Social protection and COVID-19: Evaluation of regional impacts of the Emergency Aid policy in Brazil☆

Prisciane Raupp da Rosa [a,*], Adelar Fochezatto [a], Giácomo Balbinotto Neto [b], Eduardo Rodrigues Sanguinet [c]

[a] Post Graduate Program in Development Economics, Pontifical Catholic University of Rio Grande do Sul (PUCRS), Porto Alegre, Brazil
[b] Department of Economics Science, Federal University of Rio Grande do Sul, Porto Alegre, Brazil
[c] Institute of Agricultural Economics, Faculty of Agricultural and Food Sciences Austral Unieversity of Chile, Valdivia, Chile

ARTICLE INFO

ABSTRACT

The new Coronavirus pandemic (COVID-19), which began in late 2019 in China, lead to a health and economic crisis of significant proportions. The decrease in economic activity in order to prevent further spread of the disease affected all economic sectors, resulting in the unprecedented loss of jobs and the weakening of the informal economy. The Emergency Aid (EA) was created with the purpose of guaranteeing a subsistence income, minimizing the economic problems brought about by the pandemic. The aim of this paper is to analyze the direct and indirect impacts of the EA income transfers on the economy of Brazilian states. Of particular interest is to assess the distribution of indirect impacts as there may be spillovers of income between regions because of inter-sector relations and production chains. Thus, given the differences in production structures, the accounting of indirect impacts can result in a structure of regional distribution of benefits that is quite different from the initial one. The aim of this study is to assess which regions are relatively more benefited by comparing the initial structure of the distribution of the EA benefits with the final structure, after accounting for the spillovers. To do so, an interregional input-output model developed by Haddad et al. (2017) and data from the Brazilian Transparency Portal (*Portal da Transparência*) on resources allocated by the EA in the period from April to August 2020 were used. The results show that the states that benefited most in the initial distribution of the EA are the relatively most populous and poorest (Northeast) and the most benefited in the final distribution are those with more complex and relatively more developed productive structures (Southeast and South).

© 2022 National Association of Postgraduate Centers in Economics, ANPEC. Production and hosting by Elsevier B.V. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0/).

1. Introduction

At the end of 2019, a new virus (Covid-19) was identified, which spread rapidly among countries. In March 2020, the World Health Organization (WHO) started to consider the situation a pandemic. Uncertainties about the virus, the disease and its transmissibility have led many countries to adopt actions to reduce the circulation of people, directly impacting economic activity. Demand for some products and services has declined dramatically, affecting employers, employees, and self-employed workers (Kissler et al., 2020).

In Brazil, the set of restrictions on economic activities affected different sectors, implying a heterogeneous increase in unemployment rates in Brazilian states. Brazil reached the mark of 12.8 million unemployed people, associated with a 9.7% decrease in Gross Domestic Product (GDP) in the second quarter of 2020 (IBGE, 2020). In this context, the political pressure for actions that could compensate for social distancing measures increased, transferring income mainly to the poorest families. In response, the federal government created a comprehensive national social protection program based on direct income transfer, the so-called Emergency Aid (EA).

The EA is a financial benefit granted by the Federal Government, aimed at informal workers, individual micro-entrepreneurs (MEI), self-employed and unemployed people, and aims to provide emergency protection in the period of confronting the crisis caused by the Coronavirus pandemic (CEF, 2020). The transfers aim to benefit the most vulnerable social strata in the face of the economic problems caused by the pandemic. More specifically, the target audience consists of the low-income population (identified by the Single Registry for social programs), the beneficiaries of the Bolsa Família program, informal workers and individual micro-entrepreneurs. Once the eligible beneficiaries are identified, the funds are transferred monthly to their respective accounts.

Based on the direct distribution of resources, which follows the criteria defined in the policy, it is interesting to assess the second-order effects of these resources. These occur with benefits in the purchase of products by the beneficiaries, which end up generating multiplier effects in the economy. As the regional productive structures are different and there are production chains that cross the borders of the states, the multiplier effects of the use of the EA may be different in each region, in addition to the possibility of transmission of effects between the regions.

The aim of this paper is to analyze the direct and indirect impacts of the EA income transfers on the production of Brazilian states. Of particular interest is to assess the distribution of indirect impacts as there may be spillovers of income between regions because of inter-sector relations and production chains. Thus, given the differences in production structures, the accounting of indirect impacts can result in a structure of regional distribution of benefits that is quite different from the initial one. The aim of this study is to assess which regions are relatively more benefited by comparing the initial structure of the distribution of the benefits of the EA, after accounting for the spillovers. To do so, an interregional input-output model developed by Haddad et al. (2017) and data from the Brazilian Transparency Portal on resources allocated by the EA in the period from April to August 2020 were used.

The paper is organized as follows. In Section 2 there is the bibliographic review, the presentation of the Emergency Aid program (EA) and of other programs around the world. The Section 3 presents the methodology and data. The Section 4 analyzes and discusses the results. Finally, the conclusions of the study are presented in the Section 5.

2. Literature review

The Emergency Aid is a direct income transfer program, with monthly payments of R$ 600.00, in the April-August period, and R$ 300.00 in the September-December period. The program's purpose is to benefit the most vulnerable social strata in the face of social isolation measures: low-income population (Single Registry - *Cadastro Único*), beneficiaries of the Bolsa Família

First-level (condition)	Second-level (income condition)	Third-level (social condition)
Being of legal age (except for teenage mothers)	Having per capita monthly family income of up to half a minimum wage (R$ 522.50) or total monthly family income of up to R$ 3,135.00 Having received in 2018 taxable income of less than R$ 28,559.70	Not having income from social security, assistance, unemployment insurance and not being linked to any federal government income transfer programs. Exercising activity as an individual, autonomous, informal, or unemployed micro-entrepreneur (in the Single Registry for Social Programs (CadÚnico).

Fig. 1. Requirements to access the Emergency Aid.
Source: Prepared by the authors, based on information from Caixa Econômica Federal (2020).

Table 1
EA target audience, amounts received and proportion of the total (Provision made in April 2020).
Source: Adapted based on information from Caixa Econômica Federal (2020).

Target audience	Amount (R$ million)	Proportion (%)
Beneficiaries of the Bolsa Família Program (BFP)	19.2	32.5
Registered in the Single Registry (CadÚnico)	10.5	17.8
Not Registered in the Single Registry (CadÚnico)	29.3	49.7
Total	59.0	100%

program, informal workers, and individual micro-entrepreneurs (Fig. 1). Each beneficiary receives a quota, with a limit of two per family unit, except for single mothers who are heads of household, who are entitled to two instead of a single quota.

These government transfers contribute to mitigate variations in unemployment, poverty and income inequality. It is even possible that the effects of the aid overlap with the effects generated by the loss of work (Komatsu and Menezes Filho, 2020). According to Barbosa and Prates (2020), the Emergency Aid has the potential to increase the average family income per capita by R$ 178.00, and for Trovão (2020) the EA makes it possible to sustain the income of the poorest due to the concentration of resources in this population group. The program allows a double effect on the economy, with a significant increase in the income of the unemployed and beneficiaries of programs such as Bolsa Família with monthly income below R$ 600.00 (Trovão, 2020). On the other hand, informal workers and individual micro-entrepreneurs (with an income above R$ 600.00) have their income reduced. The crucial point, however, is the income distribution allowed by the aid.

The payment of the aid automatically and temporarily replaces the payment of the benefit associated with the Bolsa Família program whenever it is more advantageous for the beneficiary. The coordination of the EA concession policy is carried out by the Ministry of Citizenship, the database is managed by Dataprev and the payments are made operational by Caixa Econômica Federal in bank accounts called *Poupança Social Digital* (Digital Social Savings). Table 1 shows the target audience for the Emergency Aid. The beneficiary must pay Income Tax on the amount received if s/he obtains, in calendar year 2020, other taxable income in an amount greater than R$ 28,559.70 (value of the first range of the Individual Income Tax progressive annual table – IT). In this case, the beneficiary must submit the income tax return for the year 2021 and add to the tax the amount of the aforementioned aid received by him/her or his/her dependents. The measure does not affect the IT on the aid amount but requires the return of the total amount received as EA – including the benefits received by the dependents – under the same terms and conditions of payment of the due tax determined in the declaration.

Income transfers made in Brazil follow the actions of other economies in the world. Many countries have implemented aid measures due to the pandemic; actions can be categorized by tax incentives and income transfers to the most vulnerable population. Table 2 summarizes the characteristics of the aid programs adopted in some countries in Europe and the Americas.

The analysis of the direct and indirect effects of the EA requires a methodology that considers sectoral and regional interconnections. The efficient allocation of resources for a virtuous cycle of a demand-based model is crucial to counterbalance isolation measures (restrictions) with the maintenance of minimum income levels across the country. In this sense, the

Table 2
Selected social protection programs worldwide.
Source: Prepared by the authors using data from (Greer et al., 2020) Elize Fonseca et al (2020)

Country	Characteristics
Chile	The design of the *Programa de Renda Mínima de Emergência* aims to benefit 60% of the most vulnerable families with income derived from informal jobs, in addition to monthly benefits in the amount of 50,000 Chilean pesos[a] (USD 63.51) for three months.
Argentina	One-time transfer of 10,000 Argentine pesos (USD 131.84) to workers between 18 and 65 years of age who are self-employed, retired, pensioners and others dependent on government benefits.
USA	$ 1200 was granted to each head of household, with an additional $ 500 per child under the age of 17, benefiting middle- and working-class citizens with an annual income of less than $ 75,000.
Canada	Taxable benefits in the amount of 2000 Canadian dollars (USD 1491.20) were granted to qualified workers who lost their income or ceased to pursue their professional activities as a result of Covid-19. People with disabilities, pensioners and recently graduated university students were also included. Families with school-age children received additional aid of 300 Canadian dollars.
Germany	Through the *Kinderbonus für Familien* program, 300 euros (USD 348.51) were granted to families with children, with duplicate subsidies for single parents.
Italy	600 euros (USD 697.02) went to informal, self-employed, and agricultural workers
United Kingdom	The country has defined as priorities workers, unemployed citizens, and entrepreneurs (especially those between 18 and 30 years old), and the Self-employment Income Support Scheme was developed with the purpose of granting up to 2500 pounds sterling (USD 3175.75) per month, for three months.
Russia	The country has adopted extensions to the benefits for unemployed people who have been prevented from exercising their activities. Transfers in the amount of a minimum wage, 12130 rubles (USD 154.76), were addressed to families with children aged three to 15 years, with additional benefits in case the parents lose their jobs.

[a] All conversions were carried out in United States Dollar/USD, price of 9/25/2020 provided by Banco Central do Brasil.

assessment of systematic effects, incorporating interregional dependence as a driver of the spatial distribution of total, direct and indirect effects, becomes particularly relevant.

The input-output technique is suited for this type of analysis. There are several similar studies, using this technique, applied to the Brazilian context (Guilhoto, 2010; Ichihara and Guilhoto, 2007; Porsse et al., 2003; Haddad and Domingues, 2002). Similarly, the impacts of public policies on economic systems are investigated. Silva (2016) analyze the economic impacts of Amazonas and the Continuous Cash Benefit Programme (*Benefício de Prestação Contínua* – BPC) between 2005 and 2012. They identified that the GDP of the regions with the highest number of poor people increases due to the greater volume of resources received, which ends up inducing an interregional income distribution. For the period from 2009 to 2015, Freire et al. (2018), using the same methodology, found that the Bolsa Família Program directly reduces income inequality at work, but has low effects on growth.

Neri et al. (2013) used the Circular Flow of Income to measure the direct and indirect short-term impacts of social transfers on GDP through a Social Accounting Matrix, verifying the multiplier effects of various social benefits on GDP, such as Bolsa Família (BF) and General Social Security Benefits. With the application of a for Brazil in 2006, Mostafa et al. (2010) investigated the effects on GDP and income distribution in relation to exogenous shocks in the main items of social spending. Among the main results, higher GDP multiplier effects were found for health and education spending than for average autonomous spending or commodity exports.

Ichihara and Guilhoto (2007) estimated the impacts of expected economic growth and its influence on the demand for highways in the State of São Paulo. Porsse et al. (2003) sought to estimate an interregional input-output matrix from the state of Rio Grande do Sul to the rest of Brazil. Haddad and Domingues (2002) used an interregional input-product matrix to divide the Brazilian economy into two regions, Minas Gerais and the rest of Brazil, in order to assess the participation of exports in the structure of the mining economy.

With regard to the construction of an interregional system for all states in Brazil, as is the case in the present study, initiatives are scarce. The work of Haddad et al. (2017) and Guilhoto et al. (2017) covers all Brazilian states. Guilhoto et al. (2017) used the method combined with the national input-output matrix to estimate trade flows between the units of the federation. In the results, the states of São Paulo and Rio de Janeiro proved to be the most self-sufficient, with Roraima and Tocantins presenting the lowest levels of self-sufficiency.

Haddad et al. (2017) applied the Interregional Input-Output Adjustment System (IIOAS) method, finding consistency with the approach of the national input-product matrix in the analysis of the commercial relations and the productive structures of each state and finding similar results, in relation to the self-sufficiency of the states, when compared to Guilhoto et al. (2017). In this sense, this work contributes to the literature by applying the input-output matrix approach to all states in a context of pandemic and income transfer.

Considering the sectoral and regional interdependencies, an increase in family income is expected to have positive net effects on regional gross production as shown in Fig. 2. Initially, families living in a given region receive direct transfers from the government. It is assumed that the entire value is converted into consumption within the regions of origin. Two aspects are relevant in this regard, the consumption structure, and the production structure of the regions.

Regarding the regional consumption structure, it is relevant because the sectors have different multiplier effects. Thus, the multiplier effects of income transfers will be different across regions, depending on which sectors are stimulated via increased consumption. The interregional input-output matrix used in the study has this information, which is specific to each Brazilian state.

To provide a general idea of regional differences in consumption patterns, Table 3 shows the main items of household expenditure by large regions in Brazil. This information serves to indicate on which products the families in each region will spend the funds received from the EA. The information, taken from the 2017 to 2018 Family Expenditure Survey (*Pesquisa de Orçamentos Familiares* – POF), shows that Food, Transport and Housing are the three pillars of consumption spending by Brazilian families, representing around 70% of the total. In the case of Food, there is a relatively greater weight in expenditure in the North and Northeast regions. Transport has a greater weight in consumption in the South and Midwest regions, while Housing weighs relatively more in consumption expenditures in the Southeast and North regions.
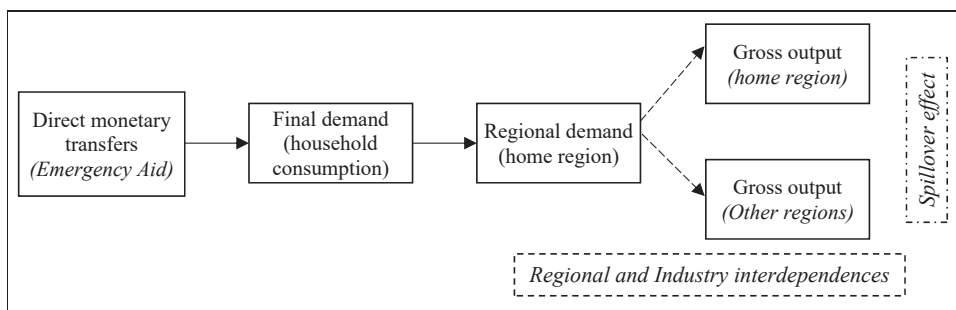

Fig. 2. Distribution of the effects of direct income transfer (EA) to families.
Source: prepared by the authors.

Table 3
Share of the main items in total household consumption in large Brazilian regions (%).
Source: Prepared by the authors, based on information from the 2017 to 2018 Household Expenditure Survey (IBGE).

Items	North	Northeast	Southeast	South	Midwest	Brazil
Food	21.0	22.0	15.8	17.1	16.6	18.0
Housing	36.4	32.4	39.0	35.7	33.4	35.5
Clothing	5.3	5.1	3.7	4.5	4.5	4.5
Transport	16.6	16.2	17.5	20.6	21.0	18.7
Hygiene and personal care	5.7	5.0	3.0	3.3	3.6	3.9
Health care	5.4	8.0	8.5	7.3	8.0	7.6
Education	3.2	4.7	5.1	3.7	4.7	4.3
Recreation and culture	2.5	2.5	2.5	2.6	2.7	2.6
Smoking	0.3	0.4	0.5	0.6	0.4	0.5
Personal services	1.1	1.3	1.3	1.2	1.3	1.3
Miscellaneous expenses	2.4	2.4	3.0	3.3	3.8	3.1
Total	100.0	100.0	100.0	100.0	100.0	100.0

Regarding regional production structures, they are relevant to indicate the intensity of the multiplier effects and they tend to stay in the region or spill into other regions. In general, the productive structures in peripheral regions are simpler than in central regions. Thus, the economic impacts of demand shocks in peripheral regions tend to spill more than shocks in central regions. As a result, although the peripheral areas of the country, represented by lower socioeconomic levels, are relatively more benefited by transfers from social protection programs, the spillovers from the multiplier effects tend to benefit the economies of the central regions. In this context, it is important to note how the regions benefit from the income transfer program via Emergency Aid. The heterogeneous productive structure of the Brazilian states is present in the interregional input-output matrix, being represented by the participation of the sectors in the economy and by the technical coefficients of production.

3. Methodology

3.1. Data sources

We seek to measure systemic characteristics to assess the economic impacts of direct transfers of resources, converted into household consumption. The data related to direct transfers from the federal government are from the Transparency Portal, disaggregated at the regional level (federative units). The empirical strategy considers an interregional input-output system to measure the effect of consumption on regional production. The matrix used in this study is IRIO, which was built by the Center for Urban and Regional Economics at the University of São Paulo (Haddad et al., 2017), and its base year represents the 2011 economic structure, including 27 regions (federative units) and 68 sectors. The results were updated for December 2019 with data from the Broad consumer price indices (Índice de Preços ao Consumidor Amplo - IPCA) of the Brazilian Institute of Geography and Statistics (IBGE).

3.2. Estimation

This study analyzes the regional multiplier effects of EA transfers from the federal government to beneficiaries in different regions (federative units) in Brazil. The idea is to provide useful regional information on the spatial distribution of a final demand shock related to the increase in family income in terms of direct and indirect effects on regional production. Therefore, an open system IRIO was assumed, which allows the components of aggregate demand to be assumed exogenously. The basic relations in the traditional input-output model are given by:

$$x = A. x + y \quad x = (I - A)^{-1}. y = B. y \tag{1}$$

where x is the product, A is the matrix of technical coefficients, y is the final demand and B represents the inverse Leontief matrix. Our approach is based on an interstate model, and the extent of these basic relatives can be expressed as

$$x = \begin{bmatrix} x^1 \\ \vdots \\ x^R \end{bmatrix}; A = \begin{bmatrix} A^{11} & \cdots & A^{1R} \\ \vdots & \ddots & \vdots \\ A^{R1} & \cdots & A^{RR} \end{bmatrix}; y = \begin{bmatrix} y^1 \\ \vdots \\ y^R \end{bmatrix}; and B = \begin{bmatrix} B^{11} & \cdots & B^{1R} \\ \vdots & \ddots & \vdots \\ B^{R1} & \cdots & B^{RR} \end{bmatrix} \tag{2}$$

Initially, we are interested in measuring the sectoral and regional effects related to the increase in regional household income, according to direct government transfers from the Emergency Aid (EA) protection program. In a general scenario, be Δy the increase in final demand, assuming the other constant components. The causal structure of the interregional input-output model extension is shown in Fig. 3. The final demand shock (Δy) is the result of an exogenous variation of a component f ($y = f + Z$), so that the regional interdependencies between R and S are relevant for the structural propagation over the product of the sectors and regions of the system.
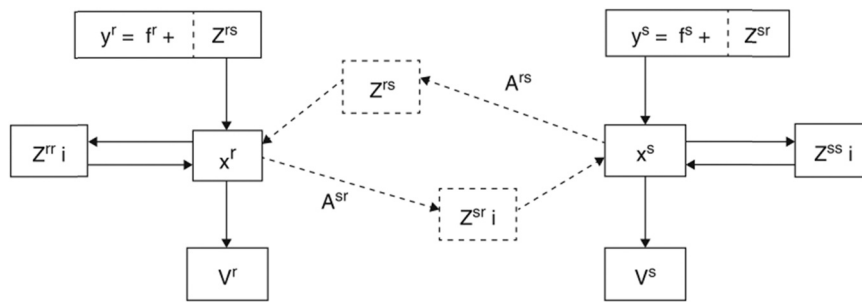
Fig. 3. Interdependences on an IRIO modeling.
Source:)(Hewings and Oosterhaven, 2015).

By multiplying the direct impact using the Leontief matrix, we obtain an estimate of the direct effects plus the indirect effects on the economic system, such as:

$$\Delta x = (I - A)^{-1} \cdot \Delta y = B \cdot \Delta y$$

Therefore, when the gross production flows associated with a given level of final demand are known, the relative changes in regional production can be assessed. The regional hierarchies of the Brazilian economy can be revealed as follows, considering a representative region R:

$$\Delta x^R = (I - A^{RR})^{-1} \cdot \Delta y^R \tag{3}$$

where x^R is the vector of gross production of R, $(I - A^{RR})^{-1}$ is the Leontief inverse of this region and Δy^r is its change in final demand, accounted for by the aggregate direct impact of transfers received from the federal government between April and August 2020 by the Units of the Brazilian Federation. It is important to consider that the results on gross production depend on the structure of preferences for interregional consumption, at least in the first round of income transfers. This aspect is particularly relevant in this study, since the maintenance of the industrial structure of consumption of the families was assumed, so that the demand increases in proportion to the value received by the families, maintaining the consumption basket. The total amount of transfers received by each federative unit (regions) was distributed proportionally to the sectors, following the distribution of household consumption present in the matrix. Therefore, the transferred income is converted into consumption by the families of each state.

Finally, we extend the assessment of size effects by measuring the ratio between direct and indirect impacts (RDI^R) at the regional level, comparing the direct and indirect effects, $RDI^R = \Delta y^R / \Delta x^R$, which allows us to measure how much the inflow of resources potentially increases regional and sectoral production. In addition, it is possible to analyze the potential effects of the spillover within the subnational hierarchical structure.

4. Results

We do not intend to quantify the real changes in regional production due to the EA program, adopted by the Brazilian Federal Government in order to mitigate the effects of the COVID-19 pandemic, but rather to identify its potential gains and losses associated with regional dynamics within the country.

4.1. Geography of the Emergency Aid program

Brazil is composed of 26 states plus the Federal District, being subdivided into five regions with marked regional disparities. When an income transfer program such as Emergency Aid is carried out, these differences end up impacting the distribution of resources and the spatial disposition of the beneficiaries. Analyzing the information in Table 4, the states of the North and Northeast have more direct beneficiaries per 1000 inhabitants compared to the states of the Midwest, Southeast and South of the country. In addition, the Northeast also presents approximately the same number of beneficiaries as the Southeast, which has a population one third larger. The most unfavorable socioeconomic conditions explain this spatial distribution of resources.

The transfers of the Emergency Aid to beneficiaries, or direct effect, were distributed as shown in Fig. 4. Regionally, the absolute amount of the benefit paid to individuals is concentrated in some states in the Northeast and Southeast regions of Brazil, which have the largest number of beneficiaries and the largest Brazilian population, respectively (see Table 4), and received approximately 36% of total transfers each. Although the values allocated in each region are similar, the indirect effect was quite different (see Annex 1), being greater than 1 for the Southeast and less than half for the Northeast. The other regions in order of distribution of transfers were North (11%), South (10%) and Midwest (7%).

The association between regional disparities and the population receiving transfers from the social program reveals two specific patterns. The first is that the most populous regions receive a larger number of resources, even if they have a lower beneficiary per capita ratio than other regions with less inhabitants. The second is that, as regional inequality grows, there is a

Table 4
Spatial distribution of the population and beneficiaries of the EA.
Source: prepared by the authors.

State	Population (2020)	Percentage participation in the total population (A)	Absolute beneficiaries (individuals)	Percentage participation in the total beneficiaries (B)	Beneficiaries per 1000 inhabitants	B/A	Gini Index (2010)
RO	1,796,460	0.85	470,477	0.87	262	1.03	0.50
AC	894,470	0.42	273,967	0.51	306	1.2	0.55
AM	4,207,714	1.99	1,266,425	2.35	301	1.18	0.56
RR	631,181	0.3	183,772	0.34	291	1.14	0.55
PA	8,690,745	4.1	2,832,607	5.26	326	1.28	0.54
AP	861,773	0.41	264,089	0.49	306	1.2	0.55
TO	1,590,248	0.75	449,017	0.83	282	1.11	0.54
North	**18,672,591**	**8.82**	**5,740,354**	**10.65**	**307**	**1.21**	**0.54**
MA	7,114,598	3.36	2,380,918	4.42	335	1.32	0.55
PI	3,281,480	1.55	1,160,116	2.15	354	1.39	0.56
CE	9,187,103	4.34	3,057,063	5.67	333	1.31	0.56
RN	3,534,165	1.67	1,101,932	2.05	312	1.23	0.55
PB	4,039,277	1.91	1,341,349	2.49	332	1.31	0.55
PE	9,616,621	4.54	3,133,209	5.82	326	1.28	0.56
AL	3,351,543	1.58	1,065,078	1.98	318	1.25	0.56
SE	2,318,822	1.1	757,916	1.41	327	1.28	0.56
BA	14,930,634	7.05	5,058,265	9.39	339	1.33	0.55
Northeast	**57,374,243**	**27.09**	**19,055,846**	**35.37**	**332**	**1.31**	**0.56**
MG	21,292,666	10.06	4,951,471	9.19	233	0.91	0.51
ES	4,064,052	1.92	989,100	1.84	243	0.96	0.51
RJ	17,366,189	8.2	4,301,267	7.98	248	0.97	0.54
SP	46,289,333	21.86	9,414,220	17.47	203	0.8	0.50
Southeast	**89,012,240**	**42.04**	**19,656,058**	**36.48**	**221**	**0.87**	**0.52**
PR	11,516,840	5.44	2,420,200	4.49	210	0.83	0.49
SC	7,252,502	3.42	1,167,252	2.17	161	0.63	0.45
RS	11,422,973	5.39	2,023,658	3.76	177	0.7	0.49
South	**30,192,315**	**14.26**	**5,611,110**	**10.42**	**186**	**0.73**	**0.48**
MS	2,809,394	1.33	657,689	1.22	234	0.92	0.51
MT	3,526,220	1.67	867,176	1.61	246	0.97	0.50
GO	7,113,540	3.36	1,723,693	3.2	242	0.95	0.50
DF	3,055,149	1.44	562,970	1.04	184	0.72	0.57
Midwest	**16,504,303**	**7.79**	**3,811,528**	**7.07**	**231**	**0.91**	**0.55**
Brazil	**211,755,692**	**100**	**53,874,896**	**100**	**254**	**1**	**0.54**

clear tendency for transfers to increase, with a greater ratio of beneficiaries per capita, considering greater pre-existing social inequality.

However, the concentration of these transferred revenues may not reach its full potential to generate local economic effects in terms of production and employment. This can be explained because the industrial vocation for development and inter-regional ties are concentrated in the southern and southeastern states. Therefore, the regional production of the peripheries tends to be dependent on interregional demand, driven by regional hierarchies. Another reason for not reaching the full generational potential of the economic effects is the consumption pattern of the families since the regional distribution of the transfers affects the families' income in the short term.

When analyzing the consumption of the poorest population, the target audience of the Emergency Aid policy, Baptistella (2020) found that the beneficiary families of Bolsa Família had higher expenses with food and, consequently, greater consumption, variety, and nutritional quality. These income impacts on food consumption, which have low added value, are greater in families in the North and Northeast, while in the South and Southeast there is no significant change, they end up spending on other types of products with a greater aggregate impact.

The use of IRIO modeling makes it possible to assess the direct and indirect effects of the EA transfers on local economies and the possible spillovers from peripheries to central regions, as they have more complex and advanced economies. The next section discusses the role of efficient transfers in an interregional modeling environment, analyzing the main multiplier effects of the income transfer policy.

4.2. Regional effects of the EA social protection program

Fig. 5 shows the regional distribution of indirect effects on regional production. The total indirect effects are concentrated in the states of the Southeast, representing 52% of the amount transferred. The State of São Paulo accounts for 31% of the total indirect effects generated throughout the Brazilian economy. The states in the Northeast – which received a similar number of transfers – have indirect effects of 22% of the national total.

The spatial distribution of indirect effects is notably attributed to regional inequalities, concentrating on the states with the largest productive structures and with the most dynamic economic sectors. The most populous and economically prosperous
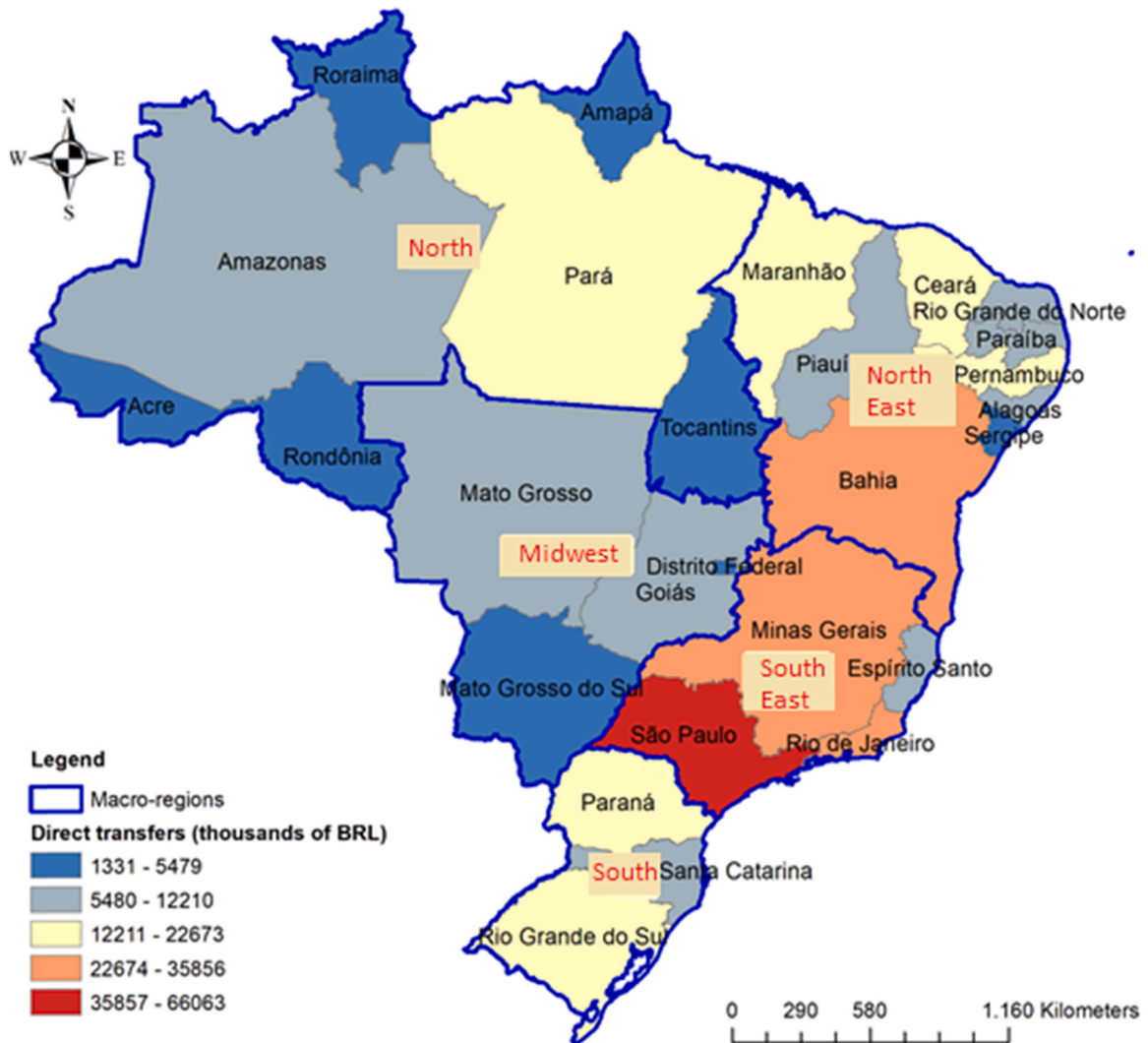
Fig. 4. Distribution of the Emergency Aid benefit by state (Direct Effect).
Source: Prepared by the authors based on the Transparency Portal.

regions produce superior product results when compared to other regions. It is noteworthy that even two macro-regions with such unequal productive structures, such as the Southeast and the Northeast, received similar amounts of direct federal transfers.

In Brazil, income inequality is the result of a historical construction, and income distribution policies allow support for Brazilian households, even if there are deficiencies in the functional distribution, in general (Trovão, 2020). It is possible that the greatest effects in these states are related to pre-existing institutional arrangements and previous public policies, since Bolsa Família beneficiaries were automatically covered by the EA (Cardoso, 2020). These differences can be explained by several factors, such as the composition of their economic sectors and the proportion of low-income people in relation to the total population of the regions. An example is the Northeast Region, which has half the poorest population in the country, while the Southeast is home to most of the richest population (Trovão, 2020).

The interdependencies of the national productive system indicate the spillover potential of the effects beyond the direct effects, counted as the total value that families received in each Brazilian state. Therefore, the potential interregional effects can be seen by Ratio between direct and indirect effect (RDI) – which allows to assess the potential income gain of the state in relation to the value of resources from the emergency aid paid to beneficiaries. The figures, at the federative unit level, show the potential effect of each \$ 1.00 received on the regional income generation capacity. On average, Brazil had an RDI of 0.696 for the period analyzed (see Annex I for details at the state level). This figure shows that, in the first five months of response, \$ 0.69 of regional income is induced in response to 1.00 transferred in the form of EA. However, there is an unequal spatial distribution of RDI, implying heterogeneous opportunities for staff capable of mitigating the negative effects of the downturn in economic activity in the context of the pandemic.
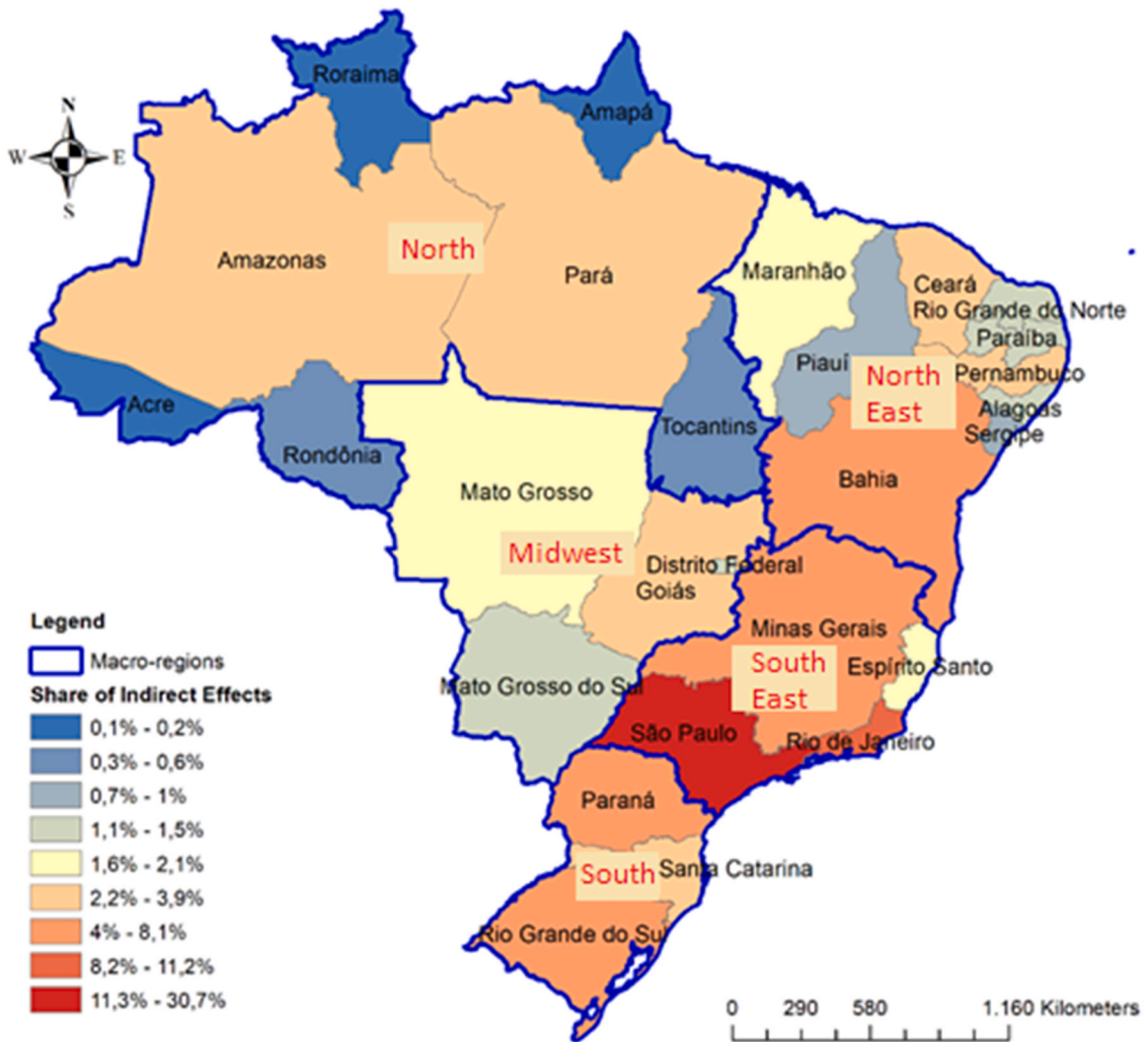
Fig. 5. Regional distribution of indirect effects.
Source: Prepared by the authors, 2020.

It is interesting to note that only nine of the twenty-seven states have RDI above the Brazilian average (of 0.70). The states with the highest RDI are mostly located in the South and Southeast. These regions have a participation of 3% and 7% in relation to the Gross Value Added (GVA) in their Industry and Transformation sectors and 4% and 18% in the sectors that comprise modern services, respectively. In addition, they are responsible for more than 78% of the total GVA of the Transformation Industry and 76% of Modern Services.

The potential economic returns from the transfer of the EA are accompanied by regional inequalities to a greater extent than by the total amount received by the beneficiaries. The winning and losing regions are clearly identified, the influence of interregional links becomes an important mechanism for spilling the effects across subnational production networks. In the Northeast, for every $ 1 paid in aid, there is an estimated average increase of 42 cents, while this multiplier effect is greater than 1 only in the state of São Paulo. The economic relations associated with the geographic proximity of São Paulo to the other states in the Southeast imply values above 0.8 for all. It is interesting to observe values higher than 0.8 in Rio Grande do Sul and higher than 0.84 in Paraná and Santa Catarina. At the other extreme are the states of Acre, Amapá, and Piauí with multiplier effects below 0.3.

Despite the smaller number of beneficiaries in these peripheral states, population differences should offset the potential effect at the regional level, however, this is not evidenced by the results. The process of disseminating the positive effects of the demand shock is noted in other states. Factors associated with regional disparities and the complexity of regional innovation systems are essential mechanisms for transmitting shocks. As a result, more complex regional systems tend to have more interregional ties that will be proportionally more affected by initial shocks in the family expenditure constraint.
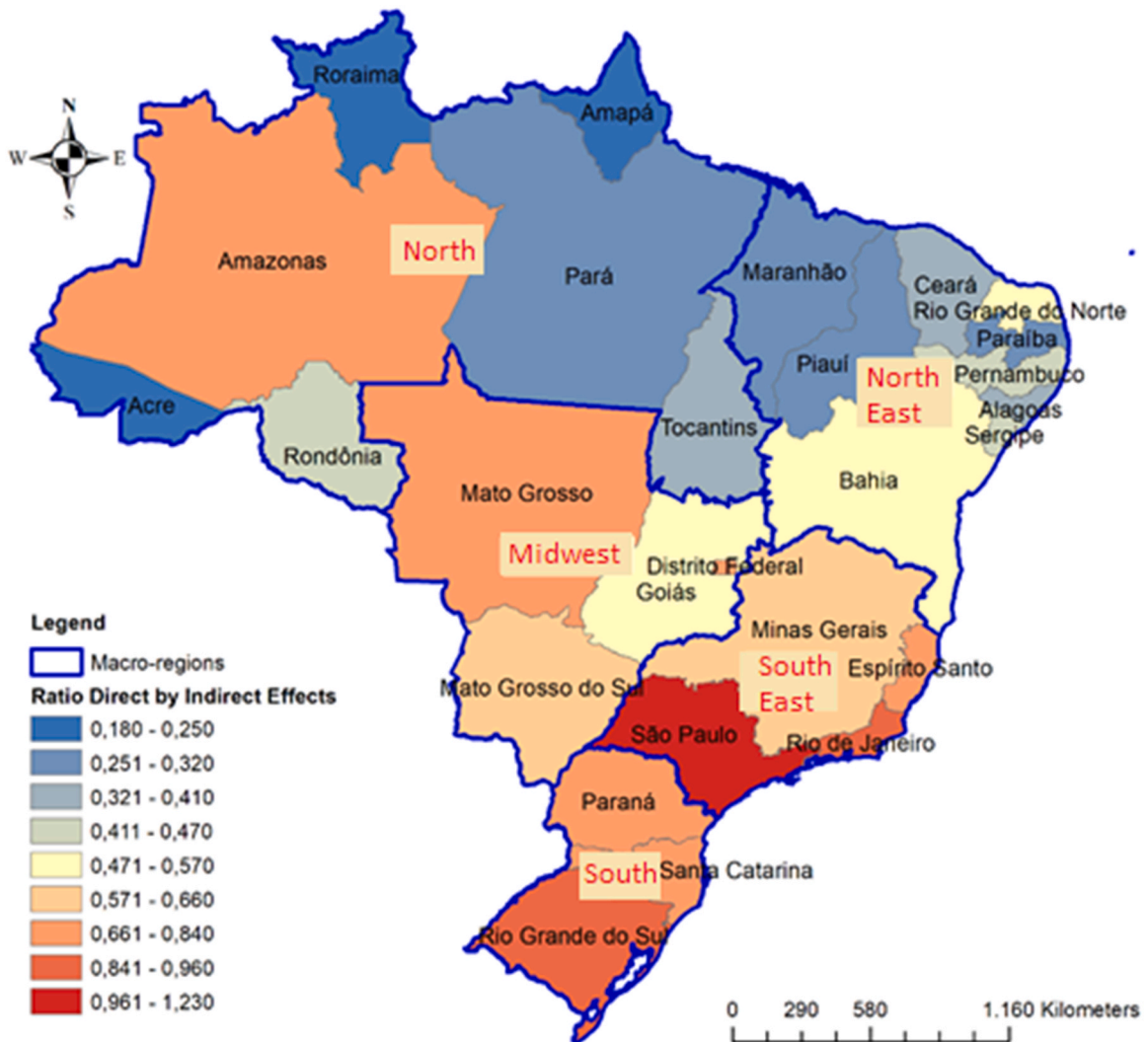
Fig. 6. Ratio between direct and indirect effect (RDI).
Source: prepared by the authors.

An important finding is that inequalities in space increase the effects of short-term concentration. In fact, the states of the North and Northeast have the largest proportions of beneficiaries per thousand inhabitants, all of which have higher rates than the national average and the largest Gini. The exception occurs in the State of Amazonas – RDI is above the national average –, the regional industrial vocation being one of the explanations since its production structure is very different from its neighboring states. In contrast, in the southern states, this relationship is the opposite.

The total effect – direct plus indirect – reveals relevant interregional restrictions to understand the potential spillovers of a final demand shock, as shown in Fig. 6. Among the five states that had the highest Total Effects, three have a lower RDI than the Brazilian average (Minas Gerais, Bahia, and Pernambuco). Despite this, these same states are the ones that received the greatest resources of the emergency benefit, while those with the lowest Total effects are precisely those with the lowest direct effects, that is, even with high indirect effects, the direct effects will be more important to determine the states that received more resources. Despite the high influence of the Direct Effect on the total Effect, in some states the RDI was so strong that it made them capable of overcoming the Total Effect of other states with a greater Direct Effect. This happens with Rio Grande do Sul, which has an RDI of 0.920 and a greater total effect than the states of Pará (0.322) and Maranhão (0.289), and other states such as Rio de Janeiro (0.958), Paraná (0.844) and Santa Catarina (0.836), which also had high RDIs (Fig. 7).

5. Final comments and policy implications

This article analyzed the relationship between the main Social Protection Program as a mitigation of COVID-19 implemented by the Brazilian Federal Government and the spatial distribution of economic effects. There is little empirical evidence on the
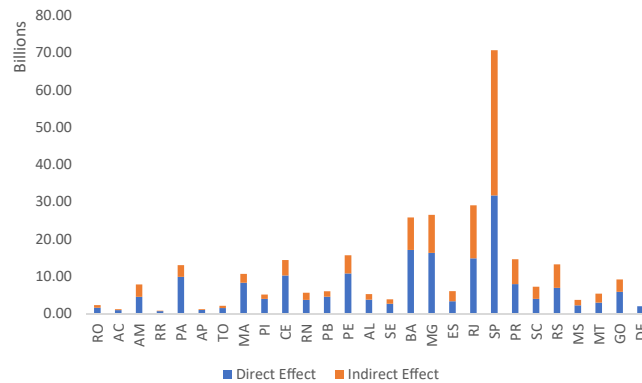
Fig. 7. : Direct, Indirect and Total Effect.
Source: Prepared by the authors.

regional systemic impacts of direct income transfer programs for families, showing the empirical contribution of this IRIO application. Spatial patterns were analyzed for the effects of income transfer, assuming that they are converted into household consumption, as a basis for the composition of the impacts of the product in general on state economies. The potential multiplier effect of this policy raises relevant doubts about the spillover effects associated with regional inequalities in Brazil.

The results suggest that the multiplier effects not only benefit the destination of the transferred income but spread through interregional systems of production and consumption. Although the EA Social Protection Program is essential to guarantee income in a recession context, it is imperative to question how the multiplier effects can perpetuate and even increase regional disparities. The efficiency of the EA mechanism to produce a more efficient allocation of resources and to reduce inequality between regions in Brazil is questioned. In contrast, as discussed earlier, the share of indirect effects by direct effects reveals a potential spillover effect on product multipliers. The evidence of this spillover is relevant to conclude that not only the wealthier regions of the Southeast and the South have direct effects that are inferior to the indirect ones. The main implication of this aggregate result is that the transfer policy has a spatial bias in relation to the location of the benefits and the economic effects generated. This transfer of product generation effects through interregional structures has shown spatially unequal benefits from this policy. Size effects depend on interregional structures, as well as territorial dynamics, including the various structural, locational, and cultural factors.

An important point to be assessed is that a large direct effect does not necessarily generate an indirect effect of the same magnitude. This is evident when analyzing two regions with similar direct effects, such as the Northeast (R\$ 64.7 million) and the Southeast (R\$ 66 million). Despite having a similar volume of transfers, the indirect effects generated were quite different, with the Southeast region having an indirect effect of R\$ 66.1 million (RDI 1.001) and the Northeast with only R\$ 27.3 million (RDI 0.420). This same phenomenon can be observed when analyzing the South and North Region, in which both have a similar direct effect, at around R\$ 19 million, but with the South obtaining twice the indirect effect, and consequently RDI. In both cases the indirect effects were greater in the richest regions and smaller in the poorest.

This phenomenon also occurs at the state level, where, although the direct effects are relatively greater in the poorest states, as they have a greater number of beneficiaries per capita, there is a spillover of indirect effects, resulting from the use of income for consumption, for the wealthier states, which ends up perpetuating dependency and inequality. The poorer regions, as they have more fragile economies and simpler productive structures, end up being relatively less benefited in terms of indirect effects. An alternative to minimize this problem could be the adoption of policies to stimulate entrepreneurship.

Finally, it is important to note that the EA has fulfilled its short-term proposal, guaranteeing the means of subsistence to the most vulnerable population, keeping families above the poverty line, and even increasing the average per capita household (around R\$ 178.00 or USD 31.97[1]). Although the most populous and poorest states have received greater volumes of resources, it is possible to demonstrate that the other states have been indirectly benefited by market transactions.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

---

[1] Conversion carried out in United States Dollar/USD, price of 9/25/2020 provided by Banco Central do Brasil.

Appendix 1. Direct, Indirect, Total and RDI Effect from April to August 2020

Source: prepared by the authors.

State	Direct Effect	Indirect Effect	Total Effect	RDI
RO	1,563,641,400.00	694,416,806.38	2,258,058,206.38	0.440
AC	931,648,200.00	232,689,299.55	1,164,337,499.55	0.250
AM	4,473,289,200.00	3,333,434,520.01	7,806,723,720.01	0.750
RR	647,920,200.00	117,544,697.15	765,464,897.15	0.180
PA	9,835,980,600.00	3,169,274,086.82	13,005,254,686.82	0.320
AP	952,971,000.00	188,338,018.72	1,141,309,018.72	0.200
TO	1,466,664,600.00	587,830,993.83	2,054,495,593.83	0.400
North	**19,872,115,200.00**	**8,323,528,422.45**	**28,195,643,622.45**	**0.420**
MA	8,249,893,200.00	2,386,290,861.94	10,636,184,061.94	0.290
PI	3,919,412,400.00	1,149,203,970.84	5,068,616,370.84	0.290
CE	10,221,785,400.00	4,146,761,390.74	14,368,546,790.74	0.410
RN	3,678,657,000.00	1,880,773,003.05	5,559,430,003.05	0.510
PB	4,507,651,800.00	1,457,522,282.11	5,965,174,082.11	0.320
PE	10,769,890,800.00	4,875,765,997.76	15,645,656,797.76	0.450
AL	3,723,619,200.00	1,506,525,757.60	5,230,144,957.60	0.400
SE	2,598,370,800.00	1,226,590,274.13	3,824,961,074.13	0.470
BA	17,063,556,600.00	8,715,413,090.41	25,778,969,690.41	0.510
Northeast	**64,732,837,200.00**	**27,344,846,628.57**	**92,077,683,828.57**	**0.420**
MG	16,283,049,000.00	10,217,077,761.25	26,500,126,761.25	0.630
ES	3,287,143,200.00	2,695,977,793.62	5,983,120,993.62	0.820
RJ	14,829,374,400.00	14,208,710,920.17	29,038,085,320.17	0.960
SP	31,680,576,000.00	39,002,376,868.32	70,682,952,868.32	1.230
Southeast	**66,080,142,600.00**	**66,124,143,343.36**	**132,204,285,943.36**	**1.001**
PR	7,898,199,000.00	6,662,688,418.69	14,560,887,418.70	0.840
SC	3,926,445,000.00	3,282,619,229.96	7,209,064,229.96	0.840
RS	6,877,362,000.00	6,326,140,227.02	13,203,502,227.02	0.920
South	**18,702,006,000.00**	**16,271,447,875.67**	**34,973,453,875.67**	**0.870**
MS	2,207,940,600.00	1,467,624,723.35	3,675,565,323.35	0.660
MT	2,941,435,800.00	2,399,415,548.98	5,340,851,348.98	0.820
GO	5,828,848,200.00	3,325,199,567.11	9,154,047,767.11	0.570
DF	1,944,685,800.00	1,541,141,897.91	3,485,827,697.91	0.790
Midwest	**12,922,910,400.00**	**8733,381,737.35**	**21,656,292,137.35**	**0.680**
Brazil	**182,310,011,400.00**	**126,797,348,007.40**	**309,107,359,407.40**	**0.700**

References

Baptistella, J.C.F., 2020. Avaliação de programas sociais: uma análise do impacto do Programa Bolsa Família sobre o consumo de alimentos e status nutricional das famílias. Rev. Bras. Aval. 3, 26–53.

Barbosa, R.J., Prates, I., 2020. Efeitos do desemprego, do Auxílio Emergencial e do Programa Emergencial de Preservação do Emprego e da Renda (MP nº 936/2020) sobre a renda, a pobreza e a desigualdade durante e depois da pandemia. IPEA, Nota Técnica 69, 65–79.

Caixa, 2020. Portal da Transparência divulga lista de beneficiários do Auxílio Emergencial. Caixa Notícias. Disponível em: ⟨https://caixanoticias.caixa.gov.br/noticia/20795/auxilio-emergencial-clique-aqui-para-ver-os-ultimos-numeros⟩. (Acesso em: 14/06/2020).

Cardoso, B.B., 2020. A implementação do Auxílio Emergencial como medida excepcional de proteção social. Rev. Adm. Púb. 54 (4), 1052–1063.

Freire, D., Domingues, E., Britto, G. , 2018. Structural Impacts of a Cash Transfer Program: An Application of a SAM Based CGE Model For Brazil.

Guilhoto, J., 2010. Estimação da Matriz Insumo-Produto Utilizando Dados Preliminares das Contas Nacionais: Aplicação e Análise de Indicadores Econômicos para o Brasil em 2005 (Using Data from the System of National Accounts to Estimate Input-Output Matrices: An Application Using Brazilian Data for 2005). Available at SSRN 1836495.

Guilhoto, J.J.M., Gonçalves Junior, C.A., Coelho Visentim, J.C., Imori, D., Ussami, K.A. , 2017. Construção da Matriz Inter-regional de Insumo-produto para o Brasil: Uma aplicação do TUPI. NEREUS, Brussels, Belgium.

Haddad, E.A., Domingues, E.P. , 2002. Matriz inter-regional de insumo-produto Minas Gerais/resto do Brasil: estimação e extensão para exportações. In: Anais do X Seminário sobre a Economia Mineira [Proceedings of the 10th Seminar on the Economy of Minas Gerais]. Cedeplar, Universidade Federal de Minas Gerais.

Haddad, E.A., Júnior, C.A.G., Nascimento, T.O., 2017. Matriz interestadual de insumo-produto para o Brasil: uma aplicação do método IIOAS. Rev. Bras. Estud. Reg. Urbanos 11 (4), 424–446.

IBGE, PIB cai 9,7% no 2º trimestre de 2020. Agência IBGE Notícias. Retrieved from ⟨https://agenciadenoticias.ibge.gov.br/agencia-sala-de-press/2013-news-agency/releases/28721-pib-cai-9-7-no-2-trimester-de-2020#:~:text=O%20Product%20Internal%20Gross%20no,Value%20Added%20a%20pré%C3%A7os%20b%C3%A1sicos⟩. (8 September 2020).

Ichihara, S.M., Guilhoto, J.J.M., 2007. O impacto do crescimento econômico sobre as rodovias de São Paulo: uma aplicação do modelo de insumo-produto combinado ao geoprocessamento. Rev. Econ. 8 (4), 199–231.

Kissler, S.M., Tedijanto, C., Lipsitch, M., Grad, Y. , 2020. Social Distancing Strategies for Curbing the COVID-19 Epidemic. medRxiv.

Komatsu, B.K., Menezes-Filho, N. , 2020. Simulações de impactos da COVID-19 e da renda básica emergencial sobre o desemprego, renda, pobreza e desigualdade. São Paulo, Policy Paper.

Mostafa, J., Souza, P.H., Vaz, F.M., 2010. Efeitos econômicos do gasto social no Brasil. Perspectivas da política social no Brasil, pp. 109–160.

Neri, M.C., Vaz, F.M., Souza, P.H. G.F. D., 2013. Efeitos macroeconômicos do Programa Bolsa Família: uma análise comparativa das transferências sociais. Programa Bolsa Família: uma década de inclusão e cidadania. Brasília, Ipea, 1, pp. 193–206.

Porsse, A.A., Haddad, E.A., Ribeiro, E.P. , 2003. Estimando uma matriz de insumo-produto inter-regional Rio Grande do Sul-restante do Brasil. São Paulo, Nereus/USP.

Silva, D.I.D., 2016. Impactos dos programas de transferência de renda Benefício de Prestação Continuada (BPC) e Bolsa Família sobre a economia brasileira: uma análise de equilíbrio geral (Doctoral dissertation). Universidade de São Paulo.

Trovão, C.J.B.M. , 2020. A pandemia da Covid-19 e a desigualdade de renda no Brasil: um olhar macrorregional para a proteção social e os auxílios emergenciais. Natal, Universidade Federal do Rio Grande do Norte.

Hewings, G. J. D. and Oosterhaven J. "Interregional input–output modeling: spillover effects, feedback loops and intra-industry trade." (2015).

Greer, S.L., King E.J., Massard da Fonseca E., Peralta- Santos A. (2020): The comparative politics of COVID-19: The need to understand government responses, Global Public Health. 15:9, 1413-1416.