**The Matrix of Social Accounting (SAM) for analysis of Brazilian welfare programs**

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**RESUMO**

Este artigo apresenta uma *matriz de contabilidade social* (SAM) para o Brasil. Esta é construída utilizando-se a *matriz de insumo-produto* (MIP) de 2010, o *Censo Demográfico de 2010*, as *contas econômicas integradas*, também de 2010 e a pesquisa de orçamento familiar de 2008-2009, todas pesquisas realizadas pelo IBGE, instituto de estatísticas oficial do Brasil. A SAM consiste em agregar informações econômicas e sociais à estrutura padrão de uma MIP. A MIP informa como os diversos setores que compõem uma economia se relacionam. O *modelo insumo-produto*, desenvolvido originalmente por Leontief, permite estabelecer o grau de dependência técnica entre os diversos ramos de atividade de uma economia, nacional ou regional. Tal precisão possibilita, então, vislumbrar como um aumento na demanda por um setor em particular repercute por toda a economia. Já a SAM descreve como a riqueza gerada e alocada é distribuída entre as classes sociais ou faixas de renda. Ao detalhar a estrutura de consumo das famílias, a SAM mostra como os setores de atividade são impactados por variações na renda de cada classe social. A SAM aqui apresentada tem por propósito investigar como um típico *choque de demanda* repercute por toda a economia, não só em termos de atividades mais afetadas, mas também no que concerne ao padrão de distribuição de renda de toda a sociedade. Um exercício proposto, neste trabalho é o de quantificar a resposta econômica e social a uma política de distribuição de renda mais intensa: uma redução de tributos para as classes mais abastadas é, assim, comparada a um aumento no volume dos programas assistenciais (como por exemplo, o Bolsa Família, criado pelo Governo Federal em 2004). **Palavra-Chave:** Insumo-Produto, Contabilidade social, multiplicadores, desigualdade e distribuição.

**ABSTRACT**

This article presents a *matrix of social accounting* (SAM) for Brazil. This is constructed using the 2010 *input-output matrix* (IOM), the *demographic census* from 2010, the integrated economic accounts (CEI), also from 2010 and the family budget survey (P(OF) from 2008-2009, all surveys conducted by The Brazilian Institute of Geography and Statistics (IBGE), the official collector of statistics in Brazil. A SAM aggregates economic and social information into the standard structure of a IOM. The IOM uses this information to see how the various sectors that make up an economy relate to each other. The *input-output model*, originally developed by Leontief, enables establishment of the degree of technical dependence among the various branches of activity of a national or regional economy. This precision makes it possible to see how an increase in demand in one sector has repercussions throughout the economy. SAM describes how wealth generated and allocated is distributed among social classes or income brackets. In detailing the household consumption structure, a SAM shows how the sectors of activity are impacted by variations in the income of each social class. The purpose of the SAM presented here is to investigate how a typical demand shock has repercussions throughout the economy, not only in terms of activities most affected, but also in relation to the income distribution pattern of the whole society. A proposed exercise in this work is to quantify the economic and social response to an income distribution policy: e.g., a reduction of taxes for the wealthier classes is thus compared to an increase in the volume of welfare programs (such as example, Bolsa Família, created by the Federal Government in 2004). **Key-words:** Input-Output, Social Accounting, multipliers, inequality, and distribution.

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## 1. INTRODUCTION

The issue of income inequality is one of the most important in economic theory. There have been important thinkers on the subject in economic thory, among them David Ricardo, Karl Marx, Simon Kuznets. In 2013, Thomas Piketty published *The Capital of the 21st Century*, a controversial work that shows an innate tendency for capitalism to increase inequality

Based on empirical research, Piketty concludes that, contrary to the opinions of those who are apologists of the free-market, capitalism without any regulation produces sharp inequality between capital holders and the rest of society. Inequality is expressed by the accumulation of wealth in the hands of a very small portion of the population. And he concluded that this enormous inequality can undermine the foundations of a free and democratic society.

Brazil is not among the 15 countries investigated by Piketty. It is common knowledge, however, that the country is among the most unequal in the world. Although in recent years such inequality has fallen, as a result of compensatory policies adopted at the federal level, as the research of Marcelo Neri (2011) research has shown, much still needs to be done in order to make Brazilian society less unequal.

This work presents a method that relates economic sectors and inequality, using a matrix of social accounting (SAM). A SAM is an analytical framework complementary to the input-output matrix (IOM). The IOM model was originally proposed by the American economist, of Russian origin, Wassily Leontief (1986). Leontief proposed a matrix model that quantifies the interrelationships between the various sectors of activity of an economy (MILLER & BLAIR, 2009). These interrelationships are expressed through technical production coefficients, which then allow us to deduce the impact across the economy of a change in some variable considered exogenous in the model, such as a component of final demand.

When economic analysis requires a more refined and accurate look at those exogenous changes in the institutional sectors of the economy (income classes, social classes) it is necessary to complement the IOM with more detailed data on the way in which the wealth generated in the economy is appropriated by the different actors who participated, in one way or another, in the productive effort. That is, the IOM needs to be rebuilt with a broader structure that clearly contemplates social relations, making it a SAM (BULMER-THOMAS, 1982).

It should be noted that this possibility of transforming IOM into a powerful instrument of social accounting had already been brought to the attention of one of the creators of modern social accounting, the English economist Richard Stone. In a book published in 1961 by the OECD, Stone argues that an IOM, by disaggregating information by industry, becames an useful social accounting tool for economic development planning (STONE, 1961: 190).

The legitimacy of Stone's proposal is affirmed by the United Nations manual which consolidates the methodology for the reporting of the national accounts of all countries. In Brazil, the IBGE, signatory of the recommendations contained in that manual, regularly produces the national IOM. SAM is not normally estimated by official bodies (UN, 2008).

The SAM can be understood as an extension of IOM, in detailing how the resource flows generated by the various productive sectors are appropriated by the institutional sectors that make up a society. That is, from the SAM it is possible to estimate accounting multipliers that can be broken down by type of transfer between institutional sectors (STONE, 1961).

A SAM aims to highlight the role of people and social institutions in the economy (MILLER & BLAIR, 2009). This structure serves the purpose of the present work, that is, to study how income shocks have repercussions in the sectors of economic activity and social classes. These idealized income shocks are an increase in the income of the poorest class in the country, which earns up to a minimum wage - through, for example, the Bolsa Família program - and an increase in disposable. There follows a description of the method used in the study, results and a discussion of these results and, finally, the conclusion.

## 2. METHODOLOGY: MATRIX OF SOCIAL ACCOUNTING AND ITS MULTIPLIERS

An IOM basically uses intersectoral information. The economic relations between the various sectors of activity, how much the sector *j* purchase of inputs from sector *i*, for example, are expressed in an input-output model by means of technical coefficients of production ($a_{ij}$). An entire square matrix of order *n* (where *n* is the number of sectors of the economy) is constructed with ($a_{ij}$). A very common assumption made in input-output models is that these technical coefficients are fixed, and this is one of the most frequent criticisms of this kind of analysis (MILLER & BLAIR, 2009).

The use of linear algebra makes it possible to show the model as an equation response, which shows how the economy reacts to the change in the final demand (LEONTIEF, 1986). For the construction of the SAM, information on the institutional sectors, such as the value added distribution, is added to the MIP. The distribution of household consumption and added value that appears in the *Input-Output Matrix of 2010* was made based on the numbers of the *Demographic Census of 2010* and the *Family Budget Survey (2008/09).*

The proposal of a SAM is, in short, to quantify the traditional circular flow of income. In this sense, the SAM is an expression of national accounts. National accounts with a detailed production structure according to industry, income and household consumption sectors (PYATT *and* ROUND, (1988); THORBECKE, Erick, 1998 e 2000; EUROPEAN COMMISSION, 2003; MILLER *and* BLAIR (2009); BERNI *and* LAUTERT (2011)).

In SAM each cell is to be read, within the perspective of its column, as a payment made, similar to the IOM. In reading across the row, the same cell is perceived as a receiver. Thus, the social accounting matrix (SAM) is a square matrix in which each account is represented in both rows and columns. Thus, the income of an account appears along its rows and its expenditures down its columns. As a numerical expression of the flow of income, it is expected that the totals of payments and receipts are equivalent. The table below, adapted from Bêrni et al. (2011) sets out the general structure of a SAM. It should be noted that the breakdown of producers into branches of activity and institutions into income range is dependent on the information available in the system of national accounts and other surveys.

Quadro 1: Social Account Matrix in five blocks

| **Accounts** | **PRODUCERS** | **FACTORS** | **INSTITUTIONS** | **TOTAL** |
|---|---|---|---|---|
| **PRODUCERS** | Inter-industrial relations $B_{11}$ | | Expenditures $B_{13}$ | Total Demand |
| **FACTORS** | Product or *Added value* $B_{21}$ | | | Gross domestic product |
| **INSTITUTIONS** | | Income $B_{32}$ | Interinstitutional relations $B_{33}$ | Revenue from Institutions |
| **TOTAL** | Total Offer | Income from Factors | Expenditure institutions | |

Fonte: BÊRNI et al. (2011).

In the table above, the first cell (B11) in row 1 reveals the interindustrial relations between the sectors that comprise the economy with respect to intermediate demand or intermediate consumption (CI). The second cell (B13) in row 1 represents the demand for final goods (DF). The total demand is then given by the following equation:

$$DT = CI + DF \quad (1)$$

The third block cell (B21) in column 1 of the second row on Table 1 informs what each sector would have spent on so-called "primary inputs (PI)", that is, expenditures made by industry with payments for capital and labor. In this area, cell B21, also fall the payments made to governments in the form of taxes on production. The total supply (OT) is be given by the following equation:

$$OT = CI + IP \quad (2)$$

The Total Demand (DT) must be equal to the Total Supply (OT), in accordance with the logic of the circular flow of income. SAM also provides information on how the factors of production (roughly, capital and labor) relate to the institutional sectors. This information appears in cell B32, in the third row. Then, with 7 income classes (institutions), a cell in this block would show, for example, how much of what was paid to labor was ultimately destined for lower-income families.

Cell B33, on the other hand, registers interinstitutional relations, that is, how much each level of *households* per income bracket "paid" the others. How much the lower income families transferred to the other lower income families. This is a residual account in the template presented here.

The third row of the table informs that income (Y) plus institutional transfers (IT) represents the income of institutions (IR). Symmetrically, the third column presents the use of these resources. Final Demand (DF) plus Institutional Transfers (IT) represents the expenses of institutions (DI). In other words, regardless of the value-added calculations (VA), the same figure for the product (P) is the income (Y) and the expenditure (D).

$$VA \equiv P \equiv Y \equiv D \quad (3)$$

Since SAM consists of the structure of an extended IOM, the same mathematical procedures are used to deduce the multipliers. A multiplier reveals the impact on household income, production or added value of productive sectors, as a consequence of a unitary change in some policy variable (shock). According to Miller & Blair (2009, page 514), SAM multipliers are arrived at from the following matrix:

$$Z = \begin{vmatrix} Q & 0 & C \\ V & 0 & 0 \\ 0 & Y & H \end{vmatrix}$$

Where:
Q = inter-sectoral relations matrix (B11 in the table above);
V = value-added matrix (B21)
C = final demand matrix (B13)
Y = factor and institutional relations matrix (B23)
H = matrix of interinstitutional relations (B33)

The multipliers that measure how much each variable of interest (classes of income, added value and sectoral production) responds to unitary changes in the considered variables of policy, are calculated as follows:

First, the technical coefficients are obtained (similar to what happens in the IOM). A technical coefficient in the case of a SAM reveals, for example, how much of the output of the agricultural sector is sold to lower income households. The operation enabling the deduction of all coefficients is as follows:

$$S = Z \cdot \hat{X}^{-1} \tag{4}$$

$$X = (I - S)^{-1} \cdot f \tag{5}$$

$$M = (I - S)^{-1} \tag{6}$$

Where:
S = SAM coefficient matrix
Z = A SAM
X = Production Vector;
f = Final demand vector;
M = SAM multiplier matrix.

The circumflex above the variable X denotes that the vector described has been transformed into a matrix (the vector elements on the main diagonal and zeros in the other positions). The two vectors X and f are:

$$X = \begin{vmatrix} x \\ v \\ y \end{vmatrix} \qquad\qquad f = \begin{vmatrix} j \\ w \\ h \end{vmatrix}$$

Where:
x = vector that totals the production of each sector of the economy;
v = value added vector
y = income vector of families
j = exogenous final demand vector
w = exogenous value-added vector
h = income vector of exogenous families

Therefore, what equation (5) above tells us is how the output of the economy (x), added value (v) and household income respond to exogenous changes in the final demand (j), exogenous changes in value added (w) and exogenous changes in household income (h).

Or, alternatively,

$$\Delta X = M \cdot \Delta f \tag{7.1}$$

In Matrix terms:

$$\begin{vmatrix} \Delta x \\ \Delta v \\ \Delta y \end{vmatrix} = \begin{vmatrix} M_{QQ} & M_{QY} & M_{QC} \\ M_{YQ} & M_{YY} & M_{YC} \\ M_{CQ} & M_{CY} & M_{CC} \end{vmatrix} \cdot \begin{vmatrix} \Delta f \\ \Delta w \\ \Delta h \end{vmatrix} \tag{7.2}$$

Or, alternatively,

$$\Delta x = M_{QQ} \cdot \Delta f + M_{QY} \cdot \Delta w + M_{QC} \cdot \Delta h \tag{8}$$

$$\Delta v = M_{YQ} \cdot \Delta f + M_{YY} \cdot \Delta w + M_{YC} \cdot \Delta h \tag{9}$$

$$\Delta y = M_{CQ} \cdot \Delta f + M_{CY} \cdot \Delta w + M_{CC} \cdot \Delta h \tag{10}$$

The multipliers are as follows:

$M_{QQ}$ = measures how the output of each sector reacts to unitary changes in the final demand of what was produced in the economy;
$M_{YQ}$ = measures how the added value responds to unitary changes in the final demand of the economy;
$M_{CQ}$ = measures how household incomes respond to changes in the final demand of the economy;
$M_{QY}$ = measures how the production of the various sectors of the economy responds to a (exogenous) change in added value that is destined to the factors of production of the economy (mainly capital and labor);
$M_{YY}$ = measures how added value responds to unitary and exogenous changes in the value added destined to the factors of production of the economy;
$M_{CY}$ = measures how household incomes (divided by income class) are affected by unitary changes in the value added to the factors of production of the economy;
$M_{QC}$ = measures how production is affected by changes in household income;
$M_{CY}$ = measures how added value responds to unitary changes in household income;
$M_{CC}$ = measures how household incomes respond to unitary and exogenous changes in household income.

If the shock occurs in the families' exogenous income, as in the proposed exercise, then the three reactions are measured as follows:

$$\Delta x = M_{QC} \cdot \Delta h \quad (11)$$
$$\Delta v = M_{YC} \cdot \Delta h \quad (12)$$
$$\Delta y = M_{CC} \cdot \Delta h \quad (13)$$

For the production of the multipliers described above, we considered 18 productive sectors, 2 factors (labor and capital) and seven classes of household consumption (according to the POF classification by family income). In total, 27 rows by 27 columns. The productive sectors considered are those presented in Table 2, and the income classes in Table 3.

Table 2: The Eighteen Productive Sectors

| **Acronym** | **Description of sectors** |
|---|---|
| ST1 | Agriculture, including support for agriculture and post harvest |
| ST2 | Livestock, including livestock support |
| ST3 | Forestry, fishing and aquaculture production |
| ST4 | Extraction industries |
| ST5 | Manufacturing Industries |
| ST6 | Electricity and gas, water, sewage, waste management and decontamination activities |
| ST7 | Construction |
| ST8 | Trade and repair of motor vehicles and motorcycles |
| ST9 | Transport, storage and mail |
| ST10 | Accommodation and food |
| ST11 | Information and Communication |
| ST12 | Financial, insurance and related services activities |
| ST13 | Real estate activities |
| ST14 | Professional, scientific and technical, administrative and complementary services activities |
| ST15 | Administration, education, health, public research and development, defense, social security |
| ST16 | Health and Business Education |
| ST17 | Arts, culture, sport and recreation and other service activities |
| ST18 | Domestic services |

Table 3: The Seven Income Classes

| Sigla | Income Classes | Monthly Average Income Range |
|---|---|---|
| **h1** | Household income 1 | To 1 minimum wage |
| **h2** | Household income 2 | From 1 to 1.5 minimum wages |
| **h3** | Household income 3 | 1.5 to 3 minimum wages |
| **h4** | Household income 4 | From 3 to 5 minimum wages |
| **h5** | Household income 5 | From 5 to 7.5 minimum wages |
| **h6** | Household income 6 | From 7.5 to 12.5 minimum wages |
| **h7** | Household income 7 | More than 12.5 minimum wages |

The following set of data was used for the construction of SAM: the inter-industry relations were taken from the Input-Output Matrix of Brazil 2010. The consumption of households by income range was obtained based on the figures published in the Family Budget Survey (POF 2008/09), both from IBGE. The income ranges (seven to all) were already been calculated from the Demographic Census of 2010. In the next section, the results of the application of the model described above will be presented for the situation in Brazil.

## 3. RESULTS

Here the multipliers mentioned in the previous section are presented. Table 1 below shows how each sector of the economy is impacted by increases in household incomes:

Table 1: Effect on total output given an exogenous shock on household income

| | h1 | h2 | h3 | h4 | h5 | h6 | h7 | Averege |
|---|---|---|---|---|---|---|---|---|
| **ST1** | 0.09 | 0.08 | 0.06 | 0.05 | 0.04 | 0.04 | 0.03 | 0.06 |
| **ST2** | 0.04 | 0.03 | 0.03 | 0.02 | 0.02 | 0.02 | 0.02 | 0.03 |
| **ST3** | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 |
| **ST4** | 0.04 | 0.04 | 0.03 | 0.03 | 0.03 | 0.03 | 0.02 | 0.03 |
| **ST5** | 0.86 | 0.78 | 0.71 | 0.65 | 0.57 | 0.56 | 0.46 | 0.66 |
| **ST6** | 0.13 | 0.12 | 0.10 | 0.09 | 0.07 | 0.06 | 0.05 | 0.09 |
| **ST7** | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| **ST8** | 0.25 | 0.25 | 0.29 | 0.30 | 0.27 | 0.26 | 0.22 | 0.26 |
| **ST9** | 0.14 | 0.13 | 0.13 | 0.13 | 0.11 | 0.11 | 0.09 | 0.12 |
| **ST10** | 0.08 | 0.08 | 0.08 | 0.08 | 0.07 | 0.07 | 0.06 | 0.07 |
| **ST11** | 0.09 | 0.10 | 0.10 | 0.10 | 0.09 | 0.09 | 0.07 | 0.09 |
| **ST12** | 0.13 | 0.14 | 0.16 | 0.18 | 0.16 | 0.18 | 0.13 | 0.15 |
| **ST13** | 0.26 | 0.25 | 0.22 | 0.19 | 0.16 | 0.15 | 0.13 | 0.20 |
| **ST14** | 0.13 | 0.12 | 0.12 | 0.13 | 0.12 | 0.12 | 0.10 | 0.12 |
| **ST15** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **ST16** | 0.09 | 0.09 | 0.09 | 0.09 | 0.08 | 0.09 | 0.08 | 0.09 |
| **ST17** | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.04 | 0.05 |
| **ST18** | 0.03 | 0.03 | 0.02 | 0.02 | 0.03 | 0.02 | 0.03 | 0.03 |
| **Sum** | 2.42 | 2.33 | 2.21 | 2.13 | 1.89 | 1.86 | 1.53 | |

Summing up all the variables (bottom row in Table 1), the calculated multipliers reveal that changes in the income of the poorest families are those that, overall, have the highest impact on the productive sectors of the economy: 2.42.

A unit change in the income of the poorest people (h1) has a major impact on the manufacturing industry (h1 / ST5 is the highest value in column h1). It also happens to be the highest value in the ST5 row, that is, variations in the poorest income class have the greatest impact on the manufacturing industry.

The second sector to receive the greatest impact of changes in the income of the poorest families, perhaps due to an increase in the amounts transferred by the Bolsa Familia program, is the construction industry sector (ST13), whose multiplier is 0.26 cents for each variation in the Brazilian Real (where row 13 intersects with column 1).

When the results of changes in the income of the richest families (h7) are analyzed, perhaps due to a reduction in the tax burden for this income range, the figures reveal the following: the most impacted sector (reading the last column on Table 1) is the industrial sector, with 0.46 cents of variation in the production of the sector for each real plus income available to the richest income class. However, this impact is significantly lower than impact caused by the income of the poorest households.

The second sector most affected by changes in the income of the richest families (h7) is the trade and repair of vehicles (ST8), whose multiplier value is 0.24.

The last column of the matrix shows that the two sectors that are most impacted on average by changes in incomes of the various classes are the manufacturing industry (ST5) and trade and repair of vehicles (ST8), whose average values are 0.66 and 0.26, respectively.

Table 2 shows how changes in the different income ranges affect the distribution of wealth among the factors of production considered in this work, capital and labor.

Table 2: Effect on value added given an exogenous shock on family income

| | h1 | h2 | h3 | h4 | h5 | h6 | h7 | Averege |
|---|---|---|---|---|---|---|---|---|
| **Job** | 0.45 | 0.44 | 0.43 | 0.43 | 0.39 | 0.39 | 0.32 | 0.41 |
| **Capital** | 0.72 | 0.70 | 0.65 | 0.63 | 0.55 | 0.53 | 0.44 | 0.60 |
| **Sum** | 1.16 | 1.13 | 1.08 | 1.05 | 0.94 | 0.92 | 0.76 | |

The Table 2 shows that variations in the income of poorer households have a greater impact on capital than on labor. In fact, according to the average values shown in the last column on Table 2, capital is the production factor that most benefits from variations in incomes in any income bracket: 0.60 of capital against 0.41 of the job.

However, it is changes in the income of the poorest people that produce the greatest changes in the wealth generated in this economy. The last row on Table 2 shows that the sum of the multipliers of the income range of the poorest families has the highest value: 1.16 of the variation in the wealth generated in the economy by real income for the poorest families, 0.76 change in the income of the richest families (h7).

This is not surprising considering the huge concentration of income in the country. According to the Demographic Census of 2010, 33% of people employed in the country receive one minimum wage

or less, while only 3% of the total number of persons employed receive 10 or more minimum wages. If it is the poorest income class that drives the economy the most, according to these numbers, it is the richest class that most appropriates the wealth, considering the natural association between poverty and work and wealth and capital.

The third table with the results of this study, Table 3, shows how household incomes respond to changes in household income.

Table 3: Effect on household income given an exogenous shock on household income.

| | h1 | h2 | h3 | h4 | h5 | h6 | h7 | Average |
|---|---|---|---|---|---|---|---|---|
| **h1** | 1.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.16 |
| **h2** | 0.02 | 1.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.16 |
| **h3** | 0.12 | 0.11 | 1.11 | 0.11 | 0.10 | 0.10 | 0.08 | 0.25 |
| **h4** | 0.11 | 0.11 | 0.10 | 1.10 | 0.09 | 0.09 | 0.08 | 0.24 |
| **h5** | 0.11 | 0.11 | 0.10 | 0.10 | 1.09 | 0.09 | 0.07 | 0.24 |
| **h6** | 0.11 | 0.11 | 0.10 | 0.10 | 0.09 | 1.09 | 0.08 | 0.24 |
| **h7** | 0.17 | 0.17 | 0.16 | 0.16 | 0.14 | 0.14 | 1.12 | 0.30 |
| **Sum** | 1.66 | 1.64 | 1.62 | 1.61 | 1.55 | 1.54 | 1.45 | |
| **Sum without the diagonal** | 0.64 | 0.62 | 0.51 | 0.51 | 0.46 | 0.45 | 0.33 | |

The main diagonal figures in Table 3 show, for example, that a change of a one Real (R$1) in the income of the poorest households (h1) affects the incomes of the poorest households by 1.01 Reais and so on.

Therefore, according to the values in the seventh column of Table 3, a variation in the income of the richest families (h7) causes the greatest impact, among all the income brackets, exactly expanding the income of the same richer families.

When the multipliers are added per column, it is once again the income class of the poorest households (h1) that produces the greatest impact: 1.66 (or 0.64 without the main diagonal).

However, when considering the average value, that is, when measuring the average value received by the various income classes for each variation of a Real (R$) in the incomes of these same income classes, it is noted that the highest value is with the richest people (h7): 0.30. This result corroborates what was found in Table 2: although the class that impacts the most is the lower income class, the richer class receives the most.

## 4. DISCUSSION

The IBGE regularly publishes the Matrix Input Product of Brazil (IBGE, 2017). An IOM is built on the basis of the relationships between the various sectors of an economy. One can safely say that an IOM is an important analytical tool for disclosing the economic structure (Leontief, 1986). The IOM technical coefficients of production, *inferred/ derived* from the relations of intersectoral dependencies, are used in the calculation of the multipliers, which show how the whole productive structure reacts to changes in the final demand.

The Social Accounting Matrix is an extension of the IOM. Variables of a social nature are detailed so that it is possible to reveal how income classes, as well as the productive structure, are affected

by changes in policy variables. In this work two modalities of income distribution are suggested. A distribution policy focused on the lower income (h1) classes, such as an increase in the reach of the and a policy targetted at the higher income families (h7), such as Bolsa Família program.

The model proposed here is characterized by its simplicity. In order to transform IOM of Brasil into a SAM, data from two large domiciliary surveys were used, carried out by the same official statistics institution of the country, the IBGE. The Family Budget Survey (POF) used in this study was latest available before our study, made between 2008 and 2009. The main objective of the POF is to identify the structures weighing heaviest on Brazilian household expenses, information necessary to update the National Index Consumer Price Index (IPCA). The IPCA is the official brazilian inflation statistics report.

The data of the POF distributed the household consumption (final consumption, therefore) according to income classes. The other survey used in the process of transforming an IOM into a SAM was the 2010 Demographic Census. The different factors weighing on household income were applied to the value added by the Economy. This data on the wealth generated in the economy between factors of production was based on the information from the Brazilian National Accounts of 2010, in particular the section on Integrated Economic Accounts.

Although less detailed in terms of the social classes presented in the Brazilian Social Accounting Matrix prepared by IPEA in 1994 (Urani et al., 1994), the matrix presented in the National Accounts uses a greater number of economic sectors. This was possible because the Country Resource and Usage Tables published by IBGE are more disaggregated than were the National Accounts about 25 years ago. The IPEA SAM distributes the institutional sectors also by level of education of the labor force.

The results presented here are similar to those obtained by SAM published in 2009 by the International Food Policy Research Institute (Breisinger et al., 2009). In order to carry out an MBA building exercise, the group of researchers funded by the aforementioned institutes, developed a matrix for Ghana, a West African country.

The shocks proposed in that work (a unitary increase in the value of agricultural exports, for example) show the importance of the agricultural sector to all Ghanaian economy and society. But the same shock in the exports of manufactured products, did not achieve the same impact. The authors explained this difference by explaining that because the industrial sector is not very developed in that country, there is a high income leak due to imports of manufactured products.

The numbers presented in our study reflect a more complex economy, if on the one hand more industrialized, on the other more unequal. Although the analytical framework here has been simpler than the one employed in the SAM used for Ghana (which divided the institutional sectors into urban and rural), the numbers produced in our study reveal a striking feature of the Brazilian economy and society.

The economic repercussion of income distribution on the poorest is the one with the greatest impact on the whole economy, both in terms of production of the various sectors of activity, as well as value added and income. Our study indicates that this is the most important factor to consider in the distribution of income.

However, we must also draw attention to the smaller impact multipliers. This is the case of the consequences of the policies suggested here in two of the sectors where labor is historically the least

qualified in the country: the domestic services sector (h18) and the civil construction sector (h7). The workforce of the domestic services sector has the lowest education, according to data of Demographic Census 2010.

But with regard to occupation by gender, it is impossible to imagine more unequal sectors. According to the 2010 Census, 97% of the people employed in construction in Brazil were male. In domestic services, 93% of the women workers were women.

Therefore, the low average multiplier revealed in Table 1 for the domestic services sector (h18 = 0.03) has a high impact on female labor. Among the sectors of activity according to which the employed population is classified in the 2010 Census, the average income of female labor employed in domestic services showed the lowest value: R $ 463.0 for an average value paid to women of all sectors of R $ 1,070.00. Taking into account that this average value corresponds to only 74% of the average value paid to men, it is concluded that expansions in the share of capital added value still mean less for the majority of working women in the country.

## CONCLUSION

This paper proposes a relatively simple mechanism to construct a Social Accounting Matrix (SAM) from a National Input Product Matrix (IOM). Data from the Family Budget Survey, Demographic Census and National Accounts were used to transform IOM into a SAM. Although the matrix here proposed is not as detailed as that of other initiatives, as commented in the results section of this paper, it produces results, through its calculated multipliers, that show how the economic and social structure in the country is unequal. In fact, it has been seen that changes in the income of the poorest people, that is, those receiving up to a minimum wage, have a greater impact in the various productive sectors than the same unitary change in the income of the richest. However, it is the capital factor that is more affected than the labor factor, in the distribution of these changes in household income. The low response of the domestic service sector to the changes proposed in this exercise, such as expansion of the Bolsa Família Program and tax reduction for the richest, is evident as a large part of the workforce of the sector, is directly excluded from the economic benefits of these policies.

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