The Economics of Trade Agreements & the design of Global Climate Accords

Frank D. Graham Memorial Lecture
Princeton University

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Dartmouth
April 19 2018
According to the ToT theory of international trade agreements:

- countries use trade agreements to internalize the international pecuniary (ToT) externalities imposed by their trade policies
- and thereby escape from a ToT driven Prisoners’ Dilemma (Johnson, 1953-54, Grossman and Helpman, 1995, Bagwell and Staiger, 1999)
According to the ToT theory of international trade agreements

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According to the Commitment theory

- countries use trade agreements to help their govs make policy commitments to their own private sectors (eg, limits to state aid)
- and thereby solve a domestic commitment problem (Staiger and Tabellini, 1987, Maggi and Rodriguez-Clare, 1998)
For global climate accords, a non-pecuniary international externality is the central problem to address (Barrett, 2003, Nordhaus, 2015)
Introduction

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- But there may also be elements of pecuniary (ToT) externalities
  - associated with competitiveness/carbon leakage impacts of unilateral policy intervention (Mattoo and Subramanian, 2013)
For global climate accords, a non-pecuniary international externality is the central problem to address (Barrett, 2003, Nordhaus, 2015). But there may also be elements of pecuniary (ToT) externalities associated with competitiveness/carbon leakage impacts of unilateral policy intervention (Mattoo and Subramanian, 2013). Plus elements of commitment issues as in the hold-up problem emphasized by Battaglini and Harstad (2016).
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- And there may be opportunities for linkage across trade and climate issues (Maggi, 2016)
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- And there may be opportunities for linkage across trade and climate issues (Maggi, 2016)

- I will focus here on the problems caused by international externalities
  - and how agreements can be designed to address them
What can the Economics of Trade Agreements teach us about the design of Climate Accords?
Introduction

What can the Economics of Trade Agreements teach us about the design of Climate Accords?

In answering this question, I will touch on the following issues:

- participation
- workable externality mitigating strategies
- border tax adjustments
- enforcement linkage
- participation linkage
- negotiation linkage
An international agreement must generate Pareto gains for the member governments relative to Nash.
Designing an international agreement

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- To inform the design of the agreement, identify the source of the Pareto gains.
Designing an international agreement

- An international agreement must generate Pareto gains for the member governments relative to Nash.

- To inform the design of the agreement, identify the source of the Pareto gains.

- In the case of agreements to address an international externality:
  - Pareto gains could come from altering the level of the international externality variable.
  - Pareto gains could come from altering own policies away from unilateral best-response.
### A taxonomy

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The source of gains from a trade agreement

- ToT theory provides simple framework within which to interpret the source of gains from a trade agreement

- Two-good two-country competitive general equilibrium trade model

- Govs use tariffs $\tau$ and $\tau^*$ to serve objectives

$$W(p(\tau, \tilde{p}^w), \tilde{p}^w) \text{ and } W^*(p^*(\tau^*, \tilde{p}^w), \tilde{p}^w)$$

- satisfying $W_{\tilde{p}w} < 0 < W^*_{\tilde{p}w}$

- $\implies$ govs would like to move the international externality variable in opposite directions
The source of gains from a trade agreement

- Nash tariffs satisfy
\[
W_p \frac{dp}{d\tau} + W_{\tilde{p}^w} \frac{\partial \tilde{p}^w}{d\tau} = 0; \quad W_p^* \frac{dp^*}{d\tau^*} + W_{\tilde{p}^w}^* \frac{\partial \tilde{p}^w}{d\tau^*} = 0
\]

\(\implies W_p < 0 < W_p^*\) at Nash tariff choices

- Pareto gains can be achieved by \textit{freezing} the level of the international externality variable
  - with \(\tilde{p}^w (-, +)\), gains then come from the reduction in domestic distortions that result from own liberalization

- Changes in the level of the international externality variable cannot generate Pareto gains
  - reflects the international redistribution associated with \(\tilde{p}^w\) movements
### The structure of Trade Agreements

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<td>Trade Agreement</td>
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- Pareto gains from altering own policies
- Pareto gains from altering the international externality variable

Staiger (Dartmouth)
The source of gains from a climate accord

- A pair of two-good competitive general equilibrium closed economies
- Govs use taxes $t$ and $t^*$ to serve objectives

$$W(q(t), p(t), C(t) + C^*(t^*)) \text{ and } W^*(q^*(t^*), p^*(t^*), C(t) + C^*(t^*))$$

- satisfying $W[C+C^*] < 0$ and $W^*[C+C^*] < 0$; $\frac{dC}{dt} < 0$ and $\frac{dC^*}{dt^*} < 0$
- $\implies$ govs would like to move the international externality variable in the same direction
The source of gains from a climate accord

- Nash taxes satisfy $\frac{dW}{dt} = 0$ and $\frac{dW^*}{dt^*} = 0 \implies$

$$\frac{d[W + W^*]}{dt} = \frac{dW^*}{dt} = W^*[C + C^*] \frac{dC}{dt} > 0$$

$$\frac{d[W + W^*]}{dt^*} = \frac{dW}{dt^*} = W[C + C^*] \frac{dC^*}{dt^*} > 0$$

at Nash tax choices

- Pareto gains come from \textit{altering} the level of the international externality variable
  - reducing global carbon output $C + C^*$

- In the absence of international transfers, no Pareto gains possible from determining which countries alter their policies
  - who undertakes the costly carbon mitigation to reduce $C(t) + C^*(t^*)$
The structure of Climate Accords

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## The structure of Trade Agreements and Climate Accords

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The source of Pareto gains from a trade agreement: changes in own policies

The source of Pareto gains from a climate accord: changes in the level of the international externality variable
Implication

- The goal of a trade agreement
  - *eliminate the influence* of movements in the international externality variable on policy choices
  - an environment that freezes the level of the international externality variable when a country makes its policy choices can achieve this goal
Implication

- The goal of a trade agreement
  - *eliminate the influence* of movements in the international externality variable on policy choices
  - an environment that freezes the level of the international externality variable when a country makes its policy choices can achieve this goal

- The goal of a climate accord
  - policy choices that *internalize the full impact* of movements in the international externality variable
  - an environment that freezes the international externality variable when a country makes its policy choices cannot achieve this goal
Participation

- Why is securing participation a key challenge in global climate accords but less so for trade agreements?
Why is securing participation a key challenge in global climate accords but less so for trade agreements?

Often observed that this is so because tariff discrimination allows non-members to be excluded from the trade liberalization of members

- hence trade liberalization is not a public good
Participation

- Why is securing participation a key challenge in global climate accords but less so for trade agreements?

- Often observed that this is so because tariff discrimination allows non-members to be excluded from the trade liberalization of members hence trade liberalization is not a public good

- But even in the absence of tariff discrimination, non-members can at most enjoy only \textit{incidental} benefits from a trade agreement

\[ W^*(p^*(\tau^*, \tilde{p}_w^*), \tilde{p}_w^*) \]

versus

\[ W^*(q^*(t^*), p^*(t^*), C(t) + C^*(t^*) + C^*(t^*)) \]
Remaining questions

- How does the GATT/WTO architecture work to eliminate the influence of movements in $\tilde{p}^w$ on policy choices?

- How does the GATT/WTO architecture work when there is both a trade and a climate problem to solve?
The GATT/WTO architecture

- The two pillars of the GATT/WTO architecture
  - Non-discrimination (MFN)
  - Reciprocity

- How does the GATT/WTO architecture work to eliminate the influence of movements in $\tilde{\rho}^w$ on policy choices?
The GATT/WTO architecture

- The two pillars of the GATT/WTO architecture
  - Non-discrimination (MFN)
  - Reciprocity

- How does the GATT/WTO architecture work to eliminate the influence of movements in $\tilde{p}^w$ on policy choices?

- MFN
  - in a multi-country world, MFN keeps the trade policy externality running through $\tilde{p}^w$, as simple as in a 2-country world
The GATT/WTO architecture

- The two pillars of the GATT/WTO architecture
  - Non-discrimination (MFN)
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- How does the GATT/WTO architecture work to eliminate the influence of movements in $\tilde{p}^w$ on policy choices?

- MFN
  - in a multi-country world, MFN keeps the trade policy externality running through $\tilde{p}^w$, as simple as in a 2-country world

- Reciprocity
  - defines a measured, *proportionate response* to a country’s trade policy changes by its trading partners; can be interpreted as freezing $\tilde{p}^w$
  - a change in trade policies from $(\tau^0, \tau^*)$ to $(\tau^1, \tau^*)$ satisfies the principle of reciprocity iff it offers a balance of concessions in that $\tilde{p}^w(0)[M(1) - M(0)] = E(1) - E(0)$
A closed economy
The GATT/WTO solution to the trade agreement problem

- A closed economy

![Graph showing consumer surplus, supply (Sa), demand (Da), and equilibrium price (P0)].
The GATT/WTO solution to the trade agreement problem

- A closed economy

![Diagram showing consumer and producer surplus in a closed economy setting.](image)
A small open economy

- A small open economy
A small open economy

- A small open economy

Diagram:

- Price (P)
- Quantity (Q)
- Demand (D)
- Supply (S)
- Consumer surplus
- Exports (E)
- Imports (M)
- Tradable productivity (PFT)

Notes:

- A small country's policy choices impose no externalities on the world.
- Policy choices are internationally efficient in a world of small countries, given national government objectives.
- Nothing for a trade agreement to do!
A small open economy

- A small open economy

[Diagram showing supply (S^a) and demand (D^a) curves with producer surplus (S^a D^a).]
A small open economy

- A small open economy

\[ \text{Diagram showing gains from trade} \]

\[ \text{Diagram showing gains from trade} \]
A small country’s unilateral tariff choice

- A small country’s unilateral tariff choice
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Loss of consumer surplus
A small country’s unilateral tariff choice

- A *small country’s* unilateral tariff choice

![Graph depicting gain in producer surplus](image-url)
A small country’s unilateral tariff choice

- A *small country’s* unilateral tariff choice

![Diagram](image)

gov’s valuation of shifting surplus from consumers to producers
A small country’s unilateral tariff choice

- A small country’s unilateral tariff choice

Diagram showing the relationship between price ($P^a$) and quantity ($Q^a$) with different levels of tariff ($t^a$) and externalities ($S^a$). The tariff revenue is indicated by the shaded area between the demand curve ($D^a$) and the supply curve ($S^a$) at the tariff level ($p^a_1$).
A small country’s unilateral tariff choice

- A small country’s unilateral tariff choice

![Diagram showing the government's valuation of converting consumer surplus to tariff revenue.]

gov’s valuation of converting consumer surplus to tariff revenue
A small country’s unilateral tariff choice

- A *small country’s* unilateral tariff choice

![Diagram showing deadweight loss](image)
A small country’s unilateral tariff choice

- A *small country’s* unilateral tariff choice

![Diagram of trade and tariff effects](image)
A small country’s unilateral tariff choice

- A small country’s unilateral tariff choice

![Diagram showing tariff choice and its effects](image)

- Benefits from redistributing surplus
- Lost gains from trade
- Marginal cost of the tariff
- Marginal benefit of the tariff
- Small country tariff choice
A small country’s unilateral tariff choice

- A *small country’s* unilateral tariff choice

  ![Graph](A small country’s unilateral tariff choice)

  - A *small country’s* policy choices impose no externalities on the world
  - ⇒ Policy choices are *internationally efficient* in a world of small countries, given national government objectives
  - No international inefficiency, nothing for a trade agreement to do!
A large country's unilateral tariff choice

- A large country's unilateral tariff choice (recall small country)

A mutually beneficial member-driven trade agreement possible!
A large country’s unilateral tariff choice

- A large country’s unilateral tariff choice

![Graph showing the impact of tariff choices on market equilibrium and welfare](attachment:graph.png)
A large country’s unilateral tariff choice

- A large country’s unilateral tariff choice

![Graph showing the effects of a large country's unilateral tariff choice]

- Tariffs imposed by large countries impose negative externalities on the world.
- Tariff choices are internationally inefficient (too high) in a world with large countries, given national government objectives.
- A mutually beneficial, member-driven trade agreement is possible!
A large country’s unilateral tariff choice

- A large country’s unilateral tariff choice

- A large country's unilateral tariff choice impose negative externalities on the world. Tariff choices are internationally inefficient (too high) in a world with large countries, given national government objectives. Address the inefficiency, and a mutually beneficial agreement possible!
A large country’s unilateral tariff choice

- A large country’s unilateral tariff choice

A large country’s tariffs impose negative externalities on the world

⇒ Tariff choices are *internationally inefficient* (too high) in a world with large countries, given national government objectives

Address the inefficiency, and a mutually beneficial agreement possible!
Reciprocity

Recall a large country’s unilateral tariff choice
Unilateral tariff choice in the presence of reciprocity

- A measured, *proportionate response* by its trading partner

![Diagram showing economic analysis related to tariff choices and reciprocity](image)

- Tariff revenue collected from domestic exporters
Unilateral tariff choice in the presence of reciprocity

- A measured, *proportionate response* by its trading partner.

- The large country faces the trade-offs of a small country.

- Legitimacy: A multilateral trade institution built on the pillars of MFN and reciprocity should work well to help governments solve the fundamental trade agreement problem.

![Diagram showing tariff revenue collected from domestic exporters.](image-url)
NYTimes March 2 2018

Trump’s Tariffs Prompt Global Threats of Retaliation

... The European Union detailed a three-step plan to penalize $3.5 billion of American trade — the same amount of European steel and aluminum the bloc estimates would be harmed by the planned tariffs. It proposed taxing American exports including bourbon, bluejeans, orange juice, cranberries, rice and motorcycles. The European Union could then ... bring a case against the United States at the World Trade Organization.

A European Union official said that the bloc had been preparing for the announcement for months and that everything was in place for a swift, proportionate response. ...
Unilateral tariff choice in the presence of reciprocity

- A proportionate response by its trading partners

The large country faces the trade-offs of a small country

- Like a small country, it cannot reduce the costs to its citizens of its tariff choice by shifting some of those costs onto foreign companies
  - nothing left for a trade agreement to do!

Staiger (Dartmouth)
This is how the GATT/WTO system works to avoid a trade war

The Organization’s control over countermeasures of this kind enables it to keep such measures within reasonable limits: to allow countermeasures commensurate with the action which occasions them; and to hold in check emotional reactions which might result in punitive measures by countries injured against the country responsible for the injury. The control over countermeasures is a check on the development of trade wars. (US Council of the ICC, 1955)
What keeps countries operating within this rules-based system?

- the off-equilibrium threat of an all-out trade war
What keeps countries operating within this rules-based system?
  
  - the off-equilibrium threat of an all-out trade war

What might the beginning of a trade war look like?

Escalating Trade Fight, Trump Threatens Higher Taxes on European Cars

By EMILY COCHRANE New York Times MARCH 3, 2018

WASHINGTON — President Trump warned on Saturday that he would apply higher taxes on imported European cars if the European Union carried through on its threat to retaliate against his proposed stiff new tariffs on steel and aluminum.

“If the E.U. wants to further increase their already massive tariffs and barriers on U.S. companies doing business there, we will simply apply a Tax on their Cars which freely pour into the U.S.,” Mr. Trump wrote on Twitter from Florida, where he was spending part of the weekend. “They make it impossible for our cars (and more) to sell there. Big trade imbalance!”
How does the GATT/WTO architecture work when there is both a trade and a climate problem to solve?
The GATT/WTO in a world of trade and climate problems

- How does the GATT/WTO architecture work when there is both a trade and a climate problem to solve?
- A partial equilibrium model of trade in aluminum, the production of which is carbon-intensive
- $N$ the population of importing country H, H gov policies $\tau$ and $t$
- $N^*$ the population of exporting country F, F gov policies $\tau^*$ and $t^*$

Welfare $W = CS + \lambda PS + REV \theta N [s(q) + s(q)]$
The GATT/WTO in a world of trade and climate problems

- How does the GATT/WTO architecture work when there is both a trade and a climate problem to solve?

- A partial equilibrium model of trade in aluminum, the production of which is carbon-intensive

- \( N \) the population of importing country H, H gov policies \( \tau \) and \( t \)

- \( N^* \) the population of exporting country F, F gov policies \( \tau^* \) and \( t^* \)

- Welfare

\[
W = CS + \lambda \cdot PS + REV - \theta N \cdot [s(q) + s^*(q^*)]
\]

\[
W^* = CS^* + \lambda^* \cdot PS^* + REV^* - \theta N^* \cdot [s(q) + s^*(q^*)]
\]

- political economy weights \( \lambda \) for the H gov, \( \lambda^* \) for the F gov

- \( \theta \) the damage to per-capita welfare from another unit of carbon output
Trade problem but no climate problem

- No climate problem: $\theta = 0$
Trade problem but no climate problem

- No climate problem: $\theta = 0$
- Efficient policies

$$\bar{\tau}^E \equiv \tau^E + \tau^{*E} = 0$$

$$t^E = -(\lambda - 1) \frac{1}{\eta_s}; \quad t^{*E} = -(\lambda^* - 1) \frac{1}{\eta_{s^*}}$$
Trade problem but no climate problem

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$$t^E = -(\lambda - 1) \frac{1}{\eta_s}; \quad t^{*E} = -(\lambda^* - 1) \frac{1}{\eta_{s^*}}$$

- Nash policies

$$\tau^N = \frac{1}{\eta_{e^*}}; \quad \tau^{*N} = \frac{1}{\eta_m}$$

$$t^N = -(\lambda - 1) \frac{1}{\eta_s}; \quad t^{*N} = -(\lambda^* - 1) \frac{1}{\eta_{s^*}}$$
Trade problem but no climate problem

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- Nash policies

$$\tau^N = \frac{1}{\eta_{e^{*}}}; \quad \tau^{*N} = \frac{1}{\eta_{m}}$$

$$t^N = - (\lambda - 1) \frac{1}{\eta_s}; \quad t^{*N} = - (\lambda^* - 1) \frac{1}{\eta_{s^{*}}};$$

- The nature of Nash inefficiencies when $\theta = 0$

Tariffs too high : $\tau^N + \tau^{*N} = \frac{1}{\eta_{e^{*}}} + \frac{1}{\eta_{m}} > 0 = \bar{\tau}^E$

Taxes set efficiently : $t^N = t^E; \quad t^{*N} = t^{*E}$
Efficient tariffs & taxes with shallow-integration reciprocity

- Position tariffs at the efficient levels
  \[ \tau^E = 0; \quad \tau^{*E} = 0 \]
Efficient tariffs & taxes with shallow-integration reciprocity

- Position tariffs at the efficient levels
  \[ \tau^E = 0; \quad \tau^*E = 0 \]

- No other preferred tariff with reciprocal response of trading partner
  - evaluated at \( \tau^E \) and \( t^E \)
    \[ \frac{dW}{d\tau} + \frac{dW}{d\tau^*} \frac{d\tau^*}{d\tau} \bigg|_{d\tilde{P}^w=0} = 0 \]
- Position tariffs at the efficient levels
  \[ \tau^E = 0; \quad \tau^*E = 0 \]

- No other preferred tariff with reciprocal response of trading partner evaluated at \( \tau^E \) and \( t^E \)
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- Will taxes remain at Nash-efficient levels?
  \[ t^E = -(\lambda - 1) \frac{1}{\eta_s}; \quad t^{*E} = -(\lambda^* - 1) \frac{1}{\eta_{s^*}} \]
Position tariffs at the efficient levels
\[ \tau^E = 0; \quad \tau^*E = 0 \]

No other preferred tariff with reciprocal response of trading partner
- evaluated at \( \tau^E \) and \( t^E \)

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\frac{dW}{d\tau} + \frac{dW}{d\tau^*} \frac{d\tau^*}{d\tau} \bigg|_{d\tilde{p}^w=0} = 0
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Will taxes remain at Nash-efficient levels?
\[ t^E = -(\lambda - 1) \frac{1}{\eta_s}; \quad t^*E = -(\lambda^* - 1) \frac{1}{\eta_{s^*}} \]

No other preferred tax with reciprocal response of trading partner
- evaluated at \( \tau^E \) and \( t^E \)

\[
\frac{dW}{dt} + \frac{dW}{d\tau^*} \frac{d\tau^*}{dt} \bigg|_{d\tilde{p}^w=0} = 0
\]
Climate problem: $\theta > 0$
Climate problem: $\theta > 0$

Efficient policies:

\[
\tilde{\tau}^E \equiv \tau^E + \tau^{*E} = 0
\]

\[
t^E = -(\lambda - 1) \frac{1}{\eta_s} + (N + N^*) \frac{\theta}{q}
\]

\[
t^{*E} = -(\lambda^* - 1) \frac{1}{\eta_{s^*}} + (N + N^*) \frac{\theta}{q^*}
\]
Trade problem and climate problem

- Climate problem: $\theta > 0$

- Efficient policies

$$\bar{\tau}^E \equiv \tau^E + \tau^{*E} = 0$$

$$t^E = - (\lambda - 1) \frac{1}{\eta_s} + (N + N^*) \frac{\theta}{q}$$

$$t^{*E} = - (\lambda^* - 1) \frac{1}{\eta_s^*} + (N + N^*) \frac{\theta}{q^*}$$

- Nash policies

$$\tau^N = \left[ \frac{s^* \times \eta_s^*}{e^* \times \eta_e^*} \right] \times N \frac{\theta}{q^*} + \frac{1}{\eta_e^*}; \quad \tau^{*N} = - \left[ \frac{s \times \eta_s}{m \times \eta_m} \right] \times N^* \frac{\theta}{q} + \frac{1}{\eta_m}$$

$$t^N = - (\lambda - 1) \frac{1}{\eta_s} + N \frac{\theta}{q}; \quad t^{*N} = - (\lambda^* - 1) \frac{1}{\eta_s^*} + N^* \frac{\theta}{q^*}$$
Trade problem and climate problem

- The nature of Nash inefficiencies when $\theta > 0$

\[ N_tE = N_\theta q_t \]

Conditional on Nash carbon taxes, tariffs too high, reflecting international pecuniary externality (trade problem)

\[ \bar{\tau}_N \bar{\tau}_E(t_N, t_N) = 1 + \eta e + 1 \eta m \]
The nature of Nash inefficiencies when $\theta > 0$

Carbon taxes too low, reflecting international non-pecuniary externality (climate problem)

\[ t^N - t^E = -N^* \frac{\theta}{q} \]

\[ t^{*N} - t^{*E} = N \frac{\theta}{q^*} \]
The nature of Nash inefficiencies when $\theta > 0$

Carbon taxes too low, reflecting international non-pecuniary externality (climate problem)

$$t^N - t^E = -N^* \frac{\theta}{q}$$

$$t^*N - t^*E = N \frac{\theta}{q^*}$$

Conditional on Nash carbon taxes, tariffs too high, reflecting international pecuniary externality (trade problem)

$$\bar{\pi}^N - \bar{\pi}^E(t^N, t^*N) = \frac{1}{\eta_e^*} + \frac{1}{\eta_m}$$
Efficient tariffs with shallow-integration reciprocity

- Nash carbon taxes and efficient tariffs conditional on Nash carbon taxes can be implemented with shallow-integration reciprocity.
Efficient tariffs with shallow-integration reciprocity

- Nash carbon taxes and efficient tariffs conditional on Nash carbon taxes can be implemented with shallow-integration reciprocity

- Position tariffs at the efficient levels given Nash carbon taxes

\[
\tau^E(t^N) = \left[ \frac{s^* \times \eta_{s^*}}{e^* \times \eta_{e^*}} \right] \times N \frac{\theta}{q^*}; \quad \tau^{*E}(t^{*N}) = -\left[ \frac{s \times \eta_s}{m \times \eta_m} \right] \times N^* \frac{\theta}{q}
\]
Efficient tariffs with shallow-integration reciprocity

- Nash carbon taxes and efficient tariffs conditional on Nash carbon taxes can be implemented with shallow-integration reciprocity

- Position tariffs at the efficient levels given Nash carbon taxes

\[ \tau^E(t^N) = \left[ \frac{s^* \times \eta_{s^*}}{e^* \times \eta_{e^*}} \right] \times N \frac{\theta}{q^*}; \quad \tau^*E(t^*N) = - \left[ \frac{s \times \eta_s}{m \times \eta_m} \right] \times N^* \frac{\theta}{q} \]

- No other preferred tariff with reciprocal response of trading partner

  - evaluated at \( \tau^E(t^N) \) and \( t^N \)

\[ \frac{dW}{d\tau} + \frac{dW}{d\tau^*} \frac{d\tau^*}{d\tau} \bigg|_{d\tilde{p}^w=0} = 0 \]
Efficient tariffs with shallow-integration reciprocity

- Will carbon taxes remain at Nash levels?

\[ t^N = - (\lambda - 1) \frac{1}{\eta_s} + N \frac{\theta}{q}; \quad t^{*N} = - (\lambda^* - 1) \frac{1}{\eta_{s^*}} + N^* \frac{\theta}{q^*} \]
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\]

- No other preferred tax with reciprocal response of trading partner
  - evaluated at \( \tau^E(t^N) \) and \( t^N \)
  \[
  \frac{dW}{dt} + \frac{dW}{d\tau^*} \frac{d\tau^*}{dt} \bigg|_{d\bar{p}^w = 0} = 0
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    \]

- \( \Rightarrow \) Nature of remaining inefficiencies under GATT/WTO when \( \theta > 0 \)
  - carbon taxes inefficient, but only due to international non-pecuniary externality
    \[
    t^N - t^E = - N^* \frac{\theta}{q}; \quad t^*N - t^*E = N \frac{\theta}{q^*}
    \]
When $\theta > 0$, the GATT/WTO shallow-integration reciprocity approach leaves carbon taxes at inefficiently low levels.
• When $\theta > 0$, the GATT/WTO shallow-integration reciprocity approach leaves carbon taxes at inefficiently low levels

• Suppose an enforceable climate accord raises carbon taxes to their efficient levels

$$t^E = -(\lambda - 1) \frac{1}{\eta_s} + (N + N^*) \frac{\theta}{q}; \quad t^{*E} = -(\lambda^* - 1) \frac{1}{\eta_{s*}} + (N + N^*) \frac{\theta}{q^*}$$
Border tax adjustments

- When \( \theta > 0 \), the GATT/WTO shallow-integration reciprocity approach leaves carbon taxes at inefficiently low levels.

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  t^E = -\left(\lambda - 1\right) \frac{1}{\eta_s} + (N + N^*) \frac{\theta}{q}; \quad t^{*E} = -\left(\lambda^* - 1\right) \frac{1}{\eta_{s^*}} + (N + N^*) \frac{\theta}{q^*}
  \]

- Could the GATT/WTO approach deliver efficient tariffs (conditional on the efficient carbon taxes)?
Border tax adjustments

- Yes, but only if H’s import tariff rises with its higher carbon tax (BTA)

\[
\tau^E(t^N) = \left[ \frac{s^* \times \eta_s^*}{e^* \times \eta_e^*} \right] \times N \frac{\theta}{q^*} \\
\tau^E(t^E) = \left[ \frac{s^* \times \eta_s^*}{e^* \times \eta_e^*} \right] \times N \frac{\theta}{q^*} + \left[ \frac{s \times \eta_s}{m \times \eta_m} \right] \times N^* \frac{\theta}{q}
\]
Border tax adjustments

- Yes, but only if H’s import tariff rises with its higher carbon tax (BTA)

\[
\begin{align*}
\text{from } \tau^E(t^N) &= \left[ \frac{s^* \times \eta_s^*}{e^* \times \eta_e^*} \right] \times N \frac{\theta}{q^*} \\
\text{to } \tau^E(t^E) &= \left[ \frac{s^* \times \eta_s^*}{e^* \times \eta_e^*} \right] \times N \frac{\theta}{q^*} + \left[ \frac{s \times \eta_s}{m \times \eta_m} \right] \times N^* \frac{\theta}{q}
\end{align*}
\]

- and F’s export subsidy rises with its higher carbon tax (BTA)

\[
\begin{align*}
\text{from } \tau^{*E}(t^{*N}) &= - \left[ \frac{s \times \eta_s}{m \times \eta_m} \right] \times N^* \frac{\theta}{q} \\
\text{to } \tau^{*E}(t^{*E}) &= - \left[ \frac{s \times \eta_s}{m \times \eta_m} \right] \times N^* \frac{\theta}{q} - \left[ \frac{s^* \times \eta_s^*}{e^* \times \eta_e^*} \right] \times N \frac{\theta}{q^*}
\end{align*}
\]
With the climate accord implementing efficient carbon taxes $t^E$ and $t^{*E}$, position tariffs at the efficient levels

$$
\tau^E(t^E) = \left[ \frac{s^* \times \eta_{s^*}}{e^* \times \eta_{e^*}} \right] \times N^* \frac{\theta}{q^*} + \left[ \frac{s \times \eta_s}{m \times \eta_m} \right] \times N \frac{\theta}{q}
$$

$$
\tau^{*E}(t^{*E}) = -\left[ \frac{s \times \eta_s}{m \times \eta_m} \right] \times N^* \frac{\theta}{q} - \left[ \frac{s^* \times \eta_{s^*}}{e^* \times \eta_{e^*}} \right] \times N \frac{\theta}{q^*}
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Border tax adjustments

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  - evaluated at $\tau^E$ and $t^E$

$$
\frac{dW}{d\tau} + \frac{dW}{d\tau^*} \frac{d\tau^*}{d\tau} \bigg|_{d\tilde{p}^w=0} = 0
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$$

$$
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\frac{dW}{d\tau} + \frac{dW \; d\tau^*}{d\tau} \bigg|_{d\tilde{p}^w=0} = 0
$$

- $\Rightarrow$ The implied BTA is \textit{not} based on carbon content of imports

  - “market access” preserving: each country adjusts its tariff to neutralize the competitive effect of its higher carbon tax and leave $\tilde{p}^w$ unchanged
Suppose a climate accord raises carbon taxes to their efficient levels

\[ t^E = - (\lambda - 1) \frac{1}{\eta_s} + (N + N^*) \frac{\theta}{q}; \quad t^{*E} = - (\lambda^* - 1) \frac{1}{\eta_{s^*}} + (N + N^*) \frac{\theta}{q^*} \]

but enforcement is left to the WTO
Enforcement linkage

- Suppose a climate accord raises carbon taxes to their efficient levels

\[
E^t = -(\lambda - 1) \frac{1}{\eta_s} + (N + N^*) \frac{\theta}{\eta_s}; \quad E^{t*} = -(\lambda^* - 1) \frac{1}{\eta_s^*} + (N + N^*) \frac{\theta}{\eta_s^*}
\]

- but enforcement is left to the WTO

- Could efficient carbon taxes be secured under the GATT/WTO reciprocity norm?
Suppose a climate accord raises carbon taxes to their efficient levels:

\[ t^E = - (\lambda - 1) \frac{1}{\eta_s} + (N + N^*) \frac{\theta}{q}; \quad t^*E = - (\lambda^* - 1) \frac{1}{\eta_{s^*}} + (N + N^*) \frac{\theta}{q^*} \]

but enforcement is left to the WTO.

Could efficient carbon taxes be secured under the GATT/WTO reciprocity norm?

No: evaluated at \( \tau^E \) and \( t^E \)

\[ \frac{dW}{dt} + \frac{dW}{d\tau^*} \frac{d\tau^*}{dt} \bigg|_{d\tilde{p}^w=0} < 0 \]

H would prefer to reduce its carbon tax below the efficient level and accept reciprocal tariff retaliation from F.
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WTO enforcement of efficient carbon taxes requires more severe tariff retaliation than implied by the GATT/WTO reciprocity norm
To address free-riding on the carbon taxes of others, the Climate Club proposal of Nordhaus (2015) envisions adding a set of “climate amendments” to the WTO that would...

...“explicitly allow uniform tariffs on nonparticipants within the confines of a climate treaty; it would also prohibit retaliation against countries who invoke the mechanism.”
Participation linkage

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  - but not all GATT members saw it in their interest to create the WTO

- To implement the Climate Club proposal, could mimic the strategy used in creating the WTO
  - the major players could formally withdraw from the WTO and enter a new treaty creating the Green WTO
Participation and enforcement linkage

Suppose the Green WTO were created with

- no change to the WTO beyond the climate amendments envisioned by Nordhaus
- no external enforcement mechanism for carbon tax commitments beyond that implied under the GATT/WTO reciprocity norm
- universal participation
Participation and enforcement linkage

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  - no change to the WTO beyond the climate amendments envisioned by Nordhaus
  - no external enforcement mechanism for carbon tax commitments beyond that implied under the GATT/WTO reciprocity norm
  - universal participation

- What would this accomplish?
Participation and enforcement linkage

- Within the Green WTO
  - H solves
    \[
    \frac{dW}{d\tau} + \frac{dW}{d\tau^*} \frac{d\tau^*}{d\tau} \Big|_{\tilde{p}^w=0} = 0; \quad \frac{dW}{dt} + \frac{dW}{d\tau^*} \frac{d\tau^*}{dt} \Big|_{\tilde{p}^w=0} = 0
    \]
    implementing \( t^N \) and \( \tau^E(t^N) \)
  - F solves
    \[
    \frac{dW^*}{d\tau^*} + \frac{dW^*}{d\tau} \frac{d\tau}{d\tau^*} \Big|_{\tilde{p}^w=0} = 0; \quad \frac{dW^*}{dt^*} + \frac{dW^*}{d\tau} \frac{d\tau}{dt^*} \Big|_{\tilde{p}^w=0} = 0
    \]
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Even universal participation in climate accord won’t accomplish much unless enforcement of climate commitments goes beyond GATT/WTO reciprocity norms.
Participation and enforcement linkage

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  - H solves

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implementing \( t^{*N} \) and \( \tau^{*E}(t^{*N}) \)

- Same as with GATT/WTO shallow-integration reciprocity and no climate accord
Participation and enforcement linkage

- **Within the Green WTO**
  - H solves
    \[
    \frac{dW}{d\tau} + \frac{dW}{d\tau^*} \frac{d\tau^*}{d\tau} \bigg|_{d\tilde{p}^w=0} = 0; \quad \frac{dW}{dt} + \frac{dW}{d\tau^*} \frac{d\tau^*}{dt} \bigg|_{d\tilde{p}^w=0} = 0
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- **⇒** Even universal participation in climate accord won’t accomplish much unless enforcement of climate commitments goes beyond GATT/WTO reciprocity norms
Negotiation linkage

- Sticking point in the WTO Doha Round: a basic asymmetry
  - BRICS willing to cut tariffs in exchange for reciprocal tariff cuts from industrialized countries, but industrialized countries have few tariffs left to cut and want BRICS to do this non-reciprocally
Negotiation linkage

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  - Industrialized countries willing to adopt high carbon taxes if BRICS also do so, but BRICS view carbon taxes as a threat to development and want industrialized countries to do this non-reciprocally.
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- An opportunity for negotiation linkage?
BRICS tariff cuts ...

Trade and tariff maps

Select one of the trade or tariff indicators from the drop-down list and click on a country or territory for further details.

MFN tariffs, simple average, final bound

You can alternatively select a country or territory from this dropdown...

Select a country/territory.

Note: The content of the maps is updated in October every year, at the same time as the WTO Trade and Tariff Profiles.
... in exchange for US/EU carbon tax commitments

Global CO2 imports and exports from trade in 2014. Based on data from the Global Carbon Project (http://www.globalcarbonproject.org/carbonbudget/16/data.htm). Note that 2014 is the latest year where CO2 import/export data is available. Also note that the scale goes from -600 to 300 MtCO2. Chart by Carbon Brief using Highcharts (https://www.highcharts.com/).
Would industrialized countries sign on to this if GATT/WTO reciprocity norm was followed in the negotiations?
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No, because H has implemented \( t^N \) and \( \tau^E(t^N) \) by solving

\[
\frac{dW}{d\tau} + \frac{dW}{d\tau^*} \frac{d\tau^*}{d\tau} \Big|_{d\bar{p}_w=0} = 0; \quad \frac{dW}{dt} + \frac{dW}{d\tau^*} \frac{d\tau^*}{dt} \Big|_{d\bar{p}_w=0} = 0
\]

so H has nothing to gain from a negotiation in which it raises \( t \) and F lowers \( \tau^* \) reciprocally to ensure \( d\bar{p}_w = 0 \)
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\]

- so $H$ has nothing to gain from a negotiation in which it raises $t$ and $F$ lowers $\tau^*$ reciprocally to ensure $d\tilde{\rho}^w = 0$

- $\Rightarrow$ BRICS must give more than reciprocal tariff cuts in exchange for industrialized country carbon taxes to make this work
The success of the GATT/WTO in addressing trade problems makes it an attractive model for other international agreements.
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But the structure of the trade problem may be special and not transferable to other problems such as global climate concerns:

- the differences in the nature of the international externality on which I have focused
- the heightened importance of dynamic considerations/threshold effects associated with global climate concerns
- other differences?

What is needed is careful analysis to identify and understand the differences and commonalities across problems and what these imply for effective institutional design.
Conclusion

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  - the differences in the nature of the international externality on which I have focused
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- What is needed is careful analysis to identify and understand the differences and commonalities across problems:
  - and what these imply for effective institutional design.
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What can the Economics of Trade Agreements teach us about the design of Climate Accords?
Conclusion

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- What can the Economics of Trade Agreements teach us about the design of Climate Accords?

- No silver bullet, but with careful analysis, potentially useful insights may emerge.
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What can the Economics of Trade Agreements teach us about the design of Climate Accords?

No silver bullet, but with careful analysis, potentially useful insights may emerge.

And in the mean time, were he here today, what might Frank D. Graham advise?
KEEP CALM AND CARRY ON