International Labour Organization

PAGE PARTNERSHIP FOR ACTION ON GREEN ECONOMY

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1. Introduction

Brazil was particularly affected by the Coronavirus pandemic. This impact was felt across the whole society, the country's economic situation being no different.

As result of the constrains imposed by the spread of the virus and associated restrictions (in Brazil and in the rest of the world), Brazil experienced a decrease in internal and external supply and demand . At the same time, oil prices decreased thus reducing Brazilian oil export revenues. By 2020, Brazil still had not fully recovered from its recession in 2015-16, leaving the country with limited fiscal space to combat the coming economic crisis, high unemployment rates, a weakened economy, and fragile households.[1] These factors combined, shrank the country's GDP by 3.9% in 2020; contrasting with the average (positive) growth of 1.4% the Brazilian economy had been experiencing over the previous 10 years (2010-19)[2].

Driving the fall in GDP, consumption, investments, and exports fell during 2020, decreasing by approximately 5.2%, 0.5%, and 1.8%, respectively. The employment rate fell 6% in 2020, from 55% (in 2019) to 49% when accounting for the total population with more than 15 years[3].

Unlike the previous year, 2021 was marked by economic recovery. Brazilian GDP grew 4.6%, surpassing 2019's GDP thanks to favourable terms of trade and growth in credit for the private sector[4]. The easing of pandemic measures, and the cash transfers made in response to the pandemic crisis in 2020 (equivalent to 4% of the country's GDP) played a crucial role in this development. In this light, consumption grew by 3.2% and the employment rate grew 1% (to 50%) in 2021, while investments and exports grew 17.2% and 5.8% relative to the year prior[5].

1 World Bank (2020), COVID-19 in Brazil: Impacts and Policy Responses.

2 World Bank (2020), COVID-19 in Brazil: Impacts and Policy Responses.

3 World Bank national accounts data, and OECD National Accounts data files.

4 World Bank (2020), COVID-19 in Brazil: Impacts and Policy Responses.

5 World Bank national accounts data, and OECD National Accounts data files.

2. Employment impacts

2.1 Introduction

The purpose of the modelling exercise in this country report is to estimate the net employment outcomes resulting from the economic fiscal interventions (detailed in Appendix A) that have been announced in Brazil during 2020-21 and implemented during 2021-2022.

The methodology consists of using the E3ME model, which takes into consideration the different economic realities and aspects at global level, as well as the recovery policies implemented. It is best placed tool to estimate the impact of these policies on employment. This modelling exercise utilised the fiscal policies present at the Global Recovery Observatory (GRO) database as well as Cambridge Econometrics' own data collection.

2.2 Modelling assumptions

Cambridge Econometrics' global E3ME model provides an economic framework with which to evaluate the effects of a wide range of policies. Behavioural relationships in the model are estimated using econometric time-series techniques applied to a database that covers the period from 1970 onwards, on an annual basis. A core feature of the model is its treatment of technology, which will be key to meeting many of the world's policy challenges. The Future Technology Transformation (FTT) models of technology diffusion [6] in E3ME provide a representation of the adoption of new low-carbon technologies. E3ME extends its treatment of the economy to cover physical measures of energy, food, and material consumption. The main data sources for European countries are Eurostat and the International Energy Agency (IEA), supplemented by the OECD's STAN database and other sources where appropriate. For regions outside of Europe, additional sources for data include the UN, OECD, World Bank, IMF, ILO and national statistics.

Table 2.1: Additional recovery spending ($bn) by archetype and year

Architype	2021	2022	2023
R	11.54	1.08	0.00
S	0.11	0.14	0.12
W	1.47	0.03	0.00
Z	0.54	0.00	0.00
λ (lambda)	0.00	0.06	0.00
φ (phi)	0.00	0.00	0.00
Grand Total	**13.66**	**1.30**	**0.12**

Source(s): Global Recovery Observatory (GRO) database and Cambridge Econometrics' own data collection.

6 Mercure, J-F (2012) 'FTT:Power: A global model of the power sector with induced technological change and natural resource depletion', *Energy Policy*, Volume 48, September 2012, pp 799-811.

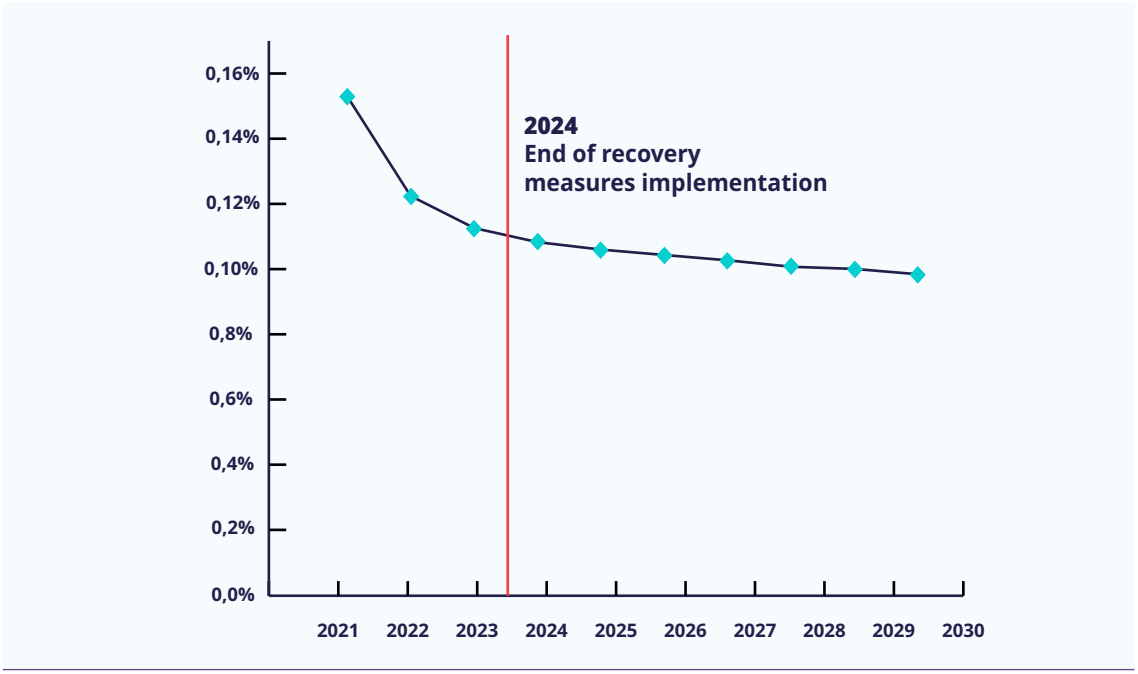
Gaps in the data are estimated using custom software algorithms.

The modelling results present the effect of the combined green and non-green recovery policies compared to a business-as-usual (BAU) case, which considers already adapted rescue measures and effects observed in 2020. Modelled policies include green (e.g. Buildings upgrades and energy efficiency infrastructure investment) as well as other fiscal policies (e.g. Targeted recovery cash transfers, Healthcare investment (non-infrastructure), etc).

The source of policies for Brazil is the Global Recovery Observatory (GRO) database[7]. The country's policies were aggregated across the following six policy archetypes; each with a specific channel through which the employment is affected:

- R – Targeted recovery cash transfers. This archetype's measures are implemented in the model through an increase in lump-sum payments to consumers at the country level.
- S - Tourism and leisure industry incentives. Measures under the archetype are treated as increasing the consumption of tourism and leisure industry goods, thereby simulating subsidized goods and services as well as exemptions granted by firms in the industry, which are passed through to prices, inducing increased consumption.
- W – Other incentive measures. Due to the highly uncertain measure of this archetype, it is modelled as a general increase in consumption, therefore affecting every sector in the economy proportional to its natural size.
- Z - Healthcare investment (non-infrastructure). This type of investment corresponds to an increase in government current expenditure in healthcare.

Figure 2.1: Employment impact of recovery policies compared to the baseline, 2021-30



Source(s): Cambridge Econometrics' E3ME model.

7 Concerning the archetypes used in this modelling exercise, the policies in the GRO database have been categorised according to a framework of 24 distinct archetypes. These archetypes consider the interventions in different sectors of the economy and are classified according to the degree of being considered "green policies". This classification varies between green, partially green, and non-green, or adaption.

- λ (lambda) - Buildings upgrades and energy efficiency infrastructure investment. Investments in this green policy archetype are modelled as an exogenous investment in public administration. This type of investment also creates an increase of energy efficiency in the economy equivalent to a decrease of 1 ktoe of energy demand for every EUR 1.3 million invested. This decrease in demand impacts the use of heavy oil, gas, and coal across all industrial sectors, proportionally with these fuels' demand in the country.

- φ (phi) - General research and development investment. Investments classified under this archetype are assigned to research and development in pharmaceuticals (45%), electronics (45%), and computing (10%)[8].

It is assumed that Brazil implements these policies and their associated investment from 2021 to 2023 according to the values and timeframe indicated in Table 2.1. Resulting in a total investment of USD 15.08 billion.

Caveats

An important caveat is the fact that the model does not take into consideration the efficiency and productivity gains resulting from the improvements to healthcare, construction and enhancing of infrastructure that came to be from the execution of the recovery policies. As such, one should consider that the efficiency and productivity gains in the modelled economy are underestimated.

Financing assumptions

This modelling exercise also assumes that there is no revenue recycling and that there is no crowding out effect caused by these investments due to the assumption of non-limited money supply. While these policies are long-term in nature, the results in this report are presented up to 2030 only.

2.3 Employment outlook

Economy-wide outcomes

Recovery policies cause an initial positive shock to the economy and thus to employment. Employment is expected to be 0.14% (or 145 thousand) higher than without the recovery policies. These gains also seem to be relatively permanent. Employment is still 0.08% above baseline (79 thousand) by 2030.

Figure 2.1 shows these effects: the impacts are the strongest in the years of implementation and decrease as the policy induced stimulus diminishes. Long-term effects are driven by higher consumption during the implementation years, which together with higher employment decreases unemployment and leads to an economy functioning at a higher level. This, in turn, creates a feedback loop: increased employment will again increase consumption, which again leads to higher stable employment levels.

This result is very much in line with the nature of the policies implemented: about 91% (in monetary terms) of the policies are consumption boosting policies (e.g. targeted cash recovery), which result in additional consumption leading to the above described feedback loops and finally a higher level of economic activity and employment.

Sectoral employment

Sectoral results, presented in Table 2.2, show more evidence of the explanation presented above. As policies focus on consumption sectors producing additional employment are mostly "consumer facing" sectors, who are responsible for producing consumer goods and services rather than intermediaries. In 2021, the increase in employment is particularly strong in service sectors: in retail and tourism about 21 thousand jobs (0.09%), in business services about 73 thousand jobs (0.3%) and in public services about 22 thousand jobs (0.12%).

8 Due to lack of data on Brazilian share of R&D investment in different sectors, CE has used data from Argentina to approximate this allocation of funds.

▶ **Table 2.2: Employment by sector (difference in '000 from baseline)**

Broad sectors	2021	2022	2025	2030
Agriculture & forestry	21	11	7	5
Extractive industries	0	0	0	0
Manufacturing	4	5	6	7
Energy & utilities	0	0	0	0
Construction	4	5	6	6
Distribution, retail, hotels and catering	21	21	21	22
Transport and storage	0	1	1	1
Business services	73	60	42	33
Public services	22	5	5	5
Total	**145**	**107**	**88**	**79**

Source(s): Cambridge Econometrics' E3ME model.

Agriculture also gains (by 21 thousand, 0.17%) from the effects of the policies, as food demand (0.7%) and hence production (0.17%) grows with employment increases.

Gains in other sectors are relatively limited and mostly due to secondary effects (i.e. intermediary demand from consumer sectors). The persistence of the effects is particularly strong in retail and tourism, and in business services: This effect is initially driven by the cash transfer policies and the feedback loops play a role in its persistence over time. Cash transfers lead to hiring more workers to fulfil increased demand in the implementation years, but then relatively rigid labour market structures ensure that employment grows slower in the later years. Higher than baseline employment induces higher than baseline income levels and finally higher than baseline consumption.

In conclusion, this modelling exercise shows that Brazil has implemented a relatively limited recovery package to combat the economic effects of COVID-19. The implemented policies have primarily focused on boosting consumption, through cash transfers and other similar incentive schemes. The simulation shows that this can lead to higher employment and economic activity, especially in consumer sectors. Crucially, the simulation also shows that employment effects, that are initially a result of higher demand, can be persistent in some sectors, due to employment-income feedback loop.

2.4 Comparison – 'green' vs 'conventional' policies and their impact on jobs and emissions

While the modelling presented so far has focused on the overall impact of the presented recovery policy package to better understand the contribution and impact of individual policies a 'marginal impact' modelling exercise has been undertaken. This means that the E3ME model has been run for the seven archetypes separately to separate out their individual effects, these effects were then compared to the baseline in terms of employment and in terms of emissions. National average carbon intensity of employment in Brazil for 2018 has also been computed in order to see how emission intensity of job opportunities created by different recovery archetypes compare to this average.

Figure2.2 and Figure 2.3 shows these cumulated emission and employment impacts for the short-term and long-term respectively. The average carbon intensity of employment for the national economy in Brazil in 2018 is further shown with a red line. 'Conventional' policies are shown with blue, while policies named 'green' by the GRO are shown with green. Finally, the size of the bubble on the figures shows the magnitude (in monetary terms) of the archetype.

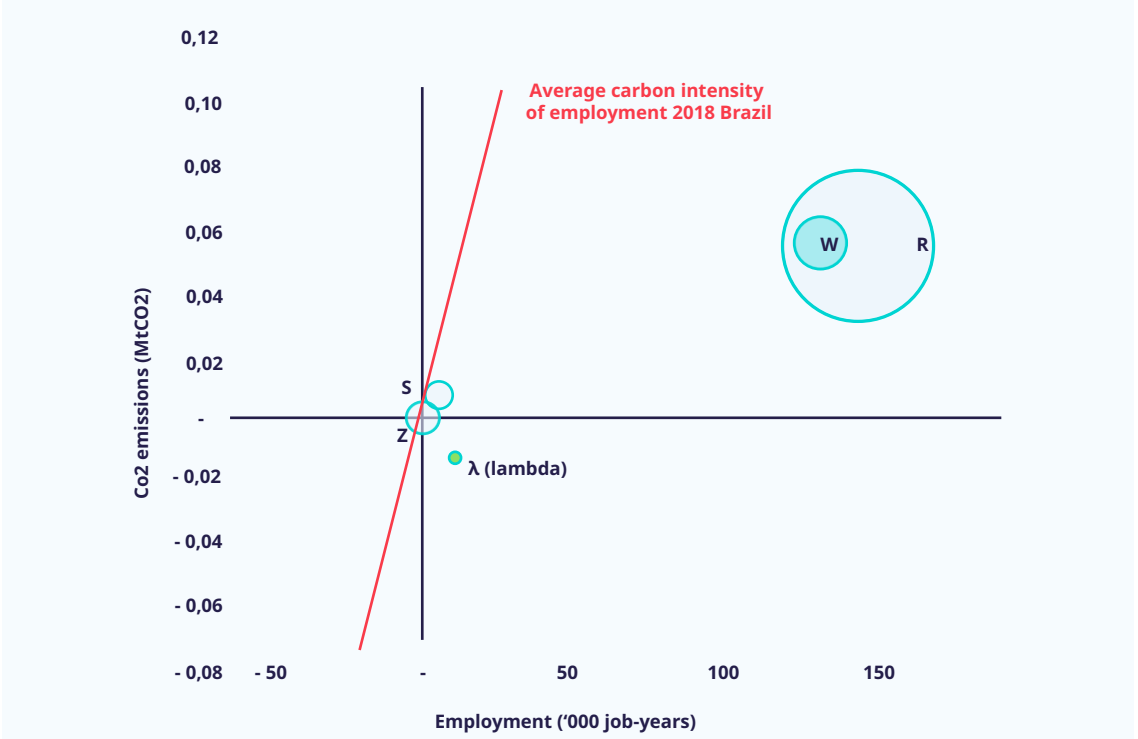
Based on GRO database, only one 'green' archetype was considered among the recovery policies. The archetype represents energy efficiency investments and building upgrades, in the short-term this is the only archetype that contributes to actual emission reductions. The other 'conventional' policy archetypes create additional emission, although their employment-to-emission ratios are well-below the national average. This means that these archetypes, specifically W and R archetypes (both archetypes increase disposable income and spending) create jobs that are less carbon intensive than an average job in the national economy.

This better than average ratio is persistent even if look at long-term effects. Even though the ratio then is much closer to the national average emission-to-employment ratio (of 2018). Curiously, by then the archetype also produces additional emissions. This is the result of a rebound effect: the archetype assumes that usage of fossil-fuels decreases due to energy efficiency improvements, however this leads to increased consumption in other areas and eventually increased energy consumption. As the scenario does not assume the transformation of the power system at the same time, the process results in overall higher emissions (although the employment impacts are positive as well).

Overall, these marginal impacts show that in the short-term, given the economic structure of Brazil, 'conventional' policies, even if they are not directly environmentally harmful, might increase CO_2 emissions. But it needs to be considered that emission-to-employment ratio of these policies might still be better than generally in the economy (national average). Interestingly, in the long-term, due to rebound effects, without systematic change, even measures (e.g. energy efficiency) that seem to provide favourable environmental outcomes in the short-term can turn out to be somewhat harmful.

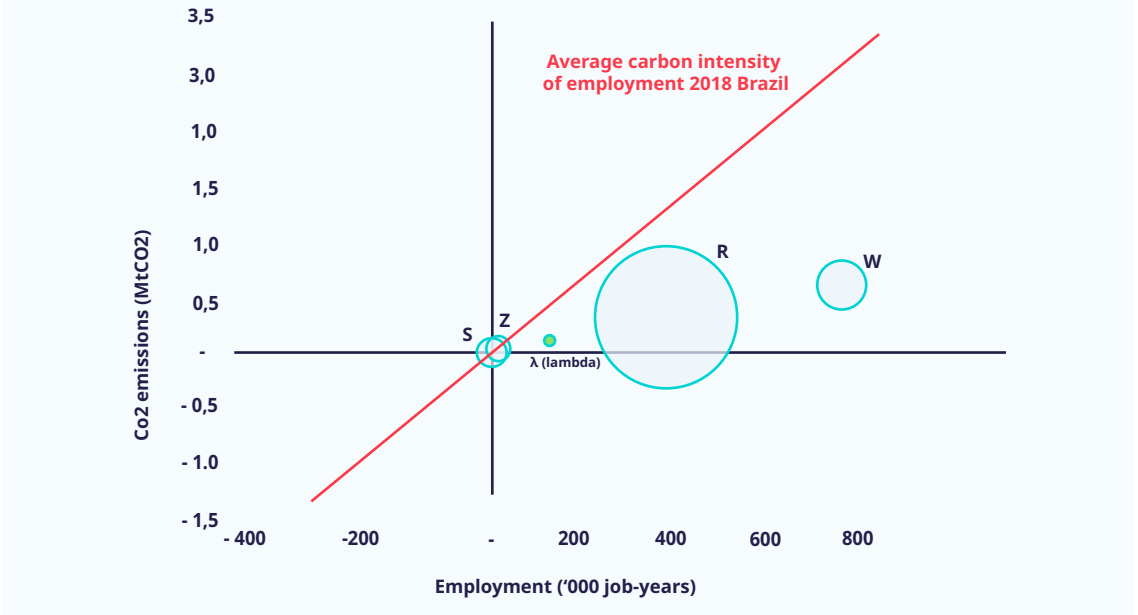
To avoid this effect, recovery policies should be analysed ex-ante. A comparison between 'green' and 'conventional' policies would then allow policy makers to analyse employment and emissions impacts simultaneously. Running alternative policy scenarios ex-ante, could then optimise fiscal, recovery and other archetype of economic development policies. They could be designed in such way so as to maximise employment creation while minimizing emission. And, they may then be accompanied by just transition and decarbonization policies ex ante, such as skills training, social protection and industrial policies and a progressive carbon or energy tax to induce a structural change towards green and low carbon growth.

▶ **Figure 2.2: Short-term employment and emission impact of archetypes, 2021-2022 cumulated effect**



Source(s): Cambridge Econometrics' E3ME model.

▶ **Figure 2.3: Long-term employment and emission impact of archetypes, 2021-2030 cumulated**



Source(s): Cambridge Econometrics' E3ME model.

Appendix A: Review of recovery policies adopted in Brazil

With the aim of enhancing the economic recovery of the nation, the Brazilian government has announced and implemented several programs to inject money into the economy at the onset of the COVID-19 pandemic and its subsequent economic fallout. In terms of funds involved, these are the five5 largest economic recovery programmes implemented by the Government of the Federal Republic of Brazil that have been included in the E3ME modelling:

Emergency aid to vulnerable people

The "Auxílio Emergencial" (Emergency Aid) is a social program with the objective of guaranteeing a minimum income to those that were left in a vulnerable during the Covid pandemic. The program started in 2020, at the onset of the pandemic, and in its first year it had BRL 293 billion (USD 57 billion) allocated to it by the Brazilian government. In the following two years, the intervention's allocated value was considerably smaller: in 2021 it had only BRL 60.6 billion (USD 11.5 billion) available, while for the current year of 2022 it is expected to spend 5.6 billion (USD 1.1 billion).

Emergency benefit to maintain employment and rent

The "Benefício Emergencial de Manutenção do Emprego e da Renda" (Emergency benefit to maintain employment and rent) is an additional social benefit policy created by the Federal Government of Brazil to provide financial support to those workers that suffered a reduction of work time, a decrease in wages, or a temporary suspension of contract as a consequence of the Covid pandemic. This social benefit, just like the Emergency Aid program, started in 2020, in which BRL 33 billion (USD 5.92 billions) were allocated to it. In 2021 the program saw the spending lowered to BRL 7.7 billion (USD 1.47 billion) and it is expected to spend BRL 0.15 billion (USD 0.03 billion) in the current year of 2022.

National Tourism Infrastructure Investment Program

Financed by the Brazilian federal government, this BRL 5 billion (USD 0.9 billion) investment program directed at the national tourism infrastructure aims to enhance the appeal of local areas for tourists, such as parks, beaches, public squares, and roads, with the goal of kickstarting the tourism sector after the pandemic shock. The program started in 2020 in which year approximately 3 billion Reais (USD 0.37 billion) were spent. The remainder of the program's value has been spent in the following years. In 2021, BRL 0.59 billion (USD 0.11 billion) were disbursed and for the year of 2022, BRL 0.71 billion (USD 0.14 billion).

Funding for the More Doctors program

BRL 1.8 billion (USD 0.34 billions) were allocated by the Brazilian government in 2021 to the More Doctors Program ("Programa Mais Médicos"), with the objective of conducting the recruitment of additional doctors for the 24th cycle. The More Doctors Program has the objective of improving and enhancing the effectiveness and accessibility of healthcare services in the interior and city-peripherical regions by mitigating the shortage of medical professionals.

Extension of transfers in primary care function

This publicly financed extension of funds to the "Previne Brasil" (Prevent Brazil) program aims to counterbalance the effect of Covid-19 in 2021. The extension accounts with BRL 0.78 billion (BRL 0.15 billion) in total. The "Previne Brasil" program aims to support primary care functions across Brazilian municipalities.

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