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The Potential of Tariff Policy for Climate Change Mitigation: Legal and Economic Analysis

Thomas Cottier* / Olga Nartova / Anirudh Shingal*****

This paper addresses a potential role that tariffs and tariff policy can play in encouraging countries to take part in a multilateral effort to mitigate climate change. It begins by assessing whether increasing tariffs on products from energy intensive or polluting industries amounts to a violation of WTO rules and whether protectionism in this case can be differentiated from genuine environmental concerns. It then argues that while lowering tariffs for environmental goods can serve as a carrot to promote dissemination of cleaner technologies, tariff deconsolidation is a legitimate stick to encourage polluting countries to move towards an international climate agreement. The paper further explores this view by undertaking a partial equilibrium simulation analysis to examine the impact of a unilateral unit increase in tariffs on the imports of the most carbon-intensive products from countries not committed to climate polices. Our results suggest that the committed importing countries would have to raise their tariffs only slightly to effect a significant decline in the imports of these products from the non-committed countries. For instance, a unit increase in the simple average applied tariffs on the imports of these carbon-intensive products in 2005 from our sample of non-committed exporting countries would reduce the imports of these products by an average 32.6% in Australia, 178% in Canada, 195% in the EU, 271% in Japan and 62% in the US, thereby suggesting the effectiveness of such a measure in pushing countries towards a global climate policy.

Key words: Climate change mitigation, WTO, carbon tariffs, partial equilibrium, global climate policy

JEL Classification: Q50, Q54, Q58

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May 24, 2011

Abstract

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Table of Contents

I. Introduction

Climate change mitigation and adaptation measures are at the heart of the contemporary economic, legal and political debate. A major effort to reach a common understanding was made in December 2009 in Copenhagen and in Cancun in 2010. The overall goal for the United Nations Climate Change Conference of the Parties (COP 15) in Denmark was to establish a global climate agreement intended to enter into force in 2013 following the end of the Kyoto Agreement's first commitment period. Unfortunately, the conference did not achieve a binding agreement, a 'Copenhagen accord'[4] was merely "taken note of" by the COP as there was no consensus.[5] The subsequent Conference in Cancun (COP 16) formalized some of the political results achieved in Copenhagen. It showed the way for further work on a multilateral system, but again failed to bring about a common and shared approach, let alone agreement on specific tools. Countries continue to prefer to adopt and develop domestic measures suitable to their political environment and levels of economic and social development.

This paper addresses a potential role that unilateral tariffs, being the most classical tools of trade policy, can play in encouraging countries to take part in a multilateral effort to mitigate climate change. It assesses whether increasing tariffs on products from energy intensive or polluting industries amounts to a violation of WTO rules and whether protectionism in this case can be differentiated from genuine environmental concerns.

The question arises within the broader context to what extent countries can use unilateral measures for environmental purposes. While this has so far mainly been discussed in the context of border tax adjustment, an issue not examined in detail here, we conclude that a WTO member is entitled to deconsolidate bound tariffs in the pursuit of CO2 abatement. The very purpose of such measures is to encourage countries to join the multilateral effort. By some, this measure will be interpreted as disguised protectionism instead of genuine concern about the climate, since the tariffs would permit the competing domestic industries to increase production. Others, however, will consider the possibility to refer to tariff protection against highly polluting products and related processes as a suitable means to encourage others to join an agreed international system of CO2 abatement, part of which would be to abstain from imposing additional tariff measures on imported products. Since emissions of Member States to such a system are capped, its domestic industries cannot increase environmentally harmful production and will be on par with foreign industries that use clean technology. Hence, these tariffs do not create advantages for domestic industries and cannot be considered as a protectionist measure if the country is a member of an international climate change mitigation agreement. At the same time, the above motivation clearly does not apply to countries that are not a member of a post-Kyoto agreement. Their uncapped products and processes would be exposed to the full effect of such tariffs. We therefore argue that while lowering tariffs for

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[4] UNFCC, FCCC/CP/2009/L.7, Draft decision -/CP.15, Proposal by the President Copenhagen Accord, 18 December 2009, available at *www.unfccc.int/resource/docs/2009/cop15/eng/l07.pdf*

[5] For more on the discussion about the main results of the Accord see "*Is there a silver lining to the failure to strike a global climate deal? Outcome and perspectives of the Copenhagen Conference*", Brown Bag seminar presentation by Dr. Joëlle de Sépibus, NCCR Trade Regulation (Work Package 5: Trade and Climate Change), held on 28 Jan. 2010 World Trade Institute, Berne, Switzerland.

environmental goods can serve as a carrot to promote dissemination of cleaner technologies, tariff deconsolidation is a legitimate stick to encourage polluting countries to move towards an international climate agreement. We further explore this view by conducting a partial equilibrium simulation analysis to examine the impact of a unilateral unit increase in tariffs on the imports of the most carbon-intensive products (as identified in this literature) from countries not committed to climate polices (non-Annex I, Kyoto Protocol). Our results suggest that the committed importing countries would have to raise their tariffs only slightly to bring about a significant decline in the imports of uncapped products from the non-committed countries, thereby suggesting the effectiveness of such a measure in pushing countries towards a global climate policy.

The paper sets out with a brief introduction to scientific evidence regarding climate change causes and consequences, and then touches upon economic incentives to take multilateral mitigation measures (II). It then analyses the WTO rules relevant for trade related mitigation measures (III) and examines the WTO-compatibility of tariff deconsolidation (IV). It finally conducts a partial equilibrium simulation analysis to examine the impact of a unilateral unit increase in tariffs on the imports of the most carbon-intensive products (as identified in this literature) from countries not committed to climate polices (non-Annex I, Kyoto Protocol). The paper concludes on a note proposing a coherent approach to climate regime in the WTO (VI).

II. Setting the scene to climate change mitigation

A. Climate change: the ultimate need for action

1. GLOBAL WARMING EVIDENCE, CONSEQUENCES AND CAUSES

Global warming of the climate system can be detected in temperature observations taken at the surface, in the troposphere and in the oceans. Observational evidence from all continents and most oceans shows that many natural systems are being affected by regional climate changes, particularly temperature increases.[6]

According to the 4th Assessment Report of Intergovernmental Panel on Climate Change (IPCC)[7], "warming of the climate system is unequivocal" and evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and the rising global average sea level.[8] At continental, regional and ocean basin scales,

[6] Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.), *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press, 2007), para 1.2.

[7] The IPCC, created back in 1989, is a scientific body established by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) to provide the world with a clear scientific view on the current state of climate change and its potential environmental and socio-economic consequences.

[8] Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and

numerous long-term changes in climate have been observed, including changes in arctic temperatures and ice, widespread changes in precipitation amounts, ocean salinity, wind patterns and aspects of extreme weather including droughts, heat waves and the intensity of tropical cyclones.

Changes in snow, ice and frozen ground have with *high confidence*[9] increased the number and size of glacial lakes, increased ground instability in mountain and other permafrost regions and led to changes in some Arctic and Antarctic ecosystems. There is *high confidence* that some hydrological systems have also been affected through increased runoff and earlier spring peak discharge in many glacier- and snow-fed rivers and through effects on thermal structure and water quality of warming rivers and lakes.[10] Regional-scale changes include increases in the frequency of hot extremes, heat waves and heavy precipitation and *likely*[11] increases in tropical cyclone intensity

Moreover, there is *medium confidence*[12] that other effects of regional climate change on natural and human environments are emerging, although many are difficult to discern due to adaptation and non-climatic drivers. These include the effects of temperature increases on agricultural and forestry management, some aspects of human health, such as heat-related mortality in Europe, changes in infectious disease vectors in some areas, and allergenic pollen, some human activities in the Arctic (e.g. hunting and travel over snow and ice) and in lower-elevation alpine areas (such as mountain sports).

2. THE IMPACT OF GREENHOUSE GAS EMISSIONS

Based on an assessment of thousands of peer-reviewed scientific publications, Working Group 1 of the IPCC concluded that most of the observed increase in global average temperatures since the mid-20th century is *very likely*[13] due to the observed increase in anthropogenic greenhouse gas[14] (GHGs) concentrations.[15] This is an advance since the IPCC

H.L. Miller (eds.), *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press, 2007), paragraphs 3.2, 4.2, 5.5.

[9] A level of confidence is used in the Report to characterize uncertainty that is based on expert judgment as to the correctness of a model, an analysis or a statement. The term h*igh confidence* corresponds to about 8 out of 10 chances of being correct.

[10] Solomon, S. et al. (eds.), *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press, 2007), paragraph 1.2.

[11] Likelihood, as defined in 'IPCC Guidance Notes for Lead Authors of the IPCC Fourth Assessment Report on Addressing Uncertainties', refers to a probabilistic assessment of some well defined outcome having occurred or occurring in the future and may be based on quantitative analysis or an elicitation of expert views. According to the Report's likehood scale, *likely* corresponds to more than 66% probability.

[12] The term corresponds to about 5 out of 10 chances of being correct.

[13] The term corresponds to more than 90% probability.

[14] GHG emissions covered by the United Nations Framework Convention on Climate Change (UNFCCC) include: carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphurhexafluoride (SF6).

Third Assessment Report concluded that "most of the observed warming over the last 50 years is *likely*[16] to have been due to the increase in greenhouse gas concentrations".[17] Evident human influences now extend to other aspects of climate, including ocean warming, continental-average temperatures, temperature extremes and wind patterns.

Changes in atmospheric concentrations of GHGs and aerosols, land cover and solar radiation alter the energy balance of the climate system. The increase in the concentration of CO_2 during the past 50 years has passed beyond the range of natural fluctuations.[18] Global GHG emissions due to human activities have grown since pre-industrial times, with an increase of 70% between 1970 and 2004.[19]

Carbon dioxide (CO_2) is the most important anthropogenic GHG. Global atmospheric concentrations of CO_2, methane (CH4) and nitrous oxide (N2O) have increased markedly as a result of human activities since 1750 and now far exceed pre-industrial values determined from ice cores spanning many thousands of years. Atmospheric concentrations of CO_2 (379ppm) in 2005 exceed by far the natural range over the last 650,000 years.[20] Global increases in CO_2 concentrations are due primarily to fossil fuel use and land-use change.

Continued GHG emissions at or above current rates would cause further warming and induce many changes in the global climate system during the 21st century that would *very likely* be larger than those observed during the 20th century.[21]

The IPCC Special Report on Emissions Scenarios (SRES) projects an increase of global GHG emissions by 25 to 90% (CO_2-eq[22]) between 2000 and 2030, with fossil fuels maintaining their dominant position in the global energy mix to 2030 and beyond. But even if the concentrations of all GHGs and aerosols had been kept constant at year 2000 levels, a further warming would still be expected due to the fact that several GHGs remain in the atmosphere

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15 See paragraphs 9.4 and 9.5 in Hegerl, G.C., F. W. Zwiers, P. Braconnot, N.P. Gillett, Y. Luo, J.A. Marengo Orsini, N. Nicholls, J.E. Penner and P.A. Stott, 'Understanding and Attributing Climate Change' in Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.), *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press 2007).

16 The term corresponds to more than 66% probability.

17 IPCC, Third Assessment Report.

18 T. Stocker, 'Earth in the Greenhouse – a Challenge for the Twenty-First Century' in T. Cottier et al. (eds), *International Trade Regulation and the Mitigation of Climate Change: World Trade Forum* (Cambridge University Press 2009).

19 Climate Change 2007: Synthesis Report, Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Core Writing Team, Pachauri, R.K. and Reisinger, A. (Eds.), IPCC.

20 Ibid.

21 See paragraph 3.2.1 in Hegerl, G.C. et al, 'Understanding and Attributing Climate Change' in Solomon, S. et al (eds.), *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press 2007).

22 CO2 equivalent

for very long periods. Hence prompt and strong action in emissions reduction is clearly necessary.

3. Economic incentives for climate change mitigation

While the IPCC reports gave the scientific analysis of the climate change scourge, the Stern Review on the Economics of Climate Change released in 2006 highlighted the economic costs of inaction or delay in action. The Stern Review report discussed the effect of climate change and global warming on the world economy. Its main conclusion was that the benefits of strong, early action on climate change would considerably outweigh the costs.

Using the results from formal economic models, the Review estimated that if there was no action, the overall costs and risks of climate change would be equivalent to losing at least 5% of global GDP each year. If a wider range of risks and impacts were taken into account, the estimates of damage could rise to 20% of GDP or more.[23] In contrast, the costs of action – reducing greenhouse gas emissions to avoid the worst impacts of climate change – could be limited to around 1% of global GDP each year.

Another study by the UNFCCC[24] concluded that additional global investment and financial flows amounting to US$ 200–210 billion would be necessary in 2030 to return global GHG emissions to the current levels.

According to Stern, the risks of the worst impacts of climate change can be substantially reduced if greenhouse gas levels in the atmosphere can be stabilised between 450 and 550ppm CO_2 equivalent (CO_2e). The current level is 430ppm CO_2e today, and it is rising at more than 2ppm each year. Stabilisation in this range would require emissions to be at least 25% below current levels by 2050, and perhaps much more.

Knutti *et al.*[25] have used the climate model of reduced complexity of the University of Bern[26] and their results show that stopping global warming at 2 °C requires rapid implementation and efficient reduction of CO_2 emissions. A capping of atmospheric concentrations at twice the pre-industrial concentrations, i.e. at around 560 ppm, would permit a global warming target of about 3 °C. It is evident from these calculations that the challenge increases rapidly with increasing CO_2 concentrations and more stringent temperature limits.

4. Safe levels of GHG emissions and precaution principle

Although scientists are still unsure about the required pace of GHG emissions reduction and level of ‘safe’ atmospheric concentrations, it has to be taken into account that if efforts to limit net greenhouse gas emissions are not initiated before scientific certainty is achieved, it may be too late to undo the damage.

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[23] N. Stern, The economics of climate change: the Stern review (Cambridge University Press 2007).

[24] UNFCCC, ‘Report on the analysis of existing and potential investment and financial flows relevant to the development of an effective and appropriate international response to climate change’, 2007, http://unfccc.int/files/cooperation_and_support/financial_mechanism/financial_mechanism_gef/application/pdf/dialogue_working_paper_8.pdf

[25] R. Knutti, F. Joos, S.A. Müller, G.-K. Plattner and T.F. Stocker, ‘Probabilistic climate change projections for CO2 stabilization profiles’, Geophys. Res. Lett. 32 (2005), L20707.

[26] T.F. Stocker, D.G. Wright and L.A. Mysak, ‘A zonally averaged, coupled ocean-atmosphere model for paleoclimate studies’, J. Climate 5 (1992), 773–797.

With a view to limiting the civil liability of governments in prohibiting potentially hazardous activities, environmental law developed the precautionary principle.[27] While the legal nature of this principle is still debated and controversial in general public international law, precaution has obviously been important and is most prominent in the field of climate change. The precautionary principle provides that activities threatening to cause serious or irreversible damage should be restricted or even prohibited even before scientific certainty about their impact is established.

Reduction of GHG emissions is considered a necessary precautionary measure which must be taken in order to avert what both the IPCC reports and the Stern Review Report of 2006 warned would be catastrophic to the future well-being of the eco-system.

B. Unilateral vs. Multilateral mitigation measures

Given the nature of the public good at hand, climate change clearly demands an international response, based on a shared understanding of long-term goals and agreement on frameworks for action. The UN Framework Convention on Climate Change and the Kyoto Protocol provide a basis for international co-operation, along with a range of partnerships and other approaches. But more ambitious action is now required around the world.

1. POLICIES FOR EMISSIONS REDUCTION

A range of options exists to cut emissions. Emissions can be cut through increased energy efficiency, changes in demand, and through adoption of clean power, heat and transport technologies. According to Stern, the power sector around the world would need to be at least 60% decarbonised by 2050 for atmospheric concentrations to stabilise at or below 550ppm CO_2e[28], and deep emissions cuts would also be required in the transport sector.

Even with very strong expansion of the use of renewable energy and other low carbon energy sources, fossil fuels could still make up over half of global energy supply in 2050. Coal would continue to be important in the energy mix around the world, including in fast-growing economies.[29] Extensive carbon capture and storage would be necessary to allow the continued use of fossil fuels without damage to the atmosphere. Cuts in non-energy emissions, such as those resulting from deforestation and from agricultural and industrial processes, are also essential. Diffusion of environmental goods and services (EGS)[30] provides for another opportunity to limit GHG emissions.

Effective policy to reduce emissions has several elements. The first is the optimal pricing of carbon; the second is to support innovation and the deployment of low-carbon technologies; and the third is action to remove barriers to energy efficiency. Last but not the least is a climate change communication strategy whose purpose is to inform, educate and persuade

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[27] For more on precautinary principle and climate change see T. Cottier and S. Matteotti, 'International environmental law and the evolving concept of common concern of mankind' in T. Cottier et al. (eds), *International Trade Regulation and the Mitigation of Climate Change: World Trade Forum* (Cambridge University Press 2009).

[28] N. Stern, The economics of climate change: the Stern review (Cambridge University Press 2007).

[29] World Energy Outlook 2008, International Energy Agency.

[30] T. Cottier, D. Baracol, *WTO Negotiations on Environmental Goods and Services: A Potential Contribution to the Millennium Development Goals*, UNCTAD, UNCTAD/DITC/TED/2008/4, 2009.

individuals on the optimal response to climate change. Most of the economic policies that can be used for climate change mitigation have a trade angle and fall under the auspices of the World Trade Organization (WTO).[31]

2. ROLE OF COOPERATION

Following the Kyoto Protocol, some countries have introduced (or are planning to introduce) cap-and-trade systems and other measures to curb CO2 emissions from power generation and large industries. However, as climate change mitigation policies are not implemented worldwide in a coherent manner, there are concerns that emission reduction efforts in one country would be offset by emission increases in non-carbon constrained regions. Reallocation of production from countries with carbon reduction commitments to countries with no emissions restrictions is termed "carbon leakage".[32] This can lead to the changes in trade patterns worldwide and increase of market share of the countries without climate policies. So, the total volume of GHG emissions remains the same or even rises. As observed by Krugman, "China announced that it plans to continue its reliance on coal as its main energy source and that to feed its economic growth it will increase coal production 30 percent by 2015. That's a decision that, all by itself, will swamp any emission reductions elsewhere."[33] Such leakage might therefore considerably decrease the effectiveness of global climate change mitigation efforts. Policymakers are therefore looking for specific policy measures to avoid carbon leakage. Some countries have a domestic focus in addressing these issues. Others have also suggested introducing measures such as sectoral approaches[34] or border adjustment schemes, which would have effects beyond their frontiers with the aim of leveling the CO2 playing field.[35]

However, it is widely recognized that the multilateral track for developing a coherent worldwide climate change mitigation policy is still a preferred option. International trade regulation has the potential to address these challenges and support the effort to bring about a multilateral system in the field. It can serve both as a carrot and as a stick to promote international cooperation in mitigating climate change.

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[31] For further information see T. Cottier et al (eds), International Trade Regulation and the Mitigation of Climate Change, Cambridge University Press, 2009.

[32] Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Metz, B., Davidson, O.R., Bosch, P.R., Dave R., Meyer L.A. (eds..), Cambridge University Press, p. 665, WTO-UNEP Report Trade and Climate Change, 2009, p99.

[33] P. Krugman, "Empire of Carbon", New York Times, 14 May 2009.

[34] Iron and steel, aluminium and cement are considered to be key sectors. See Stephenson, J. (2009) ―Post-Kyoto Sectoral Agreements: A Constructive or Complicating Way Forward? Round Table on Sustainable Development background paper, OECD, Paris, 13 March 2009.

[35] For example, The U.S. Clean Energy and Security Act (Waxman-Markey Bill) includes provisions allowing the government to take action against trading partners that fail to meet U.S. greenhouse gas standards, but not before 2020.

III. International trade regulation and climate change mitigation

A. Key disciplines of the WTO agreements

1. NON-DISCRIMINATION

The national treatment principle is a key discipline of the WTO and the GATT. In accordance with GATT Article III, a member shall not discriminate between its own and like foreign products (giving them "national treatment")[36]. The national treatment principle may be particularly relevant in cases where a climate change related regulation is applied differently to domestic and foreign producers.

According to the most-favoured nation clause, a WTO member shall not discriminate between "like" products from different trading partners (giving them equally "most favoured-nation" status). GATT Article I.1 provides that "any advantage, favour, privilege or immunity" granted by any member to any product originating in or destined for any other member shall be accorded immediately and unconditionally to the like product originating in or destined for the territories of all other members.[37]

2. EXEMPTIONS

If a trade-related climate change measure is found to be inconsistent with one of the core provisions of the GATT, justification could still be sought under Article XX. Article XX lays out a number of specific instances in which WTO members may be exempted from GATT rules. The exception potentially applies to all provisions of the Agreement, including those relating to tariffs in Article II and Article XXVIII GATT, beyond disciplines on tariff deconsolidation discussed below. Two motives are of particular relevance to the protection of the environment, mentioned in paragraphs (b) and (g) of Article XX. According to these two paragraphs, WTO members may adopt policy measures that are inconsistent with GATT disciplines, but necessary to protect human, animal or plant life or health (paragraph (b)), or relating to the conservation of exhaustible natural resources (paragraph (g)).

Some authors have argued that policies aimed at reducing CO2 emissions could fall under Article XX(b), as they intend to protect human beings from the negative consequences of climate change (such as flooding or sea-level rise), or under Article XX(g), as they intend to conserve not only the planet's climate but also certain plant and animal species that may disappear because of global warming.[38]

For a GATT-inconsistent environmental measure to be justified under Article XX, a member must perform a two-tier analysis proving first that its measure falls under at least one of the exceptions (e.g. paragraphs (b) and/or (g), two of the ten exceptions under Article XX) and second that the measure satisfies the requirements of the introductory paragraph (the "chapeau" of Article XX), i.e. that it is not applied in a manner which would constitute "a

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[36] T. Cottier, M. Oesch, International Trade Regulation. Law And Policy In The WTO, The European Union And Switzerland, Cases Materials And Comments, Cameron May Ltd. London, 2005, P. 382.

[37] T. Cottier, M. Oesch, International Trade Regulation. Law And Policy In The WTO, The European Union And Switzerland, Cases Materials And Comments, Cameron May Ltd. London, 2005, P. 346.

[38] J. Pauwelyn, US Federal Climate Policy and competitiveness Concerns: The Limits and Options of International Trade Law, Nicholas Institute for Environmental Policy Solutions, Duke University, Working Paper, 2007.

means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail," and is not "a disguised restriction on international trade."[39]

WTO jurisprudence has highlighted that relevant coordination and cooperation activities undertaken by the defendant at the international level in the trade and environment area may help to demonstrate that a measure is applied in accordance with the chapeau.[40] This is particularly relevant should international negotiations on a new binding agreement fail and the concerned WTO member introduces a unilateral trade measure such as tariff deconsolidation for the purpose of climate change mitigation.

At the same time, it is also acknowledged that, "'as far as possible', a multilateral approach is strongly preferred" to a unilateral approach.[41]

B. Trade measures as carrots and sticks

1. LIBERALIZING TRADE IN ENVIRONMENTAL GOODS AND SERVICES

Liberalisation of trade in environmental goods and services (EGS) can help achieve climate change mitigation objectives through reducing the cost of access to EGS, promoting environmentally preferable products and services, and creating incentives for technology transfer.[42] Both the Doha ministerial declaration as well as UNCTAD[43] specifically call for the reduction or elimination of tariffs on EGS.[44]

So far the EGS negotiations have witnessed major difficulties. By organizing negotiations on the basis of specific target areas and goals, these difficulties could be better managed as negotiations would be more focused.[45] The Environmental Area Initiative approach offers a method which reduces negotiations complexity by proceeding in certain steps, from political decisions in identifying relevant climate change areas, to technical implementation.

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[39] Appellate Body, US – Gasoline, p. 22.

[40] For instance, in the US – Gasoline decision (p.26), the Appellate Body considered that the United States had not sufficiently explored the possibility of entering into cooperative arrangements with affected countries in order to mitigate the administrative problems raised by the United States in their justification of the discriminatory treatment. Furthermore, in US – Shrimp (Appellate Body, US – Shrimp (Article 21.5 – Malaysia), para. 134), the Appellate Body found that, in view of the serious, good faith efforts made by the United States to negotiate an international agreement on the protection of sea turtles, including with the complainant, the measure was applied in a manner that no longer constituted a means of unjustifiable or arbitrary discrimination.

[41] Appellate Body, US – Shrimp (Article 21.5 – Malaysia), para. 124.

[42] O.Nartova, 'Assessment of GATS' impact on climate change mitigation' in T. Cottier et al (eds), International Trade Regulation and the Mitigation of Climate Change, Cambridge University Press, 2009, p.259.

[43] T. Cottier, D. Baracol, *WTO Negotiations on Environmental Goods and Services: A Potential Contribution to the Millennium Development Goals*, UNCTAD, UNCTAD/DITC/TED/2008/4, 2009.

[44] Paragraph 31(iii) of the Doha Development Agenda.

[45] On EGS negotiations see in particular T.Cottier and D.Baracol-Pinhao, 'Environmental goods and services: the Environmental Area Initiative approach and climate change" in T. Cottier et al (eds), International Trade Regulation and the Mitigation of Climate Change, Cambridge University Press, 2009, p.395.

2. TAXATION – LIMITS OF BORDER TAX ADJUSTMENT

WTO regards taxation as a prime instrument of sovereignty and does not limit member's power to tax. However, it renders it subject to the principle of national treatment,[46] providing that imported products must not be subject to less favorable tax than the member's domestic products; the underlying principle here is Article III:2 which stipulates that members must ensure equal taxation of imported and domestic products hence providing for equal conditions of competition .[47]

Recently the practice of border adjustment in international trade has attracted much interest in the context of climate change. It is often said that in the US, border adjustment measures are perceived as a "price of passage" of any ambitious climate bill establishing a cap-and-trade system at a federal level.[48] The literature[49] uses different terms, such as border tax adjustment, border carbon adjustment, and border tax measures. However all these measures boil down to the same - unilateral measures that a country imposes when a good is imported from a country where climate policy is not 'comparably effective'.

GATT Article II limits border tax adjustment to the equivalent of an internal tax. It cannot exceed levels of domestic taxation. In practice, there is no certainty that such taxes would be able to absorb the levels of pollution caused by the production in the country of origin. Hence the measure may be insufficient to offset the price of carbon emissions. Unlike tax adjustment, however, tariffs do not face this limitation and can be deconsolidated as deemed necessary to capture effective levels of pollution by non-state of the art technology.

IV. Tariffs as a climate change mitigation tool

A. *Notion of tariffs*

Although the word 'tariff' is used in different contexts, the WTO application of this term exclusively relates to taxes triggered by, and imposed upon, cross-border movement of goods. Tariffs are normally classified under three major categories based on the principle of application: ad-valorem, specific and mixed or compound tariffs. Tariffs need to be distinguished from customs-controlled, but essentially distinct levies such as quotas, other duties, indirect taxes (e.g. VAT) and service fees.

Over economic history, tariffs have evolved from being an exclusive source of governmental revenue to becoming a multifaceted international trade tool. Nowadays, the tariff system is used to perform the following commonly recognized functions[50] - an instrument of fiscal revenue; smoothing out the differences among established regional and sectoral economic structures; providing a degree of protection over infant industries; resolving military or

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[46] T. Cottier, M. Oesch, International Trade Regulation. Law And Policy In The WTO, The European Union And Switzerland, Cases Materials And Comments, Cameron May Ltd. London, 2005, p. 580.

[47] Ibid, p. 581.

[48] K. Holzer, Current Legislative Proposals on Border Adjustment Measures for Climate Policy: Are There Potential Conflicts with WTO Law? NCCR-Climate (subproject CITEL) research paper 2010/01.

[49] For instance see K. Holzer, 'Proposals on carbon-related border adjustments: Prospects for WTO Compliance,' Carbon and Climate Law Review 1: 51-64.

[50] R. Arpagaus, Zollrecht.

security-related issues; maintaining optimal balance of payments at a national level; and as punitive measures in international trade disputes.

Since GATT 1947, the main drive by WTO members has been to achieve the maximum unification and overall general reduction of rates in the national tariff systems. This has been achieved through multiple rounds of negotiations and formalized in Article II of the GATT 1994 and the Schedule of Tariff Concessions. On average, industrialized tariffs were reduced from around 40% in 1947 to around 4% in 1995.

With the Schedule of Tariff Concessions being the "hands-on" instrument for tariff formalization, Article II propounds and implements the overriding principle of MFN treatment in the field of tariffs and other duties. The Article also lays down the crucial principle of Bound and Unbound tariffs. The bound products inscribed in Part I of the schedule must not be taxed in excess of stipulated levels, while unbound products do not carry such a tariff ceiling. It should be noted that such limitations are not without exceptions.[51]

It should also be noted that the application of tariffs to a great extent relies nowadays on the generally adopted customs product specification called the Harmonized Commodity Description and Coding System (HS) developed by the World Customs Organization (WCO) and fully adopted by WTO Members and used by the Organization in its work.

B. *Harmonized Commodity Description and Coding System*

The most recent amendments to the Harmonized System Nomenclature became effective on 1 January 2007.[52] These amendments constituted the fourth major revision to the Harmonized System since it was approved by the Council of the World Customs Organization (WCO) in 1983 and entered into force on 1 January 1988. The objectives of the HS include the facilitation of international trade and the collection, comparison and analysis of trade statistics.

The volume of trade and the level of tariffs can be examined by identifying and tracking the HS system number associated with each technology or product. Typically, each product has a different code and the description of the good is expressed in digits. The lower the number of digits, the more generic the product category; the higher the number of digits, the more specific is the product category.

At the WTO, recognised 6 digits code level clean energy technologies and components are often found lumped together with other technologies that may not be necessarily be classified as being beneficial to either the global or local environment. For instance, solar photovoltaic panels are categorised as 'Other' under sub-class for light emitting diods.[53] This suggests that reducing tariffs on solar panel might also result in tariff reduction for unrelated LEDs. Similarly clean coal technologies are not classified under a separate category.

Members may extend a Harmonized System number to eight or ten digits, hence providing for more precise classification, particularly useful for climate change mitigation policies. As per

[51] See e.g. Article II:2(b) of the GATT 1994, which explicitly exempts anti-dumping and countervailing duties applied consistently with Article VI.

[52] HS Nomenclature 2007 Edition is available at World Customs Organization website at http://www.wcoomd.org/home_wco_topics_hsoverviewboxes_tools_and_instruments_hsnomenclaturetable2007.htm.

[53] Code 854140.

the decision on *Spain-Tariff Treatment of Unroasted Coffee*,[54] the possibility to add sub-positions in a schedule of concessions is a valid option for positions beyond the six digits level; however, when doing so, WTO Members cannot reduce the value of their commitments.

Most of the problems involved in the application of a customs nomenclature are essentially questions of classification. The appropriate heading or sub-heading for each individual product has to be determined on the basis of available technological data and by application of the texts of the headings or sub-headings, the section, chapter or sub-heading notes, the Interpretative Rules and the relevant Explanatory Notes.

The Preamble to the HS Convention emphasizes the importance of ensuring that the HS is kept up to date in the light of changes in technology and patterns in international trade. Environmental and social concerns are other major features of HS 2007. Many amendments relate to the protection of the environment (e.g. the creation of new sub-headings for the separate identification of certain species of fish, the monitoring and control of products of bamboo, of pesticides, of ozone-layer depleting substances and of products containing asbestos). As a general rule, headings or sub-headings are deleted when annual trade at the world level is less than USD 100 million and USD 50 million, respectively, over several years. The same thresholds apply for the creation of new headings and subheadings. However, they do not apply to headings or subheadings that refer to goods of environmental or social concern, or for headings or sub-headings of special interest to developing countries. As a multipurpose classification tool, the HS also facilitates the monitoring and control of various products covered by other international agreements such as the Rotterdam Convention dealing with hazardous chemicals, the Montreal Protocol governing ozone-layer depleting substances, and the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) on international trade in endangered species of wild fauna and flora. To accommodate trade in these goods, new categories were created in HS 2007.

C. Deconsolidation

Article XXVIIIbis of the GATT 1994 encourages members to increasingly lower and bind maximum tariff ceilings, the process which has been largely completed for industrialized countries and which gradually envelops in increasing numbers the developing countries too.

However, binding or consolidating a tariff is not irreversible. Unbound tariffs, by definition, are open to increases and do thus do not offer legal security. Members, however, can also deconsolidate bound tariffs by offering compensation to the members primarily affected by such deconsolidation, the alternative being an appropriate suspension of market access rights. WTO tariff law thus offers ample flexibility in accommodating the changing needs of Member States.

Deconsolidation is addressed in Article XXVIII of the GATT 1994 and by corresponding notes, the Understanding on the Interpretation of Article XXVIII of the GATT 1994 and the Procedures for Negotiations under Article XXVIII. The principles and procedures of

[54] GATT Doc. L/5135, report adopted on 11 June 1981, BISD 28S/102, para 4.4. Spain modified its concessions by adding a distinction between roasted and unroasted coffee in its schedule and provided different tariff treatment to the two categories.

deconsolidation are based on the idea of preserving reciprocal and mutually advantageous trade relations. [55]

In practice, tariff deconsolidations are not frequent, as governments tend to negotiate tariff bindings beyond the tariff levels actually in existence. [56]

A WTO member can increase its bound protection on a given item provided that the multilateral process included in Article XXVIII has been followed - in the typical case the member wishing to raise its duties will negotiate and agree compensation with a subset of the WTO membership that has been more severely affected by the tariff change. The agreed compensation will be applied on an MFN basis. Negotiation will involve the WTO member holding initial negotiating rights (INR), the WTO member that qualifies as the Principal Supplying Interest (PSI) member and the WTO member having a substantial interest (SI). The latter would be consulted but would have no legal right to participate in the negotiations.

In case no agreement is reached, the requesting WTO member will still be free to increase its tariff protection and the main affected members would then have the right to withdraw substantially equivalent concessions.

Looking into mechanics of the negotiation, there are three ways and in two of them there is no need to secure approval of WTO membership before negotiations.

Article XXVIII.1 provides that the requesting WTO member must initiate negotiations during a specified period from July to October in any 3 year period starting on 1.1.1958. The Requesting member would notify the CTG of its interest to initiate negotiations and the CTG would identify the primarily concerned members. In case agreement with them was not reached, the WTO member can go ahead and unilaterally modify its concessions, running a risk of retaliation. Hence Article XXVIII.3 explicitly acknowledges that the WTO Member has the right to modify unilaterally its schedule of concessions, even in the absence of agreed compensation. Both the primary concerned members and SIs can withdraw substantially equivalent concessions on goods initially negotiated with the requesting Member.

The second category of procedures with no prior approval is described in Article XXVIII.5. WTO members can reserve their right to renegotiate at a later date. These procedures have one important downside - the right can be exercised only within a particular time period.

WTO members that have not reserved their right to renegotiate or who wish to negotiate outside the period prescribed in Article XXVIII.1, can do so only if they have first secured the authorisation from the WTO membership under Article XXVIII.4. The WTO member will submit its request to the CTG and the latter will decide. A short period for renegotiations (60 days) can be granted. If no agreement can be reached, the CTG will determine whether adequate compensation in terms of tariff reductions on appropriate items has been offered in order to restore the overall balance and levels of market access. If it does, the modified concession will be allowed to stand. Yet, in the alternative, a unilateral modification is still allowed, in which case a primary concerned Members as well as SIs have the right to retaliate by suspending equivalent concessions. In conclusion, members retain a right to unilaterally increase tariffs subject to compensation to, and retaliation by, other affected members. In all

[55] A central requirement of Art. 17 of the Havana Charter and Article XXVIII bis of the GATT is that negotiations are held on a reciprocal and mutually advantageous basis.

[56] T. Cottier, M. Oesch, International Trade Regulation. Law And Policy In The WTO, The European Union And Switzerland, Cases Materials And Comments, Cameron May Ltd. London, 2005, p. 606.

three types of negotiations, the requesting state identifies a commodity the tariff of which it wishes to modify, and the primary concerned members will identify the commodity where compensation will be paid. Compensation for increased tariffs can be in the form of lowering tariffs for certain environmental goods.

Deconsolidation on the Basis of PPMs

The main and unresolved problem is whether tariff deconsolidation can be undertaken on the basis of process and production methods. The issue is controversially debated in the context of Article III analysis. While some argue that like product differentiation can be undertaken on the basis of PPMs here and in the context of the TBT Agreement, other exclude such differentiation. However, it is established in case law that distinctions based upon PPMs, in the final analysis, can be operated under the exceptions of Article XX(g) discussed above. The Appellate Body essentially agreed to distinctions based upon production methods in the land-mark case of Shrimps Turtle (references). These exceptions, in our view, also apply to tariff deconsolidation and will inform tariff policies taking into account levels of pollution caused by production technology relating to the item taxed.

V. Trade effect of carbon tariffs

To further corroborate this viewpoint, we explore the possibility of a unilateral unit increase in tariffs on the imports of the most carbon-intensive products (as identified in this literature) from countries not committed to climate polices (non-Annex I, Kyoto Protocol) through a partial equilibrium simulation exercise. The importing countries that we considered in this analysis included Australia, Canada, the EC, Iceland, Japan, New Zealand, Norway, Switzerland and USA[57]. The list of exporters included Argentina, Brazil, Chile, China, India, Indonesia, Israel, Mexico, the Philippines, Russia[58], South Africa, South Korea, Thailand, Turkey and the US. Significantly, these countries account for 70-80% of global CO2 emissions over 1996-2008. Products for this analysis included the most-carbon intensive products identified in this literature - paper, rubber, glass, plastics, iron & steel, cement and basic chemicals[59].

To begin with, we conducted preliminary statistical analysis to study the importance of these products in the trade flows of both importing and exporting countries. Table 1 looks at the import share of these products in the importing countries' (reported in columns) total imports from the exporting countries (reported in rows) for the year 2005[60] and documents the importance of carbon-intensive trade in the import profiles of several of these countries

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[57] Although the US has not ratified the Kyoto Protocol, given its position as the largest polluter in the world in terms of per capita emissions, it was decided to include it amongst the importers as well as the exporters.

[58] Both Russia and Turkey are Annex I countries, but they are net carbon-exporters and hence were included in the list of exporting countries.

[59] The nomenclature used was ISIC Rev.3.

[60] This is the latest year for which import and tariff data is the most complete for our sample of countries and products.

(shares in excess of 15% have been highlighted in the table). For instance these products accounted for more than 40% of Australia's total imports from Chile and Russia; more than a third of Canada's total imports from Argentina; close to 70% of New Zealand's total imports from Russia; and more than 40% of Swiss total imports from Mexico.

Table 1: Share of carbon-intensive products in importing countries' total imports from exporters (year 2005)

Exporter/Importer	Australia	Canada	EU	Iceland	Japan	NZ	Norway	Switzerland	USA
World	11.3	12.9	8.8	10.1	7.8	13.1	13.7	14.1	10.0
Argentina	9.5	**35.9**	7.9	0.1	3.5	12.0	**20.6**	3.4	11.7
Brazil	**19.0**	**18.3**	14.6	1.6	8.8	4.5	1.2	12.4	**20.0**
Chile	**42.6**	1.8	13.4	3.5	4.3	3.7	**17.2**	**21.9**	6.9
China	9.9	8.0	6.1	5.5	7.5	9.4	5.0	14.1	6.7
India	**14.9**	14.4	13.5	**31.5**	8.4	13.0	6.4	**23.6**	10.1
Indonesia	9.1	10.3	8.0	**15.8**	6.4	**22.0**	**20.9**	10.1	6.1
Israel	**25.0**	12.2	**16.9**	11.9	9.4	**18.4**	10.2	8.1	4.6
South Korea	**17.1**	13.7	6.8	5.8	**20.3**	**26.4**	7.1	12.1	11.0
Mexico	3.5	4.3	10.3	6.6	1.9	9.3	9.2	**42.3**	5.5
Philippines	8.7	1.3	1.9	0.5	3.9	7.8	2.7	2.0	2.2
Russia	**44.6**	13.1	8.0	**18.6**	4.5	**69.3**	9.5	10.5	14.6
South Africa	**15.6**	**22.1**	**15.2**	1.8	13.1	**25.1**	6.8	1.6	**18.8**
Thailand	9.2	9.3	7.4	3.6	8.6	14.3	5.1	3.1	8.4
Turkey	12.7	**27.6**	9.8	4.5	5.5	7.4	4.3	4.0	**15.9**
USA	12.2	**16.0**	11.6	6.1	9.7	10.7	9.2	8.5	

Source: WTO's IDB through World Bank WITS; author's calculations

Analogously, Table 2 looks at the export shares of these products in the exporting countries' (reported in rows) total exports to the importing countries (reported in columns) for 2005[61] and once again, documents the importance of carbon-intensive trade in the export profiles of many of these countries (shares in excess of 15% have been highlighted in the table). For instance, these products accounted for 40% of Chilean and more than 60% of Russian exports to Australia; more than a third of Argentinean and Turkish exports to Canada; nearly half of Russian exports to Iceland; nearly 80% of Mexican exports to Norway and Russian exports to New Zealand; and more than a third of Russian exports to the US.

Table 2: Share of carbon-intensive products in exporters' total exports to the importing countries (year 2005)

[61] In the case of the Philippines, the data pertains to 2007.

Exporter/Importer	Australia	Canada	EU	Iceland	Japan	NZ	Norway	Switzerland	USA
World	11.3	14.1	14.4	9.3	7.9	12.9	13.4	12.6	9.9
Argentina	11.2	**36.1**	7.7		3.1	12.5	**37.8**	1.4	11.7
Brazil	**15.2**	**17.2**	13.1	1.8	11	6.3	1.3	**24.7**	**20.8**
Chile	**40.5**	1.7	15.1	13	2.6	4.8	0.4	0.2	6.9
China	12.3	10.4	7.1	6.8	8.1	12.4	6.6	6.7	7.7
India	**16.1**	**17.8**	12.7		9.9	13.4	5.8	**21.8**	10.3
Israel	**28.8**	**15.8**	18.4	13.3	12.7	**29.7**	**15.9**	2.3	5.3
South Korea	**21.2**	**16.8**	5.9	3.9	**20.4**	**25.2**	6.1	6.1	11.5
Mexico	4.5	5	11.9	8.1	2.3	**18.7**	**78.6**	**18.9**	5.5
Philippines	7.6	1.4	2.6		6.2	3.6	**16.3**	4.2	2.1
Russia	**63.3**	**32.1**	8.9	**47.0**	4.0	**77.8**	**15.5**	3.2	**36.6**
South Africa	12.7	**23.7**	17.4	1.2	13.2	**24.9**	7.2	3.7	**25.8**
Thailand	11.7	9	7.5	2.3	8.2	**15.3**	5.4	5.9	9.8
Turkey	11.4	**34.7**	9.3	4.1	4.4	11.4	4.6	4.5	**17.7**
USA	9.9	16	12.0	4.8	11.4	9.6	7.7	5.2	

Source: UN Comtrade through World Bank WITS; authors' calculations

The tariff picture is reported in Table 3 and shows that the average simple applied tariffs across these products are low in all the importing countries (reported in columns) in our sample; in several cases (highlighted in the table), the average applied tariffs are less than 1%, even zero. In fact, the applied tariffs in Norway and Switzerland on the import of all these products from the exporting countries in our sample are zero. This said, the tariffs are relatively higher in Australia, EU, Iceland and New Zealand.

Table 3: Average simple applied tariffs (%) on exporters' carbon-intensive products in destination markets (year 2005)

Exporter/Importer	Australia	Canada	EU	Iceland	Japan	NZ	USA
World	3.1	1.5	2.9	1.0	**0.9**	2.7	1.4
Argentina	4.0	1.1	2.8	6.3	**0.1**	4.5	**0.6**
Brazil	4.0	**0.9**	2.8	3.1	**0.1**	2.6	**0.5**
Chile	3.4	**0.0**	3.2	2.1	**0.5**	2.4	**0.2**
China	3.1	**0.9**	2.8	3.6	**0.0**	2.7	2.0
India	3.3	1.0	2.8	4.0	**0.0**	3.2	**0.8**
Indonesia	3.3	1.3	2.7	3.6	**0.0**	2.8	**0.6**
Israel	3.8	**0.0**	2.8	4.1	1.1	2.8	**0.0**
South Korea	3.8	1.0	2.8	2.3	1.4	2.9	2.0
Mexico	4.3	**0.0**	2.9	3.3	**0.1**	3.3	**0.1**
Philippines	3.3	1.4	2.9	7.6	**0.0**	2.9	**0.6**
Russia	4.0	1.0	2.8	4.7	1.4	2.7	**0.8**
South Africa	4.2	**0.9**	2.9	4.7	**0.1**	3.1	**0.0**
Thailand	**0.5**	1.0	2.8	3.7	**0.0**	2.8	**0.5**

Turkey	3.9	**0.9**	2.9	3.3	**0.0**	2.8	**0.6**
USA	**0.0**	**0.0**	2.8	2.5	1.3	2.6	

Source: WTO's IDB through World Bank WITS; authors' calculations

In view of the low average value of these tariffs, we employed partial equilibrium analysis using import demand elasticities from Kee et. al. (2008)[62] to simulate the impact of a unilateral unit increase in tariffs. The import demand elasticity measures the responsiveness of imports to a change in tariffs and is calculated as the ratio of the percentage change in imports to the percentage change in tariffs[63]. We use these elasticities from Kee et. al. (2008) to estimate the percentage reduction in imports of these carbon-intensive products resulting from a unit increase in tariffs.

$\Delta M_i = (\eta^{M,t}_i * \Delta t_i * M_i)/t_i$

where

ΔM_i = Change in imports M of good i

$\eta^{M,t}_i$ = Import demand elasticity of good i with respect to tariff t

Δt_i = Change in tariff on good i

t_i = Simple applied tariff on good i

Note that Δt_i equals 1 in this simulation as we explore the impact of a unit increase in tariffs. Percentage change in imports is given by $\Delta M_i/M_i*100$.

Unfortunately, the import demand elasticities in Kee et.al. (2008) have been calculated with respect to global imports and not bilaterally for each trading pair in our sample. We thus have to use the same elasticities for each trading pair in our sample which is a limitation of this analysis. To that extent, the results from the simulation are more indicative than exact. However, given the importance of these products in the trade flows of our sample countries, the elastic import demand for five of these six products and the low applied tariffs on their imports, the impact of a unilateral unit tariff increase on trade in these carbon-intensive products and by extension on the countries' overall trade would be non-trivial.The elasticities from Kee et.al. (2008) are reported in Table 4[64].

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[62] Kee, H.L., A. Nicita & M. Olarreaga , 'Import Demand Elasticities and Trade Distortions,' The Review of Economics & Statistics, November 2008, Vol. 90, No. 4, Pages 666-682.

[63] Demand for a product is said to be elastic (inelastic) if the absolute value of the computed elasticity is greater than (less than) unity.

[64] The authors have calculated these elasticities at the ISIC Rev. 2 classification, which is what we use in the analysis. These elasticities were not available separately for cement and cement products, which are therefore excluded from the partial simulation analysis. The results in Table 5 therefore pertain to the remaining six carbon-intensive products only.

Table 4: Import demand elasticities for carbon-intensive products

Importer/Product	Paper	Basic chemicals	Rubber	Plastic	Glass	Basic iron and steel
Australia	-1.28	-1.01	-1.04	-0.95	-1.01	-1.00
Canada	-1.20	-1.02	-1.03	-0.97	-1.01	-1.01
EU	-1.13	-1.03	-1.03	-0.98	-1.00	-1.01
Iceland	-1.13	-1.02	-1.03	-0.99	-1.01	-1.01
Israel	-1.19	-1.02	-1.05	-0.97	-1.01	-1.01
Japan	-2.27	-1.02	-1.37	-0.81	-1.04	-1.00
NZ	-1.16	-1.02	-1.04	-0.97	-1.01	-1.01
Norway	-1.16	-1.02	-1.04	-0.98	-1.01	-1.01
Switzerland	-1.14	-1.03	-1.04	-0.98	-1.01	-1.01
USA	-1.70	-1.02	-1.11	-0.92	-1.02	-1.00

Source: Kee et.al. (2008)

The aggregate results from partial equilibrium simulations are reported in Table 5, while the more disaggregated results are reported in the annex. These results suggest that the committed importing countries would have to raise their tariffs only slightly to effect a significant decline in the imports of these products from the non-committed countries. For instance, a unit increase in the simple average applied tariffs on the imports of these carbon-intensive products in 2005 from our sample of non-committed exporting countries would reduce the imports of these products by an average 32.6% in Australia, 178% in Canada, 195% in the EU, 271% in Japan and 62% in the US. These results emanate from the large volume of trade in these products, their elastic import demand (especially for paper) and the low applied tariff rates (especially in Canada, Japan and the US) and highlight the huge impact that such a simple trade policy measure could have on climate policy. Such measures may also be easier to administer and control and their WTO-compliance easier to monitor. But most importantly, they may be able to push countries towards global climate policies.

Table 5: Percentage decline in the import of carbon-intensive products from a unit increase in the average simple applied tariff (year 2005)

Exporter/Importer	Australia	Canada	EU	Iceland	Japan	NZ	USA
World	35.8	**340.1**	**430.6**	39.5	**1075.1**	**407.2**	69.0
Argentina	34.7	**200.2**	45.6	25.4	62.4	**111.4**	62.4
Brazil	29.5	**196.2**	58.0	25.1	**289.1**	**151.9**	63.9
Chile	37.1	68.9	35.6	54.6	40.7	**440.8**	54.0
China	34.8	**321.4**	**365.2**	22.7	**752.8**	**305.3**	65.2
India	29.8	**202.4**	**289.5**	19.3	**143.6**	85.3	65.2
Indonesia	26.4	**167.0**	**280.1**	21.7	**177.2**	**179.1**	55.4
Israel	43.6	89.5	70.6	19.3	**152.1**	**139.7**	38.6
South Korea	26.1	**228.2**	**286.8**	32.2	**603.6**	**193.9**	69.8
Mexico	25.5	**195.4**	47.6	24.9	**179.8**	47.3	72.5
Philippines	28.6	54.3	33.4	22.2	**346.0**	59.3	28.8

Russia	53.9	**305.5**	59.9	13.9	57.8	**103.9**	87.7
South Africa	28.4	92.9	**279.9**	21.7	83.9	**108.8**	57.9
Thailand	26.1	81.6	**319.7**	20.9	**107.8**	49.4	46.8
Turkey	29.3	**125.6**	**321.2**	21.3	**147.8**	26.2	**101.6**
USA	35.2	**340.1**	**430.6**	32.1	**928.0**	**321.3**	

Source: WTO's IDB through World Bank WITS; author's calculations

VI. Conclusions

Combining legal and economic analysis in this paper, we conclude that Members of the WTO are in position to considerably influence trade of highly carbon intensive products by marginally adjusting and increasing tariffs levels. Trade of such products can be substantially reduced by reverting to agreed mechanisms of tariff deconsolidation in WTO law, either multilaterally agreed or unilaterally. These increases are subject to compensation on other tariff lines, which could be offered for clean products in terms of climate change mitigation policies. Deconsolidation, in our view, can be based upon PPM related criteria, and distinctions of tariff lines based upon production methods of the same products can, in principle be justified by Article XX(g) of the GATT 1994. At the same time, we note that such measures are subject to compensation, and are more likely to attract retaliatory measures. While tariff deconsolidation is a legitimate instrument of trade policy, it must be noted that in the absence of an agreement on compensation, unilateral measures would likely elicit comparable retaliation by affected countries and therefore can easily trigger trade wars.[65]

Recourse to tariff policies in climate change mitigation therefore requires a careful analysis of trade flows and interests at stake. It is evident that they always will be second best. Hence, we do not suggest that tariff deconsolidation be widely used as a mechanism of emissions reduction but rather that it serve as a tool to express the state's concerns and priorities and provide an incentive to its trade partners to join a post-Kyoto international climate agreement. Article 3.5 of the UNFCCC, which borrows language from GATT Article XX, states that the "Means taken to combat climate change, including unilateral ones, should not constitute a means of arbitrary or unjustifiable discrimination or a disguised restriction on international trade…" However, when political reasons prevent certain polluting countries from participating in the multilateral effort to curb greenhouse gas emissions, punitive trade measures can be the only effective resort.

Deconsolidation is at its best if not used, but taken into account as a risk and thus as an incentive to join a future international system on climate change mitigation. In light of tariff measures – exceeding the limits of border tax adjustment – powerful and effective incentives exist to convince producing countries to join a multilateral system with a view to avoid the imposition of deconsolidation and the potential need to engage in retaliation and a cycle of potentially harmful and welfare reducing tariff increases among Members of the WTO. A firm commitment to exclude deconsolidation of tariffs within a multilateral system of climate change, refraining from the exercise of WTO rights in return for committing to multilateral

[65] According to Hufbauer, a state first needs to 'make an exceptional effort to negotiate agreed international rules before blocking imports or penalizing foreign GHG control measures'.

disciplines of capping, offers the potential to convince governments and industries to seek participation and to abandon the road of unilateral climate change policies and related risks attached to it in trade policy.

Annex

Importer	Exporter	Product Name	Simple avg tariff	Imports (USD mn)	Elasticity	Change in imports from a 1% rise in tariffs (USD mn)	Percentage change in imports
Australia	World	Manufacture of paper and paper products	3.57	2066.9	-1.28	-742.0	-35.9
Australia	World	Manufacture of basic chemicals	1.23	4529.8	-1.01	-3737.9	-82.5
Australia	World	Manufacture of rubber products	6.07	1531.8	-1.04	-262.9	-17.2
Australia	World	Manufacture of plastics products	4.79	2072.0	-0.95	-411.6	-19.9
Australia	World	Manufacture of glass and glass products	2.84	424.6	-1.01	-151.1	-35.6
Australia	World	Manufacture of basic iron and steel	4.24	2625.3	-1.00	-620.6	-23.6
Australia	Argentina	Manufacture of paper and paper products	3.95	0.2	-1.28	-0.1	-32.4
Australia	Argentina	Manufacture of basic chemicals	1.10	7.4	-1.01	-6.8	-92.3
Australia	Argentina	Manufacture of rubber products	8.06	0.4	-1.04	-0.1	-12.9
Australia	Argentina	Manufacture of plastics products	5.15	4.1	-0.95	-0.8	-18.5
Australia	Argentina	Manufacture of glass and glass products	3.40	0.2	-1.01	-0.1	-29.7
Australia	Argentina	Manufacture of basic iron and steel	4.44	2.6	-1.00	-0.6	-22.6
Australia	Brazil	Manufacture of paper and paper products	3.35	37.0	-1.28	-14.2	-38.3
Australia	Brazil	Manufacture of basic chemicals	1.93	13.4	-1.01	-7.1	-52.6
Australia	Brazil	Manufacture of rubber products	6.39	14.1	-1.04	-2.3	-16.3
Australia	Brazil	Manufacture of plastics products	5.20	3.1	-0.95	-0.6	-18.3
Australia	Brazil	Manufacture of glass and glass products	3.37	1.3	-1.01	-0.4	-30.0
Australia	Brazil	Manufacture of basic iron and steel	4.63	35.0	-1.00	-7.6	-21.6
Australia	Chile	Manufacture of paper and paper products	2.64	25.7	-1.28	-12.5	-48.5
Australia	Chile	Manufacture of basic chemicals	0.00	3.3	-1.01		
Australia	Chile	Manufacture of rubber products	8.13	1.2	-1.04	-0.2	-12.8
Australia	Chile	Manufacture of plastics products	5.79	1.8	-0.95	-0.3	-16.4
Australia	Chile	Manufacture of glass and glass products	1.25	0.0	-1.01	0.0	-80.9
Australia	Chile	Manufacture of basic iron and steel	3.75	12.1	-1.00	-3.2	-26.7
Australia	China	Manufacture of paper and paper products	4.10	145.3	-1.28	-45.4	-31.3
Australia	China	Manufacture of basic chemicals	1.24	326.6	-1.01	-267.3	-81.9
Australia	China	Manufacture of rubber products	6.07	158.5	-1.04	-27.2	-17.2
Australia	China	Manufacture of plastics products	4.93	467.7	-0.95	-90.3	-19.3
Australia	China	Manufacture of glass and glass products	2.79	123.4	-1.01	-44.7	-36.2
Australia	China	Manufacture of basic iron and steel	4.37	362.0	-1.00	-83.0	-22.9
Australia	India	Manufacture of paper and paper products	3.97	3.2	-1.28	-1.0	-32.3
Australia	India	Manufacture of basic chemicals	1.66	54.4	-1.01	-33.2	-61.1
Australia	India	Manufacture of rubber products	6.22	24.8	-1.04	-4.2	-16.8

Australia	India	Manufacture of plastics products	5.17	13.7	-0.95	-2.5	-18.4
Australia	India	Manufacture of glass and glass products	3.44	3.6	-1.01	-1.1	-29.4
Australia	India	Manufacture of basic iron and steel	4.76	34.5	-1.00	-7.3	-21.1
Australia	Indonesia	Manufacture of paper and paper products	3.96	100.4	-1.28	-32.5	-32.4
Australia	Indonesia	Manufacture of basic chemicals	2.50	37.0	-1.01	-15.0	-40.6
Australia	Indonesia	Manufacture of rubber products	6.19	17.3	-1.04	-2.9	-16.8
Australia	Indonesia	Manufacture of plastics products	4.96	31.3	-0.95	-6.0	-19.2
Australia	Indonesia	Manufacture of glass and glass products	3.43	24.9	-1.01	-7.3	-29.5
Australia	Indonesia	Manufacture of basic iron and steel	5.00	25.8	-1.00	-5.2	-20.0
Australia	Israel	Manufacture of paper and paper products	4.30	8.0	-1.28	-2.4	-29.8
Australia	Israel	Manufacture of basic chemicals	0.70	53.0	-1.01	-76.9	-145.0
Australia	Israel	Manufacture of rubber products	6.96	1.8	-1.04	-0.3	-15.0
Australia	Israel	Manufacture of plastics products	4.98	31.9	-0.95	-6.1	-19.1
Australia	Israel	Manufacture of glass and glass products	3.54	1.9	-1.01	-0.5	-28.6
Australia	Israel	Manufacture of basic iron and steel	4.17	0.2	-1.00	0.0	-24.0
Australia	South Korea	Manufacture of paper and paper products	4.42	142.7	-1.28	-41.4	-29.0
Australia	South Korea	Manufacture of basic chemicals	2.19	147.2	-1.01	-68.2	-46.3
Australia	South Korea	Manufacture of rubber products	6.23	95.2	-1.04	-15.9	-16.7
Australia	South Korea	Manufacture of plastics products	5.26	70.0	-0.95	-12.7	-18.1
Australia	South Korea	Manufacture of glass and glass products	3.89	5.7	-1.01	-1.5	-26.0
Australia	South Korea	Manufacture of basic iron and steel	4.86	181.2	-1.00	-37.4	-20.6
Australia	Mexico	Manufacture of paper and paper products	4.39	4.5	-1.28	-1.3	-29.2
Australia	Mexico	Manufacture of basic chemicals	2.25	6.4	-1.01	-2.9	-45.1
Australia	Mexico	Manufacture of rubber products	7.31	2.2	-1.04	-0.3	-14.3
Australia	Mexico	Manufacture of plastics products	5.34	5.0	-0.95	-0.9	-17.8
Australia	Mexico	Manufacture of glass and glass products	3.80	0.9	-1.01	-0.2	-26.6
Australia	Mexico	Manufacture of basic iron and steel	5.00	3.7	-1.00	-0.7	-20.0
Australia	Philippines	Manufacture of paper and paper products	3.70	2.8	-1.28	-1.0	-34.6
Australia	Philippines	Manufacture of basic chemicals	2.58	15.6	-1.01	-6.1	-39.3
Australia	Philippines	Manufacture of rubber products	6.61	8.3	-1.04	-1.3	-15.8
Australia	Philippines	Manufacture of plastics products	5.17	6.2	-0.95	-1.1	-18.4
Australia	Philippines	Manufacture of glass and glass products	2.32	3.6	-1.01	-1.6	-43.6
Australia	Philippines	Manufacture of basic iron and steel	5.00	1.1	-1.00	-0.2	-20.0
Australia	Russia	Manufacture of paper and paper products	5.00	0.0	-1.28	0.0	-25.6
Australia	Russia	Manufacture of basic chemicals	1.31	26.5	-1.01	-20.5	-77.5

Australia	Russia	Manufacture of rubber products	7.14	1.1	-1.04	-0.2	-14.6
Australia	Russia	Manufacture of plastics products	6.88	0.0	-0.95	0.0	-13.8
Australia	Russia	Manufacture of glass and glass products	0.63	0.1	-1.01	-0.1	-160.5
Australia	Russia	Manufacture of basic iron and steel	3.18	6.2	-1.00	-2.0	-31.5
Australia	South Africa	Manufacture of paper and paper products	4.50	14.5	-1.28	-4.1	-28.5
Australia	South Africa	Manufacture of basic chemicals	1.74	63.5	-1.01	-37.1	-58.3
Australia	South Africa	Manufacture of rubber products	6.55	4.3	-1.04	-0.7	-15.9
Australia	South Africa	Manufacture of plastics products	5.38	5.3	-0.95	-0.9	-17.7
Australia	South Africa	Manufacture of glass and glass products	4.02	0.7	-1.01	-0.2	-25.2
Australia	South Africa	Manufacture of basic iron and steel	4.07	91.9	-1.00	-22.6	-24.6
Australia	Thailand	Manufacture of paper and paper products	4.12	42.4	-1.28	-13.2	-31.1
Australia	Thailand	Manufacture of basic chemicals	2.48	55.3	-1.01	-22.6	-40.9
Australia	Thailand	Manufacture of rubber products	5.88	68.3	-1.04	-12.1	-17.7
Australia	Thailand	Manufacture of plastics products	5.40	69.2	-0.95	-12.2	-17.6
Australia	Thailand	Manufacture of glass and glass products	3.54	12.2	-1.01	-3.5	-28.6
Australia	Thailand	Manufacture of basic iron and steel	4.83	79.8	-1.00	-16.6	-20.8
Australia	Turkey	Manufacture of paper and paper products	4.54	0.1	-1.28	0.0	-28.2
Australia	Turkey	Manufacture of basic chemicals	1.43	3.1	-1.01	-2.2	-71.0
Australia	Turkey	Manufacture of rubber products	7.06	18.7	-1.04	-2.8	-14.8
Australia	Turkey	Manufacture of plastics products	5.45	3.2	-0.95	-0.6	-17.5
Australia	Turkey	Manufacture of glass and glass products	4.12	5.4	-1.01	-1.3	-24.5
Australia	Turkey	Manufacture of basic iron and steel	5.00	0.5	-1.00	-0.1	-20.0
Australia	USA	Manufacture of paper and paper products	3.75	188.5	-1.28	-64.4	-34.2
Australia	USA	Manufacture of basic chemicals	1.24	1076.1	-1.01	-880.8	-81.9
Australia	USA	Manufacture of rubber products	6.10	210.1	-1.04	-35.9	-17.1
Australia	USA	Manufacture of plastics products	4.93	331.8	-0.95	-64.0	-19.3
Australia	USA	Manufacture of glass and glass products	2.79	41.0	-1.01	-14.9	-36.2
Australia	USA	Manufacture of basic iron and steel	4.44	108.8	-1.00	-24.6	-22.6
Canada	World	Manufacture of paper and paper products	0.08	5033.4	-1.20	-75397.4	-1498.0
Canada	World	Manufacture of basic chemicals	2.26	13249.8	-1.02	-5968.5	-45.0
Canada	World	Manufacture of rubber products	4.64	3764.5	-1.03	-833.6	-22.1
Canada	World	Manufacture of plastics products	4.29	5933.3	-0.97	-1341.1	-22.6
Canada	World	Manufacture of glass and glass products	0.50	1822.9	-1.01	-3666.9	-201.2
Canada	World	Manufacture of basic iron and steel	0.40	9397.4	-1.01	-23629.4	-251.4
Canada	Argentina	Manufacture of paper and paper products	0.00	0.5	-1.20		

Canada	Argentina	Manufacture of basic chemicals	1.65	7.4	-1.02	-4.5	-61.7
Canada	Argentina	Manufacture of rubber products	4.95	2.6	-1.03	-0.5	-20.8
Canada	Argentina	Manufacture of plastics products	4.04	1.2	-0.97	-0.3	-24.0
Canada	Argentina	Manufacture of glass and glass products	0.22	0.2	-1.01	-0.9	-457.2
Canada	Argentina	Manufacture of basic iron and steel	0.23	120.1	-1.01	-525.0	-437.3
Canada	Brazil	Manufacture of paper and paper products	0.18	25.6	-1.20	-170.4	-665.8
Canada	Brazil	Manufacture of basic chemicals	2.21	40.5	-1.02	-18.6	-46.1
Canada	Brazil	Manufacture of rubber products	4.54	16.0	-1.03	-3.6	-22.6
Canada	Brazil	Manufacture of plastics products	4.12	13.5	-0.97	-3.2	-23.5
Canada	Brazil	Manufacture of glass and glass products	0.47	4.6	-1.01	-9.9	-214.0
Canada	Brazil	Manufacture of basic iron and steel	0.49	375.2	-1.01	-770.2	-205.3
Canada	Chile	Manufacture of paper and paper products	0.00	0.6	-1.20		
Canada	Chile	Manufacture of basic chemicals	0.96	20.3	-1.02	-21.5	-106.0
Canada	Chile	Manufacture of rubber products	5.72	1.2	-1.03	-0.2	-18.0
Canada	Chile	Manufacture of plastics products	3.75	0.6	-0.97	-0.1	-25.9
Canada	Chile	Manufacture of glass and glass products	0.00	0.1	-1.01		
Canada	Chile	Manufacture of basic iron and steel	0.80	1.1	-1.01	-1.4	-125.7
Canada	China	Manufacture of paper and paper products	0.09	104.1	-1.20	-1385.8	-1331.5
Canada	China	Manufacture of basic chemicals	2.18	203.1	-1.02	-94.9	-46.7
Canada	China	Manufacture of rubber products	4.74	176.7	-1.03	-38.3	-21.7
Canada	China	Manufacture of plastics products	4.27	708.7	-0.97	-160.9	-22.7
Canada	China	Manufacture of glass and glass products	0.37	194.7	-1.01	-529.4	-271.8
Canada	China	Manufacture of basic iron and steel	0.43	538.4	-1.01	-1259.4	-233.9
Canada	India	Manufacture of paper and paper products	0.15	1.1	-1.20	-9.2	-798.9
Canada	India	Manufacture of basic chemicals	2.34	130.2	-1.02	-56.6	-43.5
Canada	India	Manufacture of rubber products	4.87	8.2	-1.03	-1.7	-21.1
Canada	India	Manufacture of plastics products	4.16	18.1	-0.97	-4.2	-23.3
Canada	India	Manufacture of glass and glass products	0.64	5.1	-1.01	-8.0	-157.2
Canada	India	Manufacture of basic iron and steel	0.59	49.5	-1.01	-84.4	-170.5
Canada	Indonesia	Manufacture of paper and paper products	0.20	31.3	-1.20	-187.6	-599.2
Canada	Indonesia	Manufacture of basic chemicals	2.69	23.9	-1.02	-9.0	-37.8
Canada	Indonesia	Manufacture of rubber products	4.85	5.5	-1.03	-1.2	-21.2
Canada	Indonesia	Manufacture of plastics products	4.09	7.5	-0.97	-1.8	-23.7
Canada	Indonesia	Manufacture of glass and glass products	0.45	6.5	-1.01	-14.6	-223.5
Canada	Indonesia	Manufacture of basic iron and steel	1.04	6.7	-1.01	-6.5	-96.7

Canada	Israel	Manufacture of paper and paper products	0.00	1.0	-1.20		
Canada	Israel	Manufacture of basic chemicals	2.56	40.6	-1.02	-16.2	-39.8
Canada	Israel	Manufacture of rubber products	4.83	3.7	-1.03	-0.8	-21.3
Canada	Israel	Manufacture of plastics products	4.16	32.2	-0.97	-7.5	-23.3
Canada	Israel	Manufacture of glass and glass products	0.32	0.2	-1.01	-0.5	-314.3
Canada	Israel	Manufacture of basic iron and steel	2.06	2.9	-1.01	-1.4	-48.8
Canada	South Korea	Manufacture of paper and paper products	0.13	27.7	-1.20	-254.9	-921.8
Canada	South Korea	Manufacture of basic chemicals	2.71	176.6	-1.02	-66.3	-37.6
Canada	South Korea	Manufacture of rubber products	4.91	110.6	-1.03	-23.1	-20.9
Canada	South Korea	Manufacture of plastics products	4.35	65.5	-0.97	-14.6	-22.3
Canada	South Korea	Manufacture of glass and glass products	0.64	2.1	-1.01	-3.3	-157.2
Canada	South Korea	Manufacture of basic iron and steel	0.48	219.6	-1.01	-460.1	-209.5
Canada	Mexico	Manufacture of paper and paper products	0.17	42.8	-1.20	-301.9	-704.9
Canada	Mexico	Manufacture of basic chemicals	2.46	117.2	-1.02	-48.5	-41.4
Canada	Mexico	Manufacture of rubber products	5.07	81.5	-1.03	-16.5	-20.3
Canada	Mexico	Manufacture of plastics products	4.28	86.3	-0.97	-19.6	-22.7
Canada	Mexico	Manufacture of glass and glass products	0.65	43.8	-1.01	-67.7	-154.7
Canada	Mexico	Manufacture of basic iron and steel	0.44	136.7	-1.01	-312.5	-228.6
Canada	Philippines	Manufacture of paper and paper products	0.00	0.4	-1.20		
Canada	Philippines	Manufacture of basic chemicals	1.96	5.4	-1.02	-2.8	-51.9
Canada	Philippines	Manufacture of rubber products	5.15	0.6	-1.03	-0.1	-20.0
Canada	Philippines	Manufacture of plastics products	4.30	2.0	-0.97	-0.4	-22.6
Canada	Philippines	Manufacture of glass and glass products	0.74	0.4	-1.01	-0.5	-135.9
Canada	Philippines	Manufacture of basic iron and steel	2.44	0.7	-1.01	-0.3	-41.2
Canada	Russia	Manufacture of paper and paper products	0.00	0.0	-1.20		
Canada	Russia	Manufacture of basic chemicals	2.32	72.0	-1.02	-31.6	-43.9
Canada	Russia	Manufacture of rubber products	2.68	0.3	-1.03	-0.1	-38.3
Canada	Russia	Manufacture of plastics products	4.36	0.1	-0.97	0.0	-22.2
Canada	Russia	Manufacture of glass and glass products	0.00	0.0	-1.01		
Canada	Russia	Manufacture of basic iron and steel	0.09	114.3	-1.01	-1277.8	-1117.5
Canada	South Africa	Manufacture of paper and paper products	0.00	0.3	-1.20		
Canada	South Africa	Manufacture of basic chemicals	1.92	36.7	-1.02	-19.5	-53.0
Canada	South Africa	Manufacture of rubber products	4.76	1.4	-1.03	-0.3	-21.6
Canada	South Africa	Manufacture of plastics products	4.47	1.4	-0.97	-0.3	-21.7
Canada	South Africa	Manufacture of glass and glass products	0.97	0.9	-1.01	-0.9	-103.7

Canada	South Africa	Manufacture of basic iron and steel	0.38	86.7	-1.01	-229.5	-264.7
Canada	Thailand	Manufacture of paper and paper products	0.00	6.0	-1.20		
Canada	Thailand	Manufacture of basic chemicals	1.74	25.5	-1.02	-14.9	-58.5
Canada	Thailand	Manufacture of rubber products	4.70	39.1	-1.03	-8.5	-21.9
Canada	Thailand	Manufacture of plastics products	4.38	27.6	-0.97	-6.1	-22.1
Canada	Thailand	Manufacture of glass and glass products	0.48	1.7	-1.01	-3.6	-209.5
Canada	Thailand	Manufacture of basic iron and steel	1.05	46.1	-1.01	-44.2	-95.8
Canada	Turkey	Manufacture of paper and paper products	0.53	0.2	-1.20	-0.5	-226.1
Canada	Turkey	Manufacture of basic chemicals	1.80	3.0	-1.02	-1.7	-56.6
Canada	Turkey	Manufacture of rubber products	4.97	4.9	-1.03	-1.0	-20.7
Canada	Turkey	Manufacture of plastics products	4.11	2.1	-0.97	-0.5	-23.6
Canada	Turkey	Manufacture of glass and glass products	0.38	9.0	-1.01	-23.9	-264.7
Canada	Turkey	Manufacture of basic iron and steel	0.62	123.9	-1.01	-201.0	-162.2
Canada	USA	Manufacture of paper and paper products	0.08	4225.5	-1.20	-63296.2	-1498.0
Canada	USA	Manufacture of basic chemicals	2.24	9875.5	-1.02	-4488.3	-45.4
Canada	USA	Manufacture of rubber products	4.64	2512.6	-1.03	-556.4	-22.1
Canada	USA	Manufacture of plastics products	4.29	4378.2	-0.97	-989.6	-22.6
Canada	USA	Manufacture of glass and glass products	0.50	1325.8	-1.01	-2667.0	-201.2
Canada	USA	Manufacture of basic iron and steel	0.40	5322.6	-1.01	-13383.5	-251.4
EU	World	Manufacture of paper and paper products	0.05	12923.4	-1.13	-291658.9	-2256.8
EU	World	Manufacture of basic chemicals	4.73	47831.6	-1.03	-10437.2	-21.8
EU	World	Manufacture of rubber products	3.35	8392.9	-1.03	-2581.9	-30.8
EU	World	Manufacture of plastics products	5.78	14359.2	-0.98	-2445.9	-17.0
EU	World	Manufacture of glass and glass products	4.67	3654.2	-1.00	-786.2	-21.5
EU	World	Manufacture of basic iron and steel	0.43	27438.7	-1.01	-64643.6	-235.6
EU	Argentina	Manufacture of paper and paper products	0.00	45.1	-1.13		
EU	Argentina	Manufacture of basic chemicals	4.68	184.8	-1.03	-40.8	-22.1
EU	Argentina	Manufacture of rubber products	2.73	42.4	-1.03	-16.0	-37.7
EU	Argentina	Manufacture of plastics products	5.51	12.3	-0.98	-2.2	-17.9
EU	Argentina	Manufacture of glass and glass products	5.31	4.3	-1.00	-0.8	-18.9
EU	Argentina	Manufacture of basic iron and steel	0.77	320.4	-1.01	-421.5	-131.6
EU	Brazil	Manufacture of paper and paper products	0.00	1588.1	-1.13		
EU	Brazil	Manufacture of basic chemicals	4.79	755.4	-1.03	-162.8	-21.5
EU	Brazil	Manufacture of rubber products	3.24	164.1	-1.03	-52.2	-31.8
EU	Brazil	Manufacture of plastics products	5.68	63.3	-0.98	-11.0	-17.3

EU	Brazil	Manufacture of glass and glass products	4.91	64.2	-1.00	-13.1	-20.5
EU	Brazil	Manufacture of basic iron and steel	0.51	1301.8	-1.01	-2585.9	-198.6
EU	Chile	Manufacture of paper and paper products	0.00	473.0	-1.13		
EU	Chile	Manufacture of basic chemicals	4.43	457.0	-1.03	-106.5	-23.3
EU	Chile	Manufacture of rubber products	3.33	0.6	-1.03	-0.2	-30.9
EU	Chile	Manufacture of plastics products	5.90	5.7	-0.98	-0.9	-16.7
EU	Chile	Manufacture of glass and glass products	5.81	0.2	-1.00	0.0	-17.3
EU	Chile	Manufacture of basic iron and steel	1.13	362.7	-1.01	-325.2	-89.7
EU	China	Manufacture of paper and paper products	0.06	637.7	-1.13	-11993.8	-1880.7
EU	China	Manufacture of basic chemicals	4.82	2881.9	-1.03	-617.1	-21.4
EU	China	Manufacture of rubber products	3.40	975.3	-1.03	-295.6	-30.3
EU	China	Manufacture of plastics products	5.78	4333.6	-0.98	-738.2	-17.0
EU	China	Manufacture of glass and glass products	4.67	1023.6	-1.00	-220.2	-21.5
EU	China	Manufacture of basic iron and steel	0.46	1749.9	-1.01	-3853.8	-220.2
EU	India	Manufacture of paper and paper products	0.08	42.3	-1.13	-597.2	-1410.5
EU	India	Manufacture of basic chemicals	4.84	1393.2	-1.03	-297.1	-21.3
EU	India	Manufacture of rubber products	3.27	242.4	-1.03	-76.4	-31.5
EU	India	Manufacture of plastics products	5.79	223.9	-0.98	-38.1	-17.0
EU	India	Manufacture of glass and glass products	4.77	82.0	-1.00	-17.3	-21.1
EU	India	Manufacture of basic iron and steel	0.43	1020.1	-1.01	-2403.2	-235.6
EU	Indonesia	Manufacture of paper and paper products	0.08	270.5	-1.13	-3815.6	-1410.5
EU	Indonesia	Manufacture of basic chemicals	4.56	223.6	-1.03	-50.6	-22.6
EU	Indonesia	Manufacture of rubber products	3.21	210.2	-1.03	-67.5	-32.1
EU	Indonesia	Manufacture of plastics products	5.65	92.4	-0.98	-16.1	-17.4
EU	Indonesia	Manufacture of glass and glass products	5.03	45.4	-1.00	-9.1	-20.0
EU	Indonesia	Manufacture of basic iron and steel	0.57	187.9	-1.01	-334.0	-177.7
EU	Israel	Manufacture of paper and paper products	0.00	64.5	-1.13		
EU	Israel	Manufacture of basic chemicals	4.83	1038.8	-1.03	-222.0	-21.4
EU	Israel	Manufacture of rubber products	2.97	96.2	-1.03	-33.4	-34.7
EU	Israel	Manufacture of plastics products	5.73	635.8	-0.98	-109.2	-17.2
EU	Israel	Manufacture of glass and glass products	4.98	45.0	-1.00	-9.1	-20.2
EU	Israel	Manufacture of basic iron and steel	0.39	33.4	-1.01	-86.8	-259.8
EU	South Korea	Manufacture of paper and paper products	0.08	76.1	-1.13	-1073.9	-1410.5
EU	South Korea	Manufacture of basic chemicals	4.84	853.9	-1.03	-182.1	-21.3
EU	South Korea	Manufacture of rubber products	3.46	783.8	-1.03	-233.4	-29.8

EU	South Korea	Manufacture of plastics products	5.75	374.3	-0.98	-64.1	-17.1
EU	South Korea	Manufacture of glass and glass products	4.65	91.4	-1.00	-19.8	-21.6
EU	South Korea	Manufacture of basic iron and steel	0.46	563.8	-1.01	-1241.6	-220.2
EU	Mexico	Manufacture of paper and paper products	0.00	33.3	-1.13		
EU	Mexico	Manufacture of basic chemicals	4.90	582.9	-1.03	-122.8	-21.1
EU	Mexico	Manufacture of rubber products	3.33	48.1	-1.03	-14.9	-30.9
EU	Mexico	Manufacture of plastics products	5.65	64.4	-0.98	-11.2	-17.4
EU	Mexico	Manufacture of glass and glass products	5.11	31.8	-1.00	-6.3	-19.7
EU	Mexico	Manufacture of basic iron and steel	0.68	353.8	-1.01	-527.0	-149.0
EU	Philippines	Manufacture of paper and paper products	0.00	42.6	-1.13		
EU	Philippines	Manufacture of basic chemicals	4.05	26.0	-1.03	-6.6	-25.5
EU	Philippines	Manufacture of rubber products	3.48	36.4	-1.03	-10.8	-29.6
EU	Philippines	Manufacture of plastics products	5.65	24.0	-0.98	-4.2	-17.4
EU	Philippines	Manufacture of glass and glass products	5.32	3.2	-1.00	-0.6	-18.9
EU	Philippines	Manufacture of basic iron and steel	1.34	3.8	-1.01	-2.9	-75.6
EU	Russia	Manufacture of paper and paper products	0.00	638.3	-1.13		
EU	Russia	Manufacture of basic chemicals	4.64	3194.8	-1.03	-710.6	-22.2
EU	Russia	Manufacture of rubber products	3.21	87.0	-1.03	-27.9	-32.1
EU	Russia	Manufacture of plastics products	5.73	27.8	-0.98	-4.8	-17.2
EU	Russia	Manufacture of glass and glass products	4.68	25.0	-1.00	-5.4	-21.5
EU	Russia	Manufacture of basic iron and steel	0.49	4985.2	-1.01	-10306.6	-206.7
EU	South Africa	Manufacture of paper and paper products	0.08	256.2	-1.13	-3613.1	-1410.5
EU	South Africa	Manufacture of basic chemicals	4.59	451.6	-1.03	-101.6	-22.5
EU	South Africa	Manufacture of rubber products	3.25	133.9	-1.03	-42.4	-31.7
EU	South Africa	Manufacture of plastics products	5.81	70.1	-0.98	-11.9	-16.9
EU	South Africa	Manufacture of glass and glass products	5.06	51.2	-1.00	-10.2	-19.9
EU	South Africa	Manufacture of basic iron and steel	0.57	2005.0	-1.01	-3563.4	-177.7
EU	Thailand	Manufacture of paper and paper products	0.07	94.1	-1.13	-1517.6	-1612.0
EU	Thailand	Manufacture of basic chemicals	4.74	151.2	-1.03	-32.9	-21.8
EU	Thailand	Manufacture of rubber products	3.28	389.6	-1.03	-122.4	-31.4
EU	Thailand	Manufacture of plastics products	5.71	275.2	-0.98	-47.5	-17.2
EU	Thailand	Manufacture of glass and glass products	4.95	67.9	-1.00	-13.8	-20.3
EU	Thailand	Manufacture of basic iron and steel	0.47	134.3	-1.01	-289.4	-215.5
EU	Turkey	Manufacture of paper and paper products	0.07	109.9	-1.13	-1771.0	-1612.0
EU	Turkey	Manufacture of basic chemicals	4.85	405.8	-1.03	-86.4	-21.3

EU	Turkey	Manufacture of rubber products	3.35	780.1	-1.03	-240.0	-30.8
EU	Turkey	Manufacture of plastics products	5.77	504.6	-0.98	-86.1	-17.1
EU	Turkey	Manufacture of glass and glass products	4.85	361.6	-1.00	-74.9	-20.7
EU	Turkey	Manufacture of basic iron and steel	0.45	1551.8	-1.01	-3493.5	-225.1
EU	USA	Manufacture of paper and paper products	0.05	2813.3	-1.13	-63492.4	-2256.8
EU	USA	Manufacture of basic chemicals	4.75	10879.9	-1.03	-2364.1	-21.7
EU	USA	Manufacture of rubber products	3.35	863.1	-1.03	-265.5	-30.8
EU	USA	Manufacture of plastics products	5.78	2406.1	-0.98	-409.9	-17.0
EU	USA	Manufacture of glass and glass products	4.67	578.7	-1.00	-124.5	-21.5
EU	USA	Manufacture of basic iron and steel	0.43	1035.9	-1.01	-2440.5	-235.6
Iceland	World	Manufacture of paper and paper products	1.45	87.7	-1.13	-68.1	-77.6
Iceland	World	Manufacture of basic chemicals	0.00	92.4	-1.02		
Iceland	World	Manufacture of rubber products	4.11	47.4	-1.03	-11.9	-25.2
Iceland	World	Manufacture of plastics products	4.17	114.2	-0.99	-27.1	-23.7
Iceland	World	Manufacture of glass and glass products	3.20	28.9	-1.01	-9.1	-31.4
Iceland	World	Manufacture of basic iron and steel	0.00	109.4	-1.01		
Iceland	Argentina	Manufacture of paper and paper products	10.00	0.0	-1.13	0.0	-11.3
Iceland	Argentina	Manufacture of plastics products	2.50	0.0	-0.99	0.0	-39.5
Iceland	Brazil	Manufacture of paper and paper products	4.26	0.0	-1.13	0.0	-26.4
Iceland	Brazil	Manufacture of basic chemicals	0.00	0.0	-1.02		
Iceland	Brazil	Manufacture of rubber products	3.52	0.0	-1.03	0.0	-29.4
Iceland	Brazil	Manufacture of plastics products	2.94	0.0	-0.99	0.0	-33.6
Iceland	Brazil	Manufacture of glass and glass products	9.17	0.0	-1.01	0.0	-11.0
Iceland	Brazil	Manufacture of basic iron and steel	0.00	0.0	-1.01		
Iceland	Chile	Manufacture of paper and paper products	2.50	0.0	-1.13	0.0	-45.0
Iceland	Chile	Manufacture of rubber products	0.00	0.0	-1.03		
Iceland	Chile	Manufacture of plastics products	1.00	0.1	-0.99	-0.1	-98.8
Iceland	Chile	Manufacture of glass and glass products	5.00	0.0	-1.01	0.0	-20.1
Iceland	China	Manufacture of paper and paper products	3.52	0.6	-1.13	-0.2	-32.0
Iceland	China	Manufacture of basic chemicals	0.00	3.8	-1.02		
Iceland	China	Manufacture of rubber products	5.19	2.1	-1.03	-0.4	-19.9
Iceland	China	Manufacture of plastics products	4.45	4.8	-0.99	-1.1	-22.2
Iceland	China	Manufacture of glass and glass products	6.06	1.4	-1.01	-0.2	-16.6
Iceland	China	Manufacture of basic iron and steel	0.00	1.4	-1.01		
Iceland	India	Manufacture of paper and paper products	4.48	0.0	-1.13	0.0	-25.1

Iceland	India	Manufacture of basic chemicals	0.00	5.4	-1.02		
Iceland	India	Manufacture of rubber products	4.12	0.2	-1.03	0.0	-25.1
Iceland	India	Manufacture of plastics products	6.45	0.2	-0.99	0.0	-15.3
Iceland	India	Manufacture of glass and glass products	8.75	0.0	-1.01	0.0	-11.5
Iceland	India	Manufacture of basic iron and steel	0.00	0.1	-1.01		
Iceland	Indonesia	Manufacture of paper and paper products	3.16	0.0	-1.13	0.0	-35.6
Iceland	Indonesia	Manufacture of basic chemicals	0.00	0.9	-1.02		
Iceland	Indonesia	Manufacture of rubber products	6.14	0.1	-1.03	0.0	-16.8
Iceland	Indonesia	Manufacture of plastics products	4.83	0.1	-0.99	0.0	-20.4
Iceland	Indonesia	Manufacture of glass and glass products	7.22	0.0	-1.01	0.0	-13.9
Iceland	Indonesia	Manufacture of basic iron and steel	0.00	0.0	-1.01		
Iceland	Israel	Manufacture of paper and paper products	5.04	0.0	-1.13	0.0	-22.3
Iceland	Israel	Manufacture of basic chemicals	0.00	0.6	-1.02		
Iceland	Israel	Manufacture of rubber products	5.77	0.2	-1.03	0.0	-17.9
Iceland	Israel	Manufacture of plastics products	3.68	0.2	-0.99	-0.1	-26.8
Iceland	Israel	Manufacture of glass and glass products	10.00	0.0	-1.01	0.0	-10.1
Iceland	Israel	Manufacture of basic iron and steel	0.00	0.0	-1.01		
Iceland	South Korea	Manufacture of paper and paper products	1.86	0.0	-1.13	0.0	-60.5
Iceland	South Korea	Manufacture of basic chemicals	0.00	0.0	-1.02		
Iceland	South Korea	Manufacture of rubber products	3.66	3.0	-1.03	-0.8	-28.2
Iceland	South Korea	Manufacture of plastics products	3.86	0.3	-0.99	-0.1	-25.6
Iceland	South Korea	Manufacture of glass and glass products	6.88	0.0	-1.01	0.0	-14.6
Iceland	South Korea	Manufacture of basic iron and steel	0.00	0.0	-1.01		
Iceland	Mexico	Manufacture of paper and paper products	5.71	0.0	-1.13	0.0	-19.7
Iceland	Mexico	Manufacture of basic chemicals	0.00	0.0	-1.02		
Iceland	Mexico	Manufacture of rubber products	2.36	0.0	-1.03	0.0	-43.8
Iceland	Mexico	Manufacture of plastics products	4.34	0.2	-0.99	-0.1	-22.8
Iceland	Mexico	Manufacture of glass and glass products	7.64	0.0	-1.01	0.0	-13.2
Iceland	Mexico	Manufacture of basic iron and steel	0.00	0.0	-1.01		
Iceland	Philippines	Manufacture of paper and paper products	2.57	0.0	-1.13	0.0	-43.8
Iceland	Philippines	Manufacture of plastics products	7.75	0.0	-0.99	0.0	-12.7
Iceland	Philippines	Manufacture of glass and glass products	10.00	0.0	-1.01	0.0	-10.1
Iceland	Russia	Manufacture of paper and paper products	10.00	0.0	-1.13	0.0	-11.3
Iceland	Russia	Manufacture of basic chemicals	0.00	1.3	-1.02		
Iceland	Russia	Manufacture of rubber products	6.70	0.2	-1.03	0.0	-15.4

Iceland	Russia	Manufacture of glass and glass products	6.67	0.0	-1.01	0.0	-15.1
Iceland	Russia	Manufacture of basic iron and steel	0.00	2.9	-1.01		
Iceland	South Africa	Manufacture of paper and paper products	10.00	0.0	-1.13	0.0	-11.3
Iceland	South Africa	Manufacture of rubber products	2.70	0.0	-1.03	0.0	-38.3
Iceland	South Africa	Manufacture of plastics products	5.79	0.0	-0.99	0.0	-17.1
Iceland	South Africa	Manufacture of glass and glass products	5.00	0.0	-1.01	0.0	-20.1
Iceland	South Africa	Manufacture of basic iron and steel	0.00	0.0	-1.01		
Iceland	Thailand	Manufacture of paper and paper products	3.63	0.1	-1.13	0.0	-31.0
Iceland	Thailand	Manufacture of basic chemicals	0.00	0.0	-1.02		
Iceland	Thailand	Manufacture of rubber products	6.07	0.1	-1.03	0.0	-17.0
Iceland	Thailand	Manufacture of plastics products	5.13	0.4	-0.99	-0.1	-19.3
Iceland	Thailand	Manufacture of glass and glass products	6.15	0.0	-1.01	0.0	-16.4
Iceland	Thailand	Manufacture of basic iron and steel	0.00	0.0	-1.01		
Iceland	Turkey	Manufacture of paper and paper products	4.63	0.1	-1.13	0.0	-24.3
Iceland	Turkey	Manufacture of basic chemicals	0.00	0.0	-1.02		
Iceland	Turkey	Manufacture of rubber products	4.40	0.5	-1.03	-0.1	-23.5
Iceland	Turkey	Manufacture of plastics products	4.63	0.2	-0.99	0.0	-21.3
Iceland	Turkey	Manufacture of glass and glass products	6.25	0.8	-1.01	-0.1	-16.1
Iceland	Turkey	Manufacture of basic iron and steel	0.00	0.4	-1.01		
Iceland	USA	Manufacture of paper and paper products	2.21	3.9	-1.13	-2.0	-50.9
Iceland	USA	Manufacture of basic chemicals	0.00	6.6	-1.02		
Iceland	USA	Manufacture of rubber products	3.80	9.8	-1.03	-2.7	-27.2
Iceland	USA	Manufacture of plastics products	4.19	5.6	-0.99	-1.3	-23.6
Iceland	USA	Manufacture of glass and glass products	3.75	0.7	-1.01	-0.2	-26.8
Iceland	USA	Manufacture of basic iron and steel	0.00	1.8	-1.01		
Japan	World	Manufacture of paper and paper products	0.04	3772.8	-2.27	-213901.2	-5669.6
Japan	World	Manufacture of basic chemicals	2.49	19384.4	-1.02	-7942.9	-41.0
Japan	World	Manufacture of rubber products	0.50	1688.0	-1.37	-4629.6	-274.3
Japan	World	Manufacture of plastics products	4.06	5435.7	-0.81	-1087.9	-20.0
Japan	World	Manufacture of glass and glass products	1.17	1787.3	-1.04	-1582.1	-88.5
Japan	World	Manufacture of basic iron and steel	0.28	7228.6	-1.00	-25828.4	-357.3
Japan	Argentina	Manufacture of paper and paper products	0.00	0.5	-2.27		
Japan	Argentina	Manufacture of basic chemicals	2.30	6.9	-1.02	-3.0	-44.4
Japan	Argentina	Manufacture of rubber products	0.00	0.0	-1.37		
Japan	Argentina	Manufacture of plastics products	4.07	3.0	-0.81	-0.6	-20.0

Japan	Argentina	Manufacture of glass and glass products	3.90	0.0	-1.04	0.0	-26.6
Japan	Argentina	Manufacture of basic iron and steel	0.63	0.9	-1.00	-1.5	-158.8
Japan	Brazil	Manufacture of paper and paper products	0.00	153.2	-2.27		
Japan	Brazil	Manufacture of basic chemicals	2.46	77.5	-1.02	-32.1	-41.5
Japan	Brazil	Manufacture of rubber products	0.13	3.2	-1.37	-33.5	-1054.9
Japan	Brazil	Manufacture of plastics products	3.74	0.7	-0.81	-0.2	-21.7
Japan	Brazil	Manufacture of glass and glass products	1.62	0.8	-1.04	-0.5	-63.9
Japan	Brazil	Manufacture of basic iron and steel	0.38	154.4	-1.00	-406.4	-263.3
Japan	Chile	Manufacture of paper and paper products	0.00	47.6	-2.27		
Japan	Chile	Manufacture of basic chemicals	1.47	146.0	-1.02	-101.3	-69.4
Japan	Chile	Manufacture of rubber products	0.00	0.0	-1.37		
Japan	Chile	Manufacture of plastics products	3.64	0.4	-0.81	-0.1	-22.3
Japan	Chile	Manufacture of basic iron and steel	3.30	24.7	-1.00	-7.5	-30.3
Japan	China	Manufacture of paper and paper products	0.06	537.9	-2.27	-20330.7	-3779.7
Japan	China	Manufacture of basic chemicals	2.56	2844.9	-1.02	-1133.9	-39.9
Japan	China	Manufacture of rubber products	0.51	327.2	-1.37	-879.7	-268.9
Japan	China	Manufacture of plastics products	4.10	2244.5	-0.81	-444.9	-19.8
Japan	China	Manufacture of glass and glass products	1.21	365.8	-1.04	-313.1	-85.6
Japan	China	Manufacture of basic iron and steel	0.31	1689.4	-1.00	-5452.3	-322.7
Japan	India	Manufacture of paper and paper products	0.00	0.4	-2.27		
Japan	India	Manufacture of basic chemicals	2.45	184.4	-1.02	-76.8	-41.6
Japan	India	Manufacture of rubber products	0.57	1.9	-1.37	-4.5	-240.6
Japan	India	Manufacture of plastics products	3.84	4.5	-0.81	-1.0	-21.2
Japan	India	Manufacture of glass and glass products	1.49	1.9	-1.04	-1.3	-69.5
Japan	India	Manufacture of basic iron and steel	0.29	74.3	-1.00	-256.5	-345.0
Japan	Indonesia	Manufacture of paper and paper products	0.00	407.3	-2.27		
Japan	Indonesia	Manufacture of basic chemicals	2.74	386.0	-1.02	-143.7	-37.2
Japan	Indonesia	Manufacture of rubber products	0.51	200.1	-1.37	-538.2	-268.9
Japan	Indonesia	Manufacture of plastics products	4.06	240.2	-0.81	-48.1	-20.0
Japan	Indonesia	Manufacture of glass and glass products	1.24	48.4	-1.04	-40.4	-83.5
Japan	Indonesia	Manufacture of basic iron and steel	0.21	35.9	-1.00	-171.0	-476.4
Japan	Israel	Manufacture of paper and paper products	0.00	1.4	-2.27		
Japan	Israel	Manufacture of basic chemicals	2.09	68.9	-1.02	-33.7	-48.8
Japan	Israel	Manufacture of rubber products	0.29	1.1	-1.37	-5.2	-472.9
Japan	Israel	Manufacture of plastics products	3.99	5.0	-0.81	-1.0	-20.4

Japan	Israel	Manufacture of glass and glass products	1.56	0.4	-1.04	-0.3	-66.4
Japan	Israel	Manufacture of basic iron and steel	0.00	1.0	-1.00		
Japan	South Korea	Manufacture of paper and paper products	0.08	209.8	-2.27	-5946.8	-2834.8
Japan	South Korea	Manufacture of basic chemicals	2.57	1502.4	-1.02	-596.5	-39.7
Japan	South Korea	Manufacture of rubber products	0.60	126.5	-1.37	-289.2	-228.6
Japan	South Korea	Manufacture of plastics products	4.11	532.6	-0.81	-105.3	-19.8
Japan	South Korea	Manufacture of glass and glass products	1.05	127.5	-1.04	-125.7	-98.6
Japan	South Korea	Manufacture of basic iron and steel	0.25	2249.8	-1.00	-9003.3	-400.2
Japan	Mexico	Manufacture of paper and paper products	0.00	2.6	-2.27		
Japan	Mexico	Manufacture of basic chemicals	2.52	34.8	-1.02	-14.1	-40.5
Japan	Mexico	Manufacture of rubber products	0.33	2.1	-1.37	-8.6	-415.6
Japan	Mexico	Manufacture of plastics products	3.78	5.1	-0.81	-1.1	-21.5
Japan	Mexico	Manufacture of glass and glass products	1.18	0.6	-1.04	-0.5	-87.8
Japan	Mexico	Manufacture of basic iron and steel	0.30	1.3	-1.00	-4.2	-333.5
Japan	Philippines	Manufacture of paper and paper products	0.00	24.4	-2.27		
Japan	Philippines	Manufacture of basic chemicals	2.74	26.2	-1.02	-9.8	-37.2
Japan	Philippines	Manufacture of rubber products	0.27	25.7	-1.37	-130.7	-507.9
Japan	Philippines	Manufacture of plastics products	4.02	142.6	-0.81	-28.8	-20.2
Japan	Philippines	Manufacture of glass and glass products	0.63	61.8	-1.04	-101.6	-164.4
Japan	Philippines	Manufacture of basic iron and steel	0.10	3.9	-1.00	-38.7	-1000.5
Japan	Russia	Manufacture of paper and paper products	0.00	28.2	-2.27		
Japan	Russia	Manufacture of basic chemicals	1.82	61.0	-1.02	-34.2	-56.1
Japan	Russia	Manufacture of rubber products	0.00	0.0	-1.37		
Japan	Russia	Manufacture of plastics products	3.94	0.1	-0.81	0.0	-20.6
Japan	Russia	Manufacture of glass and glass products	1.80	0.3	-1.04	-0.2	-57.5
Japan	Russia	Manufacture of basic iron and steel	1.03	183.4	-1.00	-178.1	-97.1
Japan	South Africa	Manufacture of paper and paper products	0.00	8.6	-2.27		
Japan	South Africa	Manufacture of basic chemicals	2.11	87.8	-1.02	-42.4	-48.4
Japan	South Africa	Manufacture of rubber products	0.88	0.9	-1.37	-1.3	-155.8
Japan	South Africa	Manufacture of plastics products	4.19	0.2	-0.81	0.0	-19.4
Japan	South Africa	Manufacture of glass and glass products	0.94	0.2	-1.04	-0.2	-110.2
Japan	South Africa	Manufacture of basic iron and steel	1.17	629.7	-1.00	-538.5	-85.5
Japan	Thailand	Manufacture of paper and paper products	0.00	35.9	-2.27		
Japan	Thailand	Manufacture of basic chemicals	3.00	400.0	-1.02	-136.0	-34.0
Japan	Thailand	Manufacture of rubber products	0.46	234.5	-1.37	-699.1	-298.1

Japan	Thailand	Manufacture of plastics products	4.10	262.6	-0.81	-52.0	-19.8
Japan	Thailand	Manufacture of glass and glass products	1.31	270.1	-1.04	-213.5	-79.1
Japan	Thailand	Manufacture of basic iron and steel	0.00	74.8	-1.00		
Japan	Turkey	Manufacture of paper and paper products	0.00	0.0	-2.27		
Japan	Turkey	Manufacture of basic chemicals	2.42	3.5	-1.02	-1.5	-42.2
Japan	Turkey	Manufacture of rubber products	0.28	7.7	-1.37	-37.7	-489.8
Japan	Turkey	Manufacture of plastics products	3.99	0.5	-0.81	-0.1	-20.4
Japan	Turkey	Manufacture of glass and glass products	2.65	3.2	-1.04	-1.2	-39.1
Japan	Turkey	Manufacture of basic iron and steel	0.00	0.4	-1.00		
Japan	USA	Manufacture of paper and paper products	0.05	1092.6	-2.27	-49554.3	-4535.7
Japan	USA	Manufacture of basic chemicals	2.56	4195.6	-1.02	-1672.2	-39.9
Japan	USA	Manufacture of rubber products	0.54	223.1	-1.37	-566.5	-254.0
Japan	USA	Manufacture of plastics products	4.06	658.2	-0.81	-131.7	-20.0
Japan	USA	Manufacture of glass and glass products	1.11	303.6	-1.04	-283.2	-93.3
Japan	USA	Manufacture of basic iron and steel	0.16	191.3	-1.00	-1195.9	-625.3
NZ	World	Manufacture of paper and paper products	0.06	656.5	-1.16	-12702.9	-1935.0
NZ	World	Manufacture of basic chemicals	0.28	1170.2	-1.02	-4268.1	-364.7
NZ	World	Manufacture of rubber products	4.13	256.0	-1.04	-64.3	-25.1
NZ	World	Manufacture of plastics products	6.23	547.4	-0.97	-85.4	-15.6
NZ	World	Manufacture of glass and glass products	1.63	161.4	-1.01	-99.6	-61.7
NZ	World	Manufacture of basic iron and steel	2.45	585.5	-1.01	-240.2	-41.0
NZ	Argentina	Manufacture of paper and paper products	0.00	0.4	-1.16		
NZ	Argentina	Manufacture of basic chemicals	0.21	0.6	-1.02	-2.9	-486.3
NZ	Argentina	Manufacture of rubber products	6.99	0.2	-1.04	0.0	-14.8
NZ	Argentina	Manufacture of plastics products	6.42	0.8	-0.97	-0.1	-15.1
NZ	Argentina	Manufacture of glass and glass products	7.00	0.0	-1.01	0.0	-14.4
NZ	Argentina	Manufacture of basic iron and steel	3.80	0.4	-1.01	-0.1	-26.5
NZ	Brazil	Manufacture of paper and paper products	0.44	0.5	-1.16	-1.4	-263.9
NZ	Brazil	Manufacture of basic chemicals	0.19	1.2	-1.02	-6.6	-537.5
NZ	Brazil	Manufacture of rubber products	5.83	0.8	-1.04	-0.1	-17.8
NZ	Brazil	Manufacture of plastics products	6.02	0.3	-0.97	-0.1	-16.1
NZ	Brazil	Manufacture of glass and glass products	1.96	0.4	-1.01	-0.2	-51.3
NZ	Brazil	Manufacture of basic iron and steel	4.08	0.5	-1.01	-0.1	-24.6
NZ	Chile	Manufacture of paper and paper products	0.00	0.0	-1.16		
NZ	Chile	Manufacture of basic chemicals	0.00	0.3	-1.02		

NZ	Chile	Manufacture of plastics products	5.72	0.8	-0.97	-0.1	-17.0
NZ	Chile	Manufacture of glass and glass products	0.00	0.0	-1.01		
NZ	Chile	Manufacture of basic iron and steel	6.50	0.2	-1.01	0.0	-15.5
NZ	China	Manufacture of paper and paper products	0.09	34.8	-1.16	-449.0	-1290.0
NZ	China	Manufacture of basic chemicals	0.25	69.4	-1.02	-283.5	-408.5
NZ	China	Manufacture of rubber products	4.03	21.9	-1.04	-5.6	-25.7
NZ	China	Manufacture of plastics products	6.26	79.7	-0.97	-12.4	-15.5
NZ	China	Manufacture of glass and glass products	1.68	31.7	-1.01	-19.0	-59.9
NZ	China	Manufacture of basic iron and steel	3.15	21.2	-1.01	-6.8	-31.9
NZ	India	Manufacture of paper and paper products	0.00	0.6	-1.16		
NZ	India	Manufacture of basic chemicals	0.32	6.7	-1.02	-21.3	-319.1
NZ	India	Manufacture of rubber products	4.19	3.1	-1.04	-0.8	-24.7
NZ	India	Manufacture of plastics products	6.28	2.8	-0.97	-0.4	-15.5
NZ	India	Manufacture of glass and glass products	2.57	2.1	-1.01	-0.8	-39.2
NZ	India	Manufacture of basic iron and steel	3.59	4.1	-1.01	-1.1	-28.0
NZ	Indonesia	Manufacture of paper and paper products	0.14	42.4	-1.16	-351.8	-829.3
NZ	Indonesia	Manufacture of basic chemicals	0.74	20.0	-1.02	-27.6	-138.0
NZ	Indonesia	Manufacture of rubber products	3.50	6.2	-1.04	-1.8	-29.6
NZ	Indonesia	Manufacture of plastics products	6.69	6.1	-0.97	-0.9	-14.5
NZ	Indonesia	Manufacture of glass and glass products	2.53	8.5	-1.01	-3.4	-39.8
NZ	Indonesia	Manufacture of basic iron and steel	4.28	3.2	-1.01	-0.8	-23.5
NZ	Israel	Manufacture of paper and paper products	0.00	0.0	-1.16		
NZ	Israel	Manufacture of basic chemicals	0.19	1.8	-1.02	-9.5	-537.5
NZ	Israel	Manufacture of rubber products	3.93	0.6	-1.04	-0.2	-26.4
NZ	Israel	Manufacture of plastics products	5.87	5.7	-0.97	-0.9	-16.6
NZ	Israel	Manufacture of glass and glass products	1.13	0.1	-1.01	-0.1	-89.0
NZ	Israel	Manufacture of basic iron and steel	3.48	0.1	-1.01	0.0	-28.9
NZ	South Korea	Manufacture of paper and paper products	0.14	20.8	-1.16	-172.3	-829.3
NZ	South Korea	Manufacture of basic chemicals	0.45	61.2	-1.02	-139.0	-226.9
NZ	South Korea	Manufacture of rubber products	4.36	15.9	-1.04	-3.8	-23.8
NZ	South Korea	Manufacture of plastics products	6.33	14.8	-0.97	-2.3	-15.4
NZ	South Korea	Manufacture of glass and glass products	2.80	1.3	-1.01	-0.5	-35.9
NZ	South Korea	Manufacture of basic iron and steel	3.12	71.0	-1.01	-22.9	-32.2
NZ	Mexico	Manufacture of paper and paper products	0.00	1.9	-1.16		
NZ	Mexico	Manufacture of basic chemicals	0.70	4.5	-1.02	-6.6	-145.9

NZ	Mexico	Manufacture of rubber products	5.06	0.3	-1.04	-0.1	-20.5
NZ	Mexico	Manufacture of plastics products	5.77	0.8	-0.97	-0.1	-16.8
NZ	Mexico	Manufacture of glass and glass products	3.05	0.2	-1.01	-0.1	-33.0
NZ	Mexico	Manufacture of basic iron and steel	5.00	0.0	-1.01	0.0	-20.1
NZ	Philippines	Manufacture of paper and paper products	0.00	0.7	-1.16		
NZ	Philippines	Manufacture of basic chemicals	0.65	4.1	-1.02	-6.4	-157.1
NZ	Philippines	Manufacture of rubber products	5.38	1.0	-1.04	-0.2	-19.3
NZ	Philippines	Manufacture of plastics products	6.40	0.6	-0.97	-0.1	-15.2
NZ	Philippines	Manufacture of glass and glass products	2.20	0.1	-1.01	0.0	-45.7
NZ	Philippines	Manufacture of basic iron and steel	0.00	0.0	-1.01		
NZ	Russia	Manufacture of paper and paper products	0.00	0.0	-1.16		
NZ	Russia	Manufacture of basic chemicals	0.28	11.0	-1.02	-40.2	-364.7
NZ	Russia	Manufacture of rubber products	5.28	0.1	-1.04	0.0	-19.6
NZ	Russia	Manufacture of plastics products	5.48	0.0	-0.97	0.0	-17.7
NZ	Russia	Manufacture of glass and glass products	1.09	0.0	-1.01	0.0	-92.3
NZ	Russia	Manufacture of basic iron and steel	4.00	4.3	-1.01	-1.1	-25.1
NZ	South Africa	Manufacture of paper and paper products	0.00	18.7	-1.16		
NZ	South Africa	Manufacture of basic chemicals	0.24	9.1	-1.02	-38.7	-425.5
NZ	South Africa	Manufacture of rubber products	4.48	1.5	-1.04	-0.4	-23.1
NZ	South Africa	Manufacture of plastics products	6.45	1.0	-0.97	-0.2	-15.1
NZ	South Africa	Manufacture of glass and glass products	3.20	0.3	-1.01	-0.1	-31.4
NZ	South Africa	Manufacture of basic iron and steel	2.06	6.5	-1.01	-3.2	-48.8
NZ	Thailand	Manufacture of paper and paper products	0.00	7.8	-1.16		
NZ	Thailand	Manufacture of basic chemicals	0.75	31.3	-1.02	-42.6	-136.2
NZ	Thailand	Manufacture of rubber products	4.14	11.3	-1.04	-2.8	-25.0
NZ	Thailand	Manufacture of plastics products	6.32	16.2	-0.97	-2.5	-15.4
NZ	Thailand	Manufacture of glass and glass products	2.60	9.5	-1.01	-3.7	-38.7
NZ	Thailand	Manufacture of basic iron and steel	3.15	15.2	-1.01	-4.8	-31.9
NZ	Turkey	Manufacture of paper and paper products	0.00	0.0	-1.16		
NZ	Turkey	Manufacture of basic chemicals	0.00	2.9	-1.02		
NZ	Turkey	Manufacture of rubber products	4.49	0.9	-1.04	-0.2	-23.1
NZ	Turkey	Manufacture of plastics products	5.87	0.6	-0.97	-0.1	-16.6
NZ	Turkey	Manufacture of glass and glass products	2.66	0.9	-1.01	-0.4	-37.8
NZ	Turkey	Manufacture of basic iron and steel	3.70	0.1	-1.01	0.0	-27.2
NZ	USA	Manufacture of paper and paper products	0.08	33.3	-1.16	-483.9	-1451.3

NZ	USA	Manufacture of basic chemicals	0.30	156.8	-1.02	-533.8	-340.4
NZ	USA	Manufacture of rubber products	4.29	23.8	-1.04	-5.8	-24.2
NZ	USA	Manufacture of plastics products	6.30	70.6	-0.97	-10.9	-15.4
NZ	USA	Manufacture of glass and glass products	1.72	7.6	-1.01	-4.4	-58.5
NZ	USA	Manufacture of basic iron and steel	2.65	13.2	-1.01	-5.0	-37.9
USA	World	Manufacture of paper and paper products	0.00	19940.8	-1.70		
USA	World	Manufacture of basic chemicals	2.79	68965.5	-1.02	-25139.8	-36.5
USA	World	Manufacture of rubber products	2.09	13166.5	-1.11	-7018.3	-53.3
USA	World	Manufacture of plastics products	4.24	21002.7	-0.92	-4557.7	-21.7
USA	World	Manufacture of glass and glass products	5.01	5278.4	-1.02	-1073.2	-20.3
USA	World	Manufacture of basic iron and steel	0.47	28631.8	-1.00	-61019.7	-213.1
USA	Argentina	Manufacture of paper and paper products	0.00	9.2	-1.70		
USA	Argentina	Manufacture of basic chemicals	2.75	269.9	-1.02	-99.8	-37.0
USA	Argentina	Manufacture of rubber products	2.66	26.3	-1.11	-11.0	-41.9
USA	Argentina	Manufacture of plastics products	4.05	19.1	-0.92	-4.3	-22.7
USA	Argentina	Manufacture of glass and glass products	5.72	7.6	-1.02	-1.4	-17.8
USA	Argentina	Manufacture of basic iron and steel	0.52	198.6	-1.00	-382.6	-192.6
USA	Brazil	Manufacture of paper and paper products	0.00	699.7	-1.70		
USA	Brazil	Manufacture of basic chemicals	3.16	917.9	-1.02	-295.4	-32.2
USA	Brazil	Manufacture of rubber products	2.13	254.3	-1.11	-133.0	-52.3
USA	Brazil	Manufacture of plastics products	4.07	101.1	-0.92	-22.9	-22.6
USA	Brazil	Manufacture of glass and glass products	6.34	35.1	-1.02	-5.6	-16.1
USA	Brazil	Manufacture of basic iron and steel	0.51	2659.8	-1.00	-5224.0	-196.4
USA	Chile	Manufacture of paper and paper products	0.00	34.2	-1.70		
USA	Chile	Manufacture of basic chemicals	2.08	309.7	-1.02	-151.4	-48.9
USA	Chile	Manufacture of rubber products	2.51	50.1	-1.11	-22.2	-44.4
USA	Chile	Manufacture of plastics products	4.14	17.8	-0.92	-4.0	-22.2
USA	Chile	Manufacture of glass and glass products	5.28	1.2	-1.02	-0.2	-19.3
USA	Chile	Manufacture of basic iron and steel	0.74	38.1	-1.00	-51.6	-135.4
USA	China	Manufacture of paper and paper products	0.00	1043.9	-1.70		
USA	China	Manufacture of basic chemicals	2.92	2632.3	-1.02	-916.8	-34.8
USA	China	Manufacture of rubber products	2.12	1930.3	-1.11	-1014.4	-52.5
USA	China	Manufacture of plastics products	4.19	6383.4	-0.92	-1401.8	-22.0
USA	China	Manufacture of glass and glass products	5.08	1058.4	-1.02	-212.2	-20.1
USA	China	Manufacture of basic iron and steel	0.51	2340.5	-1.00	-4596.9	-196.4

USA	India	Manufacture of paper and paper products	0.00	17.9	-1.70		
USA	India	Manufacture of basic chemicals	2.89	816.0	-1.02	-287.2	-35.2
USA	India	Manufacture of rubber products	2.08	120.3	-1.11	-64.4	-53.6
USA	India	Manufacture of plastics products	4.03	154.3	-0.92	-35.2	-22.8
USA	India	Manufacture of glass and glass products	5.63	47.4	-1.02	-8.6	-18.1
USA	India	Manufacture of basic iron and steel	0.51	710.1	-1.00	-1394.6	-196.4
USA	Indonesia	Manufacture of paper and paper products	0.00	125.9	-1.70		
USA	Indonesia	Manufacture of basic chemicals	3.04	212.2	-1.02	-71.0	-33.5
USA	Indonesia	Manufacture of rubber products	2.14	170.8	-1.11	-88.9	-52.1
USA	Indonesia	Manufacture of plastics products	4.33	138.1	-0.92	-29.3	-21.2
USA	Indonesia	Manufacture of glass and glass products	6.28	29.1	-1.02	-4.7	-16.2
USA	Indonesia	Manufacture of basic iron and steel	0.65	17.9	-1.00	-27.5	-154.1
USA	Israel	Manufacture of paper and paper products	0.00	16.3	-1.70		
USA	Israel	Manufacture of basic chemicals	2.80	414.8	-1.02	-150.7	-36.3
USA	Israel	Manufacture of rubber products	2.06	25.7	-1.11	-13.9	-54.1
USA	Israel	Manufacture of plastics products	4.12	232.9	-0.92	-52.0	-22.3
USA	Israel	Manufacture of glass and glass products	5.47	5.6	-1.02	-1.0	-18.6
USA	Israel	Manufacture of basic iron and steel	1.63	25.9	-1.00	-15.9	-61.5
USA	South Korea	Manufacture of paper and paper products	0.00	410.5	-1.70		
USA	South Korea	Manufacture of basic chemicals	3.00	1285.4	-1.02	-435.8	-33.9
USA	South Korea	Manufacture of rubber products	2.26	780.3	-1.11	-384.7	-49.3
USA	South Korea	Manufacture of plastics products	4.21	659.0	-0.92	-144.0	-21.9
USA	South Korea	Manufacture of glass and glass products	4.80	38.5	-1.02	-8.2	-21.2
USA	South Korea	Manufacture of basic iron and steel	0.45	1374.4	-1.00	-3059.2	-222.6
USA	Mexico	Manufacture of paper and paper products	0.00	653.6	-1.70		
USA	Mexico	Manufacture of basic chemicals	2.93	1857.8	-1.02	-644.8	-34.7
USA	Mexico	Manufacture of rubber products	2.29	800.2	-1.11	-389.3	-48.6
USA	Mexico	Manufacture of plastics products	4.26	1611.3	-0.92	-348.0	-21.6
USA	Mexico	Manufacture of glass and glass products	5.32	998.8	-1.02	-191.2	-19.1
USA	Mexico	Manufacture of basic iron and steel	0.42	2738.6	-1.00	-6531.3	-238.5
USA	Philippines	Manufacture of paper and paper products	0.00	8.4	-1.70		
USA	Philippines	Manufacture of basic chemicals	2.85	50.6	-1.02	-18.1	-35.7
USA	Philippines	Manufacture of rubber products	2.57	12.6	-1.11	-5.5	-43.3
USA	Philippines	Manufacture of plastics products	3.91	38.3	-0.92	-9.0	-23.5
USA	Philippines	Manufacture of glass and glass products	6.40	29.9	-1.02	-4.8	-15.9

USA	Philippines	Manufacture of basic iron and steel	3.92	26.8	-1.00	-6.9	-25.6
USA	Russia	Manufacture of paper and paper products	0.00	7.2	-1.70		
USA	Russia	Manufacture of basic chemicals	2.14	974.2	-1.02	-463.0	-47.5
USA	Russia	Manufacture of rubber products	1.04	2.9	-1.11	-3.2	-107.1
USA	Russia	Manufacture of plastics products	3.88	0.9	-0.92	-0.2	-23.7
USA	Russia	Manufacture of glass and glass products	6.36	2.3	-1.02	-0.4	-16.0
USA	Russia	Manufacture of basic iron and steel	0.41	1237.0	-1.00	-3022.1	-244.3
USA	South Africa	Manufacture of paper and paper products	0.00	46.7	-1.70		
USA	South Africa	Manufacture of basic chemicals	2.71	427.0	-1.02	-160.3	-37.5
USA	South Africa	Manufacture of rubber products	2.16	11.8	-1.11	-6.1	-51.6
USA	South Africa	Manufacture of plastics products	3.97	30.3	-0.92	-7.0	-23.2
USA	South Africa	Manufacture of glass and glass products	5.62	10.3	-1.02	-1.9	-18.1
USA	South Africa	Manufacture of basic iron and steel	0.63	549.4	-1.00	-873.5	-159.0
USA	Thailand	Manufacture of paper and paper products	0.00	36.5	-1.70		
USA	Thailand	Manufacture of basic chemicals	3.47	310.0	-1.02	-90.9	-29.3
USA	Thailand	Manufacture of rubber products	1.98	617.3	-1.11	-347.3	-56.3
USA	Thailand	Manufacture of plastics products	4.18	299.0	-0.92	-65.8	-22.0
USA	Thailand	Manufacture of glass and glass products	6.65	62.5	-1.02	-9.6	-15.3
USA	Thailand	Manufacture of basic iron and steel	0.90	189.7	-1.00	-211.1	-111.3
USA	Turkey	Manufacture of paper and paper products	0.00	4.9	-1.70		
USA	Turkey	Manufacture of basic chemicals	3.00	40.0	-1.02	-13.5	-33.9
USA	Turkey	Manufacture of rubber products	2.12	38.4	-1.11	-20.2	-52.5
USA	Turkey	Manufacture of plastics products	4.31	32.9	-0.92	-7.0	-21.3
USA	Turkey	Manufacture of glass and glass products	6.78	35.4	-1.02	-5.3	-15.0
USA	Turkey	Manufacture of basic iron and steel	0.26	622.8	-1.00	-2399.3	-385.3