Master's Thesis Defence

"The EU-India Free Trade Agreement: Ex-Ante Trade, CO2 Emissions, and Welfare Effects under the Carbon Border Adjustment Mechanism"

Gero Dasbach

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Erasmus Mundus Master's in the Economics of Globalization and European Integration

In a Nutshell

- **1 (old) target conflict**: trade and CO2 emissions
- **1 novel database**: Bilateral trade *and* CO2 emissions data in the inter-country-input output (ICIO) format for 2014
- **General equilibrium model**: Business-as-Usual (BAU) equilibrium → **Policy shock** → **Policy equilbrium**
- **2 different policy shocks**:
  - **EU-India FTA** as a *bilateral* **trade policy**
  - **Carbon Border Adjustment Mechanism (CBAM)** as a *unilateral* **carbon policy**
- **Variables of interest**: **changes** in **trade**, **CO2 emissions**, and **welfare**

This Study: Focus on India and the EU

3 Policy Scenarios:

1. From **BAU** to **CBAM**
2. From **BAU** to **EU-India FTA**
3. From **CBAM** to **EU-India FTA**

Research Questions:

1. How does the EU **CBAM** influence **trade**, **CO2 emissions**, and **welfare** of India and the EU?
2. Which effect does the hypothetical **EU-India FTA** have on **trade**, **CO2 emissions**, and **welfare** of India and the EU?
3. Given the EU **CBAM**, how do the effects of the hypothetical **EU-India FTA** on **trade**, **CO2 emissions**, and **welfare** change?

New Research Area: Trade and Carbon Policy Evaluation

i. Trade Policy Evaluation

- **Theory**: explanations of the economic welfare gains from trade go back to David Ricardo. Extensions to many sectors (Dornbusch et al. (1977)), country-sectors (Eaton and Kortum (2002)) and the firm-level (e.g., Melitz (2003))
- **Models**: methodological advancements to evaluate trade policy shocks in general equilibrium (GE) using the "exact hat algebra" (Dekle et al. (2008)) for different types of economies (Arkolakis et al. (2012))
- **Empirics**: Ex-post or ex-ante evaluations of trade and welfare effects of trade (de-)liberalisation policy in GE
  - **NAFTA** (Caliendo and Parro (2015) and Baier et al. (2019)), the **EEC** (Mayer et al. (2019) and Felbermayr et al. (2022a)) and **Brexit** (Felbermayr et al. (2022c))
- **Empirics (ex-ante) on the EU-India FTA:** positive GE trade and welfare effects found in Felbermayr et al. (2017) and Gallina et al. (2020)

New Research Area: Trade and Carbon Policy Evaluation

ii. Carbon Policy Evaluation

- **Empirics**: two sides of a coin
  - **Trade policy** is linked to CO2 emissions
    - 2/3 of global CO2 emissions are embodied in traded goods (Peters et al. (2011), Copeland (2021))
  - **Carbon policy** might alter the global trade pattern
    - *Multilateral* carbon policy can decrease global CO2 emissions (Aichele and Felbermayr (2013), Larch and Wanner (2019)), but *unilateral* CO2 emission decreases might be offset by increases elsewhere: *"carbon leakage"* (Felder and Rutherford (1993), Felbermayr et al. (2022d))
- **Policy: from the EU ETS (2005) to the CBAM (from October 2023)**
  - EU Emissions Trading System (ETS) as the world's first carbon market
    - Carbon leakage fears of EU firms, since there are incentives for non-EU firms to "free-ride" on responsibility for CO2
  - **CBAM**: tariffs on imported carbon-intensive products from outside the EU

New Research Area: Trade and Carbon Policy Evaluation

This study:

1. Brings **CO2 emissions** into standard trade policy evaluations (e.g., Felbermayr et al. (2017) and Gallina et al. (2020))

2. Weighs the effects of **trade policy** against the effects of **carbon policy**: ex-ante trade, CO2 emissions, and welfare effects of the **EU-India FTA** are weighed against the effects of the **CBAM**

Attempt to fill a **research gap**: towards ex-ante **Trade and Carbon Policy Evaluation**

New Quantitative Trade Model

Counterfactual general equilibrium **new quantitative trade model** (NQTM) following Costinot and Rodríguez-Clare (2014)

- **Setup**: 42 countries (+ROW) and 22 sectors, linked through intra- and international trade relations
- **Demand and supply**: representative agent of each country-sector maximizes a constant elasticity of substitution (CES) utility function
  - Assumptions of perfect competition and no increasing returns to scale $\rightarrow$ supply = demand
- **Why trade?** Armington (1969) assumption
  - Each country-sector produces a different good, the agent derives utility from consuming other countries' goods
  - Trade elasticity governs degree to which domestic and foreign good varieties are perceived as perfect substitutes
- **General equilibrium**: cost-efficient global trade pattern, given trade costs and trade elasticity
  - "Efficient" global trade pattern is distorted by **"iceberg" trade costs** (here, only **tariffs**)
- **Modelling procedure**: **1.** impose balanced trade (for practical reasons), **2.** replicate initial world equilibrium for balanced trade, **3.** simulate counterfactual world equilibrium for tariff policy changes

Data Sources and Policy Tariffs

Trade and CO2 Emissions, Trade Elasticities

- Country-sector-level export values in current USD from the OECD (2022a) ICIO tables
- Country-sector-level CO2 emissions in production from OECD (2022b), retrieved by Yamano and Guilhoto (2020) who combine the IEA's fuel combustion statistics with the OECD (2022a) MRIO tables
- Country-sector-level bilateral trade elasticity estimates: Caliendo and Parro (2015)

Methodology to obtain trade and carbon policy tariffs:

- **BAU tariffs**:
  - For **all explicit country-sector pairs**: average of MFN and preferential tariffs from **Felbermayr et al. (2022b)**. Primary source: UN TRAINS
  - For **ROW**: MFN tariffs from the **UN TRAINS** tariff database (UN (2023))
- **CBAM tariffs**:
  - Obtain bilateral export coverage ratio per each CBAM sector aggregate by applying a conversion scheme (OECD (2021)) to HS 6-digit level trade data from BACI (Gaulier and Zignago (2010))
  - **CBAM tariffs**: world carbon pricing data from **OECD (2016)**

Tariff Policy Scenarios

Importer	BAU	BAU-CBAM	BAU-FTA	BAU-CBAM-FTA
AUT	0.0066	0.0080	0.0007	0.0008
BEL	0.0066	0.0094	0.0007	0.0009
BGR	0.0060	0.0063	0.0006	0.0006
CYP	0.0051	0.0051	0.0005	0.0005
CZE	0.0127	0.0139	0.0013	0.0014
DEU	0.0066	0.0204	0.0007	0.0020
DNK	0.0066	0.0073	0.0007	0.0007
ESP	0.0066	0.0136	0.0007	0.0014
EST	0.0043	0.0045	0.0004	0.0005
FIN	0.0066	0.0072	0.0007	0.0007
FRA	0.0066	0.0131	0.0007	0.0013
GRC	0.0066	0.0075	0.0007	0.0008
HRV	0.0047	0.0048	0.0005	0.0005
HUN	0.0130	0.0134	0.0013	0.0013
IRL	0.0066	0.0072	0.0007	0.0007
ITA	0.0066	0.0246	0.0007	0.0025
LTU	0.0043	0.0045	0.0004	0.0004
LUX	0.0066	0.0066	0.0007	0.0007
LVA	0.0050	0.0051	0.0005	0.0005
MLT	0.0052	0.0053	0.0005	0.0005
NLD	0.0066	0.0094	0.0007	0.0009
POL	0.0051	0.0088	0.0005	0.0009
PRT	0.0066	0.0079	0.0007	0.0008
ROU	0.0326	0.0336	0.0033	0.0034
SVK	0.0053	0.0055	0.0005	0.0006
SVN	0.0052	0.0055	0.0005	0.0006
SWE	0.0066	0.0083	0.0007	0.0008

Figure 1: Bilateral Tariff Scheme, Exemplary for the Basic Metals (14) Sector Aggregate

- **From BAU to CBAM**:
  - **BAU tariffs** as in **Felbermayr et al. (2022b)** and **UN (2023)**
  - **CBAM tariffs** applied to all origin country-sectors
- **From BAU to FTA**:
  - **BAU tariffs** as in **Felbermayr et al. (2022b)** and **UN (2023)**
  - Sector-level **EU-IND FTA tariffs as in Gallina et al. (2020)**
- **From CBAM to FTA**:
  - **BAU tariffs** as in **Felbermayr et al. (2022b)** and **UN (2023)** + **CBAM tariffs** applied to all origin country-sectors
  - Sector-level **EU-IND FTA tariffs as in Gallina et al. (2020)**

Descriptive Data Analysis: Trade and CO2 Emissions

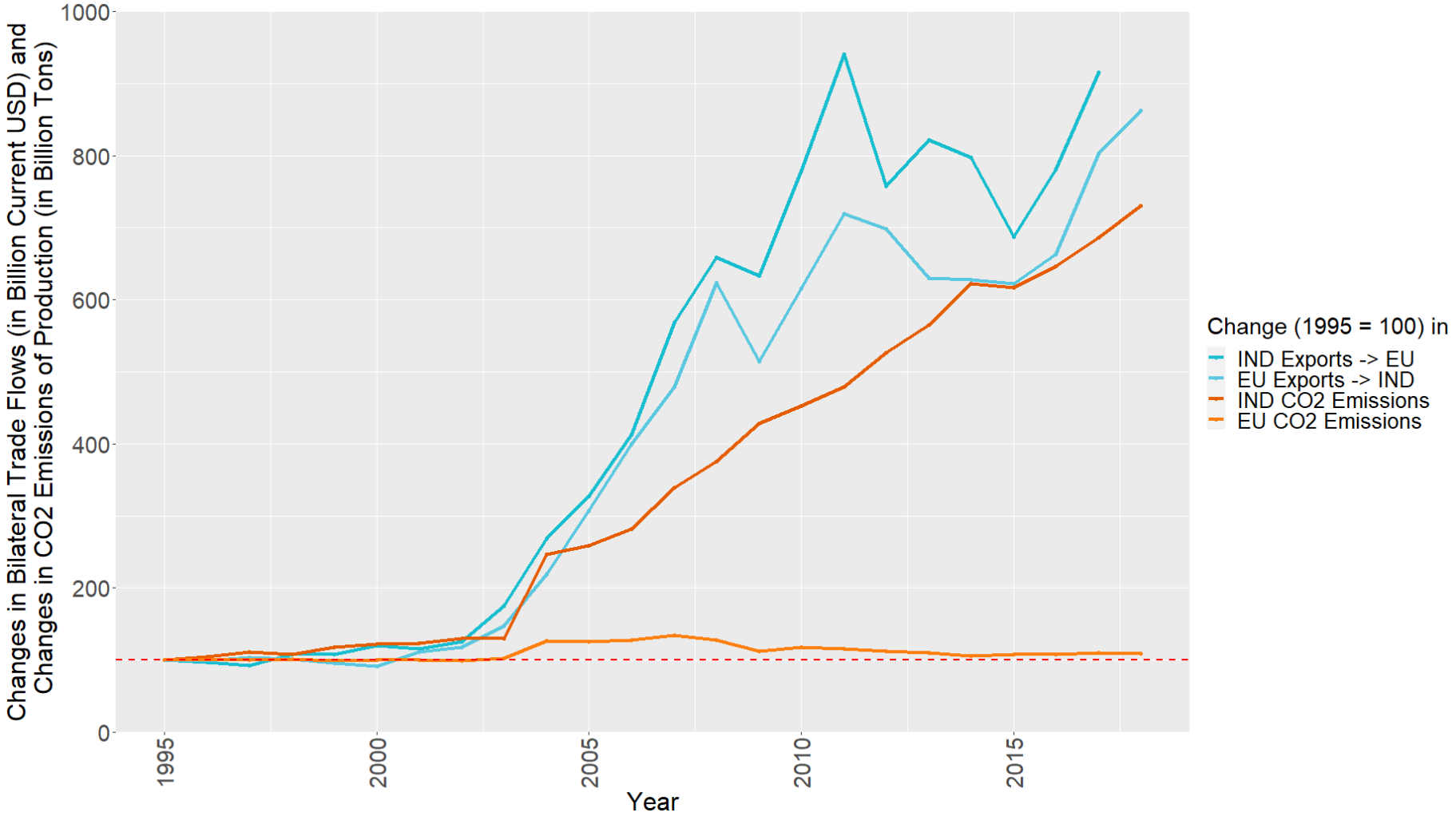

Figure 2: The Evolution of the Gross Bilateral Trade and CO2 Emissions Pattern of the EU and India, 1995-2018

Descriptive Data Analysis: India's CO2 Emissions and CBAM

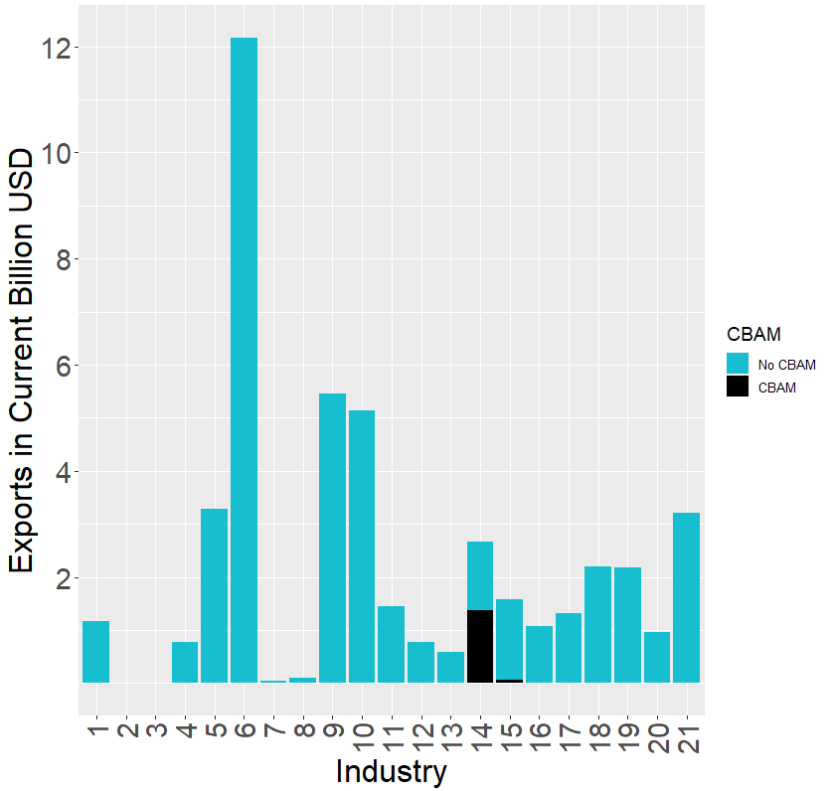

Figure 3: Within-Sector CBAM Coverage Ratio in India's Goods Exports to the EU. Source: BACI trade data, 2014

CBAM to India: Iron and Steel (14)

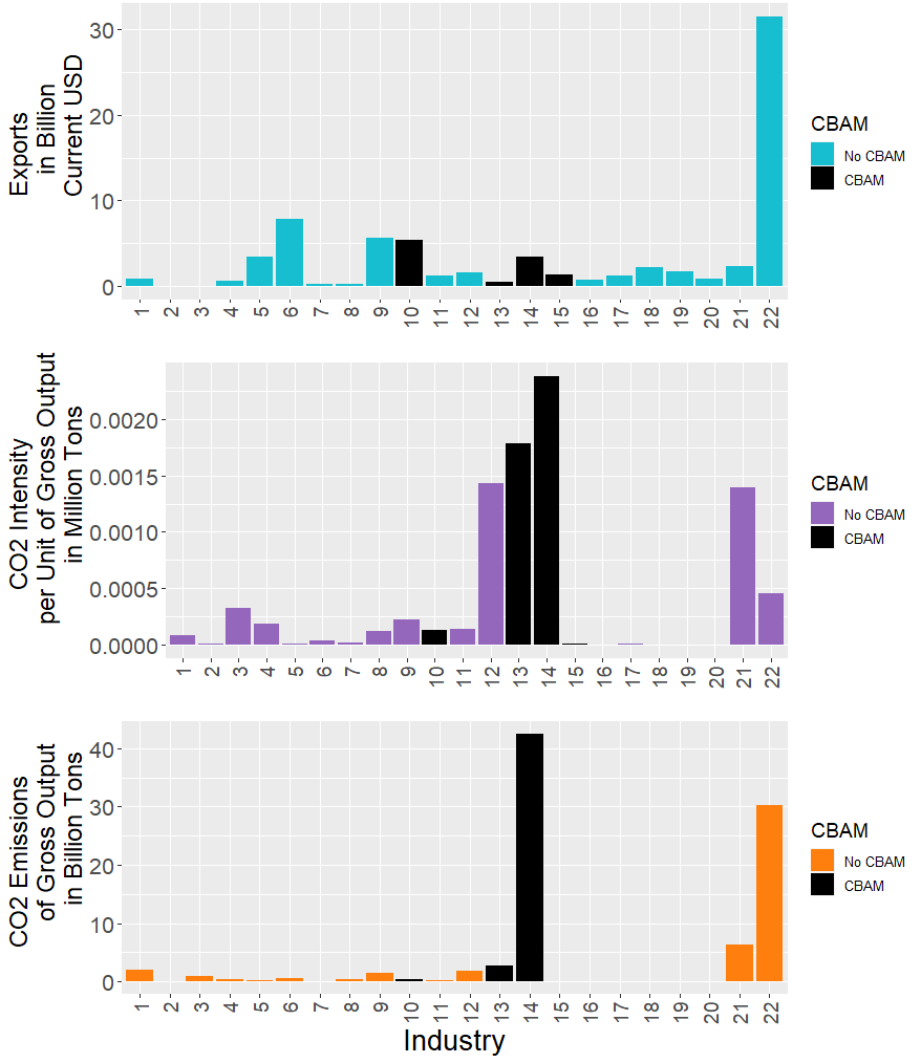

Figure 4: India's Exports to the EU and CO2 Emissions, per Sector, 2014

Results: Trade and CO2 Emissions

Policy-induced Static GE changes:

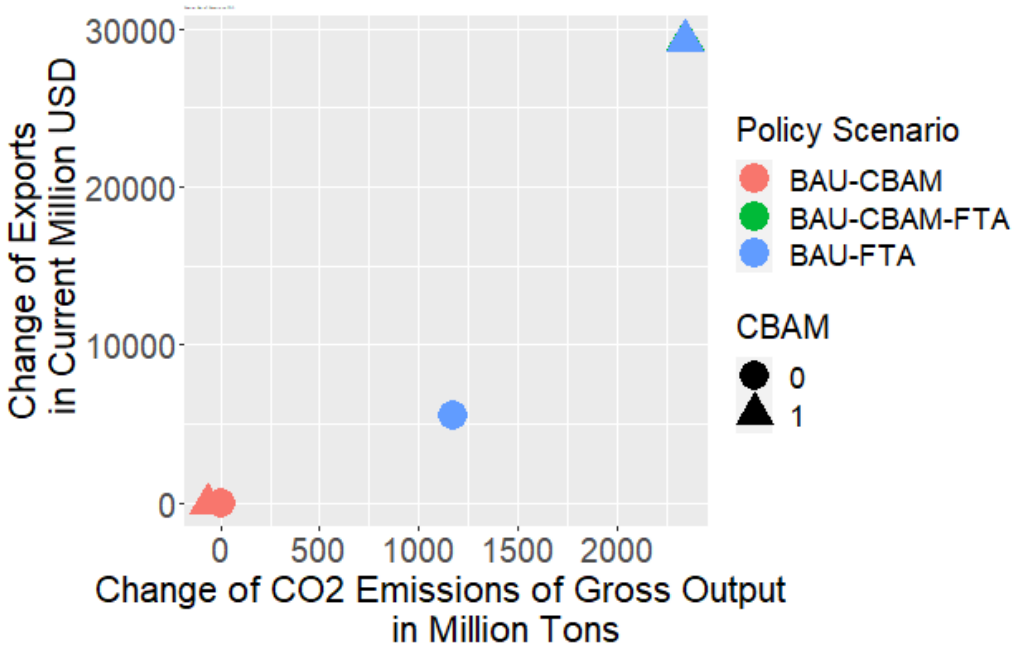

Figure 5: Counterfactual Static GE Change in India's Exports to the EU and India's CO2 Emissions

Results: Trade and CO2 Emissions

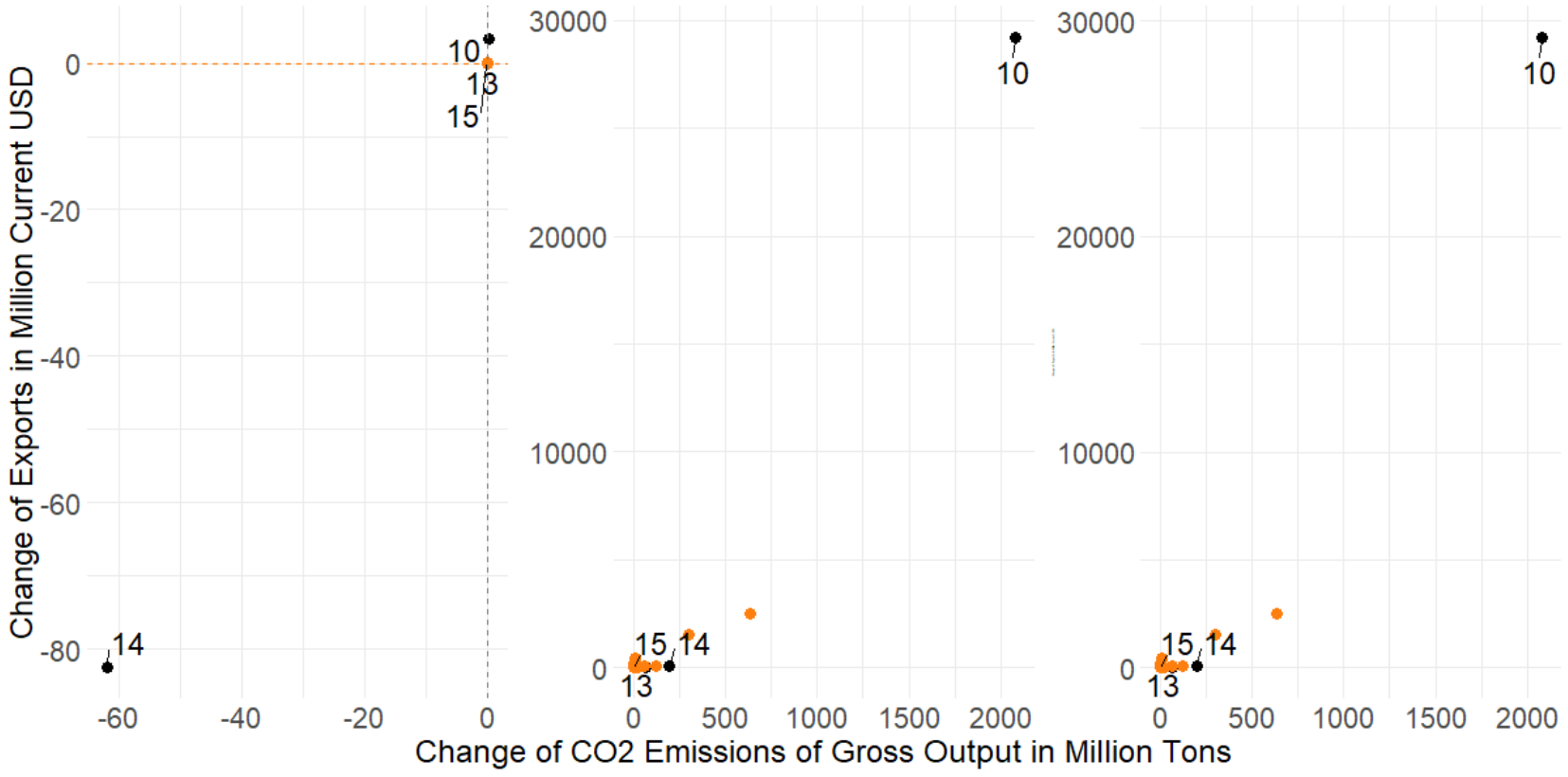

Figure 6: Counterfactual Static GE Changes in India's Exports to the EU and India's CO2 Emissions, by Sector

Results: Welfare

Country	Scenario 1		
	BAU-CBAM	BAU-FTA	BAU-CBAM-FTA
AUS	0	−0.003	−0.003
AUT	0	0.01	0.02
BEL	0	0.04	0.05
BGR	0	0.03	0.03
BRA	0	−0.002	−0.002
CAN	0	−0.001	−0.001
CHE	0	−0.007	−0.011
CHN	0	−0.002	−0.003
CYP	−0.001	0	−0.001
CZE	0	0.02	0.02
DEU	0	0.03	0.03
DNK	0	0	0
ESP	0	0.01	0.01
EST	0	0.08	0.08
FIN	0	0.02	0.02
FRA	0	0.01	0.01
GBR	0	−0.003	−0.003
GRC	0	0.01	0.01
HRV	0	−0.009	−0.009
HUN	0	−0.003	−0.002
IDN	0	−0.003	−0.003
IND	0	−0.046	−0.042
IRL	0	0	0
ITA	0	0.01	0.01
JPN	0	−0.001	−0.001
KOR	0	−0.003	−0.003
LTU	0	0.08	0.08
LUX	0	0.01	0
LVA	0	0.06	0.06
MEX	0	−0.001	−0.001
MLT	0	0	0
NLD	0	0.02	0.02
NOR	0	−0.006	−0.016
POL	0	0	0.01
PRT	0	−0.002	−0.002
ROU	0	0.01	0.01
ROW	0	−0.006	−0.006
RUS	−0.004	−0.003	−0.007
SVK	0	0.01	0.01
SVN	0	0.03	0.03
SWE	0	0.02	0.02
TUR	0	0.01	−0.003
TWN	0	−0.005	−0.005
USA	0	−0.001	−0.001

Discussion and Improvements

Caveats:

- World economy has changed since 2014 $\rightarrow$ adjust interpretations towards a more recent base year, such as 2018, or 2023
- No firms, only industries: aggregate scale and composition effects might differ when accounting for intra-industry and within-firm dynamics
- No intermediate goods linkages $\rightarrow$ might distort home market effects and welfare effects (Costinot and Rodríguez-Clare (2014)) $\rightarrow$ difference to Gallina et al. (2020)
- Simple Armington structure $\rightarrow$ might distort welfare effects (Balistreri et al. (2018))

Possible improvements:

- Account for intermediate goods linkages $\rightarrow$ More realistic model economy
- Use advantage of this framework $\rightarrow$ host more relevant policy simulations
  - Optimal FTA and carbon policy mix?
  - Optimal multilateral "WTO-style" trade and carbon policy?
- Heterogeneous firms model $\rightarrow$ account for technique effects

Q&A

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