

SPES Focus - Work Package #7

A GVAR analysis of the macroeconomic effects of the Carbon Border Adjustment Mechanism in the Global South

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Abstract

The Carbon Border Adjustment Mechanism (CBAM) is a market-based approach to carbon pricing designed to accelerate the EU's 2050 energy transition by mitigating carbon leakage and enhancing sectoral competitiveness. We assess the associated costs of CBAM by simulating the macroeconomic impacts of the policy using the latest global VAR framework (1979Q2-2023Q3) of 33 advanced and emerging economies. While modelling the international trade linkages between the EU and its Global South and Global North trade partners, we trace the direct and indirect impacts of the CBAM policy to real output, real exchange rate and inflation of the Global South countries. We find that the indirect effects through the worldwide supply pressure index & global economic conditions index and the direct impact through the disaggregated EU industry and manufacturing import prices present potential welfare losses to the Global South countries regarding the decline in real GDP and real exchange rate depreciation. The most striking implication of the results is that the policy could have far-reaching negative welfare consequences without proper mitigation measures such as: ploughing back proceeds from the CBAM scheme to support climate action internationally and exemption of poor and low-emission countries from the program as ways to moderate the impacts on the economies.

Introduction

The Carbon Border Adjustment Mechanism (hereinafter, CBAM) emanating from the European Union is a form of carbon taxation from the class of carbon pricing mechanisms¹, and serves as a policy strategy targeted at promoting clean energy transition, incentivizing green technology adoption in energy-intensive countries and sectors, and mitigating the impacts of climate risk and climate change (Maeno, 2023; Boto-García et al., 2024). The CBAM is a policy stance set up by the European Union (EU) to dissuade carbon leakage and promote sectoral competitiveness in the energy transition goal of the EU by 2050, and as such, ensure that all products consumed in the EU are subject to the same carbon costs (Perdana and Vielle, 2022; Pan & Liu, 2024; Zhang et al., 2024). Thus, as an additional step to the European Union Emissions Trading System (EU-ETS) and other stringent carbon regulations, the EU, via the CBAM, seeks to impose carbon prices on selected industrial sectors based on the embedded emissions of goods, towards a more effective and less-regressive carbon pricing system in the region.

A comprehensive background information about the CBAM including its scope, coverage and alternative implementation options can be found in the works of Beaufils et al. (2023) and therefore requires no further duplication². The CBAM policy portends positive climate and clean energy outcomes within and outside the European Union. With the Union, the policy represents an important step in the search for an equitable framework for carbon pricing in the EU that captures both locally produced goods from targeted high carbon emission sectors and foreign products imported from the rest of the world (Chu et al., 2024). Thus, within the EU, the CBAM, based on the findings of Merkie and Dolphin (2024), could help achieve a more progressive carbon taxation through equitable distribution of carbon pricing among households in the union (Feindt et al., 2021). Further, by extending the carbon pricing net with the CBAM, there is a potential to contribute positively to the global energy transition and the decarbonization drive by indirectly spurring clean energy policy in the trading partners.

The present research focuses on the macroeconomic effects of CBAM beyond the EU, particularly the likely implications on the economic growth and macroeconomic stability of the Global South countries. The main point of concern regarding the Carbon Border Adjustment Mechanism (CBAM) is its potential to influence both energy policy and macroeconomic conditions worldwide. It could create global shocks in commodities, demand, and supply by affecting trade and financial flows between countries. Additionally, there is a risk that it could provoke a trade war between the EU and its trading partners (Casoli et al., 2024; Diaz et al., 2024; Sun et al., 2024). Hence, a study on CBAM is interesting to understand the global impacts of the policy on international economies, which has remained largely unclear before. Given that the Global South is largely home to developing countries that are more susceptible to external shocks³, research of this nature is justified to examine the resilience or otherwise of Global South countries to the carbon tax on imports coming into the EU

¹ The existing carbon pricing scheme in the EU, i.e. the EU ETS, seeks to constrain the volume of greenhouse gas emissions by offering a market-based structure where CO₂ emission allowances are freely traded in spot and futures markets (Adediran and Swaray, 2023; Bellora and Fontagné, 2023).

² New set of packages are being proposed to simplify the CBAM such as proposal for exception of SMEs within an acceptable threshold, simplification of compliance issues to automate computation of emissions and financial liabilities, as well as strengthening compliance measures (see: https://taxation-customs.ec.europa.eu/news/cbam-new-commission-proposal-will-simplify-and-strengthen-2025-02-26_en).

³ Further argument on the focus on developing and emerging economies is the argument that the CBAM needs to be deployed to provide a level playing ground for economic actors on cleaner production practices globally and serve as an instrument to counteract any attempts at transferring carbon-intensive industries from countries with relatively less strict environmental laws to the EU (Perdana and Vielle, 2022; Sun et al., 2024).

with the latter's status as a large open economic unit and a major global trading block (Claeys and Vasícek, 2019).

The main research objective of this paper is to examine the vulnerability and resilience of Global South countries to the Carbon Border Adjustment Mechanism (CBAM). The aim is to provide valuable insights to policymakers in the EU regarding carbon pricing strategies. We seek answers to four research questions: (i) Do the Global South countries show macroeconomic resilience or exhibit vulnerability (via economic growth) in the face of global shocks posed by the CBAM? (ii) What is the nature of the effects of the CBAM on inflationary pressures in the Global South countries? (iii) What likely impacts are on the Global South's international trade competitiveness (via real exchange rates)? (iv) Are there dissimilarities in the macroeconomic effects of CBAM between the Global South and Global North countries to provide good insights for policymakers in the EU in the context of CBAM?

We pursue three-fold contributions with this research. First, by focusing on the international transmission of the macroeconomic impacts of carbon tax originating from the EU, this study presents a global perspective to the study of Merkle and Dolphin (2024), which is mainly limited to a sectoral analysis of carbon pricing across the EU. Our study also differs markedly from Beaufils et al. (2023) which although has a global appeal but applies a dated input-output data of the year 2016 to project the likely effects of the CBAM on emissions of the EU trading partners. The approach overlooks dynamic adjustments in production, trade, and consumption patterns as a number of trading partners are gradually transiting to low-carbon energy production, and the EU is gradually shifting towards importing goods with lower carbon intensity due to the Paris Agreement. These dynamic adjustments are essential for understanding both initial and future responses to the CBAM policy, thus, highlighting an obvious limitation of the input-output model, which may produce biased outcomes if there is a significant structural shift that establishes a new equilibrium from the equilibrium established in the base year. However, the present study in addition to capturing relevant dynamics, addresses a more pressing concern, which is the evaluation the potential spillover effects on macroeconomic stability and welfare. This paper is thus the first to present empirical results on the broader scope that examines both direct and indirect channels of the policy, contributing to the emerging literature on the CBAM policy.

Second, this study is the first to conduct an analysis of CBAM policy with a truly international appeal, given our choice of the global VAR technique that connects macroeconomic fundamentals of countries that make up to 90 per cent of the global economy through various interlinkages such as common global variables (e.g. global oil price, commodity prices, and global measures of supply and demand dynamics) and financial linkages via bilateral trade flows among the constituent economies (see Sikiru and Salisu, 2020; Salisu et al., 2021; Tumala et al., 2021) that permit both policy simulations and shock analysis of this nature to be conducted. This global large model adopted enables us to advance methodological contribution to studies such as Pan and Liu (2024), which is largely descriptive in nature, as well as Bellora and Fontagné (2023), Hinterlang (2024), Lin and Zhao (2024), Sun et al. (2024), and Zhang et al. (2024) that are based on less-efficient general equilibrium models.

Third, applying the GVAR methodology leads to empirical contributions where we trace the propagation of the global demand and supply shocks and comfortably simulate the macroeconomic effects of the CBAM originating from the EU across several countries and compare results between developed countries against those of the Global South countries. Such a contribution finds root in extant comparative and global studies such as Aor et al. (2022), Salisu et al. (2022b), and Sikiru and Salisu (2024). In other words, the effect of the ensuing carbon tax on imports can be specifically examined on the macroeconomic fundamentals (economic growth, inflation and real exchange rates) of the Global South countries individually (i.e. country-specific), regionally (Africa, Asia Pacific,

Latin America & the Caribbean, and Arab regions), and as a unit, as well as comparative analyses between the Global South regions against advanced economies in the global VAR modelling framework. The outcomes from this paper allow us to offer suggestions to policymakers in the EU on how to effectively implement a carbon tax on imports based on responses from various energy-intensive products/sectors, particularly the Global South trading with the EU region.

The rest of the paper is structured in the following manner. Section 2 discusses the theoretical framework for tying the study, including the channels for the shocks to permeate through the macro economies. Section 3 details the methodology as well as the data issues, whereas Section 4 conducts preliminary data analyses and highlights stylized facts. Section 5 extensively discusses findings highlighting economic intuition and policy implications. The final section articulates policy recommendations in Section 6.

2. Literature and Theoretical Framework

In theory, at any given price, carbon pricing offers an effective approach to generate reductions in greenhouse gas emissions by integrating the environmental cost of emissions into the cost of production of final outputs to dis-incentivize carbonization in production and consumption (Timilsina, 2022; Merkie and Dolphin, 2024). The neoclassical international trade theories are based on perfect market assumptions under which there is no distinction between private and social marginal costs, and between private and social marginal benefits. In his factor price equalization theory, Professor Paul Samuelson explains that as free trade continues, this condition will equalize the prices of products and factors across countries (Samuelson, 1948). Meanwhile, market imperfection usually exists due to various factors, including externalities. Carbon emission increases global greenhouse gases, and countries have signed an agreement (Paris Agreement) to pursue a reduction in carbon emissions. While the EU is committed and uses less carbon-intensive technology in the production process, some of its trading partners use high carbon-intensive technology, thus polluting the atmosphere for everyone, including the EU, which is low-carbon compliant. This causes carbon leakage to the EU; a negative externality. The Carbon Border Adjustment Mechanism (CBAM) adds carbon tax in the form of an environmental pollution tax on imported carbon-intensive goods to reduce carbon leakage to the EU and discourage producers from using high carbon-intensive technology. Higher prices of these imported goods induced by the addition of carbon tax are expected to reduce output and export supplies and increase the relative prices of foreign to EU-produced goods, thus reducing the trade competitiveness of the foreign countries.

Furthermore, the Carbon Border Adjustment Mechanism represents an important step to complement the pre-existing carbon pricing mechanism towards the carbon-neutral goal of Europe by the year 2050. Through the policy, the EU is expected to push both energy policy and macroeconomic-type shocks internationally since the shocks are difficult to self-absorbed by the EU (Casoli et al., 2024). The EU is a large economic unit and trading block responsible for about one-quarter of global GDP and a host to many multinational companies involved in the global supply chain (Claeys and Vasíček, 2019)⁴. Hence, climate policy stringency in the EU can engender strict climate policies in the trading partners and causing spillover effects on macroeconomic

⁴ Its carbon allowance trading market (EU ETS) was the largest for over 15 years, from 2005 to 2021, when China introduced a similar trading system (Merkie and Dolphin, 2024).



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