

**Policy Analysis Focus 23-2**  
**The Impact of Carbon Pricing on the EU Member States<sup>1</sup>**

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**I. Introduction**

The European Union (EU) has agreed to introduce a carbon border adjustment mechanism (CBAM) in 2023. In 2021 the European Commission (EC) conducted an impact assessment to accompany the proposal.<sup>2</sup> That said, impact on macroeconomy, sector and trade in the EU as a whole is provided in that assessment, but not necessarily in terms of the individual EU member states in detail.

This article discusses the impact of the EU CBAM on the individual EU member states. The impact of a CBAM will be investigated quantitatively in comparison with that of other policy measures including carbon tax and tariff removals, based on simulation studies using a Computable General Equilibrium (CGE) model.<sup>3</sup>

**II. Impact of carbon tax**

Trends in and the state of carbon dioxide (CO<sub>2</sub>) emissions by country have shown different features, depending on the assessment, based on levels of emissions relative to either population or economic activities. CO<sub>2</sub> emissions broadly correlate to economic activities and therefore, per capita emissions have been higher in countries where per

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<sup>1</sup> This is a supplementary note to Kawasaki (2023), “Development of CO<sub>2</sub> Emissions and Impact of Carbon Pricing,” GRIPS Discussion Paper 22-13, GRIPS, March 2023. The views expressed in this article are the author’s own and do not represent those of GRIPS Alliance or other organizations to which the author belongs.

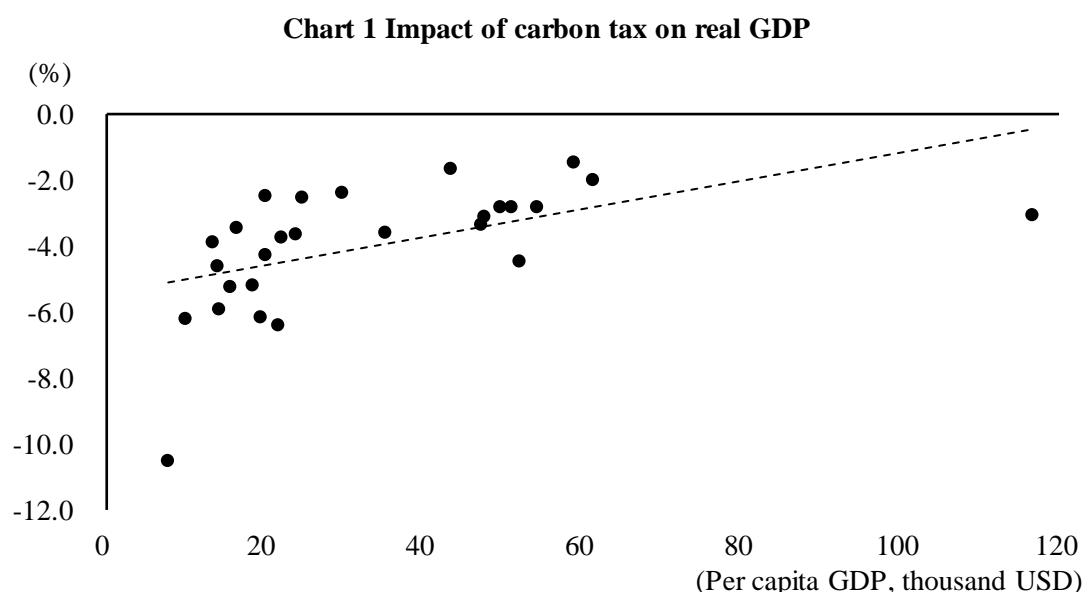
<sup>2</sup> EC (2021), Commission Staff Working Document, Impact Assessment Report, Accompanying the document, “Proposal for a regulation of the European Parliament and of the Council establishing a carbon border adjustment mechanism,” European Commission, July 2021.

<sup>3</sup> The framework of model simulations broadly remains unchanged from that in Kawasaki (2023). It is based on the Global Trade Analysis Project (GTAP) Data Base 10, and the GTAP-E model is solved using GEMPACK software referred to in Horridge, Jerie, Mustakinov & Schiffmann (2018), GEMPACK Manual, ISBN 978-1-921654-34-3. That said, the EU member states, which were aggregated to one region in Kawasaki (2023), are disaggregated and treated individually here.

capita income has been higher. On the other hand, developed countries with advanced technology for reducing emissions have been more carbon efficient and therefore, emissions per Gross Domestic Product (GDP) have been lower in countries where income level has been higher.

The EU has introduced various common policy measures among member states despite the variety in economy size and income level. As a matter of fact, the above correlations between income level and CO<sub>2</sub> emissions per capita and/or per GDP have also been observed to some extent among the EU member states. The impact of carbon pricing on individual member states would be a matter of concern from the perspective of income distribution among countries.

If the EU were to introduce a uniform carbon tax of 100 United States (US) dollars (USD) per tonne (t) CO<sub>2</sub> equivalent,<sup>4</sup> CO<sub>2</sub> emissions in the EU are estimated to be reduced in magnitudes varying from 16% to 45% depending on the member state. The contractions of real GDP would also vary, between 1.4% and 10.5%, with variation statistically larger than that of emissions reductions.<sup>5</sup> Moreover, as is shown in Chart 1, the magnitudes of adverse impact on real GDP are suggested to be positively correlated<sup>6</sup>



Source: Based on GTAP 10 Data Base, GTAP and author's simulation.

<sup>4</sup> According to Carbon Pricing Dashboard, World Bank, as of April 2022, the EU introduced an emissions trading system (ETS) at around 86.5 USD per t CO<sub>2</sub>, but has not yet introduced a carbon tax. Around half of the EU member states have individually introduced carbon tax but those price rates have not yet been equivalent to or higher than that of the EU ETS above, with the exception of Finland and Sweden.

<sup>5</sup> The coefficient of variation (-0.47) is larger than that of emissions reductions (-0.31).

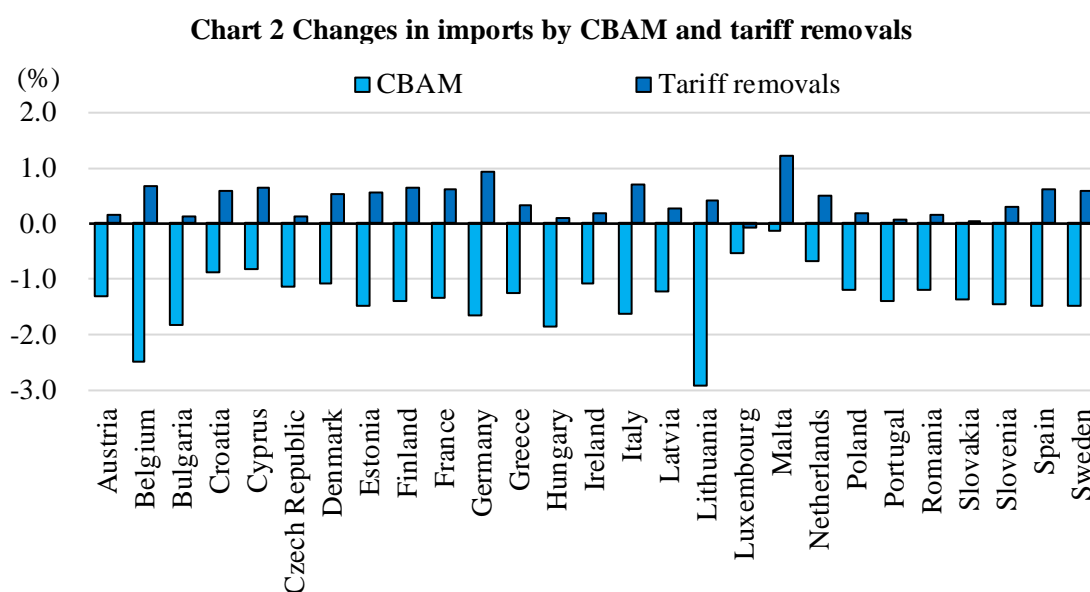
<sup>6</sup> Correlation coefficient is 0.52 for the 27 EU member states and 0.64 without one outlier.

with per capita GDP. This means that the introduction of a carbon tax would widen the income gap among the EU member states.

### III. Impact of CBAM

The EU CBAM aims at preventing the risk of carbon leakage, i.e. EU domestic products being replaced by imports that would be subject to lower carbon standards than that of the EU. That CBAM would initially be applied to EU imports of five commodities (cement, iron and steel, aluminum, fertilizers, electricity), except imports from the European Economic Area (EEA) members and Switzerland, depending on the EU ETS price. Carbon content, and therefore the CBAM rate, would vary by product and region. The impact of a CBAM would typically be seen in changes in EU imports on a bilateral and sector basis. The magnitudes of changes in regional imports for aggregated source regions and sectors would be moderate compared with those above, as a result of the general equilibrium mechanism of income and price effects. That said, impact would still vary among countries.

If the EU were to extend its application of a CBAM at the equivalent rate of the carbon tax above to all imports of goods and services without regional exceptions, it is estimated that the imports of the EU member states as a whole would decrease by 1.48%, but over a wide range, between 0.13% and 2.93%, as is shown in Chart 2. Adverse impact on real GDP would also vary among the EU member states, by an average of 0.36%, which is close to a tenth of that under carbon tax (3.12%). The magnitude of that variation



Source: Author's simulations.

could be even larger than that under a carbon tax.<sup>7</sup> That said, its correlation with per capita income level is estimated to be no longer as significant as that under a carbon tax.<sup>8</sup> It is suggested that the trade effects of a CBAM at the border, with respect to per capita income, would be mitigated (through general equilibrium mechanism) relative to the impact of a carbon tax at home.

The adverse impact of the EU CBAM on imports could be offset by EU tariff removals to some extent, as is shown in Chart 2. It is estimated that EU imports would increase by 0.58%. Real GDP would also be boosted by 0.15% on average, which is around half of the adverse impact under a CBAM. The variation of the impact of tariff removals among the EU member states would be similar to that of a CBAM; its magnitude and correlations with per capita income are estimated to differ little from that of a CBAM.<sup>9</sup>

#### IV. Concluding remarks

The adverse impact of a uniform carbon tax in the EU on economy would widely vary among the EU member states. Moreover, it is suggested that that carbon tax would widen the income gap. On the other hand, the impact of a CBAM and tariff removals would also vary but their correlations with income level would not be as significant as that of a carbon tax. It would be meaningful (for the design of appropriate climate change policy which would still be common across the EU member states), to quantitatively examine the impact of an EU carbon pricing on the member states. This would have useful implications for other countries considering the impact of national policy at the sub-national level.

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<sup>7</sup> Coefficient of variation under a CBAM is -0.91, which is around twice of that under carbon tax.

<sup>8</sup> Correlation coefficient is 0.14 by the 27 EU member states and 0.19 without one outlier.

<sup>9</sup> Coefficient of variation under tariff removals is 1.02 and correlation coefficient is -0.04 by the 27 EU members and 0.26 without one outlier.