FINAL RESEARCH REPORT


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ABSTRACT

A persistent and very high-income inequality is well known feature of the Brazilian economy. However, from 2001 to 2005 the Gini index presented an unprecedented fall of –4.6% combined with a significant poverty reduction. Former studies using partial equilibrium analysis have pointed out the importance of federal government transfer programs for this inequality reduction. The aim of this research was to evaluate the efficiency of the two most important cash transfer programs, “Bolsa Família” and “BPC”, in achieving their purposes of alleviating poverty and reducing the inequality in Brazil’s income distribution using an integrated modeling approach, CGE-MS model. The simulation results confirm the importance of these programs to reduce inequality during 2003-2005. But, the effect on poverty alleviation was not strong. Finally, the methodological approach allows the identification of some important economic facts that were not presented in previous analysis, such as the issue of taxation structure that finances these policies.

Key words: computable general equilibrium model, micro-simulation model, income distribution, cash transfer program, fiscal policy, Brazil.


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1. Introduction

It is widely known that the Brazilian economy has historically presented one of the most unequal income distributions in the world with a Gini index around 0.60 until the beginning of this decade.\(^5\) It is also known that the inequality in income distribution is the main determinant of the high poverty level in the country, being the average income level a secondary determinant, that is, the poverty level does not decline in significant way when the country grows because the income gains are very unequally distributed, being mostly appropriated by non-poor families.\(^6\) Thus, falls in income inequality can have stronger effects on poverty level than the economic growth.

In addition to a high inequality degree in income distribution, Brazil also presents significant levels of poverty and severe poverty. In 2005, around 34% (60 millions) and 13% (23 millions) of Brazilian population were, respectively, poor and extremely poor (Barros \textit{et al.}, 2007c). Due to the historically unequal income distribution and the very large number of people in the poverty and extreme poverty condition, the Federal Government has been transferring income to these people by means of transfer programs as a way of a broad poverty alleviation strategy.

There are many kinds of income transfer programs in Brazil, such as “\textit{Bolsa Família} (BF),” \textit{Benefício de Prestação Continuada} (BPC), several retirement benefits and pensions, \textit{Abono do PIS/PASEP} and \textit{Salário-Família}. This research will analyze the first two programs (BF and BCP), because they are the main cash transfers programs specifically designed as social policies with the purposes of poverty (and inequality) reduction and have called the attention of several researches from different scientific fields. In the next two paragraphs we present a summary of the characteristics of these programs since their full description and data are presented in the appendix D.

The \textit{Beneficio de Prestação Continuada} (BPC) is a benefit of social assistance guaranteed by the Federal Constitution of 1988 and has been implemented since 1996. This benefit aims to aid the elderly that is not included in the public social security system and the disabled people that cannot support themselves with their families’ financial care, reaching 2.9 millions of Brazilians nowadays and expending the budget of R$11.63 billions in 2006. The benefit consists of one minimum wage (R$415) and the beneficiary’s family per capita income must be less than a quarter of a minimum wage.

The \textit{Bolsa Família} (BF) program was created in October 2003 and is the main transfer program of the federal government today. It is the unification of four other former programs that already existed, which were: \textit{Bolsa Escola} (since 2001), \textit{Bolsa Alimentação} (since September 2001), \textit{Auxílio Gás} (since December 2001), \textit{Cartão Alimentação} (since 2003). Since then, the program has been enlarged to incorporate new groups of beneficiaries. \textit{Bolsa Família}

is pointed towards extremely poor and poor families, with Famíliar per capita income under R$120 in 2008. The families receive a transference of R$62 and a variable amount of R$20 per child, until the maximum of R$60 (three occurrences), with the maximum benefit at R$122.

Unlike the BPC, Bolsa Família is a conditional cash transfer program and requires the fulfillment of some requirements for the benefit concession, like the school attendance of 85% for the children in scholar age, the actualization of vaccination for children under six years old, and regular visits to the health center for pregnant women and for those in phase of breastfeeding. In 2007, Bolsa Família beneficiated 11.048.348 families and reaching the expense of R$9.26 billions.

Despite the historical stability presented by the inequality in income distribution in Brazil, recent studies show empirical evidence that this inequality has declined in an expressive, accelerated and continuous way from 2001 to 2005, as shown in the chart below.

**Figure 1.1 - Temporal evolution of inequality in per head income distribution in Brazil**

Recent studies also show that the “BF” and “BPC” income transfer programs have played an important role in this process, once 22.9% of the decline in income distribution was due to the implementation and enhancement of these programs.

While in 2001 the Gini index was close to its average value for the last 30 years (0.592), in 2005 it achieved its lowest magnitude (0.566) until that date. According to Barros et al. (2007c), from 2001 to 2005, the Gini index value declined from 0.593 to 0.566, corresponding to a reduction of 4.6% in the inequality degree in income distribution. Once this inequality is the main determinant of poverty in Brazil, we should also expect that it has caused a significant reduction of the poverty level. Barros et al. (2007b) reports that the reduction of the inequality in income distribution from 2001 to 2005 induced declines of the poverty and the extreme poverty levels of around 3.3 and 2.7 percentage points, respectively. Once the poverty
and extreme poverty levels have decreased 4.6 and 3.4 percentage points, respectively, the fall in income distribution have caused almost 73% and 80% of these reductions.

Moreover the more immediate impacts of these programs on income distribution and poverty, they point towards to better perspectives, since as stressed by UNDP (2006, p. 272):

“The good news is that extreme inequality is not an immutable fact of life. ... a large social welfare program - “Bolsa Família” - has provided financial transfers to 7 million families living in extreme or moderate poverty to support nutrition, health and education, creating benefits today and assets for the future.”

Considering the existing information on inequality in income distribution for 124 countries, almost 95% of them present an income distribution less concentrated than the Brazilian one (Barros et al., 2006; and Hoffmann, 2006a; UNDP, 2006).

Once there are different programs, the resources should be primarily allocated to the ones that have stronger impacts in the sense of poverty and income inequality reduction, which brings the need of assessing these effects. For doing this, some researchers use the methodology of comparing program participants (the treatment group) with a control group of people with similar characteristics that are relevant to program participation, that is, they run counterfactual simulations, whose construction determines the evaluation design. These evaluation designs can be classified into two categories: experimental and quasi-experimental. Also, they vary in feasibility, cost, and the degree of clarity and validity of results (Rawlings and Rubio, 2003).

Experimental or randomized control designs involve the random assignment of individuals into beneficiaries (treatment group) and non-beneficiaries (control group). Once these assignments are random, any difference with the control group is due to chance, not to selection. Thus, experimental designs are usually regarded as the most reliable evaluation method and the one yielding the easiest-to-interpret results (Freeman and Rossi, 1993; Grossman, 1994; apud Rawlings and Rubio, 2003). When randomization is not feasible, a quasi-experimental design can be constructed by generating a control group, as using statistical matching to select non–beneficiaries, based on observable characteristics.

Experimental and non-experimental designs have been used to impact evaluation of conditional cash transfers in some Latin American countries. To evaluate the Programa de Educación, Salud y Alimentación (PROGRESA) in Mexico, evaluators applied an experimental design with panel data that randomly assigned localities into the treatment and control group. A similar design was used to impact evaluation of the Programa de Asignación Familiar (PRAF) in Honduras, and of the Red de Protección Social in Nicaragua, at the municipal and census area level respectively.8

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7 At the end of 2006, Ministério do Desenvolvimento Social informed that the number of beneficiary families reached 11.1 millions.
8 Further details can be found in Rawlings and Rubio (2003).
In the contrast to the abovementioned programs, the Programa de Erradicação do Trabalho Infantil (PETI) in Brazil was evaluated by a quasi-experimental design with single-cross section. This program was firstly implemented only in a few municipalities in the state of Pernambuco, and later expanded to other states including Bahia and Sergipe. Once the evaluation was planned after the program beginning, and it was not possible to randomly allocate the municipalities into treatment and control groups, then the treatment group was composed of three participating municipalities in separate states, and the comparison group of three similar municipalities not in the program.

Other methodologies were also used to evaluate similar impacts, as partial equilibrium and decomposition analysis. Some studies that used these methodologies shed some light on the issue about the impacts of transfer programs on income inequality and poverty in Brazil. Among them, some recent studies deserve to be commented in order to show how this research can contribute to address some knowledge gaps on this subject.

By simulating the impacts that some income transfer programs would have whether they were applied to their entire target population, considering the rules for each program, Rocha (2005) points that the more recent programs would be more efficient in reducing poverty once their value of transfers were much higher and the target population much larger.

Hoffmann (2006b) evaluates the impacts of the income transfer programs on poverty and income inequality at national and regional levels. The study points that 31% of the decline in income distribution in Brazil from 2002 to 2004 was due to the mentioned programs. In Northeast region, these programs induced 87% of the estimated decline in income distribution for the same period.

Barros et al. (2007) estimated that Bolsa Família induced around 11.8% of the income inequality fall from 2001 to 2005, while BPC would have caused around 11.1% of this reduction.

However, the abovementioned empirical evidences were found by means of partial equilibrium or decomposition approaches and, in this sense, they did not take in account some systemic (general equilibrium) effects induced by these programs as well as the feedback impacts from the economic system on the household income. When poor families receive the income transfer, they increase their consumption expenditures, which tends to induce firms to produce more and, in some extent, to employ more workers. When these people receive their payments, a new round of additional effects induced by their expenditures goes on. Then, the original amount of transfer generates a higher amount of money in the economy or, in other words, the poor families not only benefit from receiving transfers but also can benefit from the secondary effects induced by the expenses of the original transfers.

These demand effects can be enhanced when we take into account the differences in the expenditure pattern of Brazilian families differentiated by income level. Among the poor urban

9 Idem.
Brazilian households, the food expenditure was 40% of the total consumption. On the other side, the Brazilian richest households’ consumption standards are totally different, once their food expenditure was just 12%, while health and education private services accounts for near 20% (Cury et al., 2006).

Also, the relevance of the general equilibrium effects is justified by the size and evolution of the transfer programs between 2001 and 2005. In the same period, the total expenditure in the main targeted transfer program, *Bolsa Família*, increased 300%. According to the last Brazilian Central Government report (“Perfil das Famílias Beneficiárias do Bolsa Família”), in 2007, 11 millions of families (around one in each five in the country) are program beneficiaries, reaching 45.8 millions of individuals (around one fourth of population).

On the other hand, we also expect that the program effects are sensitive to the budget sources that are financing this specific public expenditure. As mentioned before, the increased amount in the transfers were financed in specific ways. Also, during this period, some important changes were introduced in the fiscal system. For example, in the social security budget, the sharpest increase revenue came from PIS-COFINS taxes (increased 30% as ratio of GDP), which in 2003-2004 started to levy imports. Facts like this one changed the size and composition of the fiscal sources that are financing the programs and reinforce the general equilibrium impacts derived from the programs recent evolution.  

By other side, when the income of poor families increases, it is possible that this additional income can induce some people to reduce their labor offer and reducing their working hours. If this happens, the abovementioned effects induced by expending the transfers would be less than expected.

However, this negative effect of transfer on willingness to supply labor does not have empirical support until now. According to Medeiros et al. (2007), the rate of participation in the labor market among programs beneficiaries is 73% for the first poorest decile of distribution, 74% for the second and 76% for the third, while the same rate is of 67%, 68% and 71%, respectively, for people that live in households with no beneficiaries. These authors also evaluated the effects of *Bolsa Família* on labor supply of four demographic groups: women head of family, women non-head of family, men head of family, and men non-head of family. They found that only the benefited women head of family has likelihood of participation in the labor market lower than similar non-benefited women.

CEDEPLAR (2006, *apud* Medeiros, 2007), also found positive effects of “BF” on labor supply. According to it: (1) adults in households with beneficiaries presented a participation rate 3% higher than adults in households with no beneficiaries; (2) the positive impact is higher

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10 In this research we identified in the Federal Brazilian Budget (“Orçamento Geral da União”) the specific expenditure items related to the transfer programs. The first classification level for expenditure items is identified by a system of 4 digit codes, named “programas”. For example, Bolsa Família has the code “1335” and can also be divided into a second classification level with more 4 digits, called “subprogramas”. On the other hand, each “programa”/“subprograma” is earmarked with your own revenue source. In this case, it is a system of 3 digit identification code, called “fonte”. See section 4 and Appendix D for more details about this subject.
among women, 4%, than among men, 3%; (3) the program reduced the chances of women quitting their jobs in 6%. However, Tavares (2008) found evidence of an adverse effect of Bolsa Família on willingness to labor market participation of benfited mothers. As we can see, there is some evidence that Bolsa Família can reduce the participation in the labor market only for benefited mothers, and, even in this case, this effect is not consensual.

From the discussion above, it is clear that changes in transfer programs imply modification in both, relative prices and quantities that can be far from being negligible. In this sense, it is not unequivocal which would be the final prevailing effects.

Proving that a specific methodology is unequivocally superior to others is not an easy task to do. Despite this, given the systemic consequences induced by the changes in these programs on markets and on financing sources, we believe that the usage of a CGE model integrated to a Microsimulation model, as presented in section 3, for evaluating the impacts of Bolsa Família and Benefício de Prestação Continuada programs will generate information that will enhance the debate on the effects of these programs on poverty and inequality, once it will capture some systemic effects that are not considered by the methodologies used by other studies.

This final report is organized in more four sections, besides this introduction. The section 2 presents a brief literature review of the CGE - MS integration methodology. In the third section, we described the adopted methodology, including all the steps of CGE - MS integration and solution. The research questions, the implemented simulations and results are presented in the section 4. The last section presents the conclusion and the final remarks. Appendix A, B, C and D complete this report.

2. Review of literature on CGE and microsimulation integration.

The first assessments on the issue about the distributional and poverty effects of economic policies using CGE models were proposed by Dervis et al. (1982) and Gunning (1983), and, after them, some other papers have introduced other modeling approaches to this issue. This section presents some characteristics of these approaches and highlights theirs main advantages and drawbacks.11

The first approach is characterized by a CGE model with representative households (CGE-RH). By this method, distributional analysis is performed by comparing the changes in income of these representative households (RHs) generated by the CGE model between the different groups of RHs or applying these changes to households’ income in survey data to perform comparison between distributive indicators after and before policy implementation. Poverty analysis is made by applying the change(s) of income of the RH(s) generated by the CGE model on household survey data to compare ex ante and ex post poverty indicators.12

11 We are considering the same categories proposed by Savard (2003), where more details can be found.
12 Dervis et al. (1982), de Janvry et al. (1991), Chia et al. (1994), Decaluwé et al. (1999a), Colatei and Round (2001) and Agenor et al. (2001) present evaluations based on this approach.
The disadvantages of this approach are either the assumption of no intra-group income distribution change, or that the intra-group distribution change follows a defined statistical relationship between mean (µ) and variance (σ²) of the income distribution. This drawback is more serious when the analysis is performed with CGE model with just one RH. In this case the impacts on poverty are evaluated by applying the change of income of the RH on all households in the survey data. The consequence is that, besides not capturing intra-group effects, this approach also does not capture between group effects, once it just changes the average mean (µ) but not the variance (σ²) of the distribution.

Despite that, this approach can be easily implemented by simulating the economic policy with a CGE model and using the simulation outputs to make distributional and poverty analysis.

The second approach is called integrated multi-households CGE (CGE-IMH) modeling, which consists in incorporating to the CGE model as many households as are present in income and expenditure household surveys, or a large sample of them.13

Compared to the CGE-RH, this method has the advantages of allowing changes in intra-group income distribution and not requiring pre-definition of household groups, which gives more flexibility to poverty and income distribution analysis since the households grouping can be defined in more different ways.

Nonetheless, the large size of the model can difficult its numerical solution and the conciliation of data from household income or expenditure surveys and national accounts, due to under or over reported variables in the household surveys.

According to Bonnet and Mahieu (2000, apud Savard, 2003), the above limitations could be overcome by the usage of microsimulation which is required to analyze income distribution (dispersion) effects. Thus, in order to achieve better assess of distributional and/or poverty effects of economic policies Savard (2003) and Muller (2004) proposed the methodology of using a CGE model linked to a micro-simulation model, with a bi-directional linkage between them that would guarantee a convergence of solution for both models.

3. Methodology

This section describes the methodology used in this research. In the following three subsections are described the CGE model, the microsimulation model, and the integration between the CGE and the MS models.

3.1. The CGE Model

This section briefly describes some characteristics of the CGE model, as they are standard features, and emphasizes the presentation on the labor market, the household income distribution, and the government interventions.
formation process and the Government expenditure. Further details on it can be found in the Appendix A.\textsuperscript{14}

The CGE model is single country and recognizes 42 domestic sectors,\textsuperscript{15} 8 families,\textsuperscript{16} the Government and the external sector.

The model takes the hypothesis that Brazilian economy is an international price taker and small open economy. Foreign product supply does not face any constraint to attend Brazilian demands. The supply of the 42 domestic sectors is represented by a function that convert 7 types of labor,\textsuperscript{17} capital and intermediate inputs into products that are sold as imperfect substitutes in the domestic and international markets.

Concerning demand for products, the utility maximizing families choose their consumption levels according to a Cobb-Douglas function. Families and firms demand domestic and imported goods according to the Armington (1969) hypothesis. Firms demand commodities to fulfill their production requirements of intermediate inputs according to the technical coefficients from the input-output matrix. The Government expenditure faces the fixed budget amount registered for the base year and according to a Cobb-Douglas utility function.

3.1.1. The Labor Market

Firms demand the seven types of labor, classified according to contract status and schooling.\textsuperscript{18} It is assumed that firms aim at maximizing profits under technological constraints conditions imposed by production function, in an environment where prices of inputs, production factors (labor and capital) and output are beyond their control. Therefore, as a result of this maximization, for each type of workers, a specific demand curve is defined by the condition that their marginal productivities equalize their wages:\textsuperscript{19}

\[ P_i \cdot \frac{\partial X_i}{\partial F_i} = W_i \] \hspace{1cm} (3.1.1)

\textsuperscript{14} The CGE model used in this research is an extension from the one presented by Cury et al. (2005) where further details can be found. This model results from a series of developments made in the model proposed by Devarajan et al. (1991), as can be seen in Cury (1998), Barros et al. (2000) and Coelho et al. (2003).

\textsuperscript{15} Listed in the 2003 Brazilian National Accounts.

\textsuperscript{16} Poor urban families headed by active individual (F1), poor urban families headed by non-active individual (F2), poor rural families (F3), urban families with low average income (F4), urban families with medium income (F5), rural families with medium income (F6), families with high average income (F7), and families with high income (F8).

\textsuperscript{17} Unskilled informal (L1), skilled informal (L2), formal with low skill (L3), formal with average skill (L4), formal with high skill (L5), public servant with low skill (L6) and public servant with high skill (L7).

\textsuperscript{18} The labor treatment that follows is applied for the five types of private workers. The two types of public servants follow the traditional labor market closure of CGE models with either wage or employment being fixed. Therefore, there is no substitution between public servants and the private kinds of workers, in the sectors where there is no public companies. In the sectors where public and private firms coexist, the changes in the public-private composition of labor are related to the changes in the public-private composition of the sectoral representative firm.

\textsuperscript{19} The derivative of the profit function with relation to the factor demand must be equal to the factors’ price (first order condition).
This research uses a CGE model integrated to a MS model. In the last, each individual chooses between offering or not his workforce in the labor market after comparing the observed wage in his sector to his reservation (potential) wage. Thus, the labor supply by type of worker is generated by the MS model and communicated to the CGE model, where it is exogenous.\footnote{Further details on the determination of labor supply by type of worker will be presented in the section 3.2.}

The labor market equilibrium (employment and wage), for each type of worker, is determined by $E'$, the intersection point between the labor demand ($L^d$) and the labor supply ($L^s$). The difference between the economically active population and the employment level, ($L^0 - L$), is the excess of labor supply that corresponds to the involuntary unemployment level (U) in the economy.\footnote{The CGE model can also adopt an alternative specification of the labor market, in which the involuntary unemployment is captured by means a wage curve as proposed by Blanchflower and Oswald (1990, 1994).}

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{labor_market_equilibrium.png}
\caption{Equilibrium in the labor market by type of worker}
\end{figure}

It deserves to be mentioned that the CGE model takes the assumption that this market equilibrium mechanism does not describe the adjustments for the two types of public servants considered in the model. In Brazil, in general, public servants are hired by mean of official examination for a governmental post and their working contract includes a job stability clause in Brazil. Therefore, it is assumed that the employment levels of these workers are fixed and that the disequilibria in their labor markets are adjusted by means of changes in wages.

The labor market closure is not formulated by sector, but rather by type of labor. In this sense, the adjustment mechanism is from the aggregate to the sectoral level. After an economic shock, first, we have the definition of the aggregate levels of labor supply, wages and unemployment for each type of labor by the interaction of their aggregate demand and supply curves, as explained earlier.

To define the employment and wage levels in each sector, it is assumed that the wages of the given types of workers are differentiated by sector in the model, which implies, in sectoral imperfect segmentation in the labor market.
The hypothesis implicit in the adopted mechanism is that workers with similar observed productive characteristics (schooling and contract status) are paid in a different way according to their sector of employment. The idea is to capture the fact that, although the abovementioned similarities, the workers have another characteristics such as profession type and sector specific training or qualifications that do not permit their free mobility between all sectors but also do not completely constrain their mobility to some other sectors. Therefore, the wage differentials among sectors would remain due to the imperfect mobility of workers between the economic sectors. Pinheiro and Ramos (1995) have not only proven this fact but have also demonstrated that the wage differentials among sectors are stable along the time.

In this sense, there is imperfect mobility of workers among sectors and, thus, the sectoral wage differentials will not be eliminated, that is, the wage equalization among sectors cannot be achieved by the migration of workers from sector(s) paying lower wages to sector(s) paying higher wages.

The wage of each kind of worker in each sector \( W_{li} \) is obtained by the interaction between the average wage for each type of labor \( W_l \) and an exogenous variable for the relative wage differentials among the sectors. With this information, by means of a sector and labor type specific demand curve (equation 3.1.1), we can also determine the sectoral employment level of each type of labor \( F_{il} \), which are aggregated by a Cobb-Douglas function\(^{22}\) to define the sector \( i \)’s composite labor.

### 3.1.2. The Income Transfer Mechanisms

This section presents the formation process of income flows received by families and firms. The remuneration of capital is paid to firms\(^{23}\) and the labor earnings to workers. In each sector, the payments to capital are distributed to the firms according to their initial share in the total earnings of capital.

The eight types \( (h) \) of families receive earnings from the seven types \( (l) \) of labor according to the initial shares \( (\varepsilon_{hl}) \) of these workers in these families, which also receive the remuneration of capital transferred by firms \( (YK) \) according to the family \( h \)’s share in these income flows \( (\varepsilon_{hk}) \). Finally, the families also receive net remittances from abroad \( (RE_h) \), adjusted by the exchange rate \( (R) \), and transfers from the Government \( (TG) \), in the form of payment of benefits (direct income transfers)\(^{24}\) and as other transfers (essentially domestic debt interest) that are allocated to the families according to the initial shares \( (\theta_{ht}) \). Therefore, the family \( h \)’s income is:

\[
Y_h = \varepsilon_{hl} \times W_l + \varepsilon_{hk} \times YK + (\text{pindex}) \times \theta_{hk} \times TG + R \times RE_h
\]

\( (3.1.2) \)

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22 Equation 2.1 in the Appendix A.
23 The firms are classified in small (self-employed people) and large (other firms).
24 These transfers include the social security benefits as well as other programs such as unemployment benefits, income transfer social programs and other cash benefits.
3.1.3. The Government

The Government spends by consuming ($\sum_i CG_i$) and transferring resources to the economic agents. It plays a very important role in the process of determination of secondary income, once it directs a share of its transfers to firms as interests on the domestic debt and also demands products. Similar to families, the sharing of government transfers to the types of firms follows the proportions observed in the base year ($\theta_k$). Finally, it also transfers resources to abroad (GE) and its total expenditure is:

$$ GG = \sum_i CG_i + \text{pindex} \times (\theta_h + \theta_k) \times TG + R \times GE $$  \hfill (3.1.3)

To face all expenditures, the Government relies on three types of collections: (1) direct taxes levied on firms’ and families’ income ($\phi_h$ and $\phi_k$, respectively), and (2) indirect taxes on domestic and imported goods (proportional to production ($X$), domestic sales ($D$), imports ($M$) and value added ($VA$) amounts). Besides these sources, it also receives transfers from abroad (gfbor) and, finally, there is the balance of the social security system (SOCBAL).\footnote{In fact, social security is treated as an agent apart from the Government in the model, not only because of the considerable amount of resources that it handles in Brazil, but also because of the contributions that it applies on either the company’s income (here again in a different form), or on the installments of the added value of labor.} Thus, the Government total revenue is:

$$ RG = \sum_h \phi_h \times Y_h + \sum_k \phi_k \times YK + \sum_i (\eta_i \times X_i) + \sum_i (\zeta_i \times D_i) + \sum_i (\pi_i + \sigma_i) \times VA_i + \sum_i (\mu_i + \kappa_i + \gamma_i) \times M_i + R \times gfbor + SOCBAL $$  \hfill (3.1.4)

where $\eta_i$ are the tax rates on production, $\zeta_i$ and $\pi_i$ are, respectively, the sector $i$’s PIS-COFINS rates on domestic sales value (cumulative regime) and on value-added (non-cumulative regime), $\sigma_i$ and $\kappa_i$ are, respectively, the ICMS-IPI tax rates on value-added and imports, $\mu_i$ is the tariff on imports, while $\gamma$ are the PIS-COFINS rates on imports of commodity type $i$.

An eventual lack of government resources is defined as a government deficit that, together with domestic private (firms and families) and foreign savings, defines the amount of resources spent as investments.

The indirect tax revenue (INDTAX) from domestically produced goods is given by:

$$ \text{INDTAX} = \sum_i (\eta_i \times (PX_i \times X_i)) + \sum_i (\zeta_i \times (PD_i \times D_i)) + \sum_i ((\pi_i + \sigma_i) \times (VA_i)) $$  \hfill (3.1.5)

where $PX_i \times X_i$ is the production value, $PD_i \times D_i$ is the gross revenue value from domestic sales and $VA_i$, $\eta_i$, $\zeta_i$, $\sigma_i$ and $\pi_i$ were presented in equation (3.1.4).

The other equation that contributes to the Government revenue and deserves to be mentioned is the one describing the indirect taxes on imports revenue, which is given by:

$$ \text{TARIFF} = \sum_i (pwm_i \times R) (\mu_i + \kappa_i + \gamma_i) \times M_i $$  \hfill (3.1.6)
where $pwm_i$ is the external price of imports (in US$), $\mu_i$ is the tariff on imports, $\kappa_i$ is ICMS-IPI rates on Imports and $\gamma_i$ are the PIS-COFINS rates on imports.

### 3.2. The Microsimulation Model

This section describes specification of the household income model used for the microsimulation, as well as its estimation procedure. The initial hypothesis for using a microsimulation model is the fact that the Governmental income transfers can induce changes of individuals’ behavior, concerning their willingness to participate in the job market and their level of expenditure. The usage of a microsimulation model will permit to evaluate the effects of the programs *Bolsa Família* and BPC on the individual’s willingness to supply labor, and also on poverty and income distribution indicators, considering a nationally representative sample of the population.\(^\text{26}\)

The microsimulation model adopted in this research is based on the procedure proposed by Savard (2003). In this case, we will assume a non-segmented labor market, in which the workers receive a flexible wage that adjusts with labor supply and demand in each segment.\(^\text{27}\)

The potential wage of each worker determines its choice between offering (or not) his workforce in this market. Thus, a worker decides to quit the job market if the observed wage in his sector is lower than his potential wage.

The procedure used to estimate the microsimulation model is applied to individuals in active age (over 10 years old) belonging to the five type of factors (L1 to L5) who have the wages paid in the private sector as the main source of income. Once in Brazil, the public servants’ working contract includes a job stability clause, it is assumed that their employment levels are fixed.

A prior concern to the individuals’ potential wage estimation is the issue related to labor supply identification problem. In principle, the enlargement of transfers exogenously affects the willingness to supply labor of various demographic groups in different ways. Thus, it is necessary to estimate an equation for individual labor supply, identified by the number of individuals’ worked hours, as a function of the wage amount after changes in transfers, for each demographic group to be considered. Besides, it is also necessary to correct the potential auto-selection bias to labor supply participation. After applying this procedure, it is possible to properly identify the different reaction of the labor supply to exogenous changes of level of transfers, for individuals in each demographic group.

Therefore, the estimation procedure can be is described in two steps.

- **Step 1**

---

\(^{26}\) As the database used in this work, the National Research of Sample by Domicile (PNAD), doesn’t possess information about the domicile’s expenditures, the micro simulation model will be reduced to the analyzes of the individual’s labor offer. See appendix B for further details.

\(^{27}\) In Savard (2003), the labor market is segmented in two types: one with a fixed wage and another one with a flexible wage. Therefore, an individual could alter between three states (observing the implicit costs of choosing each one of them): offering her workforce in each one of the two markets or getting unemployed by choice.
The predicted working hours are obtained from the observable and non-observable individuals’ characteristics, as well as the family H’s characteristics, to which this individual belongs to, and his own wage. Therefore, the worker i’s predicted hours of work, $h_i^j$, is estimated by the semi-log specification, according to Blundell and McCurdy (1999):

$$h_i^j = \alpha_i + \theta_i \log w_i + \beta_i \log Q_i + \delta_i \log B_i + \gamma_i(Z_i) + u_i, \quad i = 1,\ldots,n \quad e \quad j = 1,2,3 \quad (3.2.1)$$

where $\alpha_i$, $\theta_i$, $\beta_i$, $\delta_i$, and $\gamma_i$ are the parameters to be estimated; $w_i^j$ is the hourly wage rate for individual $i$; $Q_i$ is the vector of the total household income net of all earnings received by individual $i$ (including income transfers); $B_i$ is the vector of benefits received by individual $i$; $Z_i$ represents the individuals’ observable characteristics; $u_i$ is the random error term, which captures the non-observable characteristics that affect the individual labor supply; and $j$ is the individual’s demographic group, being 1 for men, 2 for woman head of household with children, and 3 for other women. The value of $\theta$ determines the substitution-effect related to sensitivity of individual labor supply to changes in wages. The values of $\beta$ and $\delta$ represent the income-effect, that is, the impact of non-labor-income on labor supply.

The $Z_i$ vector of individual characteristics was composed by the following variables:

$$Z_i = educ, age, age^2, famsize, D_a$$

where $educ$ denotes the number of years of schooling, $age$ is a proxy to the level of experience; $famsize$ is the family size in number of individuals (excluding pensioners, domestic servants and their parents), $D_a$ is a dummy for the area where the family’s domicile is located (0 for urban and 1 for rural).

The individual working journey is observed just for occupied people. Thus, the sample of individuals that present a strictly positive journey is not random. However, it is possible that the choice to work be related to the dependent variable, income, either from labor or from non-labor (other sources). Therefore, the situation is typically one of endogenous selection, in which there is a decision to participate or not in the job market and, given that the individual had decided to work, it is necessary to determine how many working hours he will offer. In order to control the potential selection bias, it will be applied the procedure proposed by Heckman (1970), which consists of:

$$Pr(S_i = 1|z) = \Phi(\gamma_i(Y_iZ_i)) \quad (3.2.2)$$

where: $\Phi$ is a function of accumulated distribution; $\gamma_i$ is a vector of estimated parameters that determine the probability of the individual to take part in the labor market; $Y_i$ is the vector

---

28 This functional form was proposed because it is consistent, first, with the existence of individuals’ preferences by labor and leisure, and, second, with the presence of households budgets constraints.

29 This is the amount of benefits that the individual received from Bolsa Família (BF) and BPC in 2003.

30 In this last case, the women that have no children and are not head of family.
representing the variables related to the labor and non-labor income that affect the decision of supplying labor by individual \(i\); as before, \(Z_i\) is the individual characteristics that determine the probability of participating in the labor market.

The equations (A) and (B) are estimated by the two stages method proposed by Heckman (1979). In this model, equation (B) is also known as the equation of correction of sample selection’s bias by non-observable. These equations are run for three demographic groups: men, women with children and that are head of family, and other women which permits to estimate their elasticity of labor supply. From equation (3.2.2) is extracted the inverse of Mills’ ratio, \(\lambda(z\gamma)\), which will be applied in equation (3.2.1), in a way that the parameters of this equations are going to be consistently estimated.

Possessing the estimated coefficients in (3.2.1) and the inverse of Mills’ ratio, it will be possible to estimate the adjusted working hour of each individual, \(\bar{h}_i\), based on her observable and non-observable characteristics. If the individual belongs to state \(S_i = 1\), the working hour of worker \(i\) is adjusted towards the mean value of his demographic group. If he pertains to the state \(S_i = 0\), the working hour of this individual is equalized to zero, because this individual did not offer work. The adjusted working hour is then applied to the individual \(i\)’s observed wage, \(w_i^o\), which results in the adjusted individual \(i\)’s wage (\(w_i\)).

- **Step 2**

The potential wage is obtained from the observable and non-observable individuals’ characteristics, as well as the family \(H\)’s characteristics, of which this individual belongs to. Therefore, the worker \(i\)’s potential log wage, \(\log w_i\), is estimated by the equation:

\[
\log w_i = \alpha_i + \beta_i \log Q_i + \delta_1 \log B_i + \gamma(Z_i) + u_i, \quad i = 1, ..., n
\]  

(3.2.3)

where \(\alpha_i\), \(\beta_i\), \(\delta_i\) and \(\gamma_i\) are the parameters to be estimated, \(w_i\) is the hourly wage adjusted by the procedure descript in step 1; \(Q_i\), \(B_i\) and \(Z_i\) are the same variables presented early.

Due to the impossibility of observing the wage offer to the sample’s individuals that are unemployed, we need to estimate a probit model that determines the probability of the individual to take part in the labor market. This probability, \(S_i = 1\), is estimated by the function:

\[
\Pr(S_i = 1 | z) = \Phi\{\gamma_i' (Y_i Z_i D_g)\}
\]  

(3.2.4)

where: \(\Phi\) is a function of accumulated distribution; \(\gamma_i\) is a vector of estimated parameters that determine the probability of the individual to take part in the labor market; as before, \(Z_i\) and \(Y_i\) are respectively the individual characteristics and the work and non-work income that determine the probability of participating in the labor market; and \(D_g\) is a demographic dummy (0 for man, 1 for woman that is mother and head of family, 2 for the other women).
Finally, the equations (3,3) and (3,4) are estimated by the two stages method proposed by Heckman (1979). In this model, equation (3.2.4) is also known as the equation of correction of sample selection’s bias by non-observable. From this equation is extracted the inverse of Mills’ ratio, $\lambda(z\gamma)$, which will be applied in (3.2.3), in a way that the parameters of this equations are going to be consistently estimated.

Possessing the estimated coefficients in (3.2.3) and (3.2.4) and the inverse of Mills’ ratio, it will be possible to calculate the expected wage of each individual, $\bar{w}_i^j$, based on her observable and non-observable characteristics. If the individual belongs to state $j = 1$, the potential wage of worker $i$ is obtained. If he pertains to the state $j = 0$, the reservation wage of this individual is obtained. This potential or reservation wage will be used in comparison with the observed wage, $w_i$.

For each employed person, this procedure applies the following criterion: if the estimated potential wage $\left(\bar{w}_i^j\right)$ is higher than the earned wage ($w_i$) observed in the database, then this person is indicated as potentially unemployed; otherwise, he remains employed, i.e.:

\[
\begin{cases} 
\text{if } w_i < \bar{w}_i^j, & \text{individual } i \text{ is a potentially unemployed} \\
\text{otherwise}, & \text{he is a potentially employed} 
\end{cases}
\]

After making this comparison for each employed person, the model determines the Heckman pre-simulation occupational level by labor type ($HLsl$) by summing up the number of people originally unemployed with the number of people that would unemployed according to the Heckman criterion.

It deserves mentioning that this occupational level by labor type ($HLsl$) is different from the original level in the database ($Lsl$), once there are people in the database that work and earn wages lower than their estimated reservation wages. Actually, this happens because these last wages are estimates of the ones that these people could earn in the market according to characteristics of themselves and of their families. Therefore, just the application of the Heckman procedure to the database changes the occupational level for each labor type.

As proposed by Savard (2003), the selection of individuals who should be unemployed starts with the classification of workers according to their reservation wages. Those with the highest reservation wage will be the first to become unemployed if the real wage decreases. If there is positive change in the real wages, the first to be employed will be those with lower reservation wage.

### 3.3. Integration Between The CGE and The MS model

The impacts of the Bolsa Família and BPC programs on welfare indicators will be assessed with an integrated CGE-MS modeling framework with bi-directional linkage between
them to guarantee convergence of solutions for both models. The communication between CGE and MS models will occur by means of wages and occupational level of labor. This subsection describes the way these models are integrated to generate a convergent solution for them.

Running the integrated model involves the following procedure: we first compute the income transfers changes in the MS model and sequentially run the CGE model. By computing the changes of income transfer programs the MS model simulates the variations in labor supply by type of worker that are communicated to the CGE model.

The basic issue is using then the CGE model to simulate the effects of changes in transfer programs on labor supply and on Government expenses, to calculate the induced variations on the general average real wage and the general price index. These last changes are fed back into the MS model, in which they are exogenous variables, to define a new labor occupational level for each kind of worker, that are feed backed to the CGE model, in which they become exogenous variables after the first simulation, producing new values for general average real wage, and general price index that are retransmitted to the MS model, in order to define labor occupational levels compatible with the new value for the general wage.

This iterative process continues until the difference between the values of occupational levels for the labor types in the CGE model between two consecutive iterative steps are very close to zero. The following description illustrates the way that we intend the bidirectional procedure works in the case of simulating the implementation of changes in the Bolsa Família and BPC programs according to each simulation, which will be described in the next section:

- **Step 1**

  The MS model contains data about thousands of individuals and estimates the potential wage ($\bar{w}_i$) for each person $i$ in the database and defines occupational levels for each category of labor by means of the equations (3.2.3) and (3.2.4), as exposed in the previous section.

  The first step of the integrated solution consists in replacing the values that represents the benefits received from the income transfer programs in 2003 ($B_i$) in the equations (3.2.3) and (3.2.4) by the specific values of these benefits ($B_i^*$) in each simulation and, then, re-estimating to calculate what the Heckman post-simulation occupational level for each labor type ($HLsl_{MS}^*$), the occupational level under the simulated conditions.

  In order to capture the changes in the occupational level by labor type due only to the variation in the benefits, isolated from the effects of applying the Heckman procedure to the database, it is calculated the difference between the Heckman post-simulation occupational level by labor type ($HLsl_{MS}^*$) and the Heckman pre-simulation one ($HLsl$), and sum it to the original occupational level in the database ($Lsl$) to have an occupational level that is
compatible with the new values of benefits, that is, a post-simulation occupational level by labor type calculated by the MS model \( L_{sl_{MS}}^* \).

- **Step 2**

  The occupational level after implementation of changes in transfer programs \( L_{sl_{MS}}^* \), as well as the new amount of given benefits \( B^* \) are applied to the CGE model, where

  \[
  B^* = \sum_i \sum_j B_{ij}^*, \quad i = 1, \ldots, n; \quad t = BF, BPC
  \]  

  and \( B_{ij}^* \) is the amount of benefits that individual \( i \) received from *Bolsa Família* and BPC.

  Besides, the new values of taxes that are used to finance the changes in transfer programs \( B^* \) are also applied to the CGE model in order to simulate the changes in the economic environment induced by the variation in the transfer programs.

  All these changes will induce the economic system to achieve a new general equilibrium and, as part of this process, the labor market will reach equilibrium with new values for the real wage \( \tilde{W}_{CGE}^* \).

- **Step 3**

  The percentage change in the general average real wage \( \Delta \tilde{W}_{CGE}^* \) obtained from the simulation with the CGE model is applied on the wages earned by each person \( i \) in the MS model’s database \( w_i \), defining after-shock values for earned wages \( w_i^* \). For example, if the post-simulation general average real wage in the CGE model is 5% higher than its initial value, then all wages earned by each one in the MS model’s database are raised by 5%.

  After that, we compare the values of these new individual wages \( w_i^* \) with their respective potential wage amounts \( \overline{w}_i^j \) by means of Heckman procedure. Using the same previously mentioned criterion for this procedure, we have that:

  \[
  \begin{cases} 
  \text{if } w_i^* < \overline{w}_i^j, \text{ individual } i \text{ is unemployed} \\
  \text{otherwise}, \text{ he is employed.}
  \end{cases}
  \]

  Therefore, after classifying the workers by the reservation wages, those with the highest reservation wage will be the first to become unemployed if the real wage decreases, and in the case of a positive change in real wages, the first to be employed will be those with lower reservation wage. Summing up the number of people to be employed or unemployed according to this criterion to the initial occupational level, one obtains a new level of occupation for each labor type \( L_{sl_{MS}}^* \).

- **Step 4**
These new levels of occupational levels are then transmitted to the CGE model, as shown in the figure below that illustrates the iterative procedure:

If the occupational levels calculated by the MS model are different from those in the CGE model, they change the equilibrium of the labor markets, which will present new values for wages and induce changes in the economic environment as a whole until the CGE model reaches a new equilibrium situation. In this sense, the step 2 restarts, but without changes in benefits and their financing sources, and this integrated solution procedure loops until the difference between the post-simulation occupational level calculated by the MS model ($Lsl^*$) in one round is reasonably close to the one obtained in the previous round.

This association is done in a consistent way with the equilibrium of aggregate markets in the CGE model, which requires that: (1) relative changes in average earnings in the micro simulation must be equal to changes in wage rates obtained in the CGE model for each wage group in the labor market; (2) relative changes in the number of waged workers by labor-market segment in the micro simulation model must match those same changes in the CGE model, and (3) changes in the consumption price vector, $p$, must be consistent with the CGE equivalent price indicator.
3.4. Non-Labor Income Procedures

After the models solutions’ convergence it is still necessary to treat the non-labor incomes before calculating poverty and inequality indicators. Basically, the variables related to these sources of income or follow the CGE variations or held the same value of the household survey, as described in the table bellow.

Table 3.1 – Integration CGE-MS Model for non labor Income (base 2003)

<table>
<thead>
<tr>
<th>Household Income Source</th>
<th>Procedure in the Microsimulation (PNAD 2003)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Governmental Transfers</td>
<td>The 2005 imputed “Bolsa Família” and “BPC” values described at Appendix C.</td>
</tr>
<tr>
<td>Self Employed Income</td>
<td>CGE results variations of these income sources are applied to the microsimulation model vectors.</td>
</tr>
<tr>
<td>Interest, Dividends and Others and House Rental</td>
<td>CGE results variation of these income flows individualized to the 8 family types in the model are applied to the microsimulation model vectors.</td>
</tr>
<tr>
<td>Retiree and Pension Public Benefits</td>
<td>The same vector value of the microsimulation base year model.</td>
</tr>
<tr>
<td>Retiree and Pension Private Benefits</td>
<td>The same vector value of the microsimulation base year model.</td>
</tr>
<tr>
<td>Donation received</td>
<td>The same vector value of the microsimulation base year model.</td>
</tr>
</tbody>
</table>

The above sources are deflated by the CGE model price index (after simulation) for each family type (weighted by the consumption model vector).

4. Simulations and Results

This section presents the simulations features in order to provide some basis for a better understanding the reported results which are also presented bellow.

4.1. Simulations description

The aiming of this section is the description of the simulations carried out in this project which are related to the project research questions: what are the impacts of the current income transfer programs on income distribution and poverty in Brazil? Each of them is accomplishing its objective of poverty reduction? Which would be the impacts of these programs if they have alternative policy designs?

At the CGE level, our simulation objective is the evaluation of the effects of changing the values and the beneficiaries of the programs Bolsa Família (BF) and Benefício de Prestação Continuada (BPC), from the ones they presented in 2003 to the ones presented in 2005. Also, we can understand this simulation as the following question: How the 2003 Brazilian economy (base year) would behave if it had the same characteristics of the transfer program in the year 2005. To do so, we proceed in the following way.
Transfer Programs. We addressed the changes between 2003 and 2005 with similar procedures adopted by Barros et al. (2007). However, we construct a specific imputation methodology for the 2005 additional benefits as fully explained in the Appendix C. At the CGE level, with that information, we just took the benefits share among the 8 CGE model families with amounts, for each program, given by the administrative Federal Budget data respecting the consistency with our SAM data. The values are shown in the table 4.1 below.

**Table 4.1 – Total Amount of Benefits for CGE Model Family type, changes between 2003 and 2005 (R$ mil)**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bolsa Família</td>
<td>BPCs</td>
<td>Bolsa Família</td>
<td>BPCs</td>
</tr>
<tr>
<td>F1</td>
<td>777.344</td>
<td>675.171</td>
<td>1.829.805</td>
<td>1.418.757</td>
</tr>
<tr>
<td>F2</td>
<td>35.269</td>
<td>19.741</td>
<td>88.412</td>
<td>410.307</td>
</tr>
<tr>
<td>F3</td>
<td>616.145</td>
<td>302.187</td>
<td>1.250.466</td>
<td>410.307</td>
</tr>
<tr>
<td>F4</td>
<td>810.877</td>
<td>2.203.557</td>
<td>1.861.258</td>
<td>4.346.372</td>
</tr>
<tr>
<td>F5</td>
<td>131.450</td>
<td>653.335</td>
<td>276.218</td>
<td>336.645</td>
</tr>
<tr>
<td>F6</td>
<td>319.388</td>
<td>653.445</td>
<td>647.264</td>
<td>757.034</td>
</tr>
<tr>
<td>F7</td>
<td>336.965</td>
<td>575.066</td>
<td>635.454</td>
<td>288.837</td>
</tr>
<tr>
<td>F8</td>
<td>157.558</td>
<td>50.428</td>
<td>282.481</td>
<td>25.328</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>3.185.000</td>
<td>5.132.934</td>
<td>6.871.361</td>
<td>7.838.638</td>
</tr>
</tbody>
</table>

Source: Author's elaboration based on data from Federal Budget and SAM (2003) based model

The Table 4.1 shows the differences among the benefits amounts in 2005 and 2003. The amount imputed in the 2003 model base year increased the transfers by R$ 6,392 million which represents 0.57% of the total family income in the model. Separately, the program’s increase was approximately 116% for “BF” and 53% for “BPC”. Also, there was an improvement in the targeting group. The poorest families in the CGE model (F1, F2, F3) increase their “BF” share from 44.9% (2003) to 46.1% (2005). Despite these improvement, the data shows that the BPC targeting were much worse than those from BF program (from 19.4% in 2003 to 26.6% in 2005).

The effects of abovementioned changes will be evaluated by the simulations henceforth referred as SIMU A and SIMU B. The only difference between them is if the programs are financed or not, before the shock. In the SIMU A, the government expenditure in transfers is not financed and government just increases its expenditure in transfers.

Program Budget Finance at SIMU B. The expenditure increase of “BF” and “BPC” was fully financed by the increase in federal government taxes. This choice was made in order to hold almost constant the nominal Government deficit and its contribution to the total amount of savings, at the CGE level. The justification for this policy arrangement can be explained by the “fiscal responsibility law”, which requires that every new expenditures must be explicitly

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31 For 2003, at micro data level, we used the same adapted household survey, which was provided by those authors.
financed at the budget law, which means at the moment the law is approved but before the expenditure occurrence.

For the choice of which tax we should increase, we made an extensive research in the 2005 federal budget data to identify the specific tax sources that were financing the BF-BPC programs in that year. The Table 4.2 bellow shows the amounts of the federal tax sources, their participation and the equivalent CGE tax, presented in the CGE model.32

**Table 4.2 - Programs Tax Sources in 2005 (R$ mil)**

<table>
<thead>
<tr>
<th>Brazil Tax Source</th>
<th>Value</th>
<th>Composition</th>
<th>TAX in the CGE model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contribucao p/ Financiam. da Seguridade Social (Code 153)</td>
<td>7,570.121</td>
<td>51.46%</td>
<td>Pis-Cofins tax reform – value added reform</td>
</tr>
<tr>
<td>Contrib. Provisoria s/ Movimentação Financeira (Code 155)</td>
<td>5,265.907</td>
<td>35.80%</td>
<td>Direct taxes on firms and households</td>
</tr>
<tr>
<td>Outros Impostos Diretos (Income Tax And Others)</td>
<td>993,630</td>
<td>6.75%</td>
<td>Direct taxes on firms and households</td>
</tr>
<tr>
<td>Impostos S/ Produtos (Mix Of Indirect Taxes)</td>
<td>445,959</td>
<td>3.03%</td>
<td>Indirect taxes on Revenue</td>
</tr>
<tr>
<td>Contr.Social S/ o Lucro das Pessoas Juridicas (Code 151)</td>
<td>418,667</td>
<td>2.85%</td>
<td>Direct taxes on firms and households</td>
</tr>
<tr>
<td>Operações de Credito Externas - Em Moeda (code 148)</td>
<td>15,713</td>
<td>0.11%</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>14,710,000</strong></td>
<td><strong>100.00%</strong></td>
<td></td>
</tr>
</tbody>
</table>

From the Table 4.2 above, we collected the financial share of each tax in the total increase of programs expenditure. Thus, the taxes below were increased to finance the programs in the following way:

- 2.2% increase of direct income taxes of all types of families (IR);
- 2.2% increase of direct income taxes of the model firms (IR);
- It was made an appropriation of 27.5% from the tax increase due to the PIS-COFINS tax reform, which was implemented in the same period and is fully described by Cury and Coelho (2006).

**4.2. Macroeconomic Impacts**

Table 4.3 presents the macro results that formed the background for SIMU A and SIMU B. The analysis will focus on results from SIMU A once it captures the effects of changes in transfers and in the taxes that were used to finance the variation in transfers, while the results from SIMU A are reported to provide information on the impacts only from the changes in transfer programs.

In general, the impacts were adverse since they induced a real GDP fall of 0.46%, an aggregate employment decrease of 0.48% and generated a price index increase of 0.65%. These adverse effects can be mainly attributed to the partial PIS-COFINS tax reform that was

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32 A more comprehensive data about tax sources is presented in the appendix D of this report.
one of the financing sources of the transfer programs. The analysis of this tax reform done by Cury and Coelho (2006) provided similar results.\textsuperscript{33}

Table 4.3 - Macroeconomic Indicators (percentage change)*

<table>
<thead>
<tr>
<th>Macroeconomics indicators</th>
<th>SIMU A</th>
<th>SIMU B</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP</td>
<td>-0.02</td>
<td>-0.46</td>
</tr>
<tr>
<td>Consumption</td>
<td>0.50</td>
<td>-0.35</td>
</tr>
<tr>
<td>Investment</td>
<td>-1.42</td>
<td>-1.04</td>
</tr>
<tr>
<td>Public Sector Deficit</td>
<td>+17.87</td>
<td>+7.38</td>
</tr>
<tr>
<td>Exports</td>
<td>(**)</td>
<td>-0.84</td>
</tr>
<tr>
<td>Imports</td>
<td>(**)</td>
<td>-1.07</td>
</tr>
<tr>
<td>Employment</td>
<td>-0.11</td>
<td>-0.48</td>
</tr>
<tr>
<td>Price Index</td>
<td>0.13</td>
<td>0.65</td>
</tr>
</tbody>
</table>

Note: (*) Real percentage change from the CGE base year. (**) Lower than 0.01%.
Source: Authors’ elaboration.

The taxation of the firms’ value-added (VA) imposed to firms the need of earning higher marginal revenues or reducing marginal costs, which can be done by reductions of the VA components usage. This implies in a lower labor demand that induces decrease in wages, and so, reduces the available income. Particularly, the consumption fall is due to the decrease in the overall family income despite the rise in the poorest ones due to the transfer’s increase.

The taxation of imports imposed by the fiscal reform increased their prices in the domestic market and induced another adverse effect on aggregate consumption, once this have risen the composite commodities prices in the internal market. This relative increase of prices in the internal market induces reductions of the households and firms demands.

Exports fell due to the price-responsiveness behavior of external agents and the model external closure characteristics. First, the simulation induced an increase in domestically produced commodities prices, which, by its turn, caused a decrease in external demand for Brazilian commodities. Second, the rise in import prices and the reduction of internal absorption (activity) induced a fall in demand for imported commodities, and in exports, in order to cause no disequilibrium in the trade balance.

The government deficit worsened 7.88% showing that the simulated taxation changes were not enough to completely finance the total transfer costs. However, comparing with SIMU A, the government deficit decreased from 17.87 % to 7.88%. Despite the intention of fully finance in SIMU B, design, the government deficit was not held constant because the tax dead weight losses incurred during the simulation.

Finally, the comparison between both simulations can demonstrated the isolated effect of transfers without the tax increases (SIMU A). At this simulation, the GDP is practically stable. The same occurred with internal absorption, but the shock caused a trade off between consumption and the investment, with the former increasing 0.5 % and the later decreasing 1.42 %. This fact can be explained by the increase in income transfer and the higher public

\textsuperscript{33} This paper provides an intensive analysis of the PIS COFINS tax reform explaining the negative effects reasons.
deficit (+17.89 %) and consequently, reducing total savings. Overall, SIMU A almost doesn’t change the macro indicators, therefore the adverse impacts of SIMU B are due to the implemented financing structure.

4.3. Impacts on Labor Market

The changes of income transfer programs from 2003 to 2005 induced a slight adverse effects on aggregate employment (–0.48%, see Table 4.3) and on employment by labor type, as shown in Table 4.4.

Table 4.4 - change in employment from the base-year (%)

<table>
<thead>
<tr>
<th></th>
<th>L1</th>
<th>L2</th>
<th>L3</th>
<th>L4</th>
<th>L5</th>
<th>L6</th>
<th>L7</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIMU A</td>
<td>–0.13</td>
<td>–0.14</td>
<td>–0.17</td>
<td>–0.06</td>
<td>–0.06</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>SIMU B</td>
<td>–0.85</td>
<td>–0.47</td>
<td>–0.47</td>
<td>–0.28</td>
<td>–0.23</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Note: L1-unskilled informal; L2-skilled informal; L3-formal with low skill; L4-formal with average skill; L5-formal with high skill; L6-low skilled public servant; L7-highly skilled public servant.

The results show that employment would fall for all categories of workers in the private sector only. The public servants employment does not change because public sector does not follow the behavior of private sector concerning hiring/firing people and so, by assumption, their employment levels are fixed and their labor market adjust only by means of wages.

Among workers in the private sector, one can see two patterns. First, the effects would be more pronounced among those allocated in the informal market (L1 and L2) and, second, among the less skilled ones in each (informal or formal) market.

In our interpretation, with lower imports there will be a pressure to overvalue the exchange rate that will tend to make exports more expensive, which will be reinforced by an increase in input prices used to produce exported goods. The sectors in which exports are more sensible to price changes are the most traditional ones. Thus, by exporting less, there would be a tendency for these sectors to produce less and, therefore, to employ less workers, especially the less skilled ones.

The decrease in employment of more skilled workers is due to the fall in the output of sectors that produce goods with higher technological content and demand this kind of worker in a more intensive way (automobiles, auto parts, electronic, electrical, and pharmaceutical). Behind this fact, probably there is the consumption fall of families with higher income.

Table 4.5 presents the impacts on real wages by labor type. Recall that the CGE model takes the assumption of rigid sectoral wage differentials, and, thus, the wage structure can only react to the type of labor. As a consequence, the changes reported in table 4.5, below, are for each type of worker without any sectoral desegregation.

Table 4.5 - change in the average real wage from the base-year (%)

<table>
<thead>
<tr>
<th></th>
<th>L1</th>
<th>L2</th>
<th>L3</th>
<th>L4</th>
<th>L5</th>
<th>L6</th>
<th>L7</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIMU A</td>
<td>+0.32</td>
<td>–0.12</td>
<td>–0.04</td>
<td>–0.07</td>
<td>–0.09</td>
<td>–0.04</td>
<td>–0.01</td>
</tr>
<tr>
<td>SIMU B</td>
<td>–1.77</td>
<td>–0.96</td>
<td>–1.52</td>
<td>–0.90</td>
<td>–1.61</td>
<td>–1.66</td>
<td>–1.62</td>
</tr>
</tbody>
</table>

Note: L1-unskilled informal; L2-skilled informal; L3-formal with low skill; L4-formal with average skill; L5-formal with high skill; L6-low skilled public servant; L7-highly skilled public servant.
Note that the general effect is a real wage fall. The wage of informal workers (L1 and L2) would fall relatively more comparing to the wage of formal workers with similar level of skills. The higher reduction of public servants’ earnings is due to the assumption that the equilibrium in their labor market is almost exclusively achieved by means of wages adjustments.

Table 4.6 below shows that the effects on payroll by type of worker (total labor income) representing the former quantity and price effects together. They are stronger among the less skilled workers, especially for those allocated in informal market.

**Table 4.6: change in the real payroll from the base-year (%)**

<table>
<thead>
<tr>
<th></th>
<th>L1</th>
<th>L2</th>
<th>L3</th>
<th>L4</th>
<th>L5</th>
<th>L6</th>
<th>L7</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIMU A</td>
<td>+0.19</td>
<td>-0.25</td>
<td>-0.21</td>
<td>-0.13</td>
<td>-0.14</td>
<td>-0.04</td>
<td>-0.01</td>
</tr>
<tr>
<td>SIMU B</td>
<td>-2.62</td>
<td>-1.43</td>
<td>-1.99</td>
<td>-1.18</td>
<td>-1.84</td>
<td>-1.66</td>
<td>-1.62</td>
</tr>
</tbody>
</table>

Note: L1-unskilled informal; L2-skilled informal; L3-formal with low skill; L4-formal with average skill; L5-formal with high skill; L6-low skilled public servant; L7-highly skilled public servant.

These effects on payroll are due mainly to the falls in real wages, once the impacts of changes in transfer programs on employment are lower than the ones on real wages for each kind of worker. Again, the comparison between the simulations shows that the transfer programs themselves practically don’t cause any significant adverse effect. Even the informal unskilled worker (L1) shows a labor income improvement, derived from the fact that there is a production reallocation in favor of more intensive labor sectors. On the other hand, the increase in taxes to finance the programs brought the adverse effects through the changes in the relative prices and a less efficient resource allocation with higher unemployment.

In the first run, the simulation consists in applying the changes in transfer programs in the MS model, which generates new values for labor supply by worker type to be transmitted to the CGE model. Thus, the second shock is fully concentrated on employment and generates percentage changes in wages that are communicated to the MS model, which completes the first loop between the models. The next loops present the following characteristic: (1) changes in wages from the CGE model are imputed to the MS model that generates new values for labor supply by worker type, and (2) these new values are imputed into the CGE model that calculates the induced changes in wages. As described in section 3, these loops run until the shock in any direction is equal to the respective one in the previous round.

It deserves to mention that the convergence issue affected the final labor market results. Thus, concerning these effects on payroll, the convergence of solutions from the CGE and the MS models, as explained, showed that the initial changes in transfer programs induce general equilibrium effects that partially transfer the impacts on employment to wages.
4.4. Impacts on Income Distribution

Table 4.7 shows the impacts of changes in transfer programs on inequality indicators. In general, the results confirm the important role of transfer programs in the Brazilian recent inequality fall.\textsuperscript{34}

<table>
<thead>
<tr>
<th>Inequality Indicators</th>
<th>Base Year</th>
<th>SIMU A</th>
<th>SIMU B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Original</td>
<td>Results**</td>
<td>Change</td>
</tr>
<tr>
<td>Gini Index</td>
<td>0.5930</td>
<td>0.5908</td>
<td>– 0.37%</td>
</tr>
<tr>
<td>Theil-T Index</td>
<td>0.7213</td>
<td>0.7163</td>
<td>– 0.69%</td>
</tr>
</tbody>
</table>

Source: from the CGE-MS integration model. (base year: 2003 PNAD survey)

Focusing on Gini index changes, the fall of –0.48% is slightly lower than ones reported by other studies that have evaluated the importance of transfer programs to the decrease in inequality using partial equilibrium/decomposition analysis. Barros et al (2007) found that 22.9\% of the total Gini decrease between 2001 and 2005 was due to “BF” and “BPC”.

The simulations implemented in this research had isolated the effects of changes in transfer programs from 2003 to 2005. In the same period, the before mentioned authors reported a total decrease of Gini index of –2.6\%. Therefore, the decrease displayed in the Table 4.7 accounts for approximately 14\% (SIMU A) and 19\% (SIMU B) of total inequality fall in that period.

Although the period is different, we found evidences that just the transfer programs (SIMU A) had lower effects on inequality than those reported by other studies that had evaluated the distributive effects of these programs. But, in the case of SIMU B, the effect is very similar. It is important to observe that the taxation changes related to the programs contributed in a significant way to reduce inequality.

Despite the previous comments, we must be careful when comparing with former analysis. As stressed before, they have methodological differences and design of the simulations is not the same, although we tried to replicate their experiments.

Table 4.8 bellow shows the impacts of changes in transfer programs on per head family income. Before presenting these results, it deserves mention that the changes in programs had slight adverse effect on the national average household income of – 0.18\% (SIMU A), which was magnified to – 0.81\%, when the changes in taxation related to the programs expansion were considered (SIMU B). At both simulations, the positive strong effects in the three poorest families are primarily due to the increase of the transfer amounts for them. But at SIMU B, the effects are a little lower for each of these same families type. This happens because one of the main sources of resources for the enlargement of the programs was the increase in income taxes that does not charge them.

\textsuperscript{34} The book printed in Brazil, edited by IPEA, called “Desigualdade de Renda no Brasil: Uma análise da queda recente”, has several chapters aligned with this view.
### Table 4.8 – change in household income from the base-year (%)

<table>
<thead>
<tr>
<th>Average household income</th>
<th>Original Values (R$)</th>
<th>SIMU A Values (R$)</th>
<th>Change</th>
<th>SIMU B Values (R$)</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>National average</td>
<td>432.36</td>
<td>431.59</td>
<td>-0.18%</td>
<td>428.84</td>
<td>-0.81%</td>
</tr>
<tr>
<td>Family 1 (F1)</td>
<td>43.88</td>
<td>45.89</td>
<td>4.58%</td>
<td>45.76</td>
<td>4.28%</td>
</tr>
<tr>
<td>Family 2 (F2)</td>
<td>70.20</td>
<td>74.90</td>
<td>6.70%</td>
<td>74.89</td>
<td>6.69%</td>
</tr>
<tr>
<td>Family 3 (F3)</td>
<td>46.87</td>
<td>47.89</td>
<td>2.17%</td>
<td>47.78</td>
<td>1.94%</td>
</tr>
<tr>
<td>Family 4 (F4)</td>
<td>166.42</td>
<td>168.19</td>
<td>1.06%</td>
<td>167.67</td>
<td>0.75%</td>
</tr>
<tr>
<td>Family 5 (F5)</td>
<td>303.65</td>
<td>302.57</td>
<td>-0.36%</td>
<td>301.23</td>
<td>-0.80%</td>
</tr>
<tr>
<td>Family 6 (F6)</td>
<td>191.94</td>
<td>192.31</td>
<td>0.19%</td>
<td>191.76</td>
<td>-0.09%</td>
</tr>
<tr>
<td>Family 7 (F7)</td>
<td>696.64</td>
<td>693.84</td>
<td>-0.40%</td>
<td>689.33</td>
<td>-1.05%</td>
</tr>
<tr>
<td>Family 8 (F8)</td>
<td>3,015.14</td>
<td>2,998.08</td>
<td>-0.57%</td>
<td>2,972.50</td>
<td>-1.41%</td>
</tr>
</tbody>
</table>

Note: F1 – poor urban families headed by active individuals; F2 – poor urban families headed by non-active individuals; F3 – poor rural families; F4 – urban families with low average income; F5 – urban families with medium income; F6 – rural families with medium income; F7 – families with high average income; F8 – families with high income.

Source: Authors’ elaboration.

For the same reason previously mentioned, the effects of programs expansion on income of richer families (F7 and F8) already were negative in the first simulation (SIMU A) and were magnified when the changes in taxation were considered.

SIMU A captures the effects just of the transfer programs expansion that positively impacts the income of the poorest family types. This simulation also captures the systemic effects induced from these programs that were generally adverse, as shown in sections 4.2 and 4.4. Besides capturing these effects, SIMU B also captures the additional negative impacts from taxation on all families, mainly on the richest ones (F7 and F8).

This helps to understand the improvement of the Gini index at SIMU B, in relation to SIMU A, because besides capturing the increase of income of the poorest families, it also captures the fall of income of the richest families due to the taxation.

### 4.5. Impacts on Poverty

The effects of the transfer programs on poverty are presented in the table 4.9 below. Based on observed and simulated per head household income, we calculate three poverty indicators: Proportion of Poor (P0), Income Gap (P1) and Severity of Poverty (P2). To calculate these indicators, it was used values for September 2005 estimated by Barros et al (2007b), and we deflated to September 2003 according to IPCA (Índice Preços ao Consumidor Amplo) index.
Table 4.9 Poverty Indicators - PNAD 2003

<table>
<thead>
<tr>
<th>Poverty Indicators</th>
<th>Base year</th>
<th>SIMU A</th>
<th>SIMU B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Results</td>
<td>Change</td>
<td>Results</td>
</tr>
<tr>
<td>Poverty Line (Line = R$ 143,70)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P0</td>
<td>0.3299</td>
<td>–1.29%</td>
<td>0.3271</td>
</tr>
<tr>
<td>P1</td>
<td>0.1599</td>
<td>–1.26%</td>
<td>0.1593</td>
</tr>
<tr>
<td>P2</td>
<td>0.1061</td>
<td>–1.28%</td>
<td>0.1060</td>
</tr>
<tr>
<td>Extreme Poverty Lines (Line = R$ 71,84)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P0</td>
<td>0.1485</td>
<td>–0.83%</td>
<td>0.1485</td>
</tr>
<tr>
<td>P1</td>
<td>0.0777</td>
<td>–1.38%</td>
<td>0.0778</td>
</tr>
<tr>
<td>P2</td>
<td>0.0578</td>
<td>–1.52%</td>
<td>0.0580</td>
</tr>
</tbody>
</table>

Source: Authors’ elaboration.

The general reduction in poverty indicators (P0, P1 and P2) show that the changes just in transfer programs (SIMU A) had positive effects on poverty and on extreme poverty. Although the impacts are positive, they are lower than the income of the poorest families showed at table 4.8 because the transfers are concentrated on the families that receive them and on the other hand, some poor families lose their labor income due to the unemployment generated in the economy.

From the results on the table above, we also see that the impacts of programs on poverty were reduced by the changes in taxation conducted to finance their expansion (SIMU B), that is, the changes in taxation generated some adverse impacts in the markets that affected the poor population and in a more intensive way, the extremely poor individuals. As we have seen previously in section 4.4, the impacts on employment were more stronger among the less skilled workers (L1 and L3) and for the informal workers (L1 and L2). Despite these workers have not presented the highest reduction in wages, their wages also have decreased in a significant way. These workers are the prevailing types in the poorest families, which also present a high dependence on the labor income. Therefore, despite the increase of the received benefits, some families experienced adverse effects from job losses and from wage reduction that were induced by the changes in taxation.

Specifically in the case of SIMU B, the extreme poverty level was not affected by the programs expansion. However, the income gap and severity of extreme poverty have worsened. One fact that helps to understand, besides what was pointed before, is the deterioration of non-labor income due to the prices increase, which especially hammered the family F2, whose income is basically from Social Security benefits.

5. Conclusions and Recommendations

In the last two sections of this final report, we presented the methodological approach and the main results of the simulations. In these previous analysis it became very clear the interdependence of both to achieve the main objectives stated in this research project: “The
Impacts of Income Transfer Programs on Income Distribution and Poverty in Brazil: An Integrated Microsimulation and Computable General Equilibrium Analysis”.

From the methodology, the general equilibrium effects can not be neglected, not only to evaluate the effects brought by the transfer increases, but mainly to address the economic impacts originated in the tax structure that finances this social expenditure. Without the CGE part of the integrated approach, many economic facts, reported at the simulation results, could not be identified.

On the other hand, the MS model allows the individualization and the treatment of individuals and families. In view of this, we implemented the individual imputation of the transfer benefits and the respective labor supply reaction, whose system inside the MS model improved a lot the treatment of the labor market. Also, without the MS model, we could not generate more realistic results about poverty and inequality than those obtained with models with representative agents.

Then, we have the integration between these models (CGE and MS). Throughout the interaction in the labor market, the employee’s reactions to wage movements were better captured allowing a set of price and quantity adjustments with economic consequences for the entire system. Without them, the simulations effects would be more concentrated on quantity adjustments that rarely fit the empirical data of this type of shock.

The aiming of the simulations presented before was the investigation of the role of the two most important Brazilian cash transfer programs in reducing inequality. Through them our main objective was to provide information that could help on the answers of the main project research questions: What are the impacts of the current income transfer programs on poverty/inequality? In which extent each of them is accomplishing its objective of poverty/inequality reduction? Which would be the impacts of these programs if they have alternative policy designs?

Adopting the same strategy of our results presentation, we will emphasize the impacts of SIMU B, which in our opinion can represent better the cost-benefits of the analyzed policies, since it captures the effects of changes in transfers and in taxes that were used to finance them.

The macro results that formed the background for both simulations showed that, in general, the impacts were adverse for several macro indicators, among them, GDP, employment and price index. However, it is important to emphasize that the adverse results came mainly from the tax increases instead of the transfer policies. Also, the identification of this fact is a direct contribution of the integrated approach.

Starting with the first question, the results confirm the importance of “Bolsa Família” and “BPC” programs for the recent reduction of Brazilian income inequality. The results of SIMU B showed that practically 1/5 of inequality fall, between 2003 and 2005, can be attributed to the adopted policies. Also, the results are very similar of those reported by other studies that used partial equilibrium/decomposition analysis. However, the taxation alone,
showed in SIMU B, had a major role in this process. Again, this finding is another contribution derived from our methodology.

For the poverty indicators, the results are also positive but the transfer policy contribution, especially at SIMU B, had a smaller impact than its inequality effect. The transfers itself (SIMU A) generated the positive impacts, but the changes in taxation to finance their expansion practically offset the former effect, particularly, in the case of extreme poverty indicators. The family income components that contributed to this process are both, the labor income through a higher unemployment and the non labor income through the fall of social security benefits, in real values.

The answer of the second question, if the programs are accomplishing their objective of poverty/inequality reduction, can not ignore the analysis pointed out before. Generally, the results demonstrate that the two analyzed programs have achieved their objectives. But, the simulation data at section 4.1 showed that “Bolsa Família” has a better focalization for their beneficiaries, concentrating its benefits in the poor families. On the other hand, BPC doesn’t show the same concentration pattern. However, in this case, as shown in the appendix C and D, the main problem lies in the program administration that has not enforced correctly the criteria established by its legal instruments.

Finally, for the third question, we didn’t formally made simulations with the alternative designs because the research results indicated there are other issues more important than the benefits alternative models. This fact was also reinforced by the small impacts of the current programs design on labor supply. On the other hand, it became evident that the taxation structure of the transfer programs has an important role in the final welfare impacts. In our opinion, this issue should deserve more attention in the research policy agenda which could explore different strategies to finance the programs and/or cutting some government expenditure that neither improves income distribution nor reducing poverty.

References


Appendix A: CGE Model

A.1. The CGE Model

A.1.1. The Product Supply

Foreign product supply is modeled as being totally elastic,\(^\text{35}\) while sectoral domestic supply is represented by a three steps nested production function with three types of inputs: labor, capital and intermediate inputs.\(^\text{36}\)

First, amounts of types of labor \((F_l)\), given by the first order firm’s profit maximization conditions, are combined in a composite labor \((Ld_i)\) for each sector \(i\), by a Cobb-Douglas function with constant returns to scale:\(^\text{37}\)

\[
Ld_i = \prod_i F_i^{\beta_i}
\]

(2.1)

where \(\beta_i\) is the share of each type of labor: unskilled informal \((L1)\), skilled informal \((L2)\), formal with low skill \((L3)\), formal with average skill \((L4)\), formal with high skill \((L5)\), public servant with low skill \((L6)\) and public servant with high skill \((L7)\).\(^\text{38}\)

Second, in each sector \(i\), aggregated labor \((Ld_i)\) and capital \((K_i)\)\(^\text{39}\) are associated by a constant elasticity of substitution (CES) function to obtain the production level \((X_i)\):

\[
X_i = a_i^D \left[ \alpha_i Ld_i^{\rho_i} + (1 - \alpha_i) K_i^{\rho_i} \right]^{1/\rho_i}
\]

(2.2)

where \(a_i^D\) is the CES shift parameter, \(\alpha_i\) is the sector’s labor share in the production value and \(\rho_i\) is the elasticity of substitution between capital and labor.

Finally, in the third step the various intermediate inputs levels \((INT_i)\) are obtained by a Leontief production function (e.g., fixed proportion to sector \(j\) total product, \(X_j)\):\(^\text{40}\)

\[
INT_i = \sum_j a_{ij} X_j
\]

(2.3)

where \(a_{ij}\) is the technical coefficient of input \(j\) in sector \(i\).

Domestic producers react to the relative prices in domestic and international markets and the domestic output is divided by a constant elasticity of transformation (CET) function with imperfect substitution between products sold in these markets:

\[
X_i = a_i^T \left[ \gamma_i X_i^{(\rho_i+1)/\rho_i} + (1 - \gamma_i) \left[ D_i^{(\rho_i+1)/\rho_i} \right]^{(\rho_i+1)/\rho_i} \right]^{\rho_i+1}/\rho_i
\]

(2.4)

\(^{35}\) Thus, Brazilian demands for imported goods are fully satisfied without facing external supply constraints.

\(^{36}\) The model represents the 42 sectors of activities listed in the 2003 Brazilian National Accounts.

\(^{37}\) This means that an identical increase of every type of worker results in an identical increase of the aggregate worker.

\(^{38}\) Also, there are more two types of employers that are treated as labor and enter in the Cobb-Douglas aggregation.

\(^{39}\) The model closure adopted in the simulations determines that the sectoral levels of capital are fixed.

\(^{40}\) It is worth mentioning that Devarajan et al (1991) makes use only the first and third steps, by combining capital with labor and value added with intermediate inputs, in this order.
where $X_i$, $E_i$ and $D_i$ are, respectively, the domestic sector $i$’s total output, exported volume and sales to internal market. $a_i^T$ and $\gamma_i$ are model’s parameters and $\rho_e$ is the elasticity of transformation.\(^{41}\)

A.1.2. Demand for products

A.1.2.1. Families

Families are classified according to per head household income, level of urbanization and household head characteristics: poor urban families headed by active individual (F1), poor urban families headed by non-active individual (F2), poor rural families (F3), urban families with low average income (F4), urban families with medium income (F5), rural families with medium income (F6), families with high average income (F7), and families with high income (F8).

They choose commodities’ consumption levels to maximize utility subject to a budget constraint,\(^{42}\) according to a Cobb-Douglas functional form (similar to the production function presented earlier).

Families and firms demand domestic and imported goods as imperfect substitutes that differ according to their source (domestic or external), as proposed by Armington (1969), and their utility levels are measured (in product quantity) by a CES function:

$$Q_i = a*c\left[\delta_i * M_i^{(\rho_e - 1)/\rho_e} + (1 - \delta_i) * D_i^{(\rho_e - 1)/\rho_e}\right]^{1/\rho_e} \quad (2.5)$$

where $M_i$ is the imported volume of good $i$ and $D_i$ is the consumption of the domestic good $i$. $a,c$ and $\delta_i$ are parameters, while $\rho_e$ is the Armington elasticity of substitution between $D_i$ and $M_i$.\(^{43}\)

Finally, $Q_i$ indicates the utility derived from the consumption of good $i$.\(^{44}\)

The external agents demand domestic goods, reacting to changes in relative prices as well. Similarly to the import demand function, the exports demand arises from a CES utility function that represents the imperfect substitution between products from the external regions and Brazil.

A.1.2.2. Firms

Firms demand commodities to satisfy their production requirements of intermediate inputs according to the technical coefficients from the input-output matrix.

Due to the static nature of accumulation in the capital market, investments are only important for product demand. Similarly to consumption, the investment is characterized as the purchases of certain goods and can be considered as a final consumption undertaken by firms. The savings represent this amount of resources and it is assumed that a share of it corresponds to investment in stocks of finished goods, while the remaining parcel represents the net investment required to expand production. The first share is defined based on a fixed proportion to the sectoral

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\(^{41}\) There are no empirical estimates of Brazilian export elasticities using a CET structure for a highly disaggregated sectoral specification. Therefore, it was adopted the same procedure used in Cury (1998, pp. 112-113), which departed from the elasticities estimated by Roland-Holst et al (1994) to the American economy.

\(^{42}\) Actually, this utility maximization can happen along the consumers’ lifetime. From the point of view of most practical applications, the maximization is on the goods and services available in a given period.

\(^{43}\) These elasticities values were estimated for the same sectors considered in the model by Tourinho et al. (2002).

\(^{44}\) It can be interpreted as the quantity of a hypothetical composite good that would be demanded by consumers.
output, while the second is distributed exogenously among the sectors, reflecting information from
the input-output tables (goods by sector of origin).

It is considered that investment goods are being produced but not used as increments of
capital stocks. Thus, the model closure is closer to a medium-run type: constant capital stock, price
flexibility and existence of involuntary unemployment in equilibrium.

A.1.2.3. Government

The Government consumption (GC) is derived from maximization of a Cobb-Douglas
utility function subject to the budgetary constraint corresponding to the total expenditure that is
fixed according to the total amount registered for the base year.

Appendix B: The Models’ Data Bases and Econometrics Estimates

B.1. CGE Data Base.

Almost all data used in the CGE model and simulations were derived from a Social
Account Matrix (MSC–2003), which contains all the quantities and prices information in 2003 (the
model’s base year). Besides, all the model’s coefficients and parameters obtained by the model
calibration process are calculated from this data matrix, whose description can be found at Cury et al. (2006). It deserves mention that it was not made based on new Brazilian National Accounts
2000 series released just in March 2007 by the Instituto Brasileiro de Geografia e Estatística
(IBGE). Another set of data used to calculate the economic shocks that will be simulated and
evaluated will be presented in the next section.

B.2. Micro Simulation Data Base

The database for the micro simulation consists of the sample of almost 384,834 individuals
distributed in 117,010 households in the PNAD 2003. Each of the individuals in active age (over
10 years old) was classified according to the 11 types of factors derived from the CGE model.
However, only individuals in active age belonging to the factors L1 to L5 were considered in the
CGE-MS integration, that is, those individuals who have as the main income source the wages paid
in the private sector. Thus, the sample had 106,590 observations that represent 48,742,853
individuals that were classified as occupied and unoccupied as shown in the table below.

One of the main difficulties in order to make the CGE-MS integration is the convergence.
For this convergence be successful it was appropriate to make the two databases had the same
values. Thus, the weights of individuals were multiplied by a factor (reweighting), so as the PNAD
data base reflected the CGE model data. Table B.1 presents the results of this reweighting for
employed and unemployed people.

B.3. Econometric Estimates

The first part of the micro simulation process is the computation of the labor supply
equation. For this phase, it was considered the entire PNAD sample. From the reweighed data base,
it was estimated the equations (3.2.1) and (3.2.2) by the two stages method proposed by Heckman
(1979), for three demographics groups: men, women head of household with children, and other women. Table B.2 contains the econometric estimates by the system equation, including the coefficients and their standard errors to 5% of significance, as well as the inverse of the Mills’s ratio, $\hat{\lambda}(z)$. From these estimates were computed the potential hours of work necessary for the completion of the step 2 of the microsimulation process.

The second part of the micro simulation process is the computation of the potential wages and the new occupation ratio. For this phase, it was considered only the factors L1 to L5. From the reweighed data base, it was estimated the equations (3.2.3) and (3.2.4) by the two stages method proposed by Heckman (1979). Table B.3 contains the econometric estimates by this system equation and the benefits shocks, changing the $\log B_i$ that corresponding the Bolsa Família and BPC amounts of 2003, to $\log B_i^*$ corresponding the benefits amounts of 2005.\textsuperscript{45}

**B.4. Labor Supply Elasticities.**

In Table B.4 we present the marginal effects in respect to hours of work, implied by the estimates in Table B.2 presented later. The wage elasticities are the coefficients reported by the variable $\log w$. For women these elasticities are positive and highest for other women, as we would expect. For men, the elasticity is negative, but non-significant. The income elasticities, described by the variables $\ln B$ and $\ln Q$ are all negative. These results are consistent with standard theory and show that the benefits may have important participation effects and corresponding welfare effects.

### Table B.1 – Employed and unemployed reweighing for L1 to L5 work factors

<table>
<thead>
<tr>
<th>Factor</th>
<th>Description of the worker</th>
<th>PNAD occupational condition (in 1.000 persons)</th>
<th>CGE model data (in 1.000 persons)</th>
<th>Reweighing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Employed</td>
<td>Unemployed</td>
<td>Total</td>
<td>Employed</td>
</tr>
<tr>
<td>L1</td>
<td>Unskilled informal</td>
<td>12.890</td>
<td>1.567</td>
<td>14.457</td>
</tr>
<tr>
<td>L2</td>
<td>Skilled informal</td>
<td>5.694</td>
<td>952</td>
<td>6.646</td>
</tr>
<tr>
<td>L3</td>
<td>Formal with low skill</td>
<td>13.923</td>
<td>1.349</td>
<td>15.272</td>
</tr>
<tr>
<td>L4</td>
<td>Formal with average skill</td>
<td>9.208</td>
<td>854</td>
<td>10.062</td>
</tr>
<tr>
<td>L5</td>
<td>Formal with high skill</td>
<td>2.211</td>
<td>95</td>
<td>2.306</td>
</tr>
<tr>
<td>Totals</td>
<td></td>
<td>43.926</td>
<td>4.817</td>
<td>48.743</td>
</tr>
</tbody>
</table>

Source: PNAD 2003, CGE model data base

\textsuperscript{45} The procedure to impute this values in 2003 data base is described in Appendix C.
### Table B.2 – Results of labor supply estimates

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Labor supply regression equation:</strong> $h_i$</td>
<td>log $w$ -2.3275 ** (0.0567)</td>
<td>log $w$ -4.4850 ** (0.1793)</td>
<td>log $w$ -2.5876 ** (0.0873)</td>
</tr>
<tr>
<td></td>
<td>log $B$ -0.0893 (0.1011)</td>
<td>log $B$ -1.5730 ** (0.1373)</td>
<td>log $B$ -1.3203 ** (0.0778)</td>
</tr>
<tr>
<td></td>
<td>log $Q$ -0.2655 ** (0.0161)</td>
<td>log $Q$ -0.2435 ** (0.0518)</td>
<td>log $Q$ -0.1505 ** (0.0371)</td>
</tr>
<tr>
<td></td>
<td>Educ 0.1386 ** (0.0129)</td>
<td>Educ 0.6143 ** (0.0375)</td>
<td>Educ 0.5238 ** (0.0199)</td>
</tr>
<tr>
<td></td>
<td>Age 0.9658 ** (0.0241)</td>
<td>Age 1.0852 ** (0.0858)</td>
<td>Age 0.6261 ** (0.0367)</td>
</tr>
<tr>
<td></td>
<td>age$^2$ -0.0112 ** (0.0003)</td>
<td>age$^2$ -0.0138 ** (0.0011)</td>
<td>age$^2$ -0.0089 ** (0.0005)</td>
</tr>
<tr>
<td></td>
<td>Famsize -0.1423 ** (0.0285)</td>
<td>Famsize -0.1175 (0.1154)</td>
<td>Famsize -0.3811 ** (0.0463)</td>
</tr>
<tr>
<td></td>
<td>$D_a$ -0.6749 ** (0.1275)</td>
<td>$D_a$ -5.6864 ** (0.5287)</td>
<td>$D_a$ -9.2074 ** (0.2064)</td>
</tr>
<tr>
<td></td>
<td>constant 34.4863 ** (0.4924)</td>
<td>constant 32.8253 ** (1.7713)</td>
<td>constant 41.7028 ** (0.7587)</td>
</tr>
</tbody>
</table>

**Selection equation:** $Pr(S_i = 1 \mid z)$

|                      | log $w$ 2.6519 ** (0.0271)        | log $w$ 2.6359 ** (0.0454) | log $w$ 2.7232 ** (0.0281) |
|                      | log $B$ -0.0938 ** (0.0159)     | log $B$ 0.0870 ** (0.0140) | log $B$ 0.0833 ** (0.0065) |
|                      | log $Q$ -0.0728 ** (0.0044)     | log $Q$ -0.0582 ** (0.0076) | log $Q$ -0.0259 ** (0.0048) |
|                      | Educ -0.0494 ** (0.0026)        | Educ -0.0424 ** (0.0048) | Educ -0.0221 ** (0.0020) |
|                      | age -0.0122 ** (0.0043)         | age 0.0429 ** (0.0089) | age 0.0464 ** (0.0033) |
|                      | age$^2$ 0.0001 ** (0.0001)      | age$^2$ -0.0005 ** (0.0001) | age$^2$ -0.0005 ** (0.0000) |
|                      | famsize 0.0660 ** (0.0055)      | famsize 0.0571 ** (0.0130) | famsize 0.0181 ** (0.0043) |
|                      | $D_a$ 1.4757 ** (0.0248)        | $D_a$ 0.9410 ** (0.0488) | $D_a$ 1.2707 ** (0.0160) |
|                      | constant -1.8483 ** (0.0941)    | constant -2.8367 ** (0.1818) | constant -3.2942 ** (0.0721) |
|                      | $\hat{\lambda}(z)$ -4.9936 ** (0.1117) | $\hat{\lambda}(z)$ -5.2360 ** (0.2599) | $\hat{\lambda}(z)$ -5.1552 ** (0.1205) |

|                      | Number of obs. 108.897            | Censored obs. 21.526 | Log likelihood -363.403.5 |
|                      | Censored obs. 20.292              | Censored obs. 8.454 | Log likelihood -57.265.63 |
|                      | Log likelihood -363.403.5         | Log likelihood -57.265.63 | Log likelihood -230.780.8 |

Note: Standard errors in brackets; ** significant at 1%; * significant at 5%. Source: Authors’ estimates.
Table B.3 – Results of potential wages – L1 to L5 factors

<table>
<thead>
<tr>
<th>Benefits of 2003</th>
<th>Benefits shocks of 2005</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Coefficients</strong></td>
<td><strong>S.E.</strong></td>
</tr>
<tr>
<td>log B</td>
<td>-0,1176 **</td>
</tr>
<tr>
<td>log Q</td>
<td>-0,0029 *</td>
</tr>
<tr>
<td>educ</td>
<td>0,1039 **</td>
</tr>
<tr>
<td>age</td>
<td>0,0876 **</td>
</tr>
<tr>
<td>age²</td>
<td>-0,0009 **</td>
</tr>
<tr>
<td>constant</td>
<td>3,4343 **</td>
</tr>
</tbody>
</table>

Selection equation: $\Pr(S_j = 1 \mid z)

<table>
<thead>
<tr>
<th><strong>Coefficients</strong></th>
<th><strong>S.E.</strong></th>
<th><strong>Coefficients</strong></th>
<th><strong>S.E.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>log B</td>
<td>0,0241 *</td>
<td>(0,0079)</td>
<td>0,0150 *</td>
</tr>
<tr>
<td>log Q</td>
<td>0,0021</td>
<td>(0,0020)</td>
<td>0,0017</td>
</tr>
<tr>
<td>educ</td>
<td>0,0204 **</td>
<td>(0,0013)</td>
<td>0,0203 **</td>
</tr>
<tr>
<td>age</td>
<td>0,0346 **</td>
<td>(0,0022)</td>
<td>0,0349 **</td>
</tr>
<tr>
<td>age²</td>
<td>-0,0003 **</td>
<td>(0,0000)</td>
<td>-0,0003 **</td>
</tr>
<tr>
<td>famsize</td>
<td>-0,0365 **</td>
<td>(0,0033)</td>
<td>-0,0348 **</td>
</tr>
<tr>
<td>$D_g = 2$ (Women w/ children)</td>
<td>-0,5199 **</td>
<td>(0,0102)</td>
<td>-0,5116 **</td>
</tr>
<tr>
<td>$D_g = 3$ (Others women)</td>
<td>-0,3597 **</td>
<td>(0,0089)</td>
<td>-0,2981 **</td>
</tr>
<tr>
<td>$D_a$</td>
<td>0,2561 **</td>
<td>(0,0220)</td>
<td>0,2556 **</td>
</tr>
<tr>
<td>constant</td>
<td>0,8714 **</td>
<td>(0,0522)</td>
<td>0,8531 **</td>
</tr>
</tbody>
</table>

$\hat{\lambda}(z)$

<table>
<thead>
<tr>
<th><strong>Coefficients</strong></th>
<th><strong>S.E.</strong></th>
<th><strong>Coefficients</strong></th>
<th><strong>S.E.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>-0,5581 **</td>
<td>(0,0053)</td>
<td>-0,5549 **</td>
<td>(0,0053)</td>
</tr>
</tbody>
</table>

Number of obs. | 103.289 | 103.289 |
Censored obs. | 10.867 | 10.867 |
Log likelihood | -128.537,9 | -126.387,7 |

Table B.8 – Elasticities: Marginal Effects for Grouping Demographics

<table>
<thead>
<tr>
<th>Variable</th>
<th>$j = 1$ (Men)</th>
<th>$j = 2$ (Women with children)</th>
<th>$j = 3$ (Women)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wage elasticity (log w)</td>
<td>-0,0230 **</td>
<td>(0,0006)</td>
<td>0,0328 **</td>
</tr>
<tr>
<td>Income elasticity (log B)</td>
<td>-0,0009</td>
<td>(0,0010)</td>
<td>-0,0128 **</td>
</tr>
<tr>
<td>Income elasticity (log Q)</td>
<td>-0,0026 **</td>
<td>(0,0002)</td>
<td>-0,0041 **</td>
</tr>
</tbody>
</table>

Note: ** significant at 1%; * significant at 5%.
Source: Authors’ estimates.
Appendix C: The methodology to assign the 2005 benefits

In this appendix it is presented the methodology adopted to assign the 2005 “BF” and “BPC” benefits in the 2003 household survey, which were used in the simulations described at section 4. The simulated shocks represented the situation where the 2005 benefits (values and profiles) were applied in the 2003 economy to check their economic impacts, mainly on poverty and income distribution.

Two main problems arise from this assign process. The first problem is the comparison between the benefits amount and values identified in the two household surveys database with the administrative government data. The benefits of 2003 and 2005 PNAD data were firstly identified by Barros et al. (2007) and they don’t show the complete universe of beneficiaries of the government administrative data. The table XX1 below compares the 2003/2005 benefits between the household surveys and the administrative data.

Table C.1 – Comparison between the Transfer Programs data.

<table>
<thead>
<tr>
<th>Programs</th>
<th>2003 PNAD (1)</th>
<th>2003 Registers (2)</th>
<th>Identification (1)/(2) in %</th>
<th>2005 PNAD (1)</th>
<th>2005 Registers (2)</th>
<th>Identification (1)/(2) in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolsa Família</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amounts (in R$ millions)</td>
<td>2.283.50</td>
<td>3.185.00</td>
<td>39,48%</td>
<td>4.226.13</td>
<td>6.871.36</td>
<td>62,59%</td>
</tr>
<tr>
<td>Number of Beneficiated Families</td>
<td>5.173.051</td>
<td>8.106.163</td>
<td>56,70%</td>
<td>6.495.157</td>
<td>10.592.024</td>
<td>63,08%</td>
</tr>
<tr>
<td>BPC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amounts (in R$ millions)</td>
<td>804.97</td>
<td>5.132.93</td>
<td>537,66%</td>
<td>4.201.55</td>
<td>7.838.64</td>
<td>86,57%</td>
</tr>
<tr>
<td>Number of Beneficiaries</td>
<td>279.503</td>
<td>2.312.711</td>
<td>727,44%</td>
<td>1.167.097</td>
<td>2.277.365</td>
<td>95,13%</td>
</tr>
</tbody>
</table>

Source: PNAD 2003, 2005 (IBGE) e IPEA.

We can realize from the above table that the survey numbers (PNAD) are always smaller than the administrative data. The major discrepant differences are in the year 2003, particularly for BCP. This fact suggests an identification problem in the 2003 survey.

The second main problem is “How to identify the new beneficiaries”, in the 2003 survey, which would be the equivalent ones of the 2005 beneficiaries. This question is amplified by the significant differences pointed out in the table which could lead to two other problems: the identification of the new beneficiaries that don’t comply with programs rules and the identification of a new number of benefits that would not represent the programs real evolution between those years.

The solution adopted for these problems was to create two different assigned rules, one for “Bolsa Família” and another for “BPC”, which are described separately bellow.
C.1. The “Bolsa Família” Benefits Allocation

In the above table, according to the government registers, the benefited families increased 30.7% and the total expenditure 115.7%, between 2003 and 2005. The higher increment in the amounts was also due to the changes in the basic benefits. In this case, the solution for the benefits assignment was the implementation of a new number of beneficiaries which would follow the same programs evolution capture in the household surveys.

This task was facilitating by the fact that the PNAD 2003 surveys presents a variable that allows a new set of potential “Bolsa Família” beneficiaries. With this information, it was possible to identify 1,619,507 new beneficiaries, totaling 6,792,558 families in 2005, representing 31.3% growth in the number of beneficiaries. For comparison, the numbers of identifications in the PNAD 2005 were 6,495,157 families, resulting in a difference of just 5% between the imputation and the identification. In this case, the payment amounts increase 90.6%. This percentage was inferior to the 115.7% of the administrative data, between 2003 e 2005, but it is important to remember that our task at household level is replicate the 2005 survey and not the registers.

C.2. The 2005 BPC Imputed Benefits

As pointed out before, the BPC beneficiaries’identification, at PNAD 2003, is very precarious, contrasting with the identification at PNAD 2005, indicating a localized problem in 2003. The analysis of beneficiaries profile in that year suggests that the identification problem was mainly due to the spread of this benefit in not just one variable in the 2003 survey but in others, such as the variables that identifies the personal income related with social security benefits (retirements, pensions, etc). In this way, the benefits were capture in the survey but were not separately identified by Barros et al. (2007).

One way to circumvent this problem is to rely in the data provided by the government administration. According to the Table XXI above, the BPC beneficiaries growth 33.9%, while the benefits amount growth 52.7%. On the other hand, table XX2 shows that this increase was mainly in the elderly benefits comparing with the disable benefits (approximately 60% e 17%, respectively). In view of this, we adopted a strategy that could identify the possible candidates for the BPC aged benefits, following the program’s rules.

<table>
<thead>
<tr>
<th>Programs</th>
<th>2003</th>
<th>2005</th>
<th>Variation (%)</th>
<th>Year Amount (R$ mi)</th>
<th>Beneficiaries</th>
<th>Year Amount (R$ mi)</th>
<th>Beneficiaries</th>
<th>Year Amount (R$ mi)</th>
<th>Beneficiaries</th>
</tr>
</thead>
<tbody>
<tr>
<td>BPC (aged)</td>
<td>1,972,45</td>
<td>664,875</td>
<td>183,3%</td>
<td>3,614,93</td>
<td>1,065,604</td>
<td>33,9%</td>
<td>60,3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BPC (disable)</td>
<td>3,160,49</td>
<td>1,036,365</td>
<td>133,6%</td>
<td>4,223,71</td>
<td>1,211,761</td>
<td>16,9%</td>
<td>17%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>5,132,93</td>
<td>1,701,240</td>
<td>152,7%</td>
<td>7,838,64</td>
<td>2,277,365</td>
<td>33,9%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Government Administrative Registers

In order to minimize the identification error of BPC’s, we opted for the following procedure:
• 1\textsuperscript{st} Step: identification of all aged individuals (65 years or more) which didn’t have pensions or retired benefits.
• 2\textsuperscript{nd} Step: choose the selected individuals at step 1 whose family per capita income was less than 1 minimum wage.
• 3\textsuperscript{rd} Step: allocate one 1 minimum wage (2003) BPC benefits to all selected individuals in the former step.

The results of this procedure resulted in an identification of 570,314 individuals who could receive the BPC. In this way, the used methodology reasonably captures the administrative programs evolution of 576.125 showed in the above table. Contrarily to the imputation process of “Bolsa Família”, the BPC process must be compare with administrative increase because the identification problems of this benefits in the base year, 2003.

Appendix D: Transfer Programs in Brazil

D.1. Bolsa Família\textsuperscript{46}

D.1.1. Objective

Integrates the program Fome Zero (Hunger Zero), which aims to assure the human right to adequate feeding, promoting the alimentary and nutritional security and contributing for the eradication of the extreme poverty and for the conquest of the citizenship by the most vulnerable parcel of the population.

D.1.2. Program Rules

D.1.2.1. Conditions to access

• Families with incomes of up to R$ 60.00 (USD 26.09) per person;
• Families with incomes of R$ 60.01 (USD 26.10) to R$ 120.00 (USD 52.17) per person, with children from 0 to 15 years.

D.1.2.2. Concession of benefits

Classified in two types, in accord with the family composition:

• Basic: the value of R$ 62.00 (USD 26.96), granted to families with monthly income of up to R$ 60.00 (USD 26.09) per person, regardless of family composition;
• Variable: the value of R$ 20.00 (USD 8.69) for each child or teenager up to 15 years within the limit R$ 60.00 (USD 26.09), equivalent to three children per family.

Table D.1 – Bolsa Família Eligibility Criterium

<table>
<thead>
<tr>
<th>Eligibility Criterium</th>
<th>Per capita Monthly Income</th>
<th>Occurrence of children / teenagers 0-15 years old, pregnant and breast-feeding</th>
<th>Quantity and Type of Benefits</th>
<th>Benefit Values (R$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poverty Situation</td>
<td>From R$ 60.01 to R$ 120.00</td>
<td>1 member (1) Variable</td>
<td></td>
<td>20.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 members (2) Variable</td>
<td></td>
<td>40.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 or more members (3) Variable</td>
<td></td>
<td>60.00</td>
</tr>
<tr>
<td>Extreme Poverty Situation</td>
<td>Up to R$ 60.00</td>
<td>No Occurrence basic</td>
<td>Basic + (1) Variable</td>
<td>62.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 Member Basic + (1) Variables</td>
<td></td>
<td>82.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 Members Basic + (2) Variables</td>
<td></td>
<td>102.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 or more members Basic + (3) Variables</td>
<td></td>
<td>122.00</td>
</tr>
</tbody>
</table>

There is also the Variable Benefit of Extraordinary Character (VBEC), that is granted to the families of Remaining Programs (Bolsa Escola, Bolsa Alimentação, Food Card and Gas Assistance Programs), whose migration to the PBF causes financial losses to the family. In these cases, the amount granted is calculated case by case and has a limitation period, beyond which, it will no longer be paid under the Ordinance MDS / GM nº 737, of 15/12/2004.

D.1.3. Recent Expansion

Since March 17, 2008, the program started attending teenagers from families who already received the benefit. Each family attended by the program started receiving up to two benefits of R$30 (USD 13.04) for children between 15 and 17 years (maximum of R$60, USD 26.09, per family) (current exchange rate R$2.3 = 1USD). The ministry estimates that 1.7 million teenagers in this age group should get the benefit. Only the young people who sign up 75% of the frequency in schools are entitled to this extension. The families will add this value to the resources already passed to them by the Bolsa Família, that is, this new benefit is cumulative to the previous one.

D.1.4. Conditionalities

D.1.4.1. Health (Ordinance MS / MDS nº 2509 of November 18, 2004)

For families with children up to 7 years:

- Take the kids to vaccination and stay up to date with the vaccination schedule;
- Take the kids to weigh, measure, and be examined according to the timetable of the Ministry of Health.
- For pregnant women and mothers who are breast-feeding:
- Participate of prenatal care;
- Continue the monitoring after the birth, according to the timetable of the Ministry of Health and always caring the Pregnant's card with;
- Participate in educational activities developed by teams of health on breastfeeding and healthy feeding.

D.1.4.2. Education (Ordinance MEC / MDS nº 3789 of November 17, 2004):

- Enroll children and teenagers aged 6 to 15 years in school;
- Ensure the attendance of at least 85% of the classes each month. The absences need to be notified to the school and the reasons need to be explained;
São Paulo, November 18, 2008

- Inform the manager of the Bolsa Família Program whenever some child move to another school. Thus, the technicians of the city hall can continue to monitor the frequency.

D.1.5. Financing

In January 2004, the Ministry of Social Development and Hunger Combat (MDS) was created to meet the national policies of social assistance, food security and income transfer. The MDS took under its responsibility the management of two funds, the National Fund of Combat and Eradication of Poverty (FCEP) and the National Fund of Social Welfare, which embraces, among others, the Manager Council of the Bolsa Família Program. Currently, the FCEP provides almost all the financing of the Bolsa Família program.

The table below shows the proportion of taxes that finance the program. We can see that much over half of the program was funded in 2005, with the Provisory Contribution over Financial Movements (CPMF) resources, which comprise the Fund to Combat and Eradication of Poverty. The second largest source value comes from the Ordinary Resources, which embraces various taxes, mainly the tax on corporations’ income, taxes on work and capital retained at source, and imports tax. The rest of the funding is due to the Contribution over Corporations’ Net Profits (CSLL-PJ), the Contribution for Social Security Funding (COFINS), and a small part to external credit operations.

Table D.2 – Program Financing 1335 – Income Transfer with Conditionalities - 2005

<table>
<thead>
<tr>
<th>Code – Source</th>
<th>Value</th>
<th>Composition</th>
</tr>
</thead>
<tbody>
<tr>
<td>155 – Provisory Contribution Over Financial Movements</td>
<td>5,021,407,702</td>
<td>76.13%</td>
</tr>
<tr>
<td>300 - Ordinary Resources</td>
<td>858,502,089</td>
<td>13.02%</td>
</tr>
<tr>
<td>151 - Contribution over Corporations’ Net Profits</td>
<td>360,361,798</td>
<td>5.46%</td>
</tr>
<tr>
<td>153 - Contribution for Social Security Funding</td>
<td>340,056,460</td>
<td>5.16%</td>
</tr>
<tr>
<td>148 - External credit operations - in currency</td>
<td>15,100,000</td>
<td>0.23%</td>
</tr>
<tr>
<td>Total</td>
<td>6,595,428,049</td>
<td>100.00%</td>
</tr>
</tbody>
</table>

Source: Federal Senate, Budget Council, own elaboration under solicitation of Senator Eduardo Suplicy’s cabinet

D.1.6. Evolution in the number of beneficiaries and in the expenditures

The Bolsa Família Program was established in 2004, unifying the previous programs Bolsa Escola, Bolsa Alimentação and Food Card, which in 2003 was managed by the Active Community Program. Table D.3 show a growth of 128% in five years. From 2003 to 2006 the growth is 36%, reaching more than 11 million families. It is also shown that the other programs have decreased in the number of beneficiaries, being only remnants of Bolsa Família.

Table D.3 – Bolsa Família - Number of Benefited Families

<table>
<thead>
<tr>
<th>Programs</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolsa Escola</td>
<td>4,794,405</td>
<td>5,106,509</td>
<td>3,771,199</td>
<td>3,042,794</td>
<td>1,783,874</td>
<td>36,481</td>
</tr>
<tr>
<td>Bolsa Alimentação</td>
<td>30,137</td>
<td>966,553</td>
<td>369,463</td>
<td>53,507</td>
<td>24,175</td>
<td>2,474</td>
</tr>
<tr>
<td>Food Card</td>
<td>349,905</td>
<td>107,907</td>
<td>83,524</td>
<td>32,136</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bolsa Família</td>
<td>3,615,596</td>
<td>6,571,842</td>
<td>8,700,451</td>
<td></td>
<td>10,965,810</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4,824,542</td>
<td>6,073,062</td>
<td>8,106,163</td>
<td>9,776,050</td>
<td>10,592,024</td>
<td>11,036,901</td>
</tr>
</tbody>
</table>

Source: IPEA - BPS n° 13 (2001-02); BPS n°15 (2003-06)
As for the expenditure, one can see a growth of $5,046,021,853 (158%) in three years, with the greatest growth occurring in the year of unification, 2004, and then, with a constant rate of growth of 16% in the other two years.

Table D.4 – Bolsa Família - Expenditure (in R$)

<table>
<thead>
<tr>
<th>Program</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolsa Família</td>
<td>3,185,000,000*</td>
<td>5,917,079,972</td>
<td>6,871,361,925</td>
<td>8,231,021,853</td>
</tr>
</tbody>
</table>


* Includes the programs Bolsa Escola, Healthy Feeding and Active Community; source: BPS nº9 (in prices of 2004, com deflator of 5.91%).

D.1.7. Specific Information of Legal and Administrative Nature

D.1.7.1. Regulation


D.1.7.2. Documentation

If the family fits in the conditions defined by the program, it should look for the responsible for the Bolsa Família program in its city, equipped with personal documents (as a voter title or CPF), to register in the Unified Register of the Federal Government Social Programs.

D.1.7.3. Operational Model

The responsible for operating the program is the municipality. The registration does not mean the immediate entry of these families in the Program neither the receipt of the benefit. Each city has an estimated number of poor families regarded as the attending goal of the Program at that specific territory and, based on the information entered into the Unified Register, the Ministry of Social Development and Hunger Combat (MDS) selects, in an automatized way, the families that will be included in the Program each month.

D.1.7.3.1. From the Federal Government

The Federal Government through the Ministry of Social Development and Hunger Combat, is the manager of the Bolsa Família Program in the federal extent. The inclusion of families in the program is managed by the National Office of Income and Citizenship (SENARC), which makes the concession of the benefit. The responsibilities of SENARC are:

- Drawing up rules and regulations of the PBF;
- Manage the Unified Register of Social Programs;
- Monitor the local management of PBF;
- Promote improvements and encourage the use of Benefits Management System by the municipal administrators, state coordinators, members of Boards of Social Control and members of the Network for Surveillance of the Bolsa Família Program, aiming the efficiency, effectiveness and transparency of benefits management actions;
- Promote the exchange of good practices among municipal managers of the program and its dissemination at the national level;
- Carry out activities for the administration of benefits;
• Promote actions to the training of officials responsible for the activities of benefit management and of members of the instances of social control, in partnership with other federal entities.

D.1.7.3.2. Responsibilities of the Municipalities

• Check periodically, if the families of the PBF and Remnants Programs meet the eligibility criteria outlined by the program, using for it statistical sampling techniques in order to match the financial benefits to the reality of families;
• Make the registration of officials from the city hall and members of the municipal instance of social control to SIBEC and empower these users;
• Meet the claims of information and clarification of the Public Surveillance Network;
• Disclose information on the benefits of PBF and Remnants of programs to other local public agencies and to the civil society organizations;
• To maintain SENARC informed about the cases of irregularities or deficiencies identified in the provision of services of Operator Agent responsibility or in its local registered network (banking correspondent, lottery agents etc.).

D.2. Benefit of Continued Installment (BPC)\textsuperscript{47}

D.2.1. General Information:

Consists in the monthly payment of one minimum wage for people with 65 years of age or older and to people who are disabled to work and live independently. In both cases the per capita family income must be less than \(\frac{1}{4}\) of the minimum wage. The benefit is administered by the Ministry of Social Development and Hunger Combat (MDS), to which competes its management, monitoring and evaluation. Its operation is at responsibility of the National Social Security Institute (INSS). Resources for costing the BPC come from the National Fund of Social Welfare (FNAS).

It is due to the eligible person, to request the benefit in Social Security. It is necessary to prove income of less than \(\frac{1}{4}\) of the minimum monthly wage per person in the family, to show the minimum age of 65 years in the case of elderly people, and to have his disabling condition certified by the medical expertise of the INSS, in the case of people with disabilities. It is not necessary that the applicant has already contributed to Social Security.

The Lifelong Monthly Income (RMV) is a similar benefit established in 1974, which was replaced by the BPC in 1993, through regulation of the Organic Law of Social Welfare (LOAS). The RMV benefits are paid as a remaining benefit.

It is considered gross monthly income family: the sum of monthly gross income earned by family members among wages, profits, pensions, food, public and private welfare benefits, commissions, pro-labor, other income from non-rewarded work, income from the informal market or self-employment, earned income from property, Lifelong Monthly Income and Benefit of Continued Installment, except when it applies to the BPC granted to another elderly in the family.

as forecasts the single paragraph of Article 34 of Law 10.741 of October the first, 2003 - Statute of the Elderly.

D.2.1.1. Legislation

BPC was created by 1988 Constitution and also is supported by Law 10.741, of October 1st, 2003, that introduced the Estatuto do Idoso. The benefit is part of SUAS (Sistema Único de Assistência Social), which is a new decentralized system for managing social benefits, and that operated the LOAS (Lei Orgânica de Assistência Social, nº 8.742, of December 7th, 1993).

D.2.1.2. Beneficiaries and Expenditure Evolution.

Table D.5 shows the number of BPC beneficiaries had a growth of 916.635 individuals, that is, a growth of 58.65% from 2002 to 2006. It is important to note that although the number of beneficiaries with disabilities is larger in absolute terms, the growth is due more to the growing number of elderly beneficiaries, reflecting the aging of the population in the period.

The benefit in the form of Lifelong Monthly Income is decreasing every year, since it is a benefit that is remaining in the process of replacement for the BPC.

Table D.5 – BPC - Number of Beneficiaries

<table>
<thead>
<tr>
<th>Programs</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>BPC issued to elderly</td>
<td>584.597</td>
<td>664.875</td>
<td>933.164</td>
<td>1.065.604</td>
<td>1.183.840</td>
</tr>
<tr>
<td>BPC issued to disabled people</td>
<td>976.257</td>
<td>1.036.365</td>
<td>1.127.849</td>
<td>1.211.761</td>
<td>1.293.645</td>
</tr>
<tr>
<td>sub-total BPC</td>
<td>1.562.856</td>
<td>1.703.243</td>
<td>2.063.017</td>
<td>2.279.370</td>
<td>2.479.491</td>
</tr>
<tr>
<td>RMV issued to elderly</td>
<td>*</td>
<td>208.297</td>
<td>181.014</td>
<td>157.860</td>
<td>135.603</td>
</tr>
<tr>
<td>RMV issued to disabled people</td>
<td>*</td>
<td>403.174</td>
<td>370.079</td>
<td>340.715</td>
<td>310.806</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1.562.856</td>
<td>2.312.711</td>
<td>2.612.106</td>
<td>2.775.940</td>
<td>2.923.894</td>
</tr>
</tbody>
</table>


Regarding the evolution of spending, there is an increase of 175.43% from 2001 to 2006, representing approximately R$ 6.190.182.160. As the value of the benefit is pegged to the minimum wage, even the RMV, which dropped in attendance in the period, shows positive increments of spending in most years. Again, the biggest growth is due to the BPC issued to the elderly, which increased R$ 3.399.377.329 (281.67%) in the period.

Table D.6 – BPC - Expenditure (in R$)

<table>
<thead>
<tr>
<th>Programs</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>RMV issued to elderly</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>645.113.156</td>
<td>604.723.319</td>
</tr>
<tr>
<td>RMV issued to disabled people</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>1.327.892.680</td>
<td>1.271.076.861</td>
<td>1.316.567.069</td>
</tr>
</tbody>
</table>


D.2.1.3. Financing

The Tables D.7 and D.8 show the BPC funding in 2005, with the figures for budgetary execution in Reais (R$), of the benefits granted to disabled and to the elderly, and the composition
of such funding. In both cases, the COFINS funds the most, but in the BPC for the elderly, these Ordinary Resources represent more at all and in percentage than in the case of the BPC issued to disabled people.

Table D.7 – Program Financing 0065 - Social Protection To The Deficient Person - 2005

<table>
<thead>
<tr>
<th>Code – Source</th>
<th>Value</th>
<th>Composition</th>
</tr>
</thead>
<tbody>
<tr>
<td>153 - Contribution for Social Security Funding</td>
<td>3,799,835,045</td>
<td>94,20%</td>
</tr>
<tr>
<td>300 - Ordinary Resources</td>
<td>233,833,395</td>
<td>5,80%</td>
</tr>
<tr>
<td>151 - Contribution over Corporations' Net Profits</td>
<td>13,249,867</td>
<td>0,33%</td>
</tr>
<tr>
<td>155 - Provisory Contribution Over Financial Movements</td>
<td>12,262,280</td>
<td>0,30%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4,033,668,439</strong></td>
<td><strong>100,00%</strong></td>
</tr>
</tbody>
</table>

Source: Federal Senate, Budget Council, own elaboration under solicitation of Senator Eduardo Suplicy's cabinet

Table D.8 – Program Financing 1282 - Social Protection To The Elderly - 2005

<table>
<thead>
<tr>
<th>Código - Fonte</th>
<th>Valor</th>
<th>Composição</th>
</tr>
</thead>
<tbody>
<tr>
<td>153 - Contribution for Social Security Funding</td>
<td>3,036,672,326</td>
<td>87,24%</td>
</tr>
<tr>
<td>300 - Ordinary Resources</td>
<td>400,487,719</td>
<td>11,51%</td>
</tr>
<tr>
<td>151 - Contribution over Corporations' Net Profits</td>
<td>22,693,119</td>
<td>0,65%</td>
</tr>
<tr>
<td>155 - Provisory Contribution Over Financial Movements</td>
<td>21,001,672</td>
<td>0,60%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3,480,854,837</strong></td>
<td><strong>100,00%</strong></td>
</tr>
</tbody>
</table>

Source: Federal Senate, Budget Council, own elaboration under solicitation of Senator Eduardo Suplicy's cabinet