# Assessment of Carbon Tax Policy and Border Carbon Adjustment

## *Implications for industrial competitiveness, carbon leakage and trade*

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# Outline

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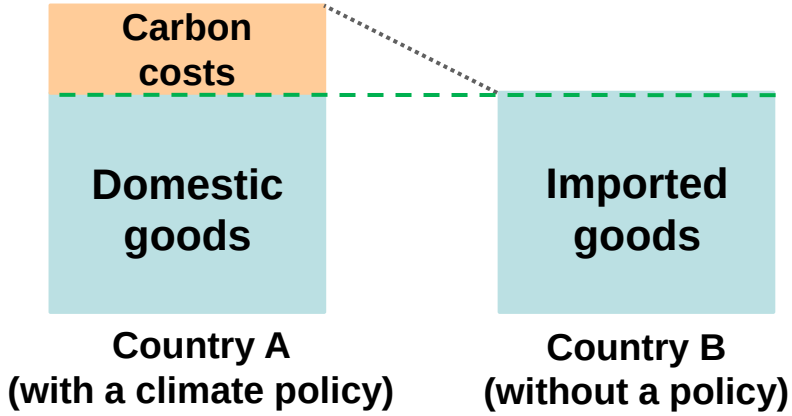
# Background: Asymmetric policy arrangement under the KP

- In Dec. 1997 (COP3), the Kyoto Protocol (KP) was adopted as a legally binding international treaty.
- Required 5% reductions of GHGs from the 1990 levels by developed countries collectively in the period of 2008-2012: 8% reductions for Europe, 7% for the US, 6% for Japan, etc.
- Developing countries were not required to do so which an generated asymmetric conditions for developed and developing countries in implementing domestic climate policies.

# Implications: International trade and competitiveness

- Domestic climate policies in developed countries: Carbon pricing (carbon tax or emissions trading system);
- Major concerns: Increase in the production costs and the terms of trade which impact adversely on industrial competitiveness;
- Energy intensive and trade exposed (EITE) sectors: ferrous metals (iron and steel), non metallic mineral products (in particular cement), non-ferrous metals (in particular aluminium), pulp and paper, and chemicals.

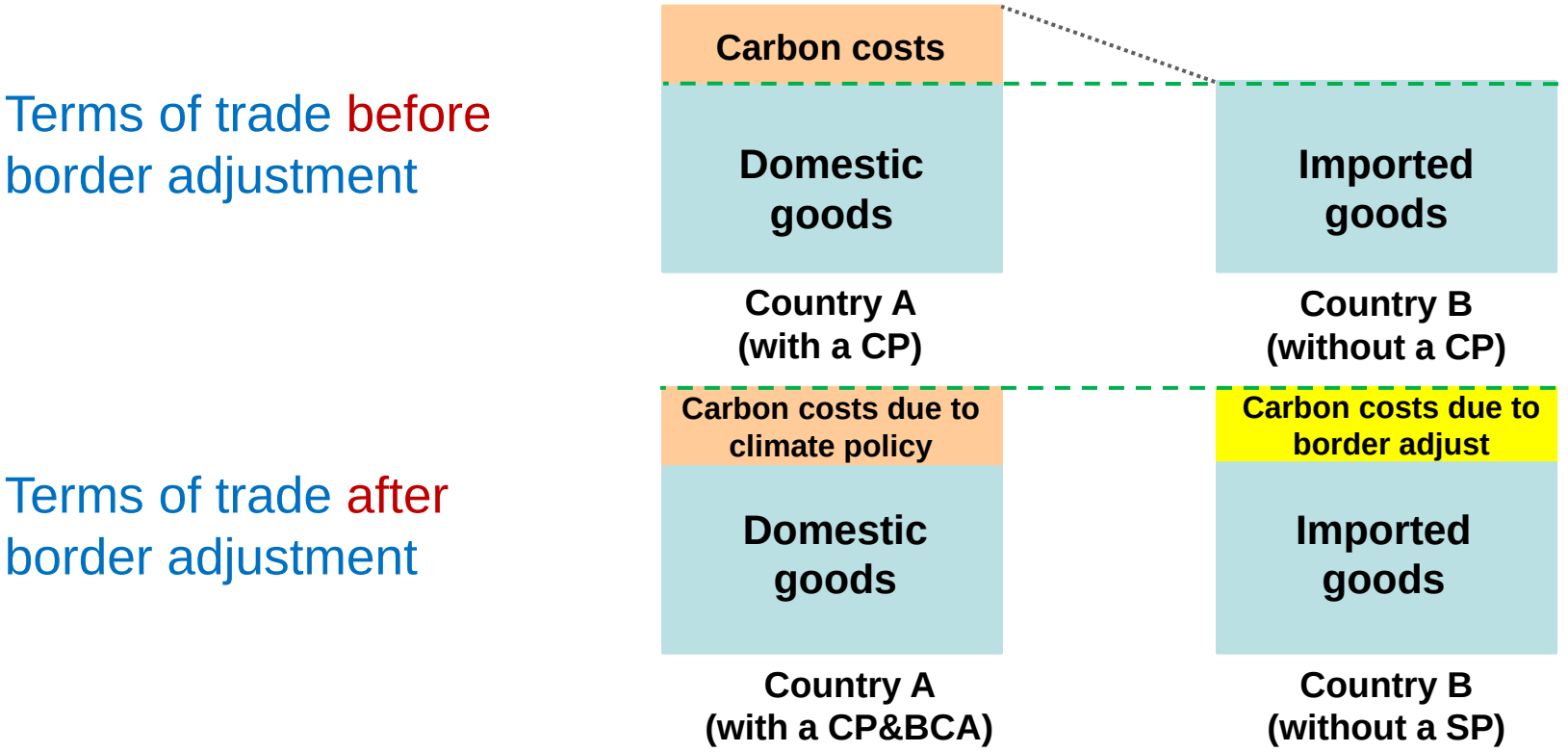


# Implications: Carbon leakage

- Carbon leakage: Emissions increases in countries without a climate policy due to the emissions reductions in countries with a climate policy.
- Leakage through production channel: Short-term competitiveness channel due to the carbon-constrained industries losing international market share (decrease in exports and increase in imports).
- Leakage through investment channel: Relocation capitals to countries with less stringent climate policies due to the differences in the returns to capital investment.
- Leakage through energy channel: Reduced energy demand in countries with a climate policy causes reduction in global energy prices and triggers higher energy consumption and therefore increase CO2 emissions in non-binding countries.

# Border Carbon Adjustment: Rationale

Trade measures: Levelling up the playing field by applying similar costs to the competing companies through treatment of traded goods (either imports or exports) at the border.



# Border Carbon Adjustment: Ways of adjustment

- Border tax adjustment (BTA): Levy an import carbon tax or provide export rebate under a carbon tax system.
- Importers to surrender allowances corresponding to the emissions embodied in their goods under a cap-and-trade system.
- Policy design: imports only, exports only, or a combination of both; sector coverage (primary products vs. finished goods); criteria for carbon intensity (inclusion of indirect emissions from electricity, etc.)

# Policy design of BCA: Criteria for determining the carbon coverage

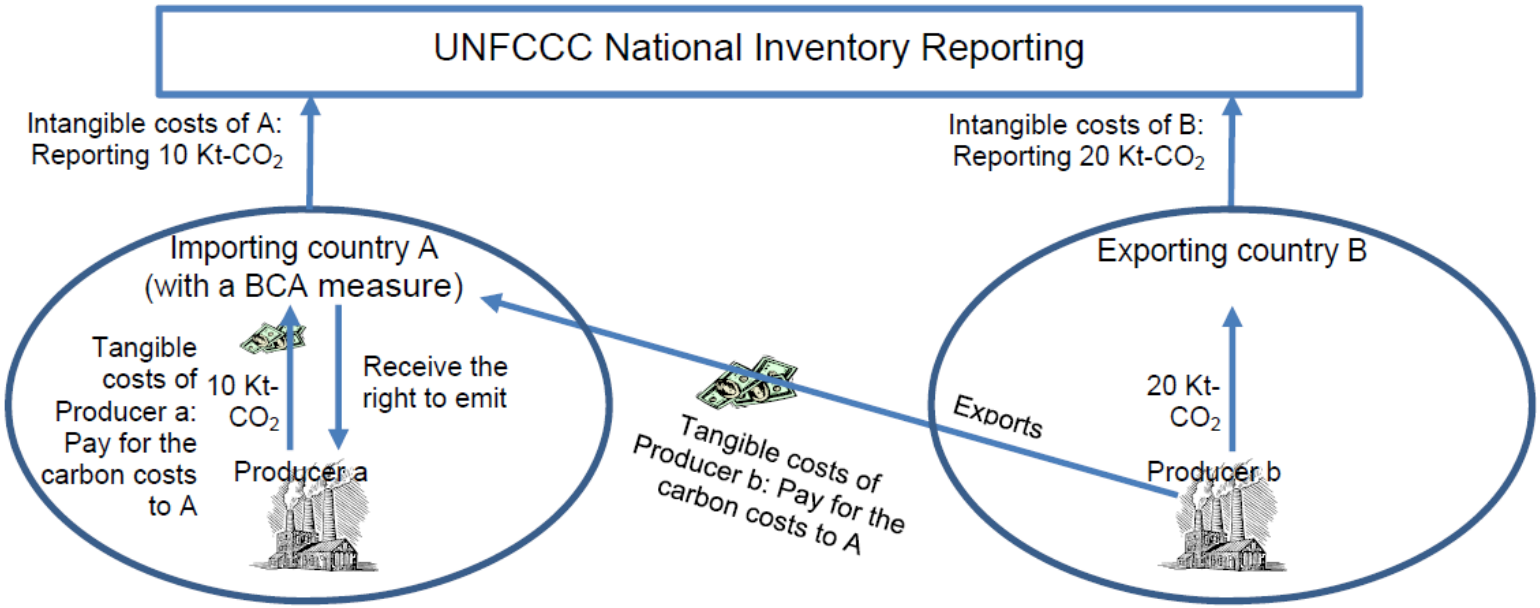
- Practical issue: How to determine the carbon contents of imports/exports that are subjected to the adjustment at the border.
- Structure of the carbon emissions and costs:
  (i) Direct carbon emissions;
  (ii) Indirect carbon emissions from electricity use;
  (iii) Indirect carbon emissions embodied in the upstream production (production chain);
- An effective and fair BCA should ensure that the carbon coverage of the subject imports/exports is the same as the carbon coverage defined by the domestic carbon pricing policy.

# Criteria for carbon coverage: Direct vs. embodies emissions

- Direct emissions: Based on producer responsibility used for the national GHG inventories.
- Pros of producer responsibility: Based on polluter-pays-principle endorsed by OECD countries in mid of 1970s, easier to estimate, monitor and report.
- Cons of producer responsibility: Impossible to allocate international transportation and trade related emissions, issues of fairness.
- Embodied emissions: Based on consumer responsibility covering all three types of emissions.
- Pros and cons of consumer responsibility: Full coverage but difficult to implement due to the complication in accounting, multiple-counting and data sharing beyond the jurisdiction of firms.

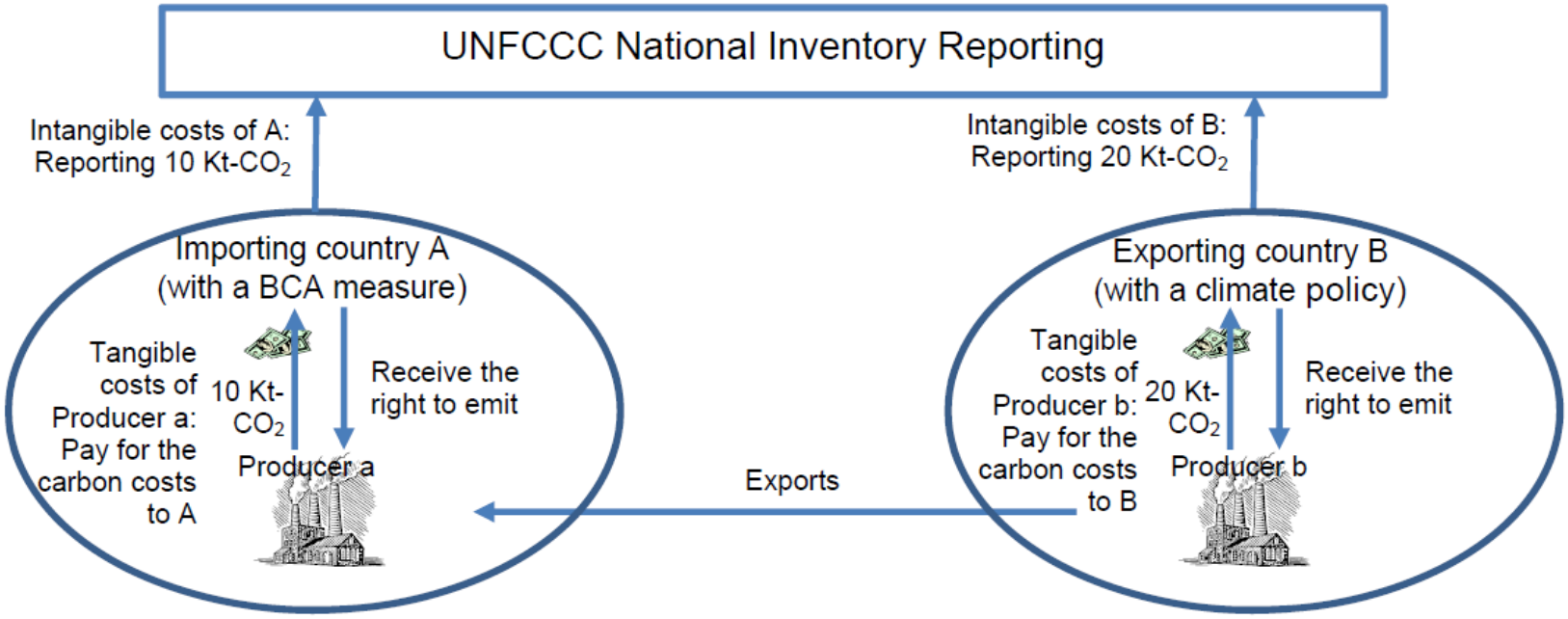
# Policy design of BCA: The hidden inequality issue

- The national inventory of the UNFCCC adopted a territory approach requiring countries to report “emissions and removals taking place within national territories…” (UNFCCC, 1998) and therefore emissions related to the exports are reported in the national inventory of the exporting countries.



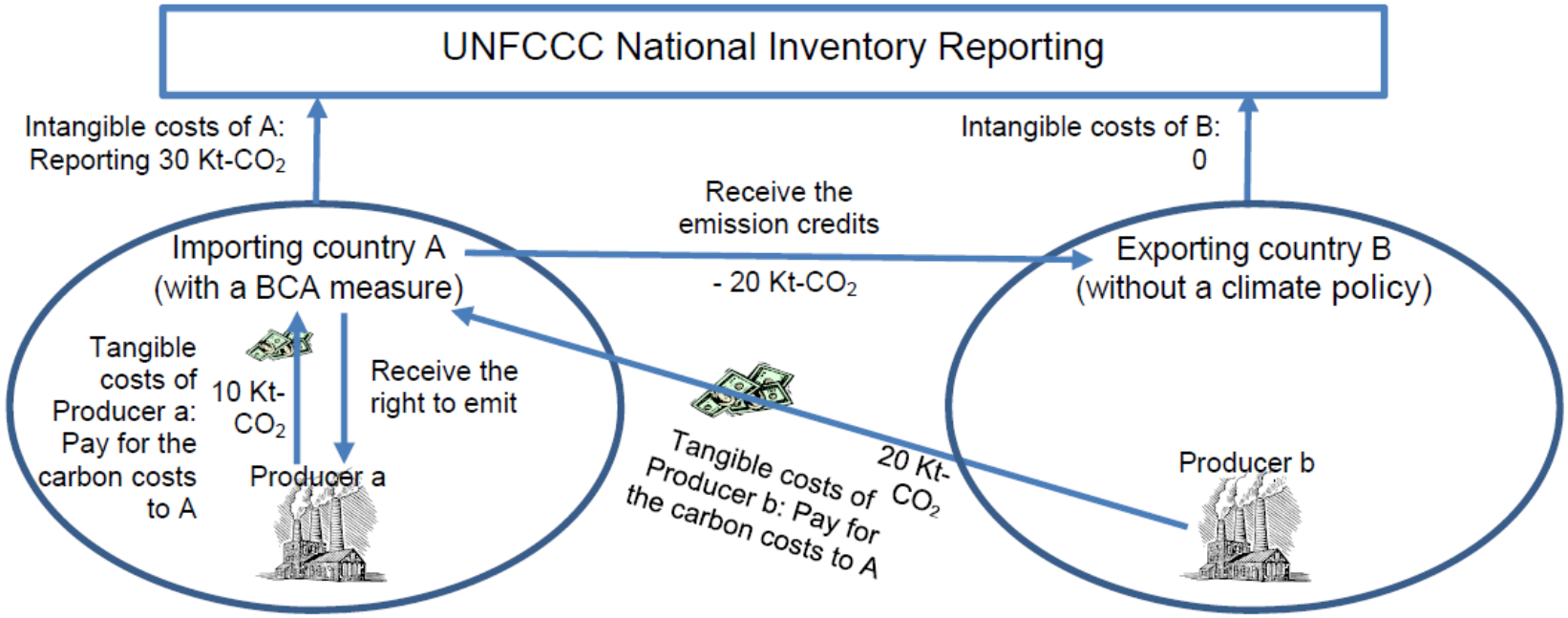
# Proposal for improvement: Exemption for countries with a climate policy

- B with a compatible climate policy in place should be exempted from the BCA.



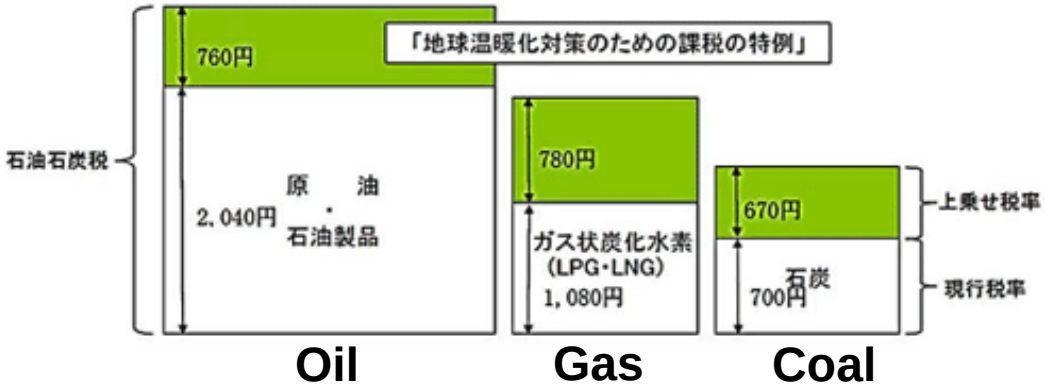
# Proposal for Improvement: National inventory adjustment for trade (NIAfT)

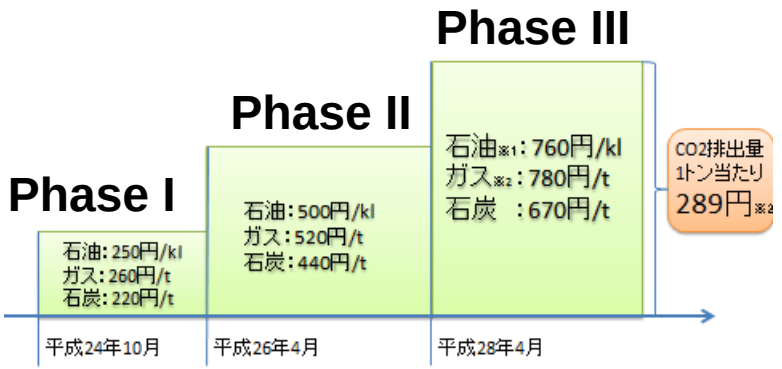
- NIAfT for B without a compatible climate policy but paying the carbon costs at the border (similar to paying for getting the emissions credits).



# Climate policy in Japan

- To achieve the KP 6% reductions target, Japan promulgated a Law to cope with global warming (1998) and the KP Target Achievement Plan (2005).
- Domestic targets of 25% reductions in GHGs from the 1990 levels by 2020 and 80% reductions by 2050.
- A carbon tax on the top of current Petroleum and Coal tax (Oct. 2012): Phase-wise by charging JPY95/t-CO2 (2012-2014), JPY190/t-CO2 (2014-2016), and JPY289/t-CO2 (- USD 3t/CO2) (2016 onward).




※1　石油：「原油・石油製品」（原油及び輸入石油製品）
※2　ガス：「ガス状炭化水素」（石油ガス（LPG）及び天然ガス（LNG））
※3　原油・石油製品　：　289円/t-CO2×2.62kg-CO2/ℓ⇒ 1kℓ当たり760円
　　ガス状炭化水素：　289円/t-CO2×2.70kg-CO2/ℓ⇒ 1t当たり780円
　　石炭　　：　289円/t-CO2×2.33kg-CO2/ℓ⇒ 1t当たり670円

# Policy assessment

- GTAP6inGAMS, a multi-region computable general equilibrium (CGE) model.
- Data: GTAP and GTAP-E database.
- Country coverage: Japan and its major trading partners (China, Korea, India, USA, ASEAN and ROW)
- Sectors: 39 sectors, 6 EITE sectors, i.e. paper products and printing (ppp), chemical, rubber and plastic products (crp), non-metallic minerals (nmm), iron and steel (i_s), non-ferrous metals (nfm) and fabricated metal products (fmp).
- **Task 1**: To examine the impacts of using direct vs. embodied emissions criteria on the effectiveness of BTA measures.
- **Task 2**: To assess the impacts of the carbon tax policy in Japan, the introduction of the BCA and the NIAfT.

# Policy scenarios

| Scenarios | Direct emissions criteria | Embodied emissions criteria |
|---|---|---|
| BAU | √ | |
| CTax | √ | |
| BTA1 | IM_Dir | IM_Emb |
| BTA2 | EX_Dir | EX_Emb |
| BTA3 | IMEX_Dir | IMEX_Emb |
| NIAfT | √ | |

# Results: Output changes (%) of EITE sectors (CTax, three BATs using direct emissions )

| | ppp | | | | crp | | | |
|---|---|---|---|---|---|---|---|---|
| | CTax | IM_Dir | EX_Dir | IMEX_Dir | CTax | IM_Dir | EX_Dir | IMEX_Dir |
| 2012 | -0.0001 | 0.0013 | 0.001 | 0.0024 | -0.0005 | 0.0034 | 0.0185 | 0.0224 |
| 2015 | -0.0003 | 0.0023 | 0.0022 | 0.0048 | -0.0019 | 0.0055 | 0.0384 | 0.0458 |
| 2020 | -0.0011 | 0.0021 | 0.0038 | 0.007 | -0.006 | 0.0042 | 0.0609 | 0.0711 |
| | **nmm** | | | | **i_s** | | | |
| | CTax | IM_Dir | EX_Dir | IMEX_Dir | CTax | IM_Dir | EX_Dir | IMEX_Dir |
| 2012 | -0.0003 | 0.016 | 0.0122 | 0.0286 | -0.0008 | 0.0014 | 0.0169 | 0.0191 |
| 2015 | -0.0013 | 0.0178 | 0.0309 | 0.0501 | -0.0029 | 0.0007 | 0.0363 | 0.0399 |
| 2020 | -0.0046 | 0.0083 | 0.0656 | 0.0785 | -0.0089 | -0.005 | 0.0599 | 0.0637 |
| | **nfm** | | | | **fmp** | | | |
| | CTax | IM_Dir | EX_Dir | IMEX_Dir | CTax | IM_Dir | EX_Dir | IMEX_Dir |
| 2012 | -0.001 | 0.0019 | -0.0005 | 0.0024 | -0.0004 | -0.0018 | -0.0024 | -0.0037 |
| 2015 | -0.0039 | -0.0015 | -0.0015 | 0.0009 | -0.0016 | -0.004 | -0.0063 | -0.0087 |
| 2020 | -0.0124 | -0.0143 | -0.0043 | -0.0062 | -0.0056 | -0.0093 | -0.0152 | -0.0188 |

**Note: % Changes compared with the BAU case.**

# Results: Output changes (%) of EITE sectors (CTax, three BTAs using embodied emissions )

| | ppp | | | | crp | | | |
|---|---|---|---|---|---|---|---|---|
| | CTax | IM_Emb | EX_Emb | IMEX_Emb | CTax | IM_Emb | EX_Emb | IMEX_Emb |
| 2012 | -0.0001 | 0.0067 | 0.005 | 0.0118 | -0.0005 | 0.0164 | 0.0648 | 0.0818 |
| 2015 | -0.0003 | 0.0123 | 0.0111 | 0.0237 | -0.0019 | 0.0284 | 0.1362 | 0.1664 |
| 2020 | -0.0011 | 0.0147 | 0.0205 | 0.0363 | -0.006 | 0.0336 | 0.2217 | 0.2611 |
| | **nmm** | | | | **i_s** | | | |
| | CTax | IM_Emb | EX_Emb | IMEX_Emb | CTax | IM_Emb | EX_Emb | IMEX_Emb |
| 2012 | -0.0003 | 0.0263 | 0.0277 | 0.0544 | -0.0008 | 0.0088 | 0.0719 | 0.0814 |
| 2015 | -0.0013 | 0.0288 | 0.0707 | 0.1008 | -0.0029 | 0.0121 | 0.1571 | 0.172 |
| 2020 | -0.0046 | 0.0146 | 0.1524 | 0.1715 | -0.0089 | 0.0065 | 0.269 | 0.2843 |
| | **nfm** | | | | **fmp** | | | |
| | CTax | IM_Emb | EX_Emb | IMEX_Emb | CTax | IM_Emb | EX_Emb | IMEX_Emb |
| 2012 | -0.001 | 0.0406 | 0.0862 | 0.1278 | -0.0004 | 0.0112 | 0.0092 | 0.0208 |
| 2015 | -0.0039 | 0.0428 | 0.2175 | 0.2636 | -0.0016 | 0.017 | 0.018 | 0.0366 |
| 2020 | -0.0124 | 0.0012 | 0.4324 | 0.445 | -0.0056 | 0.0073 | 0.0262 | 0.0391 |

**Note: % Changes compared with the BAU case.**

# Results: Emissions change (%) in Japan and the ROW (CTax and three BTAs)

| Japan | CTax | Direct emissions coefficients | | | Embodied emissions coefficients | | |
|---|---|---|---|---|---|---|---|
| | | IM_Dir | EX_Dir | IMEX_Dir | IM_Emb | EX_ Emb | IMEX_ Emb |
| 2012 | -0.0001 | 0.0009 | 0.0035 | 0.0046 | 0.0032 | 0.014 | 0.0174 |
| 2015 | -0.0005 | 0.001 | 0.008 | 0.0095 | 0.0047 | 0.0325 | 0.0377 |
| 2020 | -0.0016 | 0.000 | 0.0149 | 0.0165 | 0.0038 | 0.064 | 0.0694 |
| **ROW** | **CTax** | **Direct emissions coefficients** | | | **Embodied emissions coefficients** | | |
| | | IM_Dir | EX_Dir | IMEX_Dir | IM_Emb | EX_ Emb | IMEX_ Emb |
| 2012 | 0.00001 | -0.0002 | -0.0003 | -0.0005 | -0.0007 | -0.0011 | -0.0018 |
| 2015 | 0.00003 | -0.0001 | -0.0005 | -0.0006 | -0.0005 | -0.0021 | -0.0026 |
| 2020 | 0.00011 | 0.0000 | -0.0008 | -0.001 | -0.0003 | -0.0038 | -0.0042 |

**Note: % Changes compared with the BAU case.**

# Results: National emissions change (CTax, BTA1 and NIAfT)

| | Japan | | | | | | Korea | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Change in amount1 (Mt CO2) | | | Change in percentage (%) | | | Change in amount (Mt CO2) | | | Change in percentage (%) | | |
| | Ctax | BTA1 | NIAfT | Ctax | BTA1 | NIAfT | Ctax | BTA1 | NIAfT | Ctax | BTA1 | NIAfT |
| 2012 | -0.0015 | 0.0107 | 26.4694 | -0.0001 | 0.001 | 2.5672 | 0.0000 | 0.0014 | -0.7782 | 0.0000 | 0.0003 | -0.1743 |
| 2015 | -0.0056 | 0.0169 | 22.8445 | -0.0005 | 0.0016 | 2.1214 | 0.0002 | 0.0023 | -0.8133 | 0.0000 | 0.0005 | -0.1688 |
| 2020 | -0.0188 | 0.0186 | 20.0067 | -0.0016 | 0.0016 | 1.7488 | 0.0008 | 0.0018 | -0.8535 | 0.0001 | 0.0003 | -0.1593 |
| | **China** | | | | | | **India** | | | | | |
| | Change in amount (Mt CO2) | | | Change in percentage (%) | | | Change in amount (Mt CO2) | | | Change in percentage (%) | | |
| | Ctax | BTA1 | NIAfT | Ctax | BTA1 | NIAfT | Ctax | BTA1 | NIAfT | Ctax | BTA1 | NIAfT |
| 2012 | 0.0013 | -0.0451 | -8.7628 | 0.0000 | -0.0008 | -0.1609 | 0.0003 | 0.0017 | -0.3744 | 0.0000 | 0.0001 | -0.0312 |
| 2015 | 0.0038 | -0.0308 | -4.8803 | 0.0001 | -0.0006 | -0.0882 | 0.0008 | 0.0035 | -0.3009 | 0.0001 | 0.0003 | -0.0246 |
| 2020 | 0.0116 | -0.009 | -1.7713 | 0.0002 | -0.0002 | -0.0332 | 0.0015 | 0.0008 | -0.1603 | 0.0001 | 0.0001 | -0.0136 |
| | **ASEAN** | | | | | | **USA** | | | | | |
| | Change in amount (Mt CO2) | | | Change in percentage (%) | | | Change in amount (Mt CO2) | | | Change in percentage (%) | | |
| | Ctax | BTA1 | NIAfT | Ctax | BTA1 | NIAfT | Ctax | BTA1 | NIAfT | Ctax | BTA1 | NIAfT |
| 2012 | 0.0001 | -0.0141 | -4.4231 | 0.0000 | -0.0014 | -0.4297 | 0.0003 | 0.0071 | -3.6203 | 0.0000 | 0.0001 | -0.0625 |
| 2015 | 0.0003 | -0.0199 | -4.2516 | 0.0000 | -0.0018 | -0.3851 | 0.0007 | 0.0103 | -3.8777 | 0.0000 | 0.0002 | -0.0649 |
| 2020 | 0.0013 | -0.0202 | -4.4352 | 0.0001 | -0.0017 | -0.3632 | 0.0018 | 0.0013 | -3.934 | 0.0000 | 0.0000 | -0.0633 |
| | **ROW** | | | | | | **Total of Regions Other than Japan** | | | | | |
| | Change in amount (Mt CO2) | | | Change in percentage (%) | | | Change in amount (Mt CO2) | | | Change in percentage (%) | | |
| | Ctax | BTA1 | NIAfT | Ctax | BTA1 | NIAfT | Ctax | BTA1 | NIAfT | Ctax | BTA1 | NIAfT |
| 2012 | 0.0007 | -0.0017 | -8.5507 | 0.0000 | 0.0000 | -0.0771 | 0.0026 | -0.0507 | -26.5095 | 0.00001 | -0.0002 | -0.106 |
| 2015 | 0.0032 | -0.0023 | -8.7407 | 0.0000 | 0.0000 | -0.0762 | 0.0089 | -0.0368 | -22.8644 | 0.00003 | -0.0001 | -0.0887 |
| 2020 | 0.0125 | -0.0085 | -8.8676 | 0.0001 | -0.0001 | -0.0746 | 0.0294 | -0.0338 | -20.0219 | 0.00011 | -0.0001 | -0.0759 |

**Note: % Changes for Ctax compared with the BAU case; and % changes for BTA1 and NIAfT compared with the Ctax cases**

# Summary of the results

| Policy scenarios | Environmental effectiveness | | | | Competitiveness | |
|---|---|---|---|---|---|---|
| | Domestic reductions | Reductions in ROW | Global reductions | Carbon leakage | EITE sectors | Economy-wide effects |
| CTax | + | − | − | + | − | − |
| IM_Dir | − | + | + | − | + | − |
| EX_Dir | − | + | + | − | + | + |
| IMEX_Dir | − | + | + | − | + | − |
| IM_Emb | − | + | + | − | + | − |
| EX_Emb | − | + | + | − | + | + |
| IMEX_Emb | − | + | + | − | + | + |
| NIAfT | − | + | + | − | + | − |

# WTO compatibility

- WTO compatibility: Ensure GATT Articles I, II and III on national treatment and the most-favoured-nation treatment and GATT Article XX requiring to prove substantial link between the trade measure and the stated objectives climate change policy.
- The inequality hidden behind a BCA in terms of the intangible costs of national inventory may be challenges by the national treatment clause.
- Negative carbon leakage under the cases of the three BTAs and the NIAfT can be contradictory to the stated objective of domestic climate policy which is to address domestic emissions and therefore be challenged by GATT Article XX.

# Conclusions

- International climate change treaty has profound implications for trade, international competitiveness and carbon leakage.
- Carbon tax policy in Japan can reduce domestic emissions but at the same time trigger the carbon leakage mechanism. However both effects are very small.
- Carbon tax policy in Japan will impact the competitiveness of domestic industries adversely, including both EITE sectors and the whole economy. However, the impacts are also very small.
- The three BTAs (IM, EX and IMEX) can effectively address the competitiveness issues, in particular BTA2 (EX) has the effects on both the EITE and the economy as a whole.

# Conclusions

- The three BTAs are effective to address the emissions out of the border and therefore effective to address carbon leakage, in particular BTA3 (IMEX) is the most effective, however due to the negative carbon leakage from Japan to the ROW, they might be challenged by the WTO rules.
- For using direct vs. embodied emissions criteria, embodied emissions-based BTAs can be more effective to address the two concerns (competitiveness and carbon leakage) than direct emissions criteria-based BTAs.
- When NIAfT is introduced, there are substantial changes in the national emissions with implications on the national emissions accounting.
- In the Paris Agreement (COP21), though many countries both developed and developing submitted their nationally determined contributions (NDC), variations in the national efforts exist and the issues discussed here remain unsolved….

# Thank you!

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