

Risco climático de transição: avaliação do impacto no SFN

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Objective:

- First assessment of the potential impact of a carbon tax on financial institutions.
 Main characteristics:
 - All financial institutions regulated by the BCB (top-down)
 - Static balance sheet (as of June 2024)
 - Short term horizon
 - Transition Risk related to a regulatory/policy change (carbon tax)
 - Credit risk impact on firms due to changes in demand and costs
 - Computable general equilibrium (CGE) model to provide sectoral impacts

Results published in the Financial Stability Report (November 2024) (https://www.bcb.gov.br/en/publications/financialstabilityreport)



Main characteristics:

- Two scenarios of gradual increase in emissions costs for all sectors of the economy are simulated, starting in 2025 and achieving USD50/tCO2e (Scenario 1) or USD100/tCO2e (Scenario 2) in 2030.
- Focus on seven most emission-intensive sectors
 - A: agriculture, forestry and fishing;
 - **B: mining;**
 - C: manufacturing;
 - D: electricity and gas;
 - E: water supply , sewerage and waste management;
 - F: construction; and
 - H: transportation and storage.

Methodology:





Methodology: CGE model



Data:

- Brazilian economic sectors and the trade blocs are represented by input-output tables (GTAP), base year 2017.
- GHG emissions in Brazil by sector (scope 1 and 2) are based on the national emissions inventory (annual data).
- Intersectoral labor migration based on Annual database of social information (RAIS).
- Economic data from IBGE (Brazilian Institute of Geography and Statistics).

Reference:

- Caliendo, Dvorkin and Parro (2019).
- Oliveira, J. M. (2020).



Methodology: CGE model

Scenario:

 Two scenarios: starting in 2025 and increasing up to 50USD/tCO2e and 100USD/tCO2e in 2030.

Explicit carbon pricing schemes (2022, national subnational and regional)



Coverage of nationwide greenhouse gases (%)



Methodology: CGE model

- CGE model to evaluate the sectoral impact of a carbon tax. Monetary policy response is not modelled.
- The model represents the Brazilian economy through 46 economic sectors that interact with 10 trade blocs around the world.
- Interactions between economic agents (production sector, families, government and exporters/importers).
- The effect of intersectoral migration of the labor force in Brazil over time.
- Simulate the state of the economy for short-term horizons due to the rigidity assumed for production structures.



Methodology: Provision and capital models



Data:

- Loan data from the BCB's Credit Information System
- Data from the FI's capital regulatory reports
- Macroeconomic scenario of the main macro variables (Interest rate, exchange rate, GDP growth, etc) provided by the BCB's Research Department.
- Sectoral GDP from the CGE model



Methodology: Provision and capital models

- The credit risk model estimates the relationship between the proportion of sectoral NPL and macroeconomic variables, such as the sectoral GDP, unemployment, inflation and interest rates.
- A dynamic panel data, fixed-effects model, whose individuals are the CNAE divisions, grouping together different economic activities, for the period 2012-2021 is used for the estimation.

$$NPL_{it} = \beta_1 NPL_{i,t-1} + \mathbf{x}_{it}\beta_j + c_i + u_{it}$$

- The proportion of NPLs for each FI is forecasted for the period 2025 to 2027.
- For the other macroeconomic variables, the macroeconomic baseline scenario is used.



Methodology: Provision and capital models

- The effect of the decline in asset quality on the capital of the FIs are measured using the methodology applied in the macroeconomic stress test.
- It is assumed that the composition of the FIs' portfolios do not change over time (static balance sheet).
- Additional provision expenses arising from the projected stock of NPL add to the macroeconomic shocks from the baseline scenario.
- The effects on balance sheets and capital ratios of the FIs are calculated.



Results:

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- The exposure of Brazilian financial institutions to the transition risk is low (FSR November 2022).
- Transition risk score based on emission intensity, total emissions and export share.



Results:

• Agriculture and transportation are the sectors that show the largest drops in GDP following the imposition of the carbon tax.



Results:

- The losses from addition provisions are mainly concentrated in the manufacturing, construction and transportation sectors due to the NPL increase in these sectors.
- The impact on capital ratios is limited given the moderate increase in NPLs for FIs exposed to the sectors most impacted by the carbon tax.





1/ Values above bars refer to the number of banks in each range.

1/ Ratio represents additonal provisions in proportion to total capital (TC).

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Conclusions:

- The impact of a carbon tax on the Financial System is low. Large financial institutions have a diversified credit portfolio with exposures to different economic sectors.
- Many challenges to be addressed (data gaps, modelling assumptions and approaches, adaptation, technological changes, monetary policy reactions).
- Possible extensions of the CGE model to account for the CO₂ emissions explicitly or an Emission Trading System (ETS).

