBGE, which ended in January 2016.

According to IBGE data, after presenting an average growth rate of 4.1% between 2010 and 2013, the Brazilian economy's activity slowed. In 2014, the

economy grew only 0.5% and experienced negative growth of 1.98% in 2017. The effects from the Brazilian economic performance in the labour market were observed by the increase in the unemployment rate, which transitioned to two digits in April of 2015 by achieving the 10.20% mark; it has accelerated since then.

Thus, the slowing in the pace of economic growth in Brazil had significant impacts on the labour market, mainly through an increase in unemployment. Therefore, it is to be expected that, with the loss of the work of one of the family members and the subsequent reduction in the family income level, more family members offer to enter the workforce. In this context, the purpose of this work is to test the hypothesis that the labour supply of the wife complements the labour supply of the head of household via the added worker effect. Specifically, the purpose is to verify the response of the wife's labour supply given the loss of employment of the head of household. To comply with the objective of this work, we used quarterly data of the continuous National Household Sample Survey – continuous PNAD, from Brazilian Institute of Geography and Statistics – IBGE from 2012 to 2017 and estimates of the model's logit, according to the transition of the spouse in the labour market.

Thus, this work contributes to the existing literature on the subject by confirming the hypothesis of the added worker effect for the wife during the recent Brazilian economic crisis, from 2012 to 2017. In this sense, to verify this hypothesis, in this research is considered only household with head and his wife in the database, which corresponds to type of family arrangement with couples.

Therefore, the work is divided into five sections, in addition to this introduction. In the next section, the theoretical and empirical revision of the added work is realized; then, the data source and methodology of this article are presented. A descriptive analysis of the data is subsequently conducted. Thereafter, the results of the methodology are presented and discussed. In the last section, final considerations are provided.

## **2 THEORETICAL AND EMPIRICAL REVIEW**

Since the great depression, the impacts of cyclical fluctuations on the size of the workforce and, consequently, its effect on unemployment, has been garnering

focus, resulting in various approaches. In general, one of the ways to analyze these theories is to consider the additional worker effect. According to Lundberg (1981), the additional worker occurs in families whose employed members lose their jobs. Faced with this, to compensate for the drop in family income, other family members, secondary workers, become part of the workforce.

When analyzing the effect of additional work, it is assumed that a person's decisions in the labor market consider information about the situation of the other in the labor market, which is in line with the idea of collective models. According to Cahuc and Zylberberg (2004), in the collective model, family choices start from individual preferences, thus a utility function is used for each family member. By maximizing the utility function of one of the members subject to the utility function of the others, there is an efficient allocation. Thus, considering the collective models, international and national works were dedicated to analyzing the effect of the additional worker.

Internationally, there are works that have been found to have the added worker effect. According to Long (1958), in the 1930 crisis, it was observed that, when the principal provider was unemployed, other members of the family (those formerly involved in household chores, of school age or retired) would need to enter the workforce and reduce family unemployment. Therefore, during the Depression, Woytinsky (1940) and other economists began to analyse the theory of the added worker, in which case the unemployment of the family head would force many dependents to enter the labour market (Long 1953, 1958). Lundberg (1985) verified that each member's workforce status affects the job search and the participation decisions of the other and, therefore, the probabilities of transitions observed between the states of employment, unemployment, and non-participation. The author found that the increase in the number of unemployed among married men has a short-term effect on the participation and employment of married women. In addition, Woytinsky (1940) determined that a depression and boom can lead to more participation than during a period of economic tranquillity. When there is economic stability, workers who were previously encouraged to enter the labour market return to inactivity.

There are certain works that analyse the added worker effect among the wives. In Japan, Kohara (2008) studied how wives react to the involuntary loss of their husband's work and tested the existence of the complementarity of the wife's labour supply to that of the husband. It was found that, in fact, the wife's supply labour is stimulated by the loss of the husband's employment; some do this by entering the job market, while others do so by increasing the number of hours worked. Other authors also analysed the spouse's response to the husband's transition in the labour market and obtained similar results. In China, Xin (2003) noted that, despite having found a significant increase in the wives' workforce supply, given the loss of employment of their husbands, it was found that the wives do not supply their workforce meaningfully before their receipt of public benefits. The response of her husband's workforce participation to his wife's unemployment was not significant. To Gong (2010), who studied the added worker effect among married women in Australia, it is easier for women who are currently working, increase the number of hours worked given their partner's loss of employment than to leave the inactivity to the occupation. This effect is persistent one year after the loss of employment of the partners. Similarly, Sprague (1988) and Kell and Wright (1990) studied the likelihood that wives would work in response to the loss of their husband's jobs.

Considering the life cycle of supply labour decisions, Heckman and Macurdy (1982) analysed the supply labour of married women from Michigan in a certain environment. The authors found that the supply of these is inversely related to lifelong wealth measures and that the presence of children affects the decision to supply labour lifelong. Analysing the answers of the wives before and after the loss of employment of the husband, Stephen (2002) found only small predisposition effects after offsetting those that were large and persistent. Therefore, the increase in the long-term supply labour is more than 25% of the husband's lost income.

Considering the existence of matrimonial insurance, Cullen and Gruber (2000), using panel data for the United States, made a few notable findings. Confronted with an adverse shock and the consequent unemployment of the husband, the marital workforce supply constitutes a source of insurance that softens the effects on consumption in the absence of insurance provided by a

private financial market. The researchers verified that when there is no type of insurance, husbands and wives tend to work longer hours. In addition, in general, since wives tend to receive less than their husbands, their insertion into the labour market represents only partial insurance against a decrease in family income. Juhn and Potter (2007) analysed whether changes in the work behaviour of married women affected couple's' abilities to compensate for the shocks of each other's labour market. These researchers found that the added worker effect remains important among a subset of couples; however, the overall value of "matrimonial insurance as a risk-sharing agreement decreased due to the greater positive vehicle of employment among couples.

Other authors have verified a weak, or the absence of the, added worker effect. Maloney (1987), studying married women in the United States, found no evidence of the added worker effect among couples because the supply labour of married women was influenced by the permanent and non-transient nature of the unemployment of their spouses; in addition, wives with often unemployed husbands have lower reserve wages. However, in addition to their human capital, these women encounter persistently low wage rates and greater propensities to unemployment in the labour market. Therefore, married women with unemployed spouses are less likely to be employed than married women with employed spouses. Using panel data, Spletzer (1997) found that the effect of the additional worker is a contemporary response to the extent that there is no evidence that a wife joins the workforce before or after the loss of her husband's job. Furthermore, married women with unstable husbands tend to more frequently move into the labour market.

Similarly, Ortigueira and Siassi (2013) concluded that, while the richest use their economies to soften the variations in consumption due to unemployment, the poorer families depend on the husband's labour supply. For example, for families of low wealth, the average hours worked by wives of unemployed husbands is 8% higher than those worked by wives of employed husbands. That response in wives' hours represents 9% of the lost family income. Using longitudinal data for low-income families from Seattle and Denver, Lundberg (1981) found evidence that confirms the hypothesis that the transition from the individual workforce depends

on the unemployment and wages of other family members. The author focuses on the observation that not every transition in the workforce can be explained by the influence of family members. Thus, there may be unobserved individual characteristics that affect the intensity or efficiency of the transition from unemployment to employment that do not explain the fluctuations in downtime to employment.

There are still those authors who have analysed the added worker effect and discouragement. Filatriau and Reynès (2012), in the Organization for Economic Development Cooperation (Organization for Economic Co-operation and Development – OECD) countries, have found that the rate of participation in the workforce in these countries is sensitive to the situation in the labour market regardless of sex and age. The authors also observed that the effect of the despondent worker dominates the added worker effect, although the latter is dominant among women.

Certain authors have studied European countries. Considering the added worker effect in an environment of economic stability, Khitarishvili (2013) analysed 28 countries in transition in Eastern Europe (from a centralized planning economy to a market economy) and found the added worker effect for married women from 45 to 54 years and with no children at home. This effect is the strongest among the middle-income countries in the region. Conversely, among men, there is a negative relationship between the participation of the workforce and household income shocks. The response of the labour supply to a macroeconomic environment in imbalance is negative for men and women, suggesting the presence of a discouragement effect and not of the additional worker effect. Furthermore, the reduction in the participation of the male workforce observed in the 28 countries is the result of discouragement among them; currently, among women, there was an increase in this rate of participation, suggesting that the additional worker effect surpasses the dismay among them.

Bredtmann, Otten and Rulff (2014) found that women from 28 European countries whose husbands become unemployed are more likely to enter the labour market and change from partial work to full work than women whose husbands remain employed. Similarly, using panel data for 11 European countries, Prieto-

Rodríguez and Rodríguez-Gutiérrez (2000) verified that participation in the labour market of married women depends basically on their personal and family characteristics, their non-labour income, and their salaries; only in certain countries does the participation of married women appear to be related to the status of the husband in the job market.

In Brazil, there are also studies on this subject that seek to validate the added worker effect. Fernandes and Felício (2002) found that the loss of the husband's employment has a positive impact on the likelihood that women will increase their participation in the labour market. Already Oliveira and Jacinto (2010) observed that a higher level of schooling by the wife increases their likelihood of participating in the labour market, while the increase in the husband's education reduces the likelihood of participation by the wife. Others such as Schmitt and Ribeiro (2004), also analysed specific regions; they analysed the added worker effect for the metropolitan area of Porto Alegre. The hypothesis of the added worker is valid to describe the behaviour of the married women, being the main determinant of the reduction of the husband's income instead of the loss of employment.

Other authors analysed the added worker effect and the discouragement. Gonzaga and Reis (2005) observed that by incorporating variables related to the discouragement effect in the analysis, the added worker effect ceases to be significant for all workers; it is significant only for those with low remuneration and relative schooling. In contrast, the results of the work of Jacinto and Caetano (2011) in the metropolitan regions of Recife and Salvador suggest that the joint analysis of these effects is not significant; however, separately, only the added labour effect is significant. Gonzaga and Reis (2011), considering all metropolitan regions of Brazil, verified that the wives who experienced the loss of employment by their husbands had a likelihood of participation that was approximately 7.6 percentage points higher than that of wives whose husbands remained employed. The discouragement effect also was proven relevant, influencing the participation decisions of wives whose husbands remained employed. Both the added worker effect and the discouragement effect are higher for workers with lower income.



Other authors have analysed the added worker effect for children in Brazil. Oliveira, Rios-Neto and Oliveira (2014) found a greater positive effect for male heads of households than for women heads, and the transitional variable of the son to the activity did not exhibit statistical significance that would support the existence of the additional worker effect. Silva (2016) analysed the added worker effect on the son and wife and found a significant effect for both groups, particularly for the children. However, the magnitude of this effect is greater for women and for those not in school. The magnitude of the added worker effect is also related to other characteristics of the household members, particularly the income of the head of household and the access to unemployment insurance.

Therefore, according to international and national literature, confronted with the loss of employment of the principal responsible for the livelihood of the family, another family member, who is the secondary member or so-called added worker, will become part of the workforce to maintain the family's consumption pattern. Generally, this effect is stimulated by economic instability, particularly among wives. Thus, this work analyses the added worker effect for Brazil in response to the period of economic crisis.

### **3 DATA AND METHODS**

Quarterly data on the labour market for the regions of Brazil from 2012 to 2017 for this study were obtained from the continuous National Household Sample Survey –continuous PNAD, from Brazilian Institute of Geography and Statistics – IBGE. The continuous PNAD accompanies the quarterly fluctuations and the evolution of the workforce, as well as other relevant information for the study of the country's socioeconomic development. To monitor changes in the labour market indicators, the domiciles are interviewed in a 1-2-5 rotation system; that is, the domicile is interviewed one month and is omitted from the sample in the following two months, in a sequence of five occurrences. Thereafter, the domicile is replaced in the sample.

In the current work, the data were used that considers the sample plan with stratification of the sampling units, conglomeration, and uneven odds of selection in one or more stages and adjustments of the sample weights for calibration with

known population totals<sup>2</sup>. A descriptive analysis of the data is initially realized, with the focus of the analysis on the average characteristics of the households, the spouses, the head of household, and the country<sup>3</sup>. In continuous PNAD, the sampling plan is a conglomerate in two stages of selection with the stratification of the primary sampling units. Each census sector consists of 60 households. Sectors with smaller household numbers are grouped to form a sector with this number of households, respecting the neighborhood, the type and the situation of the sectors. Each of the groups thus formed was a primary sampling unit.

As the goal is to analyse the behaviour of the additional worker, given the variation in the condition in the job market of the head of household, only the families that were in the first interview were retained in the database, which was period  $t-1$ , as were those that were held in the interview in the following period in  $t$ . Thus, initially, the database contained 2,407,861 individuals, after excluding information from persons whose age or year of birth were excluded as well as information from other relatives, pensioners, employees, relatives of employees and persons who live in the residences but do not share the expenses. In addition, information was also taken from the persons classified in the pea but under the age of 14 years, since only individuals greater than 14 years of age are legally part of the pea; finally, individuals aged to 65 years old were considered. Thus, the database was composed of 1,810,051 individuals. After retaining only, the heads of households in period  $t-1$  and excluding domiciles with two spouses or two bosses or those that did not contain couples, as well as those who had changed from the head of household from one period to the other, the group consisted of 238,939 individuals.

According to Greene (2018), the model *logit* corresponds to a probability model for an event  $Y$  occur given the value of one or a set of variables  $\mathbf{x}$ . Considering:

$$P(Y=1 | \mathbf{x}) = F(\mathbf{x}, \boldsymbol{\beta}) \quad (1)$$

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2 For further details of the sample plan, see Korn and Graubard (1990).

3 The head of household corresponds to the variable V2005 equal to 1 and his spouse refers to V2005 equal to 2 or 3, since the spouse is female.

$$P(Y = 0 | \mathbf{x}) = 1 - F(\mathbf{x}, \boldsymbol{\beta})$$

The set of parameters  $\boldsymbol{\beta}$  shows the probability of  $Y$  is equal to a unit given a value of  $\mathbf{x}$ . Considering a linear regression,

$$F(\mathbf{x}, \boldsymbol{\beta}) = \mathbf{x}'\boldsymbol{\beta} \quad (2)$$

When considering  $E[y | \mathbf{x}] = F(\mathbf{x}, \boldsymbol{\beta})$ , we can build the following regression model:

$$\mathbf{y} = E[\mathbf{y} | \mathbf{x}] + (\mathbf{y} - E[\mathbf{y} | \mathbf{x}]) = \mathbf{x}'\boldsymbol{\beta} + \boldsymbol{\varepsilon} \quad (3)$$

In the logit model, we have the logistics distribution:

$$P(Y = 1 | \mathbf{x}) = \frac{e^{\mathbf{x}'\boldsymbol{\beta}}}{1 + e^{\mathbf{x}'\boldsymbol{\beta}}} = \Lambda(\mathbf{x}'\boldsymbol{\beta}) \quad (4)$$

The notation  $\Lambda(\cdot)$  is used to indicate the cumulative function of the logistics distribution; this model is called a model logit. Four variations for specification (5) are estimated:

$$Y_i^m = \ln\left(\frac{P(\text{success})}{1 - P(\text{success})}\right) = \alpha_0 + \boldsymbol{\beta}_1 \mathbf{x}_{1i} + \boldsymbol{\beta}_2 \mathbf{x}_{2i} + \boldsymbol{\beta}_3 \mathbf{x}_{3i} + \boldsymbol{\beta}_4 \mathbf{x}_{4i} + \delta D_i + e_{it}^m \quad (5)$$

The model describes the spouse's answer  $i$  of household in time  $t$  front the change in the situation of the head of household in the labour market. The variations in the estimation of model (5) refer to the different specifications for the variable  $Y$  in a total of 4 ( $m = 4$ ). For  $m = 1$ ,  $\Delta Y$  is equal to a unit if the spouse was out of the job market in  $t-1$  and entered the workforce in  $t$  ( $A_t/I_{t-1}$ ), and zero otherwise. For  $m = 2$ ,  $\Delta Y$  is equal to a unit if the spouse was out of the workforce in  $t-1$  and switched to unemployment in  $t$  ( $I_{t-1}/U_t$ ), and zero otherwise. For  $m = 3$ ,  $\Delta Y$  is equal to a unit if the spouse was out of the workforce in  $t-1$  and entered an occupation in  $t$  ( $I_{t-1}/O_t$ ), and zero otherwise. Finally, for  $m = 4$ ,  $\Delta Y$  is equal to a unit if the spouse was working part-time in  $t-1$  and went on to work full-time in  $t$  ( $PT_{t-1}/FT_t$ ), and zero otherwise.

The variable  $D_i$  is the main variable of interest and refers to a binary variable for the additional worker who has the value of one if the head of household was employed in  $t-1$  and unemployed in  $t$  and equal to 0 if he remained employed. Continuous variables are represented by the vector  $\mathbf{x}_1$ , which includes a variable regarding the country characteristics, variation in GDP, which was obtained in IPEA (2017b); this refers to the calculation of the rate of variation of the GDP series-market prices (ref. 2010) in millions of real.<sup>4</sup> In addition, includes vectors with qualitative variables represented by binary variables, according to their categories: the vector  $\mathbf{x}_2$  with information on the age of the children, which classifies into four categories ( $\text{age} \leq 1$ ;  $1 < \text{Age} \leq 5$ ;  $5 < \text{Age} \leq 10$ ; and  $10 < \text{Age} < 14$ ); the vector  $\mathbf{x}_3$ , which includes a set of variables pertaining to the characteristics of the spouse: age; schooling, classified as low (when the individual has as much as an incomplete elementary education), average (when the individual has complete fundamental to full high school) and high (when the individual has incomplete superior or more); type of occupation, classified as white collar high, white collar low, blue collar high, and blue collar low; and sex, classified as man or woman. The vector  $\mathbf{x}_4$  includes the same set of variables contained in the vector  $\mathbf{x}_3$  but for the head of household.

#### 4 DESCRIPTIVE ANALYSIS

In Table 1, the averages for the household, spouses, heads and country characteristics, spouse, and head of the household both for the total and for the wives can be observed. The general averages were calculated as the total number of spouses. The second column of the table refers to the averages that are obtained only for the spouses who were outside the workforce (inactive) in  $t-1$  and became part of the workforce in  $t$  and finally, for the spouses who have moved from part-time work in  $t-1$  to full-time in  $t$ .

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<sup>4</sup> In four specifications, the variation of GDP will be replaced by quarterly dummies of time.

Table 1 — Average spouse characteristics, Brazil, 2012-2017 – %

Variable	Woman			All Spouses		
	All	I <sub>t-1</sub> →A <sub>t</sub>	PT <sub>t-1</sub> →FT <sub>t</sub>	All	I <sub>t-1</sub> →A <sub>t</sub>	PT <sub>t-1</sub> →FT <sub>t</sub>
Added worker	1.90	2.17	1.91	1.93	2.16	1.91
<b>Household characteristics</b>						
Age of children						
Age ≤ 1	10.67	14.73	8.25	10.21	14.42	8.12
1 <Age ≤ 5	23.05	26.69	23.55	22.48	26.27	23.21
5 <Age ≤ 10	31.25	33.15	35.82	30.79	32.79	35.62
10 <Age < 14	20.01	19.97	23.53	19.92	19.84	23.47
<b>Spouse's characteristics</b>						
Age	38.51	38.73	39.03	38.86	38.98	39.23
Schooling						
Low	38.23	49.14	45.42	38.26	49.35	45.83
Average	45.30	43.54	37.78	45.42	43.31	37.51
High	16.47	7.32	16.80	16.33	7.35	16.66
Type of Occupation						
White collar high	-	-	15.86	-	-	15.73
White collar low	-	-	24.77	-	-	24.59
Blue collar high	-	-	22.02	-	-	22.98
Blue collar low	-	-	37.36	-	-	36.70
Sex						
Woman	-	-	-	87.62	97.41	94.54
Man	-	-	-	12.38	2.59	5.46
<b>Chief's characteristics</b>						
Age	42.13	42.54	42.82	41.83	42.62	42.72
Schooling						
Low	46.08	54.53	55.41	43.59	54.10	54.41
Average	40.71	36.75	34.01	41.38	36.86	34.22
High	13.21	8.72	10.58	15.03	9.05	11.37
Occupation						
White collar high	11.76	8.45	9.99	13.05	8.70	10.60
White collar low	23.65	19.70	19.28	25.93	20.20	20.21
Blue collar high	48.47	50.83	52.30	44.01	49.86	50.34
Blue collar low	16.12	21.02	18.43	17.02	21.23	18.85
Observations	209,35	87,076	29,717	238,9	89,389	31,434

Source: basic information obtained in IBGE (2017).

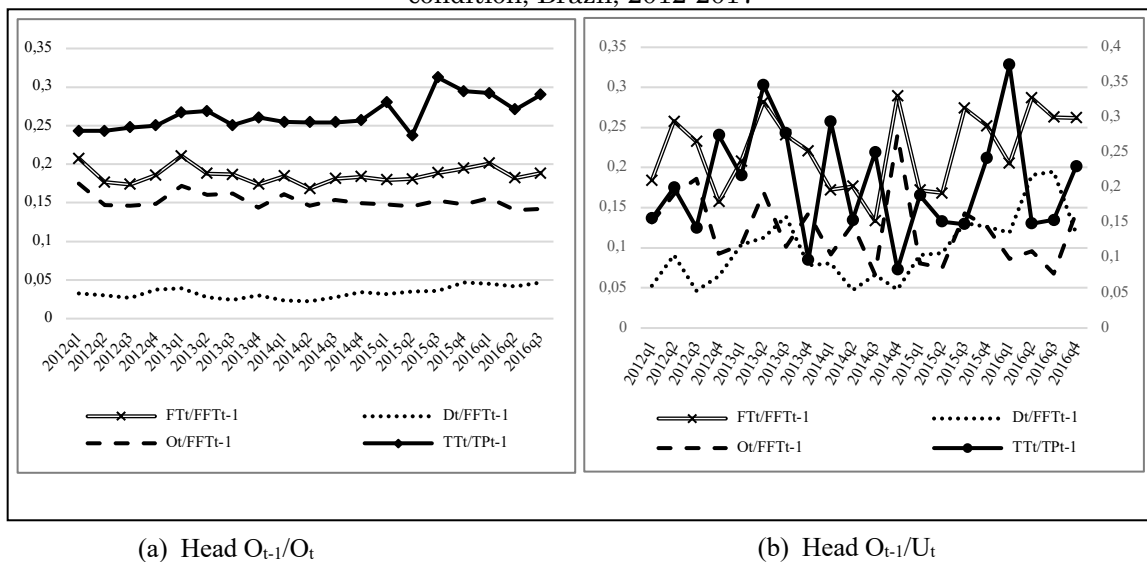
Note: Activity (A); inactivity (I); part-time (PT); full-time (FT),  $t-1$  previous period and  $t$  current period.

The household characteristics show that the highest proportion is of those with children in the age ranges from 1 to 5 years and from 5 to 10 years. Regarding spouse characteristics, they are approximately 39 years old, and a higher proportion of women have average schooling. Per occupancy level, a higher proportion of the spouses are classified as blue collar low. The head of household's characteristics show that he is 42 years old, on average; most have low schooling. Regarding occupation, the highest proportion of bosses is in the blue collar high, which is a higher level than their spouses, considering that most of the head of

household are men; this fact confirms the disadvantage of women in the labour market.

In Figure 1, the behaviour of the spouse in the labour market is observed according to the four specifications defined in the methodology, which were calculated considering that the head was employed in  $t-1$  and remained employed in  $t$  and was employed in  $t-1$  and unemployed in  $t$ . According to Spletzer (1997), married women with husbands in unstable employment generate more instability in the labour market. Thus, it is expected that given the loss of the job of the head of household, the spouse is more likely to enter into labour market.

Figure 1 – The proportion of spouses who transitioned in the labor market in relation to the head condition, Brazil, 2012-2017

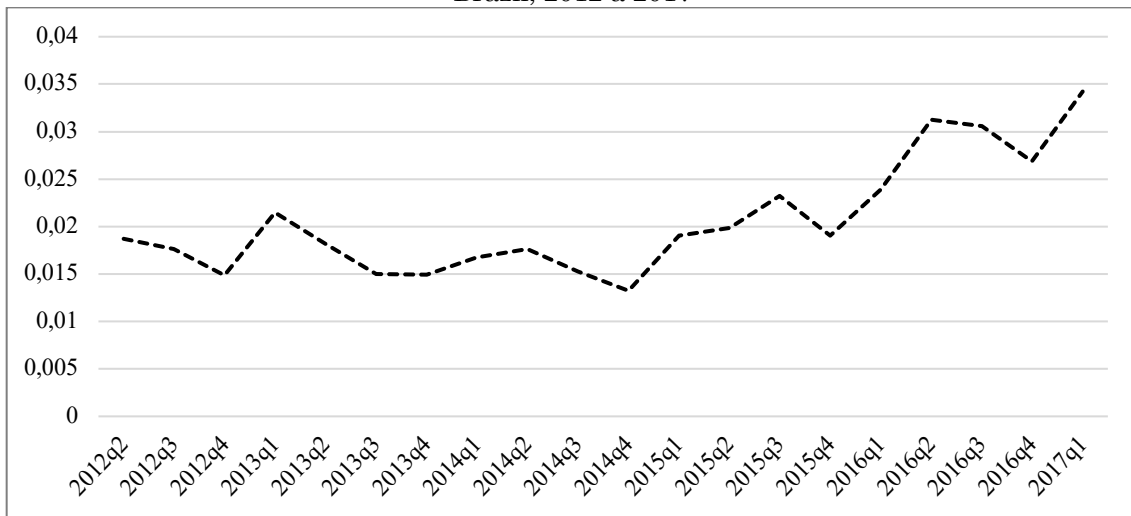


Source: basic information obtained in IBGE (2017a).  
 Note: Activity (A); inactivity (I); Occupation (O); Unemployment (U); part-time (PT); full-time (FT),  $t-1$  previous period;  $t$  current period.

In fact, it is noted that Figure 1a has more stable behaviour than Figure 1b. Thus, when the head of household remains employed in  $t-1$  and in  $t$ , the behaviour of the spouses in relation to the labour market also shows stability over time, in Figure 1a. Conversely, when the head of household goes from employed in  $t-1$  to unemployment in  $t$ , the spouse has more oscillations, in Figure 1b, as suggested by Spletzer (1997). This behaviour makes evident the strong presence of the effect of the additional worker, that is, the greater instability in the behaviour of the wife in the labour market due to the unemployment of the head of household.

Figure 2 shows the behaviour of the head of household in the labour market. It is noted that the proportion of unemployed heads of household showed a growing trajectory, mainly from the third quarter of 2014, with large oscillations justifying the replies of the spouses exposed in Figure 1b, which seek to maintain the level of household consumption.

Figure 2 – Unoccupied head proportions in  $t$  in relation to the total of occupied heads in  $t-1$ , Brazil, 2012 a 2017



Source: basic information obtained in IBGE (2017a).

The anticyclic behaviour of the additional worker can also be verified from the information in Table 2, in which the proportion of the spouses in each specification is indicated when the head of household remained employed in  $t$  and when the chief was laid off in  $t$ , both departing from the assumption that this person was employed in  $t-1$ .

The proportions of the spouses who became part of the workforce in  $t$  is much larger when the heads of families change to the unemployed situation. As previously expected, the variation of the spouses towards the job loss is much higher than towards the employment. Initially, the spouses leave the inactivity condition and begin to seek work; being classified in this period as unemployed causes an increase in unemployment, not because more people lost their jobs but because the number of people willing to work increased.

Table 2 – Proportion of spouses who transitioned in the labor market in relation to the condition head, Brazil, 2012-2017 - (%)

Description	Head	
	$O_{t-1} \rightarrow O_t$	$O_{t-1} \rightarrow U_t$
	$I_{t-1} \rightarrow I_t$	78.27
	$I_{t-1} \rightarrow A_t$	21.73
Spouse	$I_{t-1} \rightarrow U_t$	10.39
Woman	$I_{t-1} \rightarrow O_t$	11.34
	$PT_{t-1} \rightarrow PT_t$	81.16
	$PT_{t-1} \rightarrow FT_t$	18.84

Source: basic information obtained in IBGE (2017a).

Note: Activity (A); inactivity (I); Occupation (O); Unemployment (U); part-time (PT); full-time (FT),  $t-1$  previous period; and  $t$  current period.

In relation to the number of hours worked, the proportion of members who transition from part-time to full-time work decreases with the unemployment of the head of household. This result was previously expected because there is likely to be economic instability that makes the head unable to maintain his job while, at the same time, reducing the likelihood that the spouse will increase her work journey.

## 5 EVIDENCE OF THE EFFECT OF THE ADDITIONAL WORKER

The results for the four model specifications logit for wives are provided in Table 3. Seeking the effects of the economic cycle on the spouses supplying labour, each specification of the models was estimated. However, this was done according to two variations, one including the GDP information as the explanatory variable and the other using binary for the quarters.

The main variable of interest, the added worker dummy, indicated that, when the head of household transitions from an occupation to unemployment, there is an increase of approximately 38% in the likelihood of the wife exiting inactivity for activity in the labour market. Targeting the insertion of the spouses into the labour market in inactivity and occupation, it was also found that the loss of the husband's employment increases the likelihood of them participating in the labour market, as their unemployment increases by more than 200%. Conversely, the spouses' likelihood to enter an occupation was not statistically significant. In contrast, the unemployment of the head of household decreases the partial working time transition by 24%. This result is similar to that found by Bredtmann, Otten



and Rulff (2014) for wives. In their study was verified an increase in job offers mainly by changing the condition of inactivity to unemployment.

Table 3 – Pooled Regressions of the logit estimations for wife – odds ratio, Brazil, 2012-2017

Variables	$I_{t-1} \rightarrow A_t$		$I_{t-1} \rightarrow U_t$		$I_{t-1} \rightarrow O_t$		$PT_{t-1} \rightarrow FT_t$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Added worker	1.382*** (4.211)	1.379*** (4.182)	3.237*** (10.62)	3.166*** (10.42)	0.883 (-1.249)	0.887 (-1.203)	0.760* (-1.911)	0.759* (-1.920)
<b>Household charac.</b>								
Age of children								
Age ≤ 1	0.587*** (-14.15)	0.588*** (-14.12)	0.469*** (-9.657)	0.474*** (-9.527)	0.631*** (-11.03)	0.631*** (-11.04)	0.850** (-2.147)	0.848** (-2.175)
1 < Age ≤ 5	0.802*** (-8.385)	0.801*** (-8.396)	0.732*** (-6.099)	0.728*** (-6.221)	0.828*** (-6.420)	0.828*** (-6.419)	0.886*** (-2.752)	0.883*** (-2.840)
5 < Age ≤ 10	0.992 (-0.372)	0.991 (-0.417)	0.974 (-0.617)	0.974 (-0.630)	1.008 (0.368)	1.007 (0.311)	0.992 (-0.224)	0.990 (-0.296)
10 < Age < 14	1.116*** (4.227)	1.116*** (4.231)	0.989 (-0.176)	0.990 (-0.162)	1.165*** (5.481)	1.164*** (5.460)	1.062 (1.504)	1.064 (1.570)
<b>Spouse's charac.</b>								
Age	0.980*** (-9.767)	0.980*** (-9.811)	0.964*** (-7.282)	0.964*** (-7.286)	0.984*** (-7.133)	0.984*** (-7.195)	0.997 (-0.789)	0.997 (-0.847)
Schooling								
Average	1.160*** (5.067)	1.158*** (5.021)	1.793*** (9.088)	1.786*** (9.024)	1.051 (1.523)	1.050 (1.507)	1.116** (2.177)	1.116** (2.180)
High	1.612*** (7.821)	1.606*** (7.771)	3.095*** (10.58)	3.103*** (10.65)	1.346*** (4.229)	1.340*** (4.186)	1.058 (0.693)	1.060 (0.711)
Occupation								
White collar high	-	-	-	-	-	-	1.377*** (4.184)	1.377*** (4.203)
White collar low	-	-	-	-	-	-	1.430*** (6.925)	1.431*** (6.968)
Blue collar high	-	-	-	-	-	-	1.241*** (3.917)	1.240*** (3.908)
<b>Head's charac.</b>								
Age	0.994*** (-2.817)	0.994*** (-2.830)	0.979*** (-4.174)	0.978*** (-4.322)	0.998 (-0.681)	0.999 (-0.630)	1.001 (0.211)	1.001 (0.193)
Schooling								
Average	0.898*** (-3.458)	0.899*** (-3.427)	1.140** (2.132)	1.139** (2.121)	0.845*** (-4.876)	0.846*** (-4.850)	1.099** (1.979)	1.100** (1.996)
High	0.694*** (-5.971)	0.694*** (-5.969)	0.977 (-0.201)	0.966 (-0.296)	0.629*** (-6.630)	0.631*** (-6.589)	1.101 (1.183)	1.103 (1.211)
Occupation								
White collar high	0.862**	0.862**	0.775**	0.783**	0.903	0.901	1.134	1.133

	(-2.359)	(-2.353)	(-2.048)	(-1.965)	(-1.467)	(-1.502)	(1.429)	(1.421)
White collar low	1.056	1.056	1.169*	1.176*	1.028	1.026	1.180**	1.181**
	(1.318)	(1.312)	(1.871)	(1.942)	(0.606)	(0.573)	(2.477)	(2.497)
Blue collar high	0.997	0.997	1.086	1.088	0.974	0.974	1.065	1.066
	(-0.108)	(-0.106)	(1.159)	(1.189)	(-0.742)	(-0.749)	(1.110)	(1.124)
<b>Country charac.</b>								
Variation of GDP <sub>t-1</sub>	0.993	-	0.944***	-	1.008	-	0.982***	-
	(-1.498)		(-7.044)		(1.608)		(-2.820)	
Time binary	No	Yes	No	Yes	No	Yes	No	Yes
Constant	1.269	1.490	0.550	0.964	0.713	0.724	0.0939***	0.107***
	(0.489)	(0.800)	(-0.899)	(-0.0535)	(-0.596)	(-0.559)	(-4.042)	(-3.792)
Observations	87,076	87,076	74,168	74,168	84,047	84,047	29,717	29,717

Source: basic information obtained in IBGE (2017a).

Notes

\*\*\* $p < 0.01$ ; \*\* $p < 0.05$ ; \* $p < 0.1$  – Robust standard errors in parentheses

Activity (A); inactivity (I); Occupation (O); Unemployment (U); part-time (PT); full-time (FT),  $t-1$  previous period;  $e$   $t$  current period.

This finding can be explained by the behaviour of the labour market, which continued to experience the effects of the economic and political crisis, with high values for unemployment. Generally, the head of household loses his job due to a poorly performing economy, causing an increase in unemployment. Prior to this scenario, it is to be expected that the wife will enter the market but in the unemployed condition, as she will not immediately obtain a job.

The behaviour of the spouse given the age group of the children indicates that, in general, the likelihood of this exiting the home for work, occupation or unemployment, as well as leaving part-time work for full time, increases with the increase in the age of the son. This result was previously expected because when the children are smaller, the spouses tend to stay at home taking care of them, particularly until they reach the school age. In general, there are those women who only reduce the hours worked while the children are smaller and then return to work full-time when they are older and others who choose to withdraw from the market, remaining inactive only while the children are very small.

Based on the spouse characteristics, it is observed that, on average, the likelihood of them exiting downtime for activity in any of the positions (occupied or unoccupied) decreases with the increase in their age. With the most advanced age, the tendency is that these spouses are retiring, which justifies the smallest insertion into the labour market with the increase of the age. Currently, these likelihoods of moving to disoccupation increase with the increase of the education level, which is

higher when the spouse has comparatively low average schooling. Conversely, the likelihoods of an increase in the number of hours worked decrease with the increase in the level of education.

Since the outcome of the regression refers to information in  $t-1$ , the period in which they consider only the spouses in the inactivity, the first three estimates do not present the information regarding their type of occupation. However, this information is presented when the spouse was working part-time in  $t-1$ , and it is observed that, in comparison to the category blue collar low, all other categories present a greater likelihood of passing part-time to the working integral, and the likelihoods are greater when they are in occupations of the type white collar low.

In relation to the chief's characteristics, the opportunity for the spouse to participate in the workforce in any position decreases with the increase in age. Based on the schooling information, the higher the level of schooling is, the lower the likelihood of the spouse leaving the inactivity in  $t-1$  for activity in  $t$ . This likelihood is reduced further when one considers only the possibility of the transition to the occupation. Currently, the likelihood of transition from the spouse to eviction increases more when the head of household has average schooling than when he has low schooling. According to the type of occupation, the likelihood of the spouse to participate in the workforce or increase the number of hours worked increases more when the head of household has a white collar occupation than a blue collar occupation.

In contrast, the economic environment represented by the variations of GDP reduces the likelihoods of the spouse leaving the downtime for the unemployment or increasing the number of hours worked. When the economy is growing, the likelihood of hiring those who are interested in working is very large, which justifies that, with increased GDP, the likelihood of the spouses becoming unemployed decreases. Therefore, the impact on employment is positive and unemployment is negative as expected. In this period, as previously emphasized, the Brazilian economy was in a recessive phase.

To verify the effects of the economic cycles on the behaviour of the spouses, Figure 3 exposes the effects of those controlled by the other variables inserted in the model for the 2012 to 2017 period; it is noteworthy that this information refers to

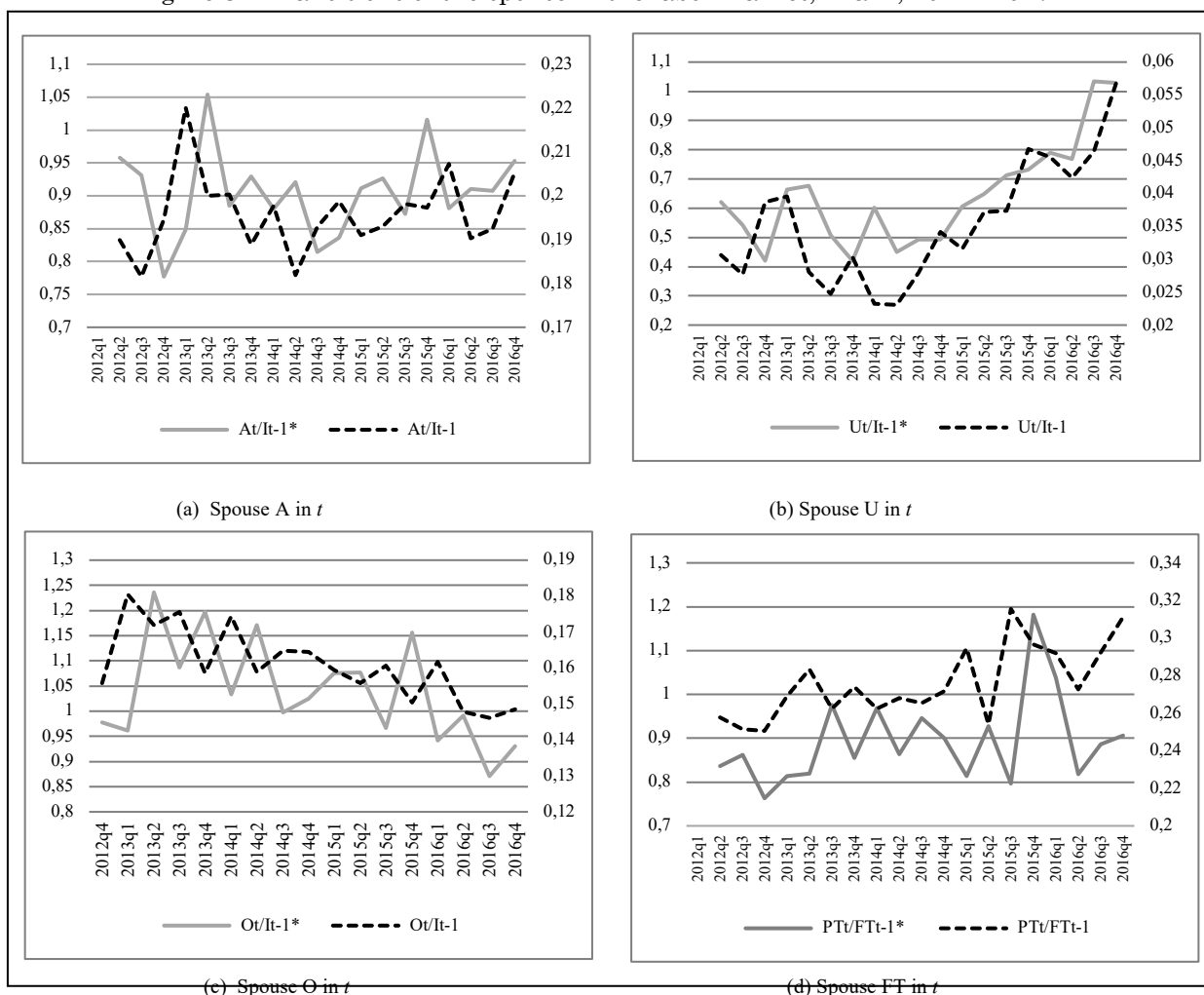
the value of the estimates of the parameters associated with the quarterly dummies. Thus, according to what is expected, the effect of the economic cycle of this period on the supply labour of the spouse increases their likelihood to participate in the workforce when unemployed but reduces their likelihood of finding a job.

It can be verified that the effect of the economic cycle is the one that most influences the movements of the spouses as regards the labour market, since being controlled by other variables the tendencies of these transitions remained. Thus, it can be said that, despite the characteristics of the spouses, the heads of households and the home itself influence the decision to offer work by the spouses and are the movements of the economy that dictate, in greater weight, the fluctuations in the supply of work such as this. This can be confirmed by the GDP information in the result of the regression, which indicated that when the GDP is growing, the spouses increase the likelihoods of leaving the downtime for the activity, particularly in the occupation situation.

This result goes to meet those presented by Woytinsky (1940), who stated that, in periods of depression and boom in economic activity, the participation of the spouses in the labour market tends to be larger. Therefore, since the spouses are in the labour market for incentives, it is to be expected that some or all will exit when the incentives cease.

It should be noted that the added worker effect among the couples was significant since, in the Brazilian economy, the loss of the husband's work was transient; this can be observed by the low pace of economic growth in recent years and by the information contained in Figure 3. This finding is supported by Maloney (1987), who did not find the effect of the additional worker for married women in the United States because their husbands' unemployment was transient, and the job offer of the wives are influenced by the permanent and non-transient nature of her husband's unemployment.

Figure 3 – Transitions of the spouse in the labor market, Brazil, 2012 - 2017



Source: basic information obtained in IBGE (2017a).

Note 1: Activity (A); inactivity (I); Occupation (O); Unemployment (U); part-time (PT); full-time (FT),  $t-1$  previous period;  $t$  current period.

Note 2: \*estimated values controlled by the other variables inserted in the model.

It can be extremely frequently noted that the wife spouse's decisions in the labour market depend on many more factors than the loss of work by her husband, although this is an important factor. According to Prieto-Rodríguez and Rodríguez-Gutiérrez (2000), married women's participation in the labour market essentially depends on their personal and family characteristics, their non-labour income and their salaries. Only in certain countries does the participation of married women appear to be related to the husband's unemployment.

Moreover, the justification for the added worker effect reduces the likelihood of the increase in the number of hours worked, and the entry of the spouse into the labour market may be related to the receipt of a benefit caused by the

unemployment of the head of household. According to Cullen and Gruber (2000), the effect of the additional worker tends to occur more in the absence of a private financial market to ensure unemployment. Corroborating these results, Xin (2003) found that, when unemployed husbands receive a public benefit, the wives do not offer to enter the workforce in a meaningful manner. Silva (2016) concludes by stating that the magnitude of the added worker effect, in addition to being related to the loss of employment by the husband, depends on other characteristics of the members of the household, particularly the income of the head of household and access to unemployment insurance.

Thus, the presence of the added worker effects for the spouses in Brazil was evident from 2012 to 2017. The economic environment has made this effect clearer since; with the economy growing, the head of household does not find it difficult to maintain his or her employment and subsequent household income pattern. However, when the economic growth phase of the economy halts, the head of household can encounter difficulties in maintaining his or her job, stimulating the entry of another family member into the market, notably in the unemployed condition.

## **6 FINAL CONSIDERATIONS**

The purpose of this work was to verify the spouse's added worker effect in response to the loss of work of the head of household. Initially, it was possible to verify the instability of the spouse's behaviour in the labour market before the unemployment of the head of household. Thus, it can be stated that the spouse, to maintain the level of household income, becomes part of the labour market.

In the specifications of the econometric models, it was found that the loss of the head of household's job has a strong effect on the job offer of his wife. The main variable of interest, the binary variable for added worker, showed a statistically significant effect. Thus, when the head of household is laid off, there is an increase in the likelihood of the spouse moving from inactivity to activity in the labour market, mainly to an unemployed position. Since the chief lost his job, with the increase in unemployment in the economy, it is to be expected that the spouse enters the market but in an unemployment condition.

In contrast, when the spouse exchanges part-time for full-time work, it is observed that the unemployment of the head of household is significant in explaining this variation of the spouse's work day, reducing the likelihood of this occurring. Since, the spouse as well as the head of household are also offering their strength in the labour market, their productivity is also affected. Thus, if the head of household has difficulty in remaining in the labour market, the spouse will also have difficulty.

In relation to the other variables included in the specifications, the behaviour of the transition of the wife in the labour market reflected certain cultural aspects in which society believes the woman is created to care for the home and the man to ensure his livelihood. It was found that the likelihood of the spouse entering the job market decreases when the family has children, which increases the responsibilities for at-home care and postpones entry into the labour market. When one considers the presence of children in households by their age level, the participation of the spouse in the labour market increases with the age of the children; this also aligns with the need to share expenses with the head of household. Thus, although there is an additional worker's effect, men's participation in the labour market tends to be greater than that of women.

Thus, the added worker effect of the spouses was observed, given the loss of the husbands' work in Brazil from 2012 to 2017. This effect has contributed to the maintenance of the household consumption pattern in times of a reduction in the income of the principal responsible for the family and for the increase of female participation in the labour market. However, it is noteworthy that this insertion continued to occur throughout the unemployment, highlighting the negative effects of the economic crisis, which has been intensifying since 2014, on the labour market.

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