

# “Impact Assessment of Interregional Government Transfers in Brazil: An Input-output Approach”

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**Abstract:** Redistributive policies carried out by the central government through interregional government transfers is a relevant feature of the Brazilian federal fiscal system. Regional shares of the central government revenues in the poorer regions have been recurrently smaller than the shares of central government expenditures in those regions. Appeal to core-periphery outcomes could be made, as São Paulo, the wealthiest state in the country, concentrated, in 2005, over 40% of total Federal tax revenue, receiving less than 35% of Federal expenditures. These figures suggest a redistribution of public funds from the spatial economic core of the economy to the peripheral areas. This paper investigates the role interregional transfers play in the redistribution of activities in the country, using an interregional input-output approach. Counterfactual simulations allow us to estimate some costs and benefits, for the core and periphery respectively, from such fiscal mechanisms.

**Keywords:** Interregional government transfers, input-output analysis, impact analysis, Brazilian economy.

**Resumo:** Um aspecto relevante do sistema fiscal federal brasileiro é a política redistributiva praticada pelo governo central através de transferências inter-regionais. A parcela das receitas do governo central coletadas nas regiões mais pobres tem sido recorrentemente menor que a parcela dos gastos do governo central nessas regiões. Resultados do tipo centro-periferia podem ser invocados, já que São Paulo, a unidade federativa mais rica do país, concentrou, em 2005, mais de 40% do total da arrecadação tributária federal, tendo recebido menos de 35% dos gastos federais. Esses números sugerem uma redistribuição de fundos públicos do centro econômico espacial da economia para as áreas periféricas. Este artigo investiga o papel desempenhado pelas transferências inter-regionais na redistribuição de atividades no país por meio de uma abordagem de insumo-produto. Simulações contra-factuais permitem estimar alguns custos e benefícios, respectivamente para o centro e a periferia, desses mecanismos fiscais.

**Palavras-chave:** transferências governamentais inter-regionais, análise de insumo-produto, análise de impacto, economia brasileira.

JEL Codes: H50, H77, R15.

Classificação Anpec: Área 9 - Economia Regional e Urbana

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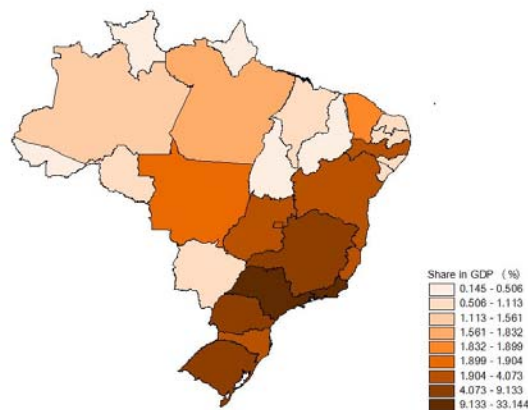
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## 1. Introduction

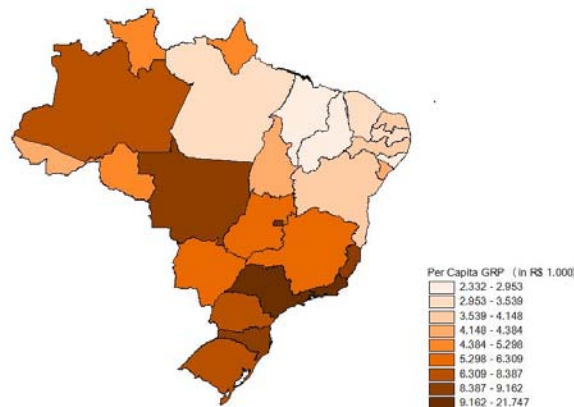
The aim of regional policy is the attainment of a more efficient and/or equitable interregional distribution of economic activity (Temple, 1994). Haddad (1999) has demonstrated that in the last twenty years or so Brazil has undergone deep structural changes that have been responsible for the setback in the process of polarization reversal in the economy. After 1988, with the new Constitution, the central government was hampered in advancing its regional policy agenda by a profound loss in its revenues to the state and municipal governments. Nevertheless, the fiscal crisis reached all levels of government, decreasing their financial capability for carrying out new investment ventures. One of the major consequences has been the paucity of investment in economic infrastructure that has contributed to increasing the average cost of production. Therefore, producers' costs increased since they faced inefficient mechanisms for trade and transportation, many of which lagged technologically.

The regional de-concentration trend that has been verified for the period from the 1960s to the early 1980s was heavily influenced by an active government intervention, manifested in actions such as direct investments in regional development projects and tax incentives in the less developed regions of the country. However, with the fiscal crisis generalized to all levels of government, there were fewer options for new public ventures. Even though the country witnessed a process of regional de-concentration and an improvement in regional inequality at that time, the situation is still striking in Brazil. In terms of the distribution of economic activity, Brazilian GDP is heavily concentrated in the Center-South of the country (Figure 1). Regarding regional inequality related to per capita GDP, the picture is not different, with many states in the poorest region of the country (Northeast) achieving per capita GDP levels more than half-way below the national average (Figure 2).

**Figure 1. Regional Shares in National GDP, Brazil, 2006**



**Figure 2. Per Capita Gross Regional Product, Brazil, 2006**



The agreed agenda for Brazil includes the competitive integration of the country in the global trade network, with additional domestic concerns focused on of sustainable stabilization and social cohesion. This implies the attraction of foreign investments and a responsible (balanced) budget policy for all levels of government, reinforced by the promulgation of the “Lei de Responsabilidade Fiscal” (Fiscal Responsibility Law) in 2000. The latter precludes regional policies that are based primarily on redistributive expenditures, as was the case in the 1970s. For foreign investors, the search is dominated by attention to maximal financial returns with little concern for regional equity; location is defined on a purely economic basis.

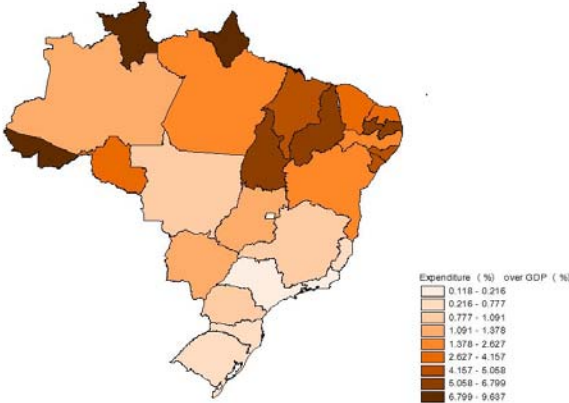
The results presented in Haddad (1999) suggest that the interplay of market forces in the Brazilian economy favors the more developed region of the country. In other words, the trickling-down effects generated by market forces are still very unlikely to overtake the polarization effects from the Center-South. If regional equity is part of the country’s development agenda, an active regional policy by the central government is still needed, in order to reduce regional economic disparities, and specifically to address the problems of the North and Northeast, traditionally backward areas reliant on low technology activities. The improvement of the economic infrastructure in those regions, as well as the establishment of enduring competitive advantages, through a consistent human capital policy, are necessary to attenuate the adverse regional effects of the development strategy to be pursued by the public authorities.

Nowadays, the regional policy carried out by the central government consists of isolated subsidies and industrial incentives to growth centers, in addition to constitutional transfers to less developed regions and rural areas. In the context of the fiscal adjustment process of the 1990s, the role of the central government in stimulating directly productive activities and enhancing the social overhead capital in the lagging regions is being neglected. In the conception of the Real Plan, in 1994, there was no explicit concern about the formulation of a regional development policy for the country. The Real Plan was conceived as a global stabilization plan, that would include economic reforms (privatization, concessions and deregulation) and institutional reforms (tax system, social security and administrative), without proposing any strategy for medium and long-run development. However, with the benefits from the stabilization and the reforms, a new cycle of private investments emerged.

These investments tended to concentrate in the South and Southeast regions, which provided a full range of non-traditional (e.g. technical skills and urban agglomeration) and traditional (e.g. friction of distance – Mercosul) locational factors to attract the incoming capital. The lack of investments by the central government, allied to the spurt in private investments, has led regional governments to engage in strong competition for private capital through fiscal mechanisms (see Baer and Hewings, 2007).

In this context, we can argue that nothing much has been done since the 1988 Constitution. In terms of what might be termed a “clearly-defined” regional policy, the central government has relied only on constitutional intergovernmental transfers through regional funds. As can be seen from Figure 3, such mechanism provides an explicit strategy of geographic targeting to reduce spatial disparities in Brazil. Whether they achieve the goal of classical regional policies – namely, the reduction of regional disparities – through direct income transfers to poorer states remains to be tested.

**Figure 3. Ratio of the Shares in Interregional Government Transfers to Shares in National GDP, Brazil, 2006**



Note: FPE and FPM transfers (see section 2).

While it is commonly accepted that Brazil’s interregional government transfers system provides initial distributional effects, there have been attempts to formally assess the implications this has had for the domestic pattern of industrial location and, by extension, the broader impacts on regional development, considering not only its direct effects, but also the indirect and induced effects closely associated with the role played by the existing economic structure. Over the next few pages, this paper aims to address this somewhat overlooked issue by adopting the following approach. After a brief review of the main institutional aspects of interregional government transfers in Brazil, an attempt is made to characterize its recent structure. Having established the nature of these transfers, the paper then goes on to evaluate their implications for the pattern of regional development within Brazil. In order to achieve this objective, an interregional input-output model is prepared and then tested to assess the recent impact of interregional government transfers on such variables as regional output and income levels. Finally, the tractability of these results is discussed before the possible policy implications are drawn.

## 2. Interregional Government Transfers in Brazil

### 2.1. *Some analytics and empirics of government transfers*

Considerable shares of public revenue and public expenditure consist of transfers, which are payments with no direct counterpart. On the revenue side, that applies to taxes and social contributions. Even though the government uses these revenues to finance, for instance, public facilities and social benefits, those come to be indirect counterparts. On the expenditure side, meanwhile, it applies to social benefits – such as pensions, unemployment benefits, and public health care expenditure – and other transfers of income and capital as subsidies granted to enterprises or households.<sup>1</sup>

Three kinds of economic reasons are usually invoked to justify the role of transfers. First, central governments have advantages over subnational governments in raising revenues from many types of particularly productive sources, while subnational governments have advantages in providing many types of public services. Quite often, there is an imbalance between expenditure responsibilities of subnational governments and their revenue raising powers, which ends up resulting in an inability of local governments to provide adequate levels of public service. Another rationale for intergovernmental transfers is provided by the need of equalization, as there is often a great deal of disparities in revenue-raising capacity across decentralized levels of government. Third, when local governments are left to make their own decisions, they may end up underspending on certain services where there are substantial external benefits to third parties, such as surrounding local governments. Moreover, resources from the central level can be used to ensure that basic national priorities will be met in all subnational jurisdictions. In case of existence of externalities on other jurisdictions, the central government financially supports sub-national authorities in order to guarantee the provision of some public services on the local level. As summed up in Nam & Parsche (2001), intergovernmental transfers are aimed at rectifying not only the vertical imbalance caused by the unequal own tax revenues and expenditures of different tiers of governments but also the horizontal imbalance which is led by the different fiscal capacities among jurisdictions at the same level. The compensation for the presence of spillovers or externalities between jurisdictions in the provision of regional and local public services is likewise a usually accepted rationale for introducing fiscal transfers from central government. We may define vertical fiscal imbalance, following Bird & Tarasov (2002), as the resulting difference between expenditure and own-source revenues at different levels of government. Following the same source, the notion of horizontal fiscal imbalance may be defined as the difference in the resources available to governments at the same (subnational) level, where this difference stems from the heterogeneity in wealth of subnational jurisdictions.

Meanwhile, transfers from or to the central government can be broken down by region. Transfers between the government and households are based on the place of residence, while transfers between the government and businesses are based on the place where the business is conducted or value is created. As it turns out, it is possible to conduct a regional comparison of the relative scale of the public transfers thus broken down. A region is seen as a contributor of interregional transfers in terms of public revenues if the per capita transfers by that region's residents to the federal government or social security are higher than the per capita national average. Conversely, a region is regarded as a recipient of such transfers if its contribution is

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<sup>1</sup> Uma elaborada tipologia das transferências governamentais é proposta em Bergvall et. al. (2006), artigo no qual também são descritas as principais características da governança dessas transferências vigente em países da OCDE.

proportionately lower than would be expected on the basis of its percentage of the population. Therefore, evaluation of the interregional transfers on the basis of both public revenue and public expenditure reveals the net position of each region in terms of interregional transfers.

The empirical literature on the determinants and impacts of the government transfers on regional performance is huge, and a small sample includes the following. Groenewold, Hagger & Madden (2003) analyze the regional effects of intergovernmental transfers by a federal government, having done so in a two-region model in which regional governments determine their tax and expenditure policies so as to maximize the utility of the representative household in their region subject to a budget constraint consisting of a CGE model describing the regional economy. The model is then calibrated using Australian data, with the authors conducting a series of six simulations of an increase in the federal government's transfer to one region matched by a decrease in the transfer payment to the other. In each simulation one of the six Australian states was taken as region 1 and the remainder of the country as region 2. The authors find that substantial changes in the amount transferred by the federal government from one region to the other had little effect on welfare, per capita consumption and wages.

Garcia-Milà & McGuire (2004) evaluate the effectiveness of the transfers received by the regional governments of Spain from both the central government and the European Union. They do so by comparing the economic performance of the regions before and after the implementation of the transfers programs, and find that these policies have not been effective at stimulating private investment or improving the overall economies of the poorer regions. Dias & Silva (2004), meanwhile, evaluate the effectiveness of the transfers received by the regional governments of Portugal from the central government, and do not find strong and robust evidence that these transfers have been stimulating convergence among Portuguese regions and improving the overall economies of the poorer regions.

As the simulation exercise to be conducted in the next section is based on the Brazilian experience, it should be pointed out that the redistributive role the government played through the federal fiscal system was a common practice in the 1970's and 1980's. As reported in Haddad (1999), the regional shares of the central government revenues in the poorer regions were recurrently smaller than the shares of central government expenditures in those regions over the period. In particular, the specific figures suggest the existence of an effective redistribution of public funds to the North and Northeast over the period.

The pioneering efforts by Rolim *et al.* (1996) provide a more complete interpretative scheme on interregional flows in Brazil, based on available statistics on trade balance, government accounts, public investment, and savings. Indeed, their preliminary results for 1985 reinforce the character of interregional government transfers just suggested. Even though the analysis covers only one year, it can give a rough idea on how interregional flows were oriented in the years preceding 1985. As shown in Haddad (1999), the repeated pattern of government fiscal transfers observed in the previous decade, together with the estimates of interregional and international trade balances for the Northeast and North in the same period, support the following generalization of the results. The North and Northeast presented trade deficits recurrently over the period. In the case of the Northeast, the perennial interregional trade deficits were partially compensated by international trade surpluses, indicating a transfer of foreign exchange earnings to other regions of the country. The continual overall interregional trade deficits of these two regions had to be financed by public and/or private savings, so that the conditions for macroeconomic balance were met. The conjecture, taking 1985 as a typical year, is that the transfers of federal resources to the Northeast, for instance, had to be greater

than the trade gaps in order to compensate the interregional flows of private capital oriented towards other regions. Even though the figures show a net outflow of private capital from the Center-South, less aggregated figures, for 1985, show a tendency of net private capital gains to the states of São Paulo and Rio de Janeiro, as well as the Center-West. The orientation of public capital to the less developed regions has often been offset by the flight of private capitals. Rolim *et al.* (1996) argue that this represents the synthesis of bad allocation of government funds from the point of view of an efficient regional policy. However, it might be argued, based on the previous discussion, that government transfers to the North and Northeast, during the 1970's and early 1980's were necessary to build the social overhead capital in those regions in order to strengthen the potential spread effects from the Center-South and create self-reinforcing mechanisms in the regions to generate their own sustainable growth.

In other words, government transfers might have achieved a greater relevance in the less developed regions by creating the necessary infrastructure to foster development and attract, in a second moment, private investments to directly productive activities. This hypothesis would be better tested by looking at estimates of investments in the region; if it is somehow relevant, the relation between the share of public investments in the target region to the share of public investments in the country should show an increasing trend during the 1970's with an inflection point after the necessary time for the economic infrastructure to have matured. From the estimates for the Northeast, however, an increasing path in the share of public investment in the region, compared to the national average, is apparent from 1973 to 1989. Even though there seems to be a declining tendency towards the national average in the first years of the 1990's, empirical evidence to support the conjecture on the existence of a change in gears is very weak.

Meanwhile, redistributive policies carried out by the central government in Brazil through interregional government transfers is still a relevant feature of the Brazilian federal fiscal system. Regional shares of the central government revenues in the poorer regions have been recurrently smaller than the shares of central government expenditures in those regions, a feature on which we elaborate down the road. Indeed, appeal to core-periphery arguments could be made, as São Paulo, the wealthiest state in the country, concentrated, in 2006, over 40% of total Federal tax revenue, receiving less than 10% of Federal expenditures. These figures suggest the existence of an effective redistribution of public funds from the spatial economic core of the economy to the peripheral areas.

Monteiro Neto (2006) evaluates the federal government transfers to Brazilian regions and states over the 1970-2000 period, and analyze the actual direction taken by the flows of those government transfers in comparison with the income flows occurring among states through their interregional and international trade. Drawing on Celso Furtado's hypothesis that underdeveloped regions have to spend a huge amount of income to buy sophisticated wage goods and capital goods produced in the developed regions to maintain a certain level of economic growth, the author shows that in 2000, the resources directed by the federal government to the poor regions (North, Northeast and Center-West) were able to offset their current trade deficits.

## *2.2. An overview of the constitutional transfer system in Brazil*

One of the main characteristics of the Brazilian economy is the excessive concentration of the income in the states of South and Southeast (Figure 1). This feature, as stressed earlier,

lessens the power of the states and municipalities located mainly in the North and Northeast regions in providing public services to the population. The constitutional transfer system in Brazil was built in order to overcome or at least to reduce this disparities of economic power between the states and municipalities.

With this objective, the mechanisms of transfer from the Union to the States and Municipalities can be divided in three kinds: constitutional transfers, legal transfers and voluntary transfers. The main constitutional transfers from the Union to States and Municipalities are the State Participation Fund (FPE); the Municipalities Participation Fund (FPM), the Constitutional Fund of the Center-West; Constitution Fund of the North; Constitution Fund of Northeast and the Constitution Fund of Compensation of Industrialized Products. The legal transfers are regulated by specific laws like the automatic transfers to education and transfers to the health care system. The volunteer transfers are connected to specific projects made by states and municipalities and submitted to federal institutions.

Our focus in this article is concentrated in the federal constitutional transfers specifically in the State Participation Fund (FPE) and Municipalities Participation Fund (FPM), established by the article 159 of the Federal Constitution. The FPE is constituted by 21.5 % of the Income Tax (IR) and 21.5% of the Excise Tax on Industrialized Products (IPI). On the other hand, the FPM is constituted by 22.5% of the Income Tax (IR) and 22.5% of the Excise Tax on Industrialized Products (IPI).

The FPE is distributed according to the following rule: 85% of the resources go to the States of the North, Northeast and Center-West and 15% are transferred to the States of the South and Southeast. The regional distribution is: 25.37 % to the North Region; 52.46% to the Northeast; 7.17% to the Center-West; 6.52% to the South and 8.48% to the Southeast.

The FPM is distributed according to the population of the municipality and inversely distributed according the average income of the municipality. We have also a division between the State capitals and other municipalities (hinterland). Of the total of resources, 10.0% are distributed to the State capitals; 86.4% for the rest of municipalities and 3.6% to municipalities with population above 142.633 inhabitants excluded the capitals.

### *2.3. Some descriptive figures on the Brazilian transfers system*

In this study, we basically have two sets of information. The first concerns the tax revenues collected by the Central government along the Brazilian states and the second, in turn, provides information regarding the amount of resources transferred to the Brazilian States via the Federal constitutional funds, both during the year of 2006. In this section of the paper, we will present a broad description of these two datasets.

Table 1 presents the regional distribution of the joint FPE and FPM expenditures in 2006 compared to the regional distribution of the originating resources that composed the funds in the same year. A very important point to be clarified is that the regional origin of these resources is very heterogeneous: column A of Table 1 shows that over 40% of Federal tax revenues come from just one state, namely, São Paulo, the richest one. Once considered that other 20% come from Rio de Janeiro state, it is possible to verify that about 2/3 of the total tax revenue is collected in only two states. Distrito Federal, Minas Gerais, Rio Grande do Sul and Paraná are other important unities, given that their total contribution is approximately



25%. The remaining share are divided among 21 states, most of the located in North (6 states with a total share of 1.70%), Northeast (9 states with a share of 5.34%) regions.

**Table 1. Regional Shares in Federal Government Tax Revenue\* and Expenditures\*\*, Brazil – 2006**

	<i>Regional Revenues (A)</i>	<i>Regional Expenditures (B)</i>	<i>(A) - (B)</i>
<b><i>North</i></b>	<b><i>1.70</i></b>	<b><i>16.88</i></b>	<b><i>-15.18</i></b>
RO	0.13	1.84	-1.71
AC	0.04	1.96	-1.91
AM	0.86	2.15	-1.29
RR	0.04	1.38	-1.34
PA	0.48	4.81	-4.33
AP	0.05	1.88	-1.82
TO	0.09	2.86	-2.77
<b><i>Northeast</i></b>	<b><i>5.34</i></b>	<b><i>43.88</i></b>	<b><i>-38.54</i></b>
MA	0.25	5.63	-5.38
PI	0.14	3.44	-3.30
CE	0.82	6.25	-5.43
RN	0.24	3.34	-3.10
PB	0.26	4.03	-3.77
PE	1.27	5.88	-4.62
AL	0.20	3.27	-3.07
SE	0.20	2.80	-2.61
BA	1.98	9.24	-7.26
<b><i>Southeast</i></b>	<b><i>70.90</i></b>	<b><i>19.85</i></b>	<b><i>51.05</i></b>
MG	6.24	8.94	-2.70
ES	1.43	1.61	-0.18
RJ	19.64	2.16	17.48
SP	43.59	7.15	36.45
<b><i>South</i></b>	<b><i>10.64</i></b>	<b><i>12.18</i></b>	<b><i>-1.54</i></b>
PR	4.12	4.92	-0.81
SC	2.14	2.62	-0.48
RS	4.38	4.63	-0.25
<b><i>Center-west</i></b>	<b><i>11.42</i></b>	<b><i>7.21</i></b>	<b><i>4.21</i></b>
MS	0.27	1.45	-1.18
MT	0.32	2.08	-1.75
GO	0.83	3.26	-2.43
DF	10.00	0.43	9.57

Source: Secretaria da Receita Federal

\* Manufacturing tax (44.0%) and income tax (44.0%)

\*\* Constitutional transfers (FPE and FPM)

The previous discussion presented an overview of how each Brazilian state contributes to the Federal taxation system. Altogether, such constitutional transfers represent around 3.1% of Brazilian GDP. In order to analyze our second set of information, Table 1, column B provides information regarding the regional distribution of constitutional resources transferred by the

Federal government to each Brazilian state. Noteworthy is that São Paulo state receives only 7.15% of the total amount of transfers against a contribution of 43.59% to the revenues – a similar effect is observed to other rich states like Rio de Janeiro and Distrito Federal, i.e., their (proportional) contributions to the Federal revenues are higher than the (proportional) amount received via the constitutional funds. On the other hand, we observe exactly the opposite for poorer states like Maranhão, for instance, which generated only 0.25% of the Federal tax revenues but received 5.63% of the total constitutional transfers. This example helps one to understand how the allocation of resources by the Central government works in Brazil, in the sense that the poorest regions are relatively more benefited than the richest ones. The last column of Table 1 summarizes such allocation presenting those regions that directly benefit from such constitutional transfers (negative values) and those that are net transferors (positive values).

In the next section, we use an interregional input-output model for the Brazilian economy for purposes of regional impact assessment. The model is to be used to capture the role of interindustrial and interregional relations in the economic development process through the evaluation of the regional impact of the existing interregional government transfers mechanisms in Brazil. The use of this modeling approach is very relevant to the Brazilian case. Its ability to handle detail at a disaggregated level is useful for analyzing the role played by Brazil's spatial productive structure from a systemic perspective.

### 3. Assessing the Regional Impacts of Interregional Government Transfers in Brazil

We start by describing the model used to analyze the regional effects of interregional government transfers in Brazil. The general equilibrium nature of economic interdependence and the fact that the policy impacts in various regional markets differ are considered in the results of the model. Attention is directed to one main issue, namely the differential regional impacts of the current interregional transfers structure on regional value added, a proxy for the tax base effects. As the simulations try to mimic a “typical year”, we have selected as our case study the transfers' estimates for 2006. In this paper, we intend to use the fiscal parameters to simulate different arbitrary allocations of the interregional government transfers.

#### 3.1. Theoretical background

The intersectoral flows in a given economy can be represented by the following system:

$$X = AX + Y \tag{1}$$

where  $X$  is a  $(nx1)$  vector with the value of the total production in each sector,  $Y$  is a  $(nx1)$  vector with values for the final demand, and  $A$  is a  $(nxn)$  matrix with the technical coefficients of production. In this model, the final demand vector can be treated as exogenous to the system, such that the level of total production can be determined by the final demand, i.e.,

$$X = BY \tag{2}$$

$$B = (I - A)^{-1} \tag{3}$$

where  $B$  is a  $(nxn)$  matrix of the Leontief inverse.

According to Miller & Blair (1985), an interregional model for two regions L and M can have its coefficients matrix represented in matricial terms as:

$$A = \begin{bmatrix} A^{LL} & A^{LM} \\ A^{ML} & A^{MM} \end{bmatrix} \quad (4)$$

Vectors  $X^L$  and  $X^M$  will constitute the total production vector,  $X$

$$X = \begin{bmatrix} X^L \\ X^M \end{bmatrix} \quad (5)$$

The final demand vector,  $Y$ , will be composed of vectors  $Y^L$  and  $Y^M$

$$Y = \begin{bmatrix} Y^L \\ Y^M \end{bmatrix} \quad (6)$$

As such, the system presented by equation (2) can then be used to represent an interregional system; in this way, it is possible to evaluate the impact of the final demand on total production, and from there, on value added, employment, etc., for each one of the regions considered in the model.

### *Multipliers*

From the multiplier results it is possible to measure the direct and indirect effects of a change in the final demand on production, value added, employment, etc. (see Miller and Blair, 1985).

From the Leontief inverse matrix ( $B$ ) defined above, one sees that the production multiplier of type I for each economic sector is given by:

$$P_j = \sum_{i=1}^n b_{ij} \\ j = 1, \dots, n \quad (7)$$

where  $P_j$  is the production multiplier for sector  $j$ , and  $b_{ij}$  is an element of matrix  $B$ .

Using the structure of derivation elaborated below for the value added multipliers, all the other multipliers in the economy can be derived.

The first step is to estimate the coefficients of value added, given by

$$w_j = \frac{va_j}{x_j} \quad (8)$$

where  $w_j$  is the coefficient of value added in sector  $j$ ,  $va_j$  is the total value added in sector  $j$ , and  $x_j$  is the level of production in sector  $j$ .

The total value added multiplier of type I ( $VA_j$ ), generated in sector  $j$ , is given by

$$VA_j = \sum_{i=1}^n w_i b_{ij} \quad (9)$$

where  $b_{ij}$  is an element of matrix  $B$  described above.

### 3.2. Hypotheses for simulation

In order to grasp the differential effects associated to interregional government transfers, the interregional input-output model briefly described in the previous sub-section was estimated for 2004 considering the 26 Brazilian States and the Federal District. The interstate input-output model also considers 110 products and 55 sectors in each region. A major effort in data compilation was undertaken in order to estimate the model.<sup>2</sup> The simulation strategy is to introduce a shock related to the existing structure of interregional government transfers – as indicated in Table 1 – and to evaluate its distributional impacts (benchmark simulation). The main research question is to check whether the production structure acts in favor of more developed regions countervailing the redistributive effects of government transfers through the operation of indirect and induced multiplier effects. A counterfactual simulation is also carried out in which we consider that the structure of interregional government transfers would follow exactly the regional structure of Federal government's tax revenue. To reach this goal we use a closed input-output model in which the regional household sectors are endogenized.

### 3.3. Results

As for the benchmark simulation, Table 2 presents the first set of results whose focus is on the regional distribution of value added effects. For reference, column A shows the regional shares in GDP; column B replicates the regional distribution of the shocks while column C shows the regional distribution of the effects of transfers expenditures on the generation of value added in the Brazilian economy. Comparing such distributions in the last column of Table 2, one can have an idea on the presence of relevant leakages from lagging regions to more developed regions. For instance, while the States in the Southeast receive about 20% of total interregional transfers, they achieve one third of total value added associated with such expenditures. On the other hand, the Northeast region also achieves about the same share in the impact on value added (34,63%) but receiving almost 44% of total interregional transfers. States highlighted in the last column – Espírito Santo, Rio de Janeiro, São Paulo, Paraná, Santa Catarina, Rio Grande do Sul and Distrito Federal – are those that have shown to receive benefits “beyond their contribution”, i.e. their share in total benefits is higher than their share in total expenditures.

Another way of looking at these results is through the computation of the truncated regional value added multipliers, which shows the value added creation in the region per money unit of regional transfers received *by the State*. Such multipliers compare the region-specific value added effect based on the overall transfers (Column C) – thus capturing all interregional effects –, with the total amount of transfers accruing to the State (column B). The results are presented in Table 3. In the case of São Paulo, for instance, for each BRL 1.00 received from

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<sup>2</sup> For details on the methodology, see Haddad et al. (2002) and FIPE (2008).

the Federal Government – and considering the transfers to other States as well – the State generates BRL 3.46 in value added, a proxy to the tax base. In the other extreme, Maranhão, one of the poorest states, generate only BRL 0.97 of value added per BRL 1.00 received as transfers.

One can also look at output effects. In this case, Table 4 presents the results for the benchmark simulation. The last column highlights those states with above-the-average multipliers. Again, states in the Center-South of the country perform better, including also the State of Amazonas, in the North region. It is clear from these results that interregional feedback effects operate in favor of the more developed regions of the country.

**Table 2. Regional Value Added Effects of Interregional Transfers in Brazil: Benchmark Simulation**

	<i>Regional Share in GRP (A)</i>	<i>Regional Share in Expenditures (B)</i>	<i>Regional Share in Total VA Impact (C)</i>	<i>(C) - (B)</i>
<b><i>North</i></b>	<b>4.95</b>	<b>16.88</b>	<b>12.86</b>	<b>-4.02</b>
RO	0.58	1.84	1.44	-0.41
AC	0.20	1.96	1.38	-0.58
AM	1.56	2.15	2.04	-0.11
RR	0.14	1.38	0.96	-0.42
PA	1.83	4.81	3.80	-1.01
AP	0.20	1.88	1.32	-0.56
TO	0.43	2.86	1.92	-0.94
<b><i>Northeast</i></b>	<b>12.72</b>	<b>43.88</b>	<b>34.63</b>	<b>-9.25</b>
MA	1.11	5.63	3.73	-1.90
PI	0.51	3.44	2.31	-1.13
CE	1.90	6.25	5.35	-0.91
RN	0.80	3.34	2.49	-0.85
PB	0.77	4.03	2.91	-1.12
PE	2.27	5.88	5.22	-0.66
AL	0.66	3.27	2.46	-0.82
SE	0.63	2.80	2.26	-0.55
BA	4.07	9.24	7.91	-1.33
<b><i>Southeast</i></b>	<b>55.83</b>	<b>19.85</b>	<b>32.21</b>	<b>12.36</b>
MG	9.13	8.94	8.78	-0.15
ES	2.07	1.61	1.65	0.04
RJ	11.48	2.16	4.85	2.69
SP	33.14	7.15	16.92	9.78
<b><i>South</i></b>	<b>17.39</b>	<b>12.18</b>	<b>13.48</b>	<b>1.30</b>
PR	6.31	4.92	5.15	0.23
SC	3.99	2.62	3.17	0.55
RS	7.10	4.63	5.15	0.52
<b><i>Center-west</i></b>	<b>9.11</b>	<b>7.21</b>	<b>6.82</b>	<b>-0.39</b>
MS	1.09	1.45	1.17	-0.27
MT	1.90	2.08	2.05	-0.03
GO	2.47	3.26	2.74	-0.52
DF	3.64	0.43	0.86	0.43

**Table 3. Regional Value Added Multipliers of Interregional Transfers in Brazil:  
Benchmark Simulation**

	<i>Regional Transfers in BRL millions (A)</i>	<i>Regional VA in BRL millions (B)</i>	<i>(B)/(A)</i>
<b><i>North</i></b>	<b><i>12296.66</i></b>	<b><i>13703.88</i></b>	<b><i>1.11</i></b>
RO	1343.92	1532.68	1.14
AC	1425.02	1469.50	1.03
AM	1567.57	2177.22	1.39
RR	1004.46	1023.34	1.02
PA	3505.69	4052.11	1.16
AP	1367.28	1405.50	1.03
TO	2082.72	2043.53	0.98
<b><i>Northeast</i></b>	<b><i>31968.35</i></b>	<b><i>36889.68</i></b>	<b><i>1.15</i></b>
MA	4099.90	3969.83	0.97
PI	2504.30	2463.41	0.98
CE	4554.73	5694.64	1.25
RN	2430.27	2652.47	1.09
PB	2934.73	3103.27	1.06
PE	4285.98	5562.40	1.30
AL	2384.13	2616.60	1.10
SE	2043.17	2402.52	1.18
BA	6731.13	8424.54	1.25
<b><i>Southeast</i></b>	<b><i>14460.25</i></b>	<b><i>34307.60</i></b>	<b><i>2.37</i></b>
MG	6509.35	9353.89	1.44
ES	1173.14	1759.28	1.50
RJ	1572.03	5167.66	3.29
SP	5205.73	18026.76	3.46
<b><i>South</i></b>	<b><i>8869.58</i></b>	<b><i>14357.08</i></b>	<b><i>1.62</i></b>
PR	3587.49	5490.96	1.53
SC	1907.48	3376.25	1.77
RS	3374.61	5489.87	1.63
<b><i>Center-west</i></b>	<b><i>5252.89</i></b>	<b><i>7263.82</i></b>	<b><i>1.38</i></b>
MS	1053.64	1248.47	1.18
MT	1512.47	2183.32	1.44
GO	2374.61	2919.15	1.23
DF	312.17	912.87	2.92
<b><i>BRAZIL</i></b>	<b><i>72847.73</i></b>	<b><i>106522.06</i></b>	<b><i>1.46</i></b>

**Table 4. Regional Output Multipliers of Interregional Transfers in Brazil:  
Benchmark Simulation**

	<i>Regional Transfers in BRL millions (A)</i>	<i>Regional Gross Output in BRL millions (B)</i>	<i>(B)/(A)</i>
<b><i>North</i></b>	<b><i>12296.66</i></b>	<b><i>21139.75</i></b>	<b><i>1.72</i></b>
RO	1343.92	2242.44	1.67
AC	1425.02	2008.04	1.41
AM	1567.57	4459.04	2.84
RR	1004.46	1432.22	1.43
PA	3505.69	6081.84	1.73
AP	1367.28	1885.61	1.38
TO	2082.72	3030.57	1.46
<b><i>Northeast</i></b>	<b><i>31968.35</i></b>	<b><i>60583.94</i></b>	<b><i>1.90</i></b>
MA	4099.90	6401.13	1.56
PI	2504.30	3790.98	1.51
CE	4554.73	9368.72	2.06
RN	2430.27	4205.55	1.73
PB	2934.73	4533.62	1.54
PE	4285.98	9363.88	2.18
AL	2384.13	4065.56	1.71
SE	2043.17	3571.92	1.75
BA	6731.13	15282.58	2.27
<b><i>Southeast</i></b>	<b><i>14460.25</i></b>	<b><i>66430.91</i></b>	<b><i>4.59</i></b>
MG	6509.35	16039.84	2.46
ES	1173.14	2887.30	2.46
RJ	1572.03	9859.47	6.27
SP	5205.73	37644.30	7.23
<b><i>South</i></b>	<b><i>8869.58</i></b>	<b><i>28506.28</i></b>	<b><i>3.21</i></b>
PR	3587.49	10712.93	2.99
SC	1907.48	6482.69	3.40
RS	3374.61	11310.66	3.35
<b><i>Center-west</i></b>	<b><i>5252.89</i></b>	<b><i>13048.16</i></b>	<b><i>2.48</i></b>
MS	1053.64	2261.70	2.15
MT	1512.47	3932.77	2.60
GO	2374.61	5177.63	2.18
DF	312.17	1676.05	5.37
<b><i>BRAZIL</i></b>	<b><i>72847.73</i></b>	<b><i>189709.05</i></b>	<b><i>2.60</i></b>

So far, we have looked at the gross effects of constitutional interregional transfers. Given the known methodological limitations of our approach to deal with general equilibrium issues that involve price changes through the tax system<sup>3</sup>, we still can have a rough idea about the net effects of such transfer mechanism. To reach this goal, we have designed a counterfactual simulation in which we have used the regional structure of Federal government's tax revenue to hypothetically distribute the interregional government transfers expenditures. The difference between the impacts of the benchmark simulation and the counterfactual simulation may be seen as a first approximation of the net results of the constitutional interregional transfer mechanism in Brazil. The results are presented in Table 5.

Column A presents the value added effects in the case interregional transfers are spent according to constitutional rules (*status quo*); column B shows the value added effects based on an hypothetical distribution of interregional transfers in which regional shares are the same as those verified in the revenue side. A first approximation of the net effects of interregional transfers is given by the difference between A and B. Two points deserve to be mentioned.

<sup>3</sup> See, for instance, Shoven & Whalley (1992).

First, it is clear that the constitutional transfer mechanisms favor the less developed regions of the country. Even though the existing economic structure lessens such redistributive effects, they help to achieve a more equitable interregional distribution of economic activity. Second, given this static picture, there does not appear a trade-off between equity and efficiency. As a matter of fact, total value added effects are a little bit (5%) higher in the benchmark simulation. This basically happens because of the stronger foreign import dependence of the states in the Center-South of the country. With higher import coefficients from the rest of the world, a higher share of expenditures in this region produces smaller multipliers. It is important to highlight that such static results should be viewed, as emphasized above, as a first approximation of the impacts.

**Table 5. Net Regional Value Added Effects of Interregional Transfers in Brazil: Comparison of the Benchmark and the Counterfactual Simulations**

	<i>Benchmark Simulation (A)</i>	<i>Counterfactual Simulation (B)</i>	<i>(C)=(A)-(B)</i>	<i>(C)/(B)</i>
<b><u>North</u></b>	<b>13703.88</b>	<b>1979.12</b>	<b>11724.76</b>	<b>5.92</b>
RO	1532.68	209.13	1323.55	6.33
AC	1469.50	61.15	1408.35	23.03
AM	2177.22	870.92	1306.30	1.50
RR	1023.34	40.97	982.37	23.98
PA	4052.11	597.96	3454.15	5.78
AP	1405.50	48.73	1356.77	27.85
TO	2043.53	150.27	1893.26	12.60
<b><u>Northeast</u></b>	<b>36889.68</b>	<b>5653.73</b>	<b>31235.95</b>	<b>5.52</b>
MA	3969.83	308.64	3661.19	11.86
PI	2463.41	144.80	2318.61	16.01
CE	5694.64	839.84	4854.80	5.78
RN	2652.47	263.19	2389.28	9.08
PB	3103.27	275.44	2827.82	10.27
PE	5562.40	1148.79	4413.61	3.84
AL	2616.60	251.27	2365.32	9.41
SE	2402.52	253.49	2149.04	8.48
BA	8424.54	2168.27	6256.27	2.89
<b><u>Southeast</u></b>	<b>34307.60</b>	<b>72029.43</b>	<b>-37721.83</b>	<b>-0.52</b>
MG	9353.89	7357.64	1996.25	0.27
ES	1759.28	1553.57	205.71	0.13
RJ	5167.66	17636.73	-12469.07	-0.71
SP	18026.76	45481.49	-27454.72	-0.60
<b><u>South</u></b>	<b>14357.08</b>	<b>12832.30</b>	<b>1524.79</b>	<b>0.12</b>
PR	5490.96	4894.74	596.22	0.12
SC	3376.25	2912.26	463.99	0.16
RS	5489.87	5025.29	464.58	0.09
<b><u>Center-west</u></b>	<b>7263.82</b>	<b>9432.45</b>	<b>-2168.64</b>	<b>-0.23</b>
MS	1248.47	476.28	772.19	1.62
MT	2183.32	842.71	1340.61	1.59
GO	2919.15	1630.09	1289.07	0.79
DF	912.87	6483.38	-5570.50	-0.86
<b>BRAZIL</b>	<b>106522.06</b>	<b>101927.04</b>	<b>4595.03</b>	<b>0.05</b>

## Final Remarks

The main goal of this paper was to evaluate the implications of interregional government transfers in Brazil for the pattern of regional development within the country. The main research question was to check whether the production structure acts in favor of more developed regions countervailing the redistributive effects of government transfers through the operation of indirect and induced multiplier effects. As for regional concentration, which



is therefore the main object of this paper, the effects are clearly favorable. The Northeast and North regions increase their share in national GDP, as their shares in total value added effect exceed their respective shares in GDP. Thus, interregional government transfers present a clear, favorable regional impact. Since it is targeted to poor regions, with a clear spatial focus, it ends-up producing a de-concentration effect. This effect is, of course, larger if government expenditures follow the proposed transfer mechanisms, since the regional pattern of central government tax revenue, if followed, would be more pro-concentration.

One last point that should be further emphasized is the role played by the existing economic structure in terms of reducing the initial redistributive effects of interregional government transfers. Our analysis has shown that interregional linkages within the Brazilian economy operate favoring the more developed regions of the country, as there are relevant leakages from lagging regions to more developed regions. Actually, while the States in the Southeast receive about 20% of total interregional transfers, they achieve one third of total value added associated with such expenditures. Meanwhile, the Northeast region also achieve about the same share in the impact on value added (34,63%) but receiving almost 44% of total interregional transfers. As it turned out, Espírito Santo, Rio de Janeiro, São Paulo, Paraná, Santa Catarina, Rio Grande do Sul and Distrito Federal are the States that have shown to receive benefits “beyond their contribution”, i.e. their share in total benefits is higher than their share in total expenditures. While the design of constitutional interregional transfer funds in Brazil do present a strong spatial focus – “poorer regions get more” –, the persistence of regional dualism in Brazil is nonetheless reinforced by the structure of productive interdependence of the economy, as our results have demonstrated.

## References

- Baer, W. & G. J. D. Hewings (Eds.) (2007). **Equity Distortion in Regional Resource Allocation in Brazil**. New York, Haworth Press.
- Bergvall, D., C. Charbit, D.-J. Kraan & O. Merk (2006). “Intergovernmental Transfers and Decentralised Public Spending”. *OECD Journal on Budgeting*, 5(4), 111-158.
- Bird, R. & A. Tarasov (2002). “Closing the Gap: Fiscal Imbalances and Intergovernmental Transfers in Developed Federations”. International Studies Program, *Working Paper 02-02*. Andrew Young School of Policy Studies.
- Dias, M. F. & R. Silva (2004). “Central Government Transfers and Regional Convergence in Portugal”. Paper presented at the 2004 European Regional Science Association Conference, *Mimeo*.
- FIPE (2008). “Matriz Interestadual de Insumo-Produto para o Brasil, 2004”, Relatório de Pesquisa, mimeo.
- Garcia-Milà, T. & T. J. McGuire (2004). “Do Interregional Transfers Improve the Economic Performance of Poor Regions? The Case of Spain”. *International Tax and Public Finance*, 8(3), 281-296.
- Groenewold, N., A. Hagger & J. R. Madden (2003). “Interregional Transfers: A Political Economy CGE Approach”. *Papers in Regional Science*, 82, 535-554.

Haddad, E. A. (1999). **Regional Inequality and Structural Changes: Lesson from the Brazilian Economy**. Aldershot: Ashgate.

Haddad, E. A., C. R. Azzoni, E. P. Domingues & F. S. Perobelli (2002). “Macroeconomia dos Estados e Matriz Interestadual de Insumo-Produto”. *Economia Aplicada*, 6(4), 875-895.

Miller, R.E. & P.D. Blair (1985). **Input-Output Analysis: Foundations and Extensions**. Englewood Cliffs: Prentice-Hall.

Monteiro Neto, A. (2006) “Fluxos de Renda Fiscal *versus* Fluxos de Renda via Comércio: O Que Há de Novo na Direção e Magnitude da Ação Redistributiva do Governo Federal nas Regiões Brasileiras”. *Texto para Discussão 1230*, IPEA.

Nam, C. W. & R. Parsche (2001). “Municipal Finance in Poland, the Slovak Republic, the Czech Republic and Hungary: Institutional Framework and Recent Development”. *MOCT-MOST Economic Policy in Transitional Economies*, 11 (2), 113-34.

Rolim, C. F. C., C. C. Machado, L. Lavinhas, M. B. Lemos, M. Magina & E. Rios-Neto (1996). “Saldo Comercial, Transferências Governamentais e Movimento de Capitais Inter-regional”. *Estudos Econômicos*, 26(1), 5-19.

Shoven, J. B. & Whalley, J. (1992). **Applying General Equilibrium**. Cambridge Surveys of Economic Literature. Cambridge University Press.

Temple, M. (1994). **Regional Economics**. New York: St. Martin’s Press