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Has the minimum wage policy been important for reducing poverty in Brazil? A decomposition analysis for the period from 2002 to 2013☆

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Abstract

This study aims to analyze the contribution of the minimum wage valorization policy to the reduction in poverty that occurred in the first decade of the 21st century in Brazil, considering not only the incidence of poverty but also its intensity and severity. A decomposition methodology was used to isolate the marginal contribution of the minimum wage in the observed changes, taking into account the roles of setting the values of basic pension and social assistance benefits (the Benefício de Prestação Continuada or BPC) in addition to setting the wage floor. Between 2002 and 2013, the minimum wage contributed to a 38.2% reduction in the proportion of impoverished people, a 39.4% reduction in the intensity of poverty and 40.6% decrease in the severity of poverty. Our results also reveal geographic differences, with the minimum wage being more important in the poorest regions.

JEL classifications: H53; H55; I32; J31

Keywords: Minimum wage; Poverty; Decomposition; Social security

1. Introduction

The first decade of the twenty-first century featured undeniable social progress in Brazil. The following two indicators summarize most of the achievements: the incidence of absolute poverty in the population and the inequality in the distribution of the per capita household income. Poverty, which affected approximately 38% of the population in 2002, fell to just below 16% in 2013, and inequality, in which the country is infamously ranked as having one of the highest levels worldwide, decreased at a respectable rate, even by international standards, from a Gini of 0.59 to 0.52.

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Some studies have documented the relative influence that the economic growth experienced in the period and the redistributive policies had on poverty reduction (Lustig et al., 2013; Pero and Cruz, 2015), and many others have addressed the factors impacting inequality, comparing the relative weights of progress in the labor market and advances in other income, such as income transfer programs and other social benefits (Soares et al., 2007; Hoffmann and Ney, 2008; Soares, 2011).

Among the redistributive policies, income transfer programs and their impacts on poverty and inequality have aroused special interest, but one specific policy—minimum wage (MW) valorization, which was implemented following the stabilization plan known as the Real Plan—has been highlighted less often. Although many studies estimate the impact of the MW on the reduction in wage inequality (Firpo and Reis, 2007; Menezes-Filho and Rodrigues, 2009; Neder and Ribeiro, 2010; Komatsu, 2013; Ferreira et al., 2014; Machado et al., 2016) and, therefore, shelter the MW policy in the classic repertoire of labor market regulation policies, few have risked appropriating it as a redistributive policy in a broader sense. That would be natural, given that in Brazil, as in some other countries, the MW is a social indexer for setting the floor of constitutionally guaranteed social benefits, in addition to the wage floor. The gap is particularly important because the MW appreciated by 112.2% between 1995 and 2013 (72.3% between 2002 and 2013).

Recently, a decomposition study documented the contribution of the MW valorization to the decrease in household income inequality in Brazil; the results showed that the total contribution—via variation in the MW value and share of MW recipients, either as labor income, retirement income, or social assistance—on the income distribution surpassed the sum total of the other income sources in accounting for the decline in income inequality that occurred in the country between 1995 and 2014 (BRITO et al., 2017).[1] Special attention was given to the coexistence of real adjustments in the MW with increased employment—particularly formal employment. The increase in formal employment, in turn, reflected, in addition to the creation of new formal jobs, the migration of workers from informality to formality, with an emphasis on hires via official employment record books (Corseuil and Foguel, 2016).

To the extent that recipients of the MW, either as wages, pensions, or social assistance, are concentrated in households with per capita income levels below the median income level, investigations into whether the MW has significant impact on poverty are warranted. This would satisfy the "guaranteed minimum income" function conferred on the MW by the 1988 Brazilian Constitution. This is the purpose that drives this study.

Therefore, to estimate the contribution of the MW valorization policy on poverty reduction in Brazil, we applied a decomposition methodology to the data of the National Household Sample Survey (Pesquisa Nacional por Amostra de Domicílios, or PNAD) from 2002, 2009, and 2013. The decline in poverty was computed not only as a decrease in the proportion of poor people in the population (incidence of poverty) but also as a reduction in the poverty level among those who remained poor (intensity of poverty) and in the marginalization of the poorest of the poor (severity of poverty). The decomposition is used to display the relative weight of different household income components in the variation of these three measures of poverty from 2002 and 2013.

Our results suggest that the MW had a significant and relevant contribution to the changes in all the measures considered.

Surprisingly, the MW contributed to reducing the intensity and the severity of poverty even more than it reduced the proportion of poor people, thus revealing its importance in very poor households. Investigating the channels through which these effects are produced, we found that the labor market greatly surpassed the social security and assistance channels, which indicates a greater fraction of working recipients, compared to retirees and those receiving assistance, in poor households in the country. The income component that includes social programs nominally aimed at poverty alleviation (e.g., the Bolsa Família Program, PBF) proved important in reducing the intensity and severity of poverty but was less important in reducing the proportion of poor people; the likely explanation is the low value of the benefits, which are usually insufficient to raise the beneficiaries above the poverty line.

Despite these important results, which illuminate the diverse contribution of various income sources through varying channels to the decrease in Brazilian poverty, we must warn that, as with any other study, there are limits to the methodology utilized in this article, which we will discuss in Section 3. The most important limitation is that the applied methodology does not allow us to ascertain causal relations; it only computes the association between factors and observed measures. Nonetheless, we believe that the information that we organized with the help of the decomposition should be able to stimulate further investigation, with complementary methods, into the underlying causes.

[1] The total effect reached 64% during this period.

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The remainder of this article is subdivided into the following sections: the second section summarizes the relevant literature; the third section introduces the methodology; the fourth section presents the descriptive statistics; and the fifth and sixth sections provide the results and final considerations, respectively.

2. Literature review

The empirical literature regarding the relationship between the MW and poverty gained some momentum in Brazil with the Real Plan and the long process of MW valorization that followed, starting in 1995. Internationally, the theme had been at the center of the American public debate for various decades throughout the twentieth century. It was famously opposed by institutionalists and neoclassical economists, who were influenced by studies from the Chicago school, which expanded the postulates of the perfect competition model to the then-so-called labor market (Kaufman, 2010). For decades, it is fair to say, the debate was mainly theoretical. However, starting in the 1990s, a change in the MW policy in the USA gave rise to a wave of essentially empirical work, reenergizing the debate. The target was the hypothesis that MW readjustments would increase poverty by triggering indirect effects on employment (unemployment or informality and the consequent lowering of wages in the informal sector). Empirical studies, such as those of Card and Krueger (1994, 1995), revealed that this phenomenon had not happened in US states that had adopted the new federal MW, and, on the contrary, a small increase in (formal) employment had been observed. These results stimulated the emergence of new theoretical models and successive waves of empirical studies in a long controversy. Presently, scholars have been unable to establish a more precise result than this: with modest annual variations in value, the employment elasticity of the MW is, when negative, of negligible value (see Belman and Wolfson, 2014 for a thorough review of the empirical literature; see Saget, 2001 for the theoretical literature).

The studies of the US were replicated in developed countries (notably France and England from 1999 onward and in Germany from 2015 onward) and less-developed countries (Colombia, Argentina, Mexico, and Uruguay, among others) with equivalent results. For developing countries, Lustig and Mcleod (1995) found a significant and relevant negative correlation between the MW and poverty in a sample of 30 countries over 25 years (an elasticity of 0.85), which reinforced the findings of the so-called "New Economy of the MW", pioneered by the works of Card and Krueger (1994, 1995). Additionally, the country-level study by Saget (2001), investigating these effects for selected developing countries over the 1990s, found a similar association, with no significant employment effects. Other studies include Alaniz et al. (2011), for Nicaragua, with similar results for the period from 1998 to 2006. Gindling (2014) provides a synthetic review of the empirical literature, which mostly converges on the negative association between MW and poverty.

For Brazil, most microlevel studies, such as those of Ramos and Reis (1995) and Foguel et al. (2000), also documented the negative impacts of the MW on the incidence of poverty in Brazil. Given the significance of informal labor, which is typical of less-developed labor markets, the study of Neri et al. (2001) stood out. When estimating the important absolute and relative effect (compared with other factors, such as gross domestic product—hereafter GDP—growth or reduction in unemployment) that the MW has on poverty in Brazil, the authors highlighted the high percentage of informal workers who receive exactly the MW, in addition to the use of the MW as numeraire in the formal sector. In reality, most of the poverty reduction effects documented in this study would have come from informal employment—the famous "lighthouse effect" (in accordance with the terminology of Souza and Baltar, 1982).

However, subsequent studies have confirmed the positive role that the MW has had in the country's poverty reduction with reservations. For example, Barros et al. (2001) found total positive effects in a simulation involving an increase in the MW—with data from the PNAD of 1995—when social security benefits were incorporated, but negative effects—even though small—when the analysis was limited to the labor market. This slightly unfavorable result appears to be due to the computable general equilibrium analysis used, which takes into account the theoretically expected indirect effects, especially on unemployment and informality. Subsequently, in a return to the topic, Barros et al. (2006a) studied the effectiveness of the MW compared to other poverty reduction instruments, such as the PBF. Whereas their simulations of increases in the MW with PNAD data from 2004 continue to document the favorable impacts that the MW has on poverty reduction, the comparison with the PBF suggests that the latter is a more cost-effective intervention, i.e., with lower expenditure, the PBF would be able to rival the effectiveness of the MW. In this analysis, the focus is on reducing income shortfalls (the number of resources needed to bring all of the poor up to the poverty line) rather than the contraction of the proportion of poor people (the percentage of people living below the poverty line). Finally, when gauging the effect of the MW on poverty and extreme poverty reduction through two

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econometric models that find significant negative coefficients, especially for retirement pensions and other pensions but also for income from labor, Afonso et al. (2011) observed that the variations in the mean effects between 1995 and 2007 do not seem to accompany the real gain of the MW in the period, thus suggesting an "exhaustion of the effects".

Another area of empirical contestation is whether the minimum wage is effective to reduce poverty not only in terms of the proportion of the population that is affected but also in terms of the income gap between the poor and the poverty line, or, still, the income situation of the poorest among the poor. Some studies suggest that although there may be effects on poverty incidence, these may be accompanied by increases in the poverty gap, as minimum wage recipients typically do not dwell in very poor households. Neumark et al. (2004), for example, found that the MW may have had adverse effects on lower income families in Brazil in the 1996–2001 period, as their estimates show that it did not raise the incomes of families in the bottom three deciles of the household income distribution, thus increasing the poverty gap.[2]

Our work discusses—and adds to—the literature in the following ways. First, we extend the analysis to the 2002–2013 period to coincide with an important moment of poverty reduction— a variation of 18 percentage points—and valorization of the MW in the country—a real variation of 72.3%. Although Cacciamali et al. (2015) had already provided some probability estimates for the period 2002–2012, which corroborated the positive effects of the MW on the decline of poverty, our research uses a detailed decomposition methodology and, in addition, attempts to gauge the decrease in poverty in three different measures (proportion, intensity and severity of poverty), with a regional focus. This enables us to test the hypothesis that increases in the MW positively affect only those better off among the poor, raised in Neumark et al. (2004). Moreover, our study sets out to check the hypothesis of the exhaustion of the effects that was foreseen by Afonso et al. (2011); to observe the most important transmission channels in the period, whether social assistance, social insurance, or the labor market (Barros et al., 2001's study found it to be the social insurance); and to approximately compare its relative importance with that of social programs especially designed for poverty alleviation, such as the Bolsa Familia Program.

3. Methodology

3.1. Poverty measures

In this article, we chose to use the poverty measures from the Foster-Greer-Thorbecke (FGT) family (1984), whose construction permits the following three variations: (a) an alpha equal to zero for incidence of poverty; (b) an alpha equal to 1 for intensity of poverty; and (c) an alpha equal to 2 for severity of poverty:

$$FGT_\alpha = \frac{1}{N}\sum_{i=1}^{N}\left(\frac{G_i}{z}\right)^{\alpha}, \quad \text{with}\, \alpha \geq 0$$

in which $G_i = (z - y_i)\ x\ I\,(y_i \leq z)$ is the income gap for poor individuals, z is the poverty line, y_i is the income of individual i, and I (.) is a function that indicates whether the individual is poor, i.e., whether their income is less than or equal to the poverty line.

The interpretation of each of the three measures is as follows. The incidence of poverty (headcount index) measures the proportion of poor people in the population based on a comparison of the income of each individual y_i with a poverty line z. If the individual's income is equal to or below the poverty line, the indicator function I (.) receives a value of 1; otherwise, a value of 0 is assigned.

$$FGT_0 = \frac{1}{N}\sum_{i=1}^{N} I\,(y_i \leq z)$$

Although simple to construct and easy to understand, this measure has the drawback of disregarding the intensity of poverty, that is, how distant poor individuals are from the poverty line. Additionally, it does not change if the individuals at or below the poverty line become even poorer. On the other hand, our second measure—the intensity of

[2] In Colombia, workers receiving the minimum wage were mostly located in the middle of the income distribution, according to Arango and Pachón (2004).

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poverty (poverty gap index)—takes into account not only the incidence but also the distance or gap. Thus, it increases as individuals, on average, move below the poverty line. The intensity is expressed as a percentage of the poverty line.

$$FGT_1 = \frac{1}{N}\sum_{i=1}^{N}\frac{G_i}{z}$$

Finally, the third measure—the severity of poverty (squared poverty gap index)—takes into account the inequality among the poor, not just the average gap. It is a weighted sum of the poverty gaps (as a proportion of the poverty line), in which the weights are proportional to the gaps themselves, that is, the greater the gap, the greater its weight.

$$FGT_2 = \frac{1}{N}\sum_{i=1}^{N}\left(\frac{G_i}{z}\right)^2$$

The use of these three measures will enable a better understanding of the possible impacts of the MW, in which we are interested in capturing not only the effect on the percentage of poor people but also on the intensity of poverty and its marginalization of the poorest.

3.2. Data[3]

We will use the microdata from the PNAD of the Brazilian Institute of Geography and Statistics (IBGE) for the years 2002, 2009, and 2013. The period as a whole coincides with the longest period of poverty reduction in Brazil since the MW valorization policy began.[4] This period was subdivided into two periods to capture possible differences in the effects between distinct governments, namely, the government of Luís Inácio Lula da Silva (Lula government) from 2002 to 2009 and the government of Dilma Rousseff (Dilma government) from 2009 to 2013.[5] Although the PNADs for 2014 and 2015 are available, the analysis ends in 2013, owing to the option of using the regional poverty lines calculated by the Institute of Applied Economic Research (IPEA), whose last available year is 2013 (see current values in the Appendix A).[6] This line seemed to us to be more appropriate because it is based on household consumption and reflects the country's regional heterogeneity. Therefore, it allows us to avoid referring to poverty either by the criteria of income programs, such as the PBF, or by fractions of the MW, which would bias our results in favor of one policy or the other (PBF or MW).

The focus of our analysis is per capita household income. Only households with monthly household income information were considered; that is, households in which the household income was ïgnoredäre excluded. The "ignored" value occurs when, in a household, at least one source of income of any resident is unanswered or does not pass the IBGE's data review.[7] Our sample for each year was, on average, 109,036 households.[8]

[3] This subsection, in addition to Subsections 3.3 and 3.4, reproduces or adapts parts of Brito (2015), whose methodology was used to estimate the effects of the MW on income inequality.

[4] We performed exercises for the period of 1995–2002 (governments of President Fernando Henrique Cardoso); however, poverty remained practically unchanged during the period. The incidence of poverty, for example, changed from 37.9% in 1995 to 37.6% in 2002. The results can be obtained from the authors.

[5] This time partition was adopted mainly for reasons of convenience, as the same rule of adjustment of the MW had been in place from 2006 to 2013. Specifically, we partitioned the time in this way for the following two basic reasons: equal time spans enabled us to track the *pace* of the contribution of the MW to the observed changes in poverty and times spans coinciding with governments have roughly homogeneous economic and social policy regimes.

[6] This poverty line was estimated using a methodology developed by the IBGE-IPEA-CEPAL commission based on regional basic food baskets that satisfied the previously defined nutritional requirements. In 1996, CEPAL conducted research on the nutritional content of Brazilian foods and the nutritional requirements of the population, based on the Survey of Family Budgets (POF) of 1987/88 and the aggregated prices of the foods of the SNIPC. For details of the methodology, see Revisada).pdf. While the use of regional lines is
appropriate, we recognize the limitation of not having access to estimates based on more recent household budgets, which may have changed during the period. Still, in real terms (see the Appendix A), ssour poverty lines seem less discrepant than the one used by the Bolsa Familia Program.

[7] The percentage of households that were excluded due to incomplete information on household income generally was below 5%–2% in 2002, 2.8% in 2009 and 4.8% in 2013.

[8] Because our analysis includes years prior to 2004, which excluded the rural areas of the North region, these were removed from the sample to enable the comparison.

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For the construction of the monthly per capita household income, individuals whose status was that of a domestic worker, relative of domestic worker, or tenant were excluded from the household, whereas the incomes of individuals aged 10 years or older were considered, as recommended by the survey.[9] All of the incomes used in the construction of the per capita household income, in addition to poverty lines, were deflated to September 2013, based on the deflator for household surveys of the IBGE proposed by Corseuil and Foguel (2002).

3.3. Variables of the model

Per capita household income is the monthly household income (Y_{hhold}) divided by the number of residents in the household (n), whereas the household income is the sum of the income y_i of the residents in the household 10 years of age or older. Thus,

$$Y_{pc} = \frac{Y_{hhold}}{n} = \frac{1}{n}\sum_{i=1}^{n} y_i \tag{1}$$

We can decompose the household income into labor income and nonlabor income (social security, assistance, and other sources) as follows:

$$Y_{hhold} = Y_L + Y_{NL} = Y_{Labor} + Y_{Social\ security} + Y_{Assistance} + Y_{Other} \tag{2}$$

Because our interest is to measure the contribution of the MW to changes in *per capita* household income, we can subdivide the household income into the following components: labor income of occupied persons (employees, self-employed, employers)[10] who earn the wage floor[11] ; social security income of retirees or pensioners earning 1 MW; income coming from the BPC, whose value is 1 MW; and other income, which includes non-MW labor income, non-MW social security income, income from continued service allowance, rent, donations, interest from savings accounts and other financial investments, dividends, social programs,[12] and other income.

$$Y_{hhold} = Y_{MWlabor} + Y_{MWsoc.security} + Y_{BPC} + Y_{Others} \tag{3}$$

Because the term öthersëncompasses very heterogeneous income, we decided to include the terms "non-MW labor income" and "non-MW social security income" separately. Thus,

$$Y_{hhold} = Y_{MWlabor} + Y_{MWsoc.security} + Y_{BPC} + Y_{non-MWlabor} + Y_{non-MWsoc.security} + Y_{Others2} \tag{4}$$

If we divide Eq. (4) by the number of residents of the household, we obtain the per capita household income as follows:

$$\frac{Y_{hhold}}{n} = \frac{Y_{MWlabor}}{n} + \frac{Y_{MWsoc.security}}{n} + \frac{Y_{BPC}}{n} + \frac{Y_{non-MWlabor}}{n} + \frac{Y_{non-MWsoc.security}}{n} + \frac{Y_{Others2}}{n} \tag{5}$$

Rewriting Eq. (5), we can separate the effects of quantity and price related to the MW (MW).[13] The quantity effect refers to the proportion of recipients of the MW in the household according to each possible channel (labor market,

[9] For details, see the Glossary of the PNAD, which is available at http://www.ibge.gov.br/home/estatistica/populacao/trabalhoerendimento/glossario_PNAD.pdf.

[10] Workers in production for their own consumption or in construction for their own use are not considered to be occupied here, owing to the specificity of the type of work.

[11] In the case of the labor market, the ëxact MWïs considered to be values within the range of 0.95–1.05 times the MW. For Social Security and Assistance, however, only the exact values in the literal sense are considered. It is expected that in the labor market, the self-declaration of income oscillates more than in Social Security, given that the informant can declare appropriate discounts or additions that occurred in the reference month of the survey.

[12] In the PNAD, income from the interest from savings accounts and other financial investments, dividends, social programs (BPC and PBF) and other income are grouped into a single variable (V1273). Among the variables that appear in the basic body of the research, there is no direct identification of social programs. To identify this benefit, we assumed that when the respondent reported—in the V1273 variable—the receipt of one exact MW, this was the BPC.

[13] In accordance with the literature, we consider M̈W effectïo be the effect of variation in the value of the MW on poverty, through variation in both the proportion of people receiving it and the amount received by those who were already receiving it. Recent causes of variation in the proportion of recipients—such as economic growth and the formalization of employment—were not investigated. Nonetheless, one cannot rule out a priori a positive impact of the MW regarding these r̈ecentc̈auses.

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social security, and BPC). In turn, the price effect is given by the average income from each MW channel. Thus,

$$\frac{Y_{hhold}}{n} = \left(\frac{n_{MWoccupied}}{n} * \frac{Y_{MWlabor}}{n_{MWoccupied}}\right) + \left(\frac{n_{MWsoc.security}}{n} * \frac{Y_{MWsoc.security}}{n_{MWsoc.security}}\right) + \left(\frac{n_{BPC}}{n} * \frac{Y_{BPC}}{n_{BPC}}\right) + \frac{Y_{non-MWlabor}}{n} + \frac{Y_{non-MWsoc.security}}{n} + \frac{Y_{Others2}}{n} \quad (6)$$

$$Y_{pc} = (\%MW_L * Y_{MW.L}) + (\%MW_{SS} * Y_{MW.SS}) + (\%MW_A * Y_{MW.A}) + Y_{non-MWlabor.pc} + Y_{non-MWsoc.security.pc} + Y_{Other2.pc} \quad (7)$$

Thus, per capita household income can be broken down into a component that measures the proportion of residents who are occupied and receive 1 MW in the labor market ($\%MW_L$), another component that measures the average remuneration of these occupied individuals who earn the floor (YMW_L), a component related to the proportion of residents who are either retired or a pensioner and who receive the Social Security minimum ($\%MW_{SS}$), another related to the average income received by them from Social Security (YMW_{SS}), a component for the proportion of residents who receive the BPC (MW in Assistance — $\%MW_A$), another for the average income received from the BPC (YMW_A), a component for non-MW labor income, another for non-MW social security income, and finally, a component that aggregates all other sources of income.

Based on Barros et al. (2006b) and Azevedo et al. (2012, 2013), we will perform simulations with Eq. (7) for the year pairs 2002–2009, 2009–2013, and 2002–2013, seeking to compute the contribution of the variation in each component on the variation in the poverty measurements (FGT0, FGT1, and FGT2) measured in terms of the per capita household income (pchi) in the periods. In the next subsection, we will describe the method in detail.

3.4. Method

Let γ be a measure of poverty. This measure will be a function $\varphi(.)$ of the cumulative density function F(.) of pchi, which depends on each of the factors below[14] :

$$\gamma = \varphi\left(F\left(Y_{pc}\left(\frac{n_{MWoccupied}}{n}, \frac{n_{MWsoc.security}}{n}, \frac{n_{BPC}}{n}, Y_{MW.L}, Y_{MW.SS}, Y_{MW.A}, Y_{Other.pc}\right)\right)\right) \quad (8)$$

Because the distributions of per capita income for periods 0 and 1 are known (2002 and 2013, for example), we can construct counterfactual distributions for period 1 by replacing the observed level of the variables of period 0 one-by-one. For each counterfactual distribution, we can calculate a poverty measurement (e.g., FGT0) and interpret this counterfactual as the incidence of poverty that would prevail as a result of the change in that variable.

In this regard, the contribution of a change in the share of occupied persons receiving the MW on the poverty measure, for example, would be calculated by substituting the value of $\frac{n_{MWoccupied}}{n}$ observed in period 0 with that observed in period 1 as follows:

$$\hat{\gamma} = \varphi\left(F\left(Y_{pc}\left(\frac{n_{\hat{MWoccupied}}}{n}, \frac{n_{MWsoc.security}}{n}, \frac{n_{BPC}}{n}, Y_{MW.L}, Y_{MW.SS}, Y_{MW.A}, Y_{Other.pc}\right)\right)\right) \quad (9)$$

This contribution would, therefore, be the difference between the $\hat{\gamma}$ estimated by the counterfactual and that observed in the initial period γ.

According to Azevedo et al. (2012) and Barros et al. (2006b) computed each counterfactual simulation in a nested manner; that is, they identified the contribution from interactions between two variables on changes in wellbeing—first by calculating the joint impact of a subset of variables and then by subtracting the marginal impact of each variable one-by-one.

In contrast, the adaptation performed by Azevedo et al. (2012) computes a cumulative counterfactual distribution by adding one variable at a time. The impact of the changes on each of the variables and their interactions with all

[14] In this example, the terms $Y_{non-MWlabor.pc}$, $Y_{non-MWsocsecurity.pc}$ and $Y_{Other2.pc}$ are considered in the term $Y_{Other.pc}$.

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the other variables are calculated as the difference between the cumulative counterfactuals in a possible order (path). In contrast to the original approach of Barros et al. (2006b), this method does not separately identify the contribution of the interaction between the variables in the distributive changes observed because, according to the authors, this is partial at best, given that changing any variable can potentially affect all other variables (Azevedo et al., 2012, p. 9), not only those that are being manipulated in pairs.

The Box 1 below illustrates the methodology to be used in this article, following Azevedo et al. (2012), in one possible order. This example can be performed with various variations of the order in which the counterfactuals are generated and added.

Box 1

$\gamma_0 = \varphi\left(F\left(Y_{pc}\left(\frac{n_{MWoccupied}}{n}, \frac{n_{MWsoc.security}}{n}, \frac{n_{BPC}}{n}, Y_{MW.L}, Y_{MW.SS}, Y_{MW.A}, Y_{Other.pc}\right)\right)\right)$	Initial poverty measure: $\gamma 0$
$\hat{\gamma}_1 = \varphi\left(F\left(Y_{pc}\left(\frac{\hat{n}_{MWoccupied}}{n}, \frac{n_{MWsoc.security}}{n}, \frac{n_{BPC}}{n}, Y_{MW.L}, Y_{MW.SS}, Y_{MW.A}, Y_{Other.pc}\right)\right)\right)$	Contribution of the share of MW occupied persons: $(\gamma_1 - \gamma_0)$
$\hat{\gamma}_2 = \varphi\left(F\left(Y_{pc}\left(\frac{\hat{n}_{MWoccupied}}{n}, \frac{\hat{n}_{MWsoc.security}}{n}, \frac{n_{BPC}}{n}, Y_{MW.L}, Y_{MW.SS}, Y_{MW.A}, Y_{Other.pc}\right)\right)\right)$	Contribution of the share of MW social security: $(\gamma_2 - \gamma_1)$
$\hat{\gamma}_3 = \varphi\left(F\left(Y_{pc}\left(\frac{\hat{n}_{MWoccupied}}{n}, \frac{\hat{n}_{MWsoc.security}}{n}, \frac{\hat{n}_{BPC}}{n}, Y_{MW.L}, Y_{MW.SS}, Y_{MW.A}, Y_{Other.pc}\right)\right)\right)$	Contribution of the share of BPC: $(\gamma_3 - \gamma_2)$
$\hat{\gamma}_4 = \varphi\left(F\left(Y_{pc}\left(\frac{\hat{n}_{MWoccupied}}{n}, \frac{\hat{n}_{MWsoc.security}}{n}, \frac{\hat{n}_{BPC}}{n}, \hat{Y}_{MW.L}, Y_{MW.SS}, Y_{MW.A}, Y_{Other.pc}\right)\right)\right)$	Contribution of the MW in labor: $(\gamma_4 - \gamma_3)$
$\hat{\gamma}_5 = \varphi\left(F\left(Y_{pc}\left(\frac{\hat{n}_{MWoccupied}}{n}, \frac{\hat{n}_{MWsoc.security}}{n}, \frac{\hat{n}_{BPC}}{n}, \hat{Y}_{MW.L}, \hat{Y}_{MW.SS}, Y_{MW.A}, Y_{Other.pc}\right)\right)\right)$	Contribution of the MW in social security: $(\gamma_5 - \gamma_4)$
$\hat{\gamma}_6 = \varphi\left(F\left(Y_{pc}\left(\frac{\hat{n}_{MWoccupied}}{n}, \frac{\hat{n}_{MWsoc.security}}{n}, \frac{\hat{n}_{BPC}}{n}, \hat{Y}_{MW.L}, \hat{Y}_{MW.SS}, \hat{Y}_{MW.A}, Y_{Other.pc}\right)\right)\right)$	Contribution of the MW in assistance: $(\gamma_6 - \gamma_5)$
$\hat{\gamma}_F = \varphi\left(F\left(Y_{pc}\left(\frac{\hat{n}_{MWoccupied}}{n}, \frac{\hat{n}_{MWsoc.security}}{n}, \frac{\hat{n}_{BPC}}{n}, \hat{Y}_{MW.L}, \hat{Y}_{MW.SS}, \hat{Y}_{MW.A}, \hat{Y}_{Other.pc}\right)\right)\right)$	Final poverty measure: contribution of Other income $(\gamma_F - \gamma_6)$

Note that like most decomposition methods, this methodology is path-dependent; i.e., the order of the simulations affects the result. To remedy this problem, the abovementioned authors performed a Shapley decomposition (1953), whose calculation involves cumulative decomposition in every possible order and, subsequently, computing the mean value of the results for each component. The mean effect for each variable is also known as the Shapley–Shorrocks estimate of each component.

Shapley decompositions have been extensively used in the literature to account for the marginal contribution of various factors to different welfare aggregates (e.g., Datt and Ravallion, 1992; Shorrocks, 2013; Shorrocks and Kolenikov, 2003). In addition to skipping problems associated with stepped decompositions (such as path-dependence), Shapley decompositions can, in a straightforward manner, inform how important each factor was to the observed change in the variable of interest, i.e., in our case, what the contribution was of changes in minimum wage to changes in poverty, ceteris paribus. However, simplicity comes at a cost, and being an accounting exercise, decompositions cannot account for general equilibrium effects and, more generally, cannot provide causal explanations. In particular, the decomposition is unable to determine the extent to which the valorization of the MW affected variables such as wage levels, unemployment, labor informality, and prices more generally. Additionally, we cannot tell whether what we take to be the sole effect of the minimum wage policy was ultimately a wage increase induced by ultimate causes, such as economic growth. Of course, the various assumptions required for the computable general equilibrium analysis make this methodology similarly limited, as it is based on very simplified behavioral models. From all we know, though, in the period of our analysis, unemployment and informality, as well as wage inequality, experienced important declines, so at the very least, the MW increase was not able to inhibit jobs and formal employment growth. Moreover, the extent to which the MW valorization policy itself was a factor contributing to the economic growth in Brazil during the period via the aggregate demand channel remains unclear. Overall, we believe that the exercise is a valid introduction to gauge the consequences of the experiment of MW valorization in Brazil.

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Table 1
Total numbers and shares (%) of households and poor households, according to the presence of MW recipients: Brazil — 2002, 2009, and 2013.

Households	2002	2009	2013
Total households (a)	46,987,499	55,739,969	59,908,171
Households with at least one MW recipient	34.0	36.0	37.4
Households with at least one occupied person receiving MW	16.9	17.4	18.3
Households with at least one retiree or pensioner receiving MW	19.7	20.0	20.4
Households with at least one BPC beneficiary	0.8	2.5	2.8
Households with at least one occupied MW recipient / households with at least one occupied person	19.4	20.4	22.0
Households with at least one retiree or pensioner receiving MW / households with at least one retiree or pensioner	55.6	55.0	56.1
Poor households	2002	2009	2013
Poor households (b)	13,876,235	9,573,553	6,881,142
Poor households with at least one MW recipient	39.1	31.4	28.6
Poor households with at least one occupied person receiving MW	23.6	20.6	20.1
Poor households with at least one retiree or pensioner receiving MW	17.5	9.9	7.3
Poor households with at least one BPC beneficiary	0.9	2.1	1.8
Poor households with at least one occupied person receiving MW/ poor households with at least one occupied person	26.9	24.5	26.2
Poor households with at least one retiree or pensioner receiving MW/poor households with at least one retiree or pensioner	76.8	61.0	52.9
Incidence of poverty	**29.5**	**17.2**	**11.5**

Source: PNAD 2002, 2009, and 2013. Own preparation.

3.5. *Descriptive statistics*

In this section, we present descriptive statistics regarding the main variables used in this study. Table 1 lists the total number of households and poor households, in accordance with the presence of individuals receiving the MW.

In 2002, out of a total of approximately 47 million households in the PNAD with a valid income (expanded by the sample weight), 34% had at least one recipient of one exact MW, 16.9% had at least one occupied person receiving the wage floor, 19.7% had at least one retiree or pensioner receiving the Social Security minimum, and 0.8% had at least one beneficiary of the BPC.[15] In 2009, these proportions increased to 36, 17.4, 20, and 2.5%, respectively, out of a total of 56 million households; in 2013, they increased further to 37.4, 18.3, 20.4, and 2.8%, respectively, out of an even higher total of 60 million households. Not only did the MW increase its presence in Brazilian households (from 34 to 37.4%), but its share was also slightly more significant as income from retirement pensions than as income from labor, and this increase has been maintained over time.

The greater presence of retirement pensions among MW recipients can also be observed through another ratio, i.e., the proportion of households with MW occupied persons relative to the total number of households with occupied persons, which varied between 19.4% in 2002 and 22% in 2013, and the proportion of households with at least one MW retiree relative to the total number of households with at least one retiree, which varied slightly from 55.6% in 2002 to 56.1% in 2013.

The second part of Table 1 provides these same statistics for poor households. For all the years, the proportion of occupied persons receiving the MW is higher for poor households than for all households. In other words, occupied MW recipients are overrepresented in poor households. In turn, the proportion of MW retirees and pensioners is always lower among the poor, possibly because poor households have proportionally fewer elderly people. The same effect is observed among the beneficiaries of the BPC. The proportion of households with recipients of this assistance benefit

[15] The capture of this benefit in the PNAD is quite complicated, whether due to errors in the informant's declaration that confuse the benefit with retirement pensions and other pension or by bias in the capture, that is, capture problems in the locations selected for the survey. Souza (2013) identified the following three possible reasons for the presence of capture bias in the case of the social programs in the PNAD: (1) the individuals of interest are geographically concentrated or difficult to sample; (2) the individuals of interest are actually selected but, purposely or not, do not report that they participate in certain programs (or the opposite case); and (3) there is an absence of variables that identify the beneficiary in the basic body of the survey.

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Table 2
Total numbers and shares (%) of households and poor households, in accordance with the presence of MW recipients: Brazil — 2002 and 2013.[18]

	Southeast, South, and Midwest		North and Northeast	
Households	2002	2013	2002	2013
Total households	32,354,355	40,240,890	14,633,144	19,667,281
Total households (%)	100.0	100.0	100.0	100.0
Households with at least one occupied person receiving MW	13.9	15.0	23.4	25.0
Households with at least one retiree or pensioner receiving MW	17.4	18.5	24.6	24.4
Households with at least one occupied person receiving MW/households with at least one occupied person	16.0	17.8	26.8	30.9
Households with at least one retiree or pensioner receiving MW/households with at least one retiree or pensioner	47.9	48.9	74.3	72.7
Poor households	2002	2013	2002	2013
Poor households (%)	100.0	100.0	100.0	100.0
Poor households with at least one occupied person receiving MW	20.6	21.2	26.0	19.6
Poor households with at least one retiree or pensioner receiving MW	14.8	6.5	19.8	7.6
Poor households with at least one occupied person receiving MW / poor households with at least one occupied person	24.1	27.4	29.2	25.7
Poor households with at least one retiree or pensioner receiving MW/poor households with at least one retiree or pensioner	66.1	40.1	85.4	60.3

Source: PNAD 2002, 2013. Own preparation.

relative to the total number of households is slightly lower in the case of poor households. It is striking that when we consider the time evolution, there is a reduction in the presence of the MW in poor households—from 39.1% in 2002 to 28.6% in 2013—which is largely due to retirement income. This finding suggests that the MW is a way out of poverty—a hypothesis that we will test in the decomposition analysis.

The prevalence of the MW among the occupied persons and among retirees, although decreasing, is certainly higher in poor households than in households on average (the only exception was retirement income in 2013), as observed from the calculation of the respective ratios presented in the bottom rows of Table 1.

An evaluation of Table 1 shows that parallel to the valorization of the MW and the reduction in poverty in the period between 2002 and 2013, there was a simultaneous increase in the importance of the MW in Brazilian households and a reduction in its originally high importance in poor households, thus indicating its potential for poverty alleviation.

Our investigation into the differentiated importance of the MW for the Brazilian regions led us to perform the same calculations, this time separating the regions into two groups, namely, the richer Southeast–South–Midwest and poorer North–Northeast, which we renamed Southeast (SE) and Northeast (NE), respectively.

Overall, as one might expect, the MW is more important in the NE region than in the SE region—the difference between the regions is greater for labor income than for retirement pensions. Whereas 13.9% of the households had at least one occupied person receiving the wage floor in the SE region in 2002, in the NE region, this proportion was 23.4%. In 2013, the regional difference remained (15% vs. 25%), thus indicating the greater importance of the MW as labor income in less-developed regions. The analysis of retirement pensions showed, once again, that in the NE region, the proportion of households with at least one retiree or pensioner receiving the MW was higher than that in the SE region. In 2013, this proportion was 24.4% in the NE region and 18.5% in the SE region, and in 2002, the proportions were 26.6 and 17.4%, respectively. In general, throughout the decade, the proportion of individuals receiving the MW out of the total number of households increased (only a small decrease in the proportion of MW retirement pensions was observed in the NE region).

The importance of the MW—whether in the income from labor (30.9% in 2013) or in retirement pensions (72% in 2013)—was significantly higher for the NE than for the SE region (17.8 and 48.9%, respectively, in 2013), as can be observed from the lower rows of Table 2.

[18] The regional division generates problems related to the sample size and operationalization of the Shapley decomposition—reasons why the effect of the BPC was not estimated separately for the NE and SE regions.

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The regional analysis—considering only the poor households—is presented in the second part of Table 2. Once again, MW recipients in the labor market are overrepresented in poor households (except in the NE region in 2013). Likewise, the MW recipients of social security are underrepresented among the poor in both regions—especially in 2013. Notably, in the NE region, a significant decrease was found in the share of persons receiving the MW (6 percentage points) and in the share of retirees receiving the MW value (12 pp) throughout the decade, which indicates the significance of the minimum wage to poverty reduction, especially in this region.

In summary, the descriptive statistics suggest that in Brazilian households, the MW plays an important role in reducing poverty, especially due to the presence of persons in these households receiving the wage floor. The presence of the MW has declined in poor households and in less-developed regions, whereas it has increased in households on average and in more-developed regions, thus suggesting that the MW is a way out of poverty. To test this hypothesis, we conducted a decomposition analysis, the results of which we present in the next section.

4. Results

In this section, we organize the results of the simulations—which were performed based on the methodology presented in the previous section—by presenting the general model, in which we highlight the MW terms for the 2002–2013 period and for the 2002–2009 and 2009–2013 subperiods.[16] Finally, we provide the detailed MW results by region.

4.1. General model

As already mentioned, between 2002 and 2013, the incidence of poverty decreased by 21.7 pp, as the poverty rate, affecting 37.6% of the population, decreased to 15.9% (Table 3, column (a)). Factors related to the MW were responsible for 38.2% of this reduction, with 20.0% occurring via the labor market channel, 14.4% via the social security channel, and 3.8% via the BPC. Considering the "value" and "proportion of people" components, the positive variation in the value of the minimum wage was generally more important than the positive variation in the percentage of people receiving this income. However, the single most important factor was the non-MW labor income, which was responsible for 52.9% of the reduction effect observed.

As can be observed from column (b) of Table 3, in the first subperiod, the FGT0 fell by 14.5 pp, and the contribution of the MW to this reduction reached 41.9%. The labor market (20.0%), social security (16.1%), and the BPC (5.8%) contributed to this effect. Once again, the effect of non-MW labor income is particularly notable, surpassing the total effect of the MW, i.e., 50.0%. In turn, in column (c), we have the variation in the incidence of poverty during the first Dilma government, which is 7.2 pp. The contribution of the MW in the labor market was 22.4%, whereas in the social security system, it was 14.1%, and via BCP, it was 1.3%—a total of 37.8%. Once again, the effect of non-MW labor income surpassed the latter by explaining 51.5% of the reduction in the proportion of poor people between 2009 and 2013.

Columns (d)–(f) present the results regarding the intensity of poverty (FGT1), that is, the measure that reflects the poverty gap (the distance between the per capita income of the household and the poverty line) as a proportion of the poverty line. Whereas in 2002 the intensity of poverty was 16.3% (i.e., it was necessary to transfer, on average, resources equivalent to 16.3% of the poverty line such that poor individuals would be over it), by 2013, this had decreased to 5.9%. However, column (d) in Table 3 indicates that the contribution of the MW to this result was 39.4%—21.8% via labor income, 11.7% from social security income, and 5.9% from BPC benefits. In other words, the MW was also

[16] Not shown here is an exercise in which we used the term "MW" flexibly in the labor market, allowing a spillover effect (meaning that labor income in its vicinity is affected by its adjustments), given that the term üon-MW labor incomeëends to explain a substantial portion of the poverty reduction in the period. We performed exercises testing whether what explained this large contribution originated from those who earn less than or more than the MW. What was concluded was that a significant share of the reduction was due to those who were immediately above the MW, in the interval between 1.05 and 1.5 MW. In the end, taking into account a larger spillover effect, i.e. the interval between 0.95 and 1.5, the MW contribution to the variation in the FGT0 amounted to 70.5%, and that of non-MW labor income amounted to only 19.9%. However, as the consideration of this income range as also an effect of the MW would greatly amplify the minimum wage effect, we cautiously decided to continue with our ëxact minimum wagedefinition.

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Table 3
Results for the general model: 2002–2013, 2002–2009, and 2009–2013.

	(a)				(b)				(c)		
	FGT0	SD	% FGT0		FGT0	SD	% FGT0		FGT0	SD	% FGT0
Index 2013	15.89			**Index 2009**	23.07			**Index 2013**	15.89		
Index 2002	37.59			**Index 2002**	37.59			**Index 2009**	23.07		
Total change	−21.70	0.00	100.0		−14.53	0.00	100.0		−7.17	0.00	100.0
MW_labor	−2.45	0.07	11.3		−1.67	0.09	11.5		−0.86	−0.04	11.9
MW_soc.security	−1.77	0.07	8.1		−1.43	0.11	9.8		−0.47	−0.02	6.6
Y_BPC	−0.41	−0.05	1.9		−0.42	0.07	2.9		−0.05	−0.08	0.7
Non-MW labor	−11.47	0.21	52.9		−7.26	0.14	50.0		−3.69	0.11	51.5
Non-MW soc.security	−0.79	0.07	3.7		−0.42	0.06	2.9		−0.26	−0.01	3.6
Other income	−1.15	−0.10	5.3		−0.76	−0.04	5.2		−0.51	−0.02	7.1
%occupied_MW	−1.88	0.06	8.7		−1.23	0.07	8.5		−0.75	−0.05	10.4
%soc.security_MW	−1.36	0.05	6.3		−0.91	0.08	6.3		−0.54	0.00	7.5
%BPC	−0.41	−0.06	1.9		−0.42	0.07	2.9		−0.05	−0.08	0.6
Observations (N) = 2,08,356		***MW = 38.2***		**N =** 216,153		***MW = 41.9***		**N =** 2,19,509		***MW = 37.8***	

	(d)				(e)				(f)		
	FGT1	SD	% FGT1		FGT1	SD	% FGT1		FGT1	SD	% FGT1
Index 2013	5.87			**Index 2009**	8.93			**Index 2013**	5.87		
Index 2002	16.29			**Index 2002**	16.29			**Index 2009**	8.93		
Total change	−10.43	0.00	100.0		−7.36	0.00	100.0		−3.07	0.00	100.0
MW_labor	−1.31	0.04	12.6		−0.87	0.01	11.9		−0.43	−0.01	14.2
MW_soc.security	−0.68	0.07	6.5		−0.46	0.03	6.3		−0.24	0.07	7.9
Y_BPC	−0.31	0.00	2.9		−0.29	0.04	3.9		−0.05	0.00	1.7
Non-MW labor	−4.05	0.25	38.9		−3.24	0.14	44.0		−0.82	0.08	26.9
Non-MW soc.security	−0.42	0.08	4.0		−0.16	0.05	2.2		−0.19	−0.01	6.0
Other income	−1.84	−0.05	17.7		−1.30	−0.01	17.6		−0.62	−0.05	20.3
%occupied_MW	−0.96	0.03	9.2		−0.48	0.00	6.6		−0.39	−0.02	12.6
%soc.security_MW	−0.54	0.06	5.2		−0.27	0.02	3.6		−0.27	0.08	8.8
%BPC	−0.31	0.00	2.9		−0.29	0.04	3.9		−0.05	0.00	1.6
Observations (N) = 208,356		***MW = 39.4***		**N =** 216,153		***MW = 36.2***		**N =** 219,509		***MW = 46.8***	

	(g)				(h)				(i)		
	FGT2	SD	% FGT2		FGT2	SD	% FGT2		FGT2	SD	% FGT2
Index 2013	3.18			**Index 2009**	4.86			**Index 2013**	3.18		
Index 2002	9.34			**Index 2002**	9.34			**Index 2009**	4.86		
Total change	−6.16	0.00	100.0		−4.48	0.00	100.0		−1.68	0.00	100.0
MW_labor	−0.76	0.04	12.3		−0.47	−0.01	10.5		−0.25	0.00	14.8
MW_soc.security	−0.38	0.09	6.2		−0.20	0.03	4.5		−0.19	0.09	11.5
Y_BPC	−0.26	0.02	4.2		−0.24	0.03	5.3		−0.05	0.01	2.7
Non-MW labor	−1.40	0.24	22.8		−1.59	0.12	35.6		0.04	0.07	−2.5
Non-MW soc.security	−0.34	0.07	5.4		−0.11	0.04	2.5		−0.16	−0.02	9.5
Other income	−1.92	−0.04	31.2		−1.35	0.00	30.0		−0.61	−0.04	36.0
%occupied_MW	−0.53	0.02	8.7		−0.19	−0.02	4.3		−0.22	−0.01	13.2
soc.security_MW	−0.31	0.08	5.1		−0.10	0.02	2.2		−0.20	0.10	12.1
%BPC	−0.26	0.02	4.2		−0.23	0.03	5.2		−0.04	0.01	2.6
Observations (N) = 208,356		***MW = 40.6***		**N =** 216,153		***MW = 31.9***		**N =** 219,509		***MW = 56.9***	

Source: PNAD 2002, 2009, and 2013. Own preparation.

important in reducing the intensity of poverty, and its impact by this criterion exceeded that of nonminimum-wage labor income.

In the analysis by subperiods, there was a reduction in 7.4 pp (column (e)) between 2002 and 2009—the MW contributed 36.2%, with a greater effect via labor income, and 3.1 pp in the last period (column (f)), but with an even more significant contribution of the MW—46.8%, more than half of which was via the labor market.

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Finally, columns (g) through (i) present the severity of the poverty (FGT2), which, as we have observed, weights the intensity of poverty by the distance of the household income from the poverty line, thus giving greater weight to the poorest families. This measurement was 9.3% in 2002 and 3.2% in 2013. The MW contributed 40.6% to the reduction in this poverty measure between 2002 and 2013 (column (g))—the labor market channel contributed approximately 20% of the effect. In this poverty measure, in which the impact of the MW was the largest, the MW exceeded all the other incident factors.

When we analyzed the dynamics of the severity of poverty by subperiods, we observed that, in the subperiod that covers the Lula governments, the reduction in the severity of poverty was 4.5 pp (column (h)), with the MW contributing 31.9%. It should be noted that this was the only measure in which the weight of the BPC (10.5%) exceeded at least one of the other channels—social security contributed 6.7% and the labor market accounted for 14.8%. In the first Dilma government (column (i)), the severity decreased from 4.9 to 3.2%. The weight of the MW, however, increased to 56.9%, divided between social security (23.6%) and the labor market (28.0%). It is remarkable that the MW effect surpassed that of nonminimum-wage income this time.

A final observation of Table 3 indicates that the variable "other income"—despite it representing a small fraction of the effect of the MW on the proportion of poor people (it accounted for 5.3%) — is important for the reduction in the intensity (17.7%) and, in particular, the severity of poverty (31.2%). In addition to interest, dividends, rent, and other income, this item includes income from social programs such as the PBF. It can be hypothesized that it would be mainly the latter that would influence the measures of intensity and severity of poverty, thus confirming the perception that these programs are very effective at alleviating poverty but less effective at overcoming it (the incidence of poverty). Even so, the exercise reveals that also from the point of view of poverty alleviation and reduction in inequality among the poor (FGT1 and FGT2), the MW—given its importance in the poor households identified in the previous section—had a greater contribution.[17] Additionally, as poverty shrinks from one period to another, and with it the influence of the MW on the incidence of poverty (from 41.9 to 37.8%), we see an increase in the importance of the minimum in terms of its effects on the intensity (from 36.2 to 46.8%) and severity (31.9–56.9%) of poverty in Brazil.

4.2. Model with regional division (NE vs. SE)

In this section, our aim is to investigate the contribution of regional heterogeneity to changes in the national indices of poverty. In particular, we will differentiate the contribution of the MW between the North and Northeast regions (referred to here as NE) and the Southeast, South, and Midwest regions (referred to here as SE). Again, the aim is to try to measure the regional heterogeneity of the importance of the MW to poverty. For this, we adapted the general model of Eq. (7), joining the terms $Y_{non-MWlabor.pc}$, $Y_{non-MWsocsecurity.pc}$ *and* $Y_{Other2.pc}$ under the item $Y_{Other.pc}$ and decomposing the MW terms in each channel into NE and SE components, as follows:

$$Y_{pc} = (\%MW_L{*}Y_{MW.L})^{NE} + (\%MW_L{*}Y_{MW.L})^{SE} + (\%MW_{SS}{*}Y_{MW.SS})^{NE} + (\%MW_{SS}{*}Y_{MW.SS})^{SE} + (\%MW_A{*}Y_{MW.A}) + Y_{Other.pc} \quad (10)$$

Table 4 presents the results for the model with regional division.

Considering the incidence of poverty (FGT0, column (a)), we see that both in the labor market and in social security, the weight of the MW is greater in the NE than in the SE. Whereas the contribution of the MW in the labor market in the NE was 12.7%, in the SE, it was 6.5%, and in terms of social security, the effects were 9.0 and 4.7%, respectively.

Regarding the intensity of poverty (FGT1), once again, the influence of the MW in the NE exceeds that in the SE as follows: 13.8% versus 6.7% in terms of the labor market and 6.5% versus 4.4% in terms of social security.

Regarding the severity of poverty (column (c)), it can be observed that the MW contributed toward its contraction more in the NE than in the SE (16.4% versus 12.1%). It is the labor market channel that accounts for the greater importance of the MW in the NE (11.6%) than in the SE (6.4%), given that, in terms of social security, the prevalence of the MW in the SE is not sufficient to compensate for its lower importance in regard to the labor market.

[17] Evidently, tax and cost-effectiveness aspects are not being considered, and the political economy issues caused by this preliminary comparison are not being discussed—these are not the subject of this study. Here, we focus our attention on investigating the effect of the MW—the decomposition used reflects this interest.

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Table 4
Results for the model with regional division: 2002–2013.

	(a)			(b)			(c)		
	FGT0	SD	% FGT0	FGT1	SD	% FGT1	FGT2	SD	% FGT2
Index 2013	15.89			5.87			3.18		
Index 2002	37.59			16.29			9.34		
Total change	−21.70	0.00	100.0	−10.43	0.00	100.0	−6.16	0.00	100.0
MWlaborNE	−1.48	0.10	6.8	−0.80	0.04	7.7	−0.41	0.02	6.7
MWlaborSE	−0.75	−0.05	3.5	−0.37	0.01	3.6	−0.21	0.02	3.4
MWsoc.securityNE	−1.06	0.01	4.9	−0.38	0.02	3.6	−0.16	0.05	2.7
MWsoc.securitySE	−0.55	0.02	2.5	−0.24	0.04	2.3	−0.18	0.05	2.9
Y_BPC	−0.42	−0.05	1.9	−0.31	0.01	3.0	−0.26	0.02	4.2
Other	−13.73	0.18	63.3	−6.53	0.25	62.6	−3.89	0.25	63.1
%occupied_MW_NE	−1.28	0.09	5.9	−0.64	0.03	6.1	−0.30	0.02	4.9
%occupied_MW_SE	−0.65	−0.05	3.0	−0.33	0.00	3.1	−0.19	0.02	3.0
%soc.security_MW_NE	−0.89	0.00	4.1	−0.31	0.02	2.9	−0.13	0.04	2.1
%soc.security_MW_SE	−0.46	0.02	2.1	−0.21	0.03	2.1	−0.17	0.05	2.7
%BPC	−0.42	−0.05	1.9	−0.31	0.01	3.0	−0.26	0.02	4.2
Observations:	208,356	***MW = 36.7***		208,356	***MW = 37.4***		208,356	***MW = 36.9***	

Source: PNAD 2002, 2009, and 2013. Own preparation.

Therefore, there are differences in the importance of the MW between the NE and SE regions—namely, it is more important for reducing poverty in the former than in the latter. However, in both regions, the labor market is the channel that is most salient.

5. Final considerations

In these final considerations, we do not intend to summarize the various results, but rather, we wish to draw attention to some of the results that enable dialogue with the literature. However, first, we wish to reiterate that a causal investigation in the usual sense on the influence of the MW on the reduction in poverty is still lacking. Thus, we do not know exactly why the MW showed such importance. What role did the substantial expansion of labor formalization and, ultimately, economic growth play in this result? Conversely, to what extent was growth pushed by the policy of MW valorization? Nevertheless, our exercise does not estimate the entire influence of the MW, which can be even greater, as we leave out the so-called lighthouse effect, i.e., that MW adjustments affect other types of labor income. We look forward to new research to clarify these points.

The results shown in this study corroborate the hypothesis of a positive and significant contribution of the MW to poverty reduction in Brazil, especially in the Northeast region, based on the experience of the last decade, in which poverty decreased concomitantly with substantial valorization of the MW.

Moreover, the results of the decomposition indicated that this contribution was not only on the incidence of poverty but also on its intensity and severity, and in increasing order of importance. Considering the exact value of the MW, its valorization contributed 38.2, 39.4, and 40.6%, respectively, to the variation in the three measures. On reflection, this result, in which the importance of the MW increases when a more focused notion of poverty is used, reveals a relatively unknown facet of the MW, i.e., its likely relevance in mitigating the poverty gap and favoring the poorest among the poor. In fact, this finding defies conventional wisdom (see Neumark et al., 2004).

A third result is the observation that the major channel was, in general, the labor market, which is consistent with the overrepresentation of occupied persons receiving the MW in poor households, despite social security being another important way out of poverty. This result differs from the findings of Barros et al. (2006a), who reported that social security was the most important channel in 2004. Similarly, as long as occupied persons receiving the MW are overrepresented in the less-developed regions, it seems natural that the contribution of the MW to poverty reduction is stronger in these regions than in the others.

Two additional comments are also necessary. In contrast to Afonso et al. (2011), we did not observe clear signs of "exhaustion of the effects" of the MW because, despite its decreasing contribution to the reduction in the incidence of poverty (from 41.9 to 37.8%), its importance in the variation of the intensity and severity of poverty soared between

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2002 and 2013 (from 36.2 to 46.8% and 31.9 to 56.9%, respectively)—and was greater in the Dilma government, from 2009 to 2013, than in the Lula government, from 2002 to 2009.

Finally, because "other income" is a variable that encompasses income such as social programs for poverty alleviation (e.g., the PBF), which one would expect to have contributed to poverty reduction and actually did have a positive impact, the slight effect on the proportion of impoverished people (5.3%) and the more significant effects on the poverty gap (17.7%) and severity of poverty (31.2%) drew attention. Even so, in terms of these two measures, the MW also had a substantially greater contribution to the drastic decline in poverty observed during the period.

It is usually remarked that the Bolsa Familia Program, which is targeted-at-the poor, is more cost-effective than the minimum wage policy (Barros et al., 2001). As the MW indexes social security benefits, its impact on the public funds is surely bigger while its influence goes beyond poor households. Nevertheless, as some research indicates, while targeted-at-the-poor programs may be more efficient, more generalized ones, such as the minimum wage policy, tend to be more politically effective (Korpi and Palme, 1998; Gelbach and Pritchett, 1997).

Appendix A. Estimated poverty lines for each region

Region — Poverty line	In current values for the year (R$)			In MW for the year		
	2002	2009	2013	2002	2009	2013
Rio de Janeiro — Metropolitan Area	143.03	224.12	281.41	0.72	0.48	0.42
Rio de Janeiro — Urban Area	121.36	190.16	238.77	0.61	0.41	0.35
Rio de Janeiro — Rural Area	109.22	171.14	214.89	0.55	0.37	0.32
São Paulo — Metropolitan Area	143.89	225.48	283.11	0.72	0.48	0.42
São Paulo — Urban Area	127.42	199.67	250.71	0.64	0.43	0.37
São Paulo — Rural Area	104.02	163.00	204.66	0.52	0.35	0.30
Porto Alegre — Metropolitan Area	159.50	249.93	313.81	0.80	0.54	0.46
Curitiba — Metropolitan Area	131.76	206.46	259.24	0.66	0.44	0.38
South — Urban Area	125.69	196.95	247.30	0.63	0.42	0.36
South — Rural Area	114.42	179.29	225.13	0.57	0.39	0.33
Fortaleza — Metropolitan Area	113.55	177.94	223.42	0.57	0.38	0.33
Recife — Metropolitan Area	149.09	233.63	293.35	0.75	0.50	0.43
Salvador — Metropolitan Area	140.43	220.04	276.29	0.70	0.47	0.41
Northeast — Urban Area	128.29	201.03	252.41	0.64	0.43	0.37
Northeast — Rural Area	114.42	179.29	225.13	0.57	0.39	0.33
Belo Horizonte — Metropolitan Area	111.82	175.22	220.01	0.56	0.38	0.32
East — Urban Area	100.55	157.56	197.84	0.50	0.34	0.29
East — Rural Area	85.82	134.47	168.84	0.43	0.29	0.25
Belém — Metropolitan Area	127.42	199.67	250.71	0.64	0.43	0.37
North — Urban Area	131.76	206.46	259.24	0.66	0.44	0.38
North — Rural Area	115.29	180.65	226.83	0.58	0.39	0.33
Federal District (DF) — Metropolitan Area	123.96	194.24	243.89	0.62	0.42	0.36
Midwest — Urban Area	106.62	167.07	209.78	0.53	0.36	0.31
Midwest — Rural Area	93.62	146.70	184.19	0.47	0.32	0.27

Notes: The regions denominated as Urban exclude the metropolitan areas considered as specific regions. The region denominated as East refers to Minas Gerais and Espírito Santo. As the incomes and poverty lines for each year were deflated to 2013, the poverty line in real values is the same as the poverty line in current values for the year 2013 (third column in the table).

Source IPEADATA.

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