Trade Agreements, Incomplete Contracts and Offshoring
A Mini Course: CESifo Munich

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Introduction

Three self-contained but related lectures

- Lecture I. Trade Agreements as Incomplete Contracts
- Lecture II. Trade Disputes and Settlement
- Lecture III. Trade Agreements and Offshoring
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Introduction

- Many puzzling features of real-world trade agreements
- ...Design of rules
  - mix of rigidity and discretion (GATT/WTO: tariff bindings, escape clause, domestic policies, national treatment)
- ...Settlement of disputes
  - role of court (GATT/WTO: interpretive, gap-filling, modification)
- ...Prominence of renegotiation
  - against backdrop of property and liability rules (GATT/WTO: quantitative restrictions, domestic subsidies)
- Hard to square with complete contracts perspective
Can design and operation of trade agreements be understood from *incomplete contracts* perspective?

Trade agreements are obviously incomplete contracts

- WTO agreement fills 24,000 pages and is still far from anything resembling a complete contract

Focus on

- rules (Horn, Maggi and Staiger, 2010)
- disputes (Maggi and Staiger, 2011)
- renegotiation (Maggi and Staiger, Forthcoming)
Real-world trade agreements display an interesting combination of 
*rigidity* and *discretion*

Consider the GATT/WTO
- trade instruments bound; domestic instruments largely left to discretion, but must satisfy National Treatment, and now (WTO) regulation of subsidies
- bindings rigid, but with “escape clauses” (e.g. GATT Article XIX)
- bindings stipulate ceilings, so governments have downward discretion

Why?
An incomplete contracts perspective can account for these features
Sources of Incompleteness

- A number of possible sources of contract incompleteness
- Focus on two features of fundamental importance to trade negotiators
- Wide array of trade-relevant policies
  - border instruments but also internal/domestic instruments
  - controlling opportunism requires comprehensive policy coverage
- Uncertainty about future economic/political conditions
  - calls for agreements that are highly contingent
- Trade-law literature emphasizes contracting implications of costs associated with these features
Approach

- Introduce *contracting costs* explicitly into economic analysis of trade agreements
- Study their implications for the structure of the optimal (incomplete) agreement
- Show that contracting costs can help explain some of the core features of the GATT/WTO
The Model

- Partial-equilibrium analysis
- Two countries, H and F, two non-numeraire goods, 1 and 2
- H a natural importer of good 1/exporter of good 2
- Sectors 1 and 2 are mirror-image, so focus on sector 1
- Illustrate main points with linear demand/supply case
  - Demand: \( D(p) = \alpha - \beta p; \) \( D^*(p^*) = \alpha^* - \beta^* p^* \)
  - Supply: \( X(q) = \lambda q; \) \( X^*(q^*) = \lambda^* q^* \)
- H chooses tariff \( \tau \), separate consumption taxes on domestic and foreign products (\( t_h \) and \( t_f \)), production subsidy (\( s \))
- F does not intervene in this sector
The Model

- Arbitrage $\implies q^* = p^*; \quad p^* = p - \tau - t_f; \quad q = p - t_h + s$

- The price relationships more compactly:
  \[ p = p^* + T; \quad q = p^* + T + S \]

where $T \equiv \tau + t_f$ and $S \equiv s - t_h$

- Market clearing $\implies p = p(T, S); \quad q = q(T, S); \quad p^* = q^* = p^*(T, S)$

- Importing country $H$ experiences a negative consumption externality equal to $-\gamma D$ with $\gamma > 0$

- Governments maximize welfare, so (with focus on sector 1):
  \[ W = CS + PS + T \cdot M - S \cdot X - \gamma D \]
  \[ W^* = CS^* + PS^* \]
Efficient and Nash Policies

- Globally efficient policies maximize $W^G \equiv W + W^*$, yielding
  \[ T^{\text{eff}} = \gamma; \quad S^{\text{eff}} = -\gamma \]

- Nash equilibrium policies:
  \[ T^{\text{NE}} = \gamma + \frac{p^*}{\eta^*} \]
  \[ S^{\text{NE}} = -\gamma \]

- Note: $T^{\text{NE}} > T^{\text{eff}}$, $S^{\text{NE}} = S^{\text{eff}}$
- Nash trade taxes inefficiently high: ToT manipulation
- Nash domestic instruments set at efficient levels
Uncertainty

- To simplify, focus on one-dimensional uncertainty
- Consider two possible sources of uncertainty
  - consumption externality ($\gamma$)
  - import demand level ($\alpha$)

- Timing:
  1. The agreement is drafted
  2. Uncertainty is resolved
  3. Policies are chosen subject to the constraints set by the agreement
Focus on *instrument-based* (not *outcome-based*) agreements

Key idea: more detailed agreements are more costly (similar to Battigalli and Maggi, 2002)

- $c_p$: cost of including a *policy* variable ($\tau, t_f, s, t_h$)
- $c_s$: cost of including a *state* variable ($\gamma, \alpha$)

Cost of writing an agreement: $C = c_s \cdot n_s + c_p \cdot n_p$, with $n_s$ ($n_p$) the number of state (policy) variables in the agreement

Let $\Omega \equiv EW^G(\cdot)$ denote expected gross-of-contracting-costs global welfare

An *optimal agreement* maximizes expected net global welfare, $\omega \equiv \Omega - C$
Optimal Agreements

To state first result, recall: \( T = \tau + t_f; \ S = s - t_h \). Hence \( T \) and \( S \) the relevant policy variables, with cost 2c for each.

**Proposition 1**: An agreement that constrains the effective subsidy \( S \) (even in a state-contingent way) while leaving the import tax \( T \) to discretion cannot improve over the Nash equilibrium, and therefore cannot be an optimal agreement.

- Broad intuition: contracting over \( S \) alone is useless because inefficiency in the NE concerns \( T \), not \( S \).
- In world of costless contracting, Proposition 1 irrelevant, but gains relevance when contracting costly
  - if contracting costs lead to incomplete policy coverage, focus of contract will be on import taxes, not domestic instruments.
Uncertainty about the Consumption Externality

- Assume $\gamma$ uncertain

- Note: $\{FB\}$ agreement is $\{T = \gamma; S = -\gamma\}$, which costs $4c_p + c_s$
  - if $c_p$ and $c_s$ small enough, $\{FB\}$ optimal
  - if large enough, empty agreement (NE payoffs) optimal
  - What happens between these two extremes?

- Two ways to save on contracting costs relative to $\{FB\}$
  - agreement can be rigid (i.e. non-contingent)
  - and/or it can leave some policies to discretion

- For now consider only agreements that impose separate equality constraints on $T$ and $S$ (e.g. $(T = \gamma)$ or $(S = 10)$)
Uncertainty about the Consumption Externality

By Proposition 1, can focus on three kinds of agreement (aside from \{FB\} and \{∅\})

- \{T, S\} (rigidity)
- \{T(γ)\} (discretion)
- \{T\} (both rigidity and discretion)

Basic trade-off:

- rigid agreement prevents ToT manipulation, but Pigouvian intervention only “on average”
- discretion creates scope for manipulating ToT, but achieves state-contingency “for free”

Two basic questions

- When is it optimal to leave S out of the contract (discretion)?
- When is it optimal to leave γ out of the contract (rigidity)?
Discretion over Domestic Instruments

- **Benefits of excluding $S$ from the contract**
  - saves $2c_p$
  - achieves state-contingency in $S$ “for free” (a benefit if contract is *rigid*)

- **Costs of excluding $S$ from the contract**
  - comes in form of $S$ distortions to manipulate ToT
  - higher when $S$ a good substitute for $T$ for ToT manipulation
  - higher when monopoly power in trade higher
  - higher when import volume higher

- $\implies$ Possible explanation for GATT/WTO evolution toward regulation of domestic instruments: rising trade volume

- $\implies$ Possible explanation for why WTO exempts developing country members from many domestic instrument commitments
Rigidity

- Large uncertainty in $\gamma$ makes it less likely that optimal agreement is rigid: unsurprising result
- But surprising result when consider uncertainty in trade volume ($\alpha$)
- Suppose $\gamma$ now fixed at $\tilde{\gamma}$ and $\alpha$ uncertain
- $\{FB\}$ agreement is rigid/non-contingent: $\{T = \tilde{\gamma}; S = -\tilde{\gamma}\}$
- Can focus on two kinds of agreements: $\{T(\alpha)\}$ and $\{T\}$
  - $\{T(\alpha)\}$ can be optimal as a way to manage incentives to distort $S$
  - novel interpretation of escape clause (import volume effect)
- If uncertainty over $\alpha$ grows large enough, optimum can switch from $\{T(\alpha)\}$ to $\{T = \tilde{\gamma}; S = -\tilde{\gamma}\}$
- $\implies$ Surprising result: large uncertainty in $\alpha$ can make it more likely that optimal agreement is rigid
- $\implies$ More broadly, source of uncertainty matters for tradeoff between rigidity and discretion in optimal agreement
National Treatment

- Return to world of uncertain $\gamma$ and consider rationale for NT clause
- Extend feasible set of agreements by allowing for an NT clause, that is a constraint $t_h = t_f$, costing $2c_p$
- An *NT-based* agreement includes the NT clause
  - the price relationships are now: $p = p^* + \tau + t$; $q = p^* + \tau + s$
  - recall for non-NT: $p = p^* + T$; $q = p^* + T + S$
- $\{NT, \tau, s\}$ costs less than $\{FB\}$ and ties down producer price wedge $q - p^*$, leaves consumer price wedge $p - p^*$ to discretion
  - not possible with non-NT agreements
- NT-based agreement optimal if low substitutability between $t$ and $\tau$
  - gets close to first best ($\{t^{\text{eff}} = \gamma, \tau^{\text{eff}} = 0, s^{\text{eff}} = 0\}$) by achieving state-contingency “for free” via discretion over internal taxes
A first step in the analysis of trade agreements as *endogenously* incomplete contracts

Provides a novel explanation for:

- the emphasis on border instruments in real world trade agreements
- “escape clauses” in response to surging import demand
- the National Treatment provision in GATT/WTO
- the emphasis on weak bindings (see paper)

Possible directions for future research:

- consider *outcome-based* agreements
- consider export-sector policies
- consider a multi-country setting to examine the potential appeal of the MFN rule and exceptions for FTAs/CUs
- consider a commitment role for trade agreements
- **consider the potential appeal of a dispute settlement body, as a mechanism to “complete” the incomplete contract**
- more explicit modeling of contract costs
Most models of trade agreements treat disputes as synonymous with enforcement.

But in a typical WTO dispute, DSB rarely called on to enforce an unambiguous obligation under the agreement:

- disagreements over what was signed on to: *Interpretation*
- instances where legal text of the agreement is silent: *Gap-filling*
- DSB might even grant exceptions to rigid obligations: *Modification*

Typical role played by DSB amounts to “completing” various dimensions of an incomplete contract.

Evaluate potential role of DSB in completing an incomplete contract.

Highlight interaction between design of contract and design of DSB.
Approach

- Building on Battigalli and Maggi (2002), two forms of contractual incompleteness: rigidity and discretion
- Introduce a third form of contractual incompleteness: vagueness
- The three possible (non-enforcement) roles of the DSB
  - can *interpret* aspects of the contract that are left vague
  - can *fill gaps* where the contract is silent and therefore leaves governments with discretion
  - can grant exceptions and thereby *modify* aspects of the contract that are rigid
- Or, the DSB can serve none of these functions and simply enforce contractual obligations that are unambiguous
- What is the combination of contract form and DSB role that maximizes the ex-ante joint payoff of the governments, i.e., the optimal *institution*?
The Model

- A single industry; importing government chooses $T \in \{FT, P\}$ to maximize $\omega(T; s)$, where $s \equiv (s_1, s_2, ..., s_N)$ is a state vector.
- The exporting government is passive in this industry; its payoff is $\omega^*(T; s)$.
- Each state variable represents a binary event, such as “there is/is not an import surge” or “the domestic industry does/does not shut down.”
- Importing government’s gain from protection: $\gamma(s) \equiv \omega(P; s) - \omega(FT; s) > 0$ for all $s$.
- Exporting government’s loss from protection: $\gamma^*(s) \equiv \omega^*(FT; s) - \omega^*(P; s) > 0$ for all $s$.
- Joint (positive or negative) gain from protection: $\Gamma(s) \equiv \gamma(s) - \gamma^*(s)$; $\Gamma(s) < 0$ for $s \in \sigma^{FT}$ and $\Gamma(s) > 0$ for $s \in \sigma^P$. 

Maggi and Staiger (Yale & Wisconsin)  |  Rules, Disputes and Renegotiation  | March 2014  | 21 / 49
Contracts

- State variables \( s_i \) are verifiable, but too costly to describe in a contract.

- Consider the following possible contracts:
  - **Rigid (R)** contract: \( T = FT \) for all \( s \)
  - **Discretionary (D)** contract: \( P \) allowed for all \( s \). (Same as no contract)
  - **Vague (V)** contract: \( P \) is allowed if and only if \( v \) (where \( v \) is a vague sentence such as “there is substantial injury to the domestic industry”)

The truth function of \( v \) is the following:

\[
\begin{align*}
\text{Sentence } v & \quad \text{is} \\
\text{True} & \quad \text{if} \quad s \in T \\
\text{False} & \quad \text{if} \quad s \in F \\
\text{Undefined} & \quad \text{otherwise}
\end{align*}
\]

where \( T \) (\( F \)) a set of “extreme” states where \( v \) clearly true (false)

- Assume \( T \subseteq \sigma^P \) and \( F \subseteq \sigma^{FT} \) and truth function of \( v \) is common knowledge to govs and DSB.
The DSB

- DSB operates within mandate (if no applicable mandate, not invoked)
- Enforcement role of DSB kept in background
- If the DSB invoked to settle a dispute, the exporter (complainant) incurs cost $c^*$ and the importer (defendant) incurs cost $c$
- If invoked, DSB observes $s$ and a noisy (unbiased) signal of $\Gamma(s)$, and it issues a ruling, $T^{DSB}$
  - attempts to complete contract as govs would have, by choosing $T^{DSB}$ to maximize the expected joint payoff of govs given the signal
  - ruling automatically enforced
- DSB recommends the wrong policy with probability $q(s)$
  - let $q(s) \equiv qk(s)$ where $k(s) \in [0, \frac{1}{2}]$ for all $s$ and $q \in [0, 1]$
The contract can be silent ($D$), rigid ($R$) or vague ($V$)

The DSB can be given an “activist” mandate to

- fill gaps ($g$) where the contract is silent and therefore leaves governments with discretion
- grant exceptions and thereby modify ($m$) aspects of the contract that are rigid
- interpret ($i$) aspects of the contract that are left vague

Or, the DSB can be given a “non-activist” mandate ($n$) to simply enforce contractual obligations that are unambiguous

<table>
<thead>
<tr>
<th>Contract DSB Role</th>
<th>Silent</th>
<th>Rigid</th>
<th>Vague</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-activist</td>
<td>$D_n$</td>
<td>$R_n$</td>
<td>$V_n$</td>
</tr>
<tr>
<td>Activist</td>
<td>$D_g$: DSB fills gaps</td>
<td>$R_m$: DSB allows exceptions</td>
<td>$V_i$: DSB interprets</td>
</tr>
</tbody>
</table>
Stage 0  The institution is designed
Stage 1  The state of the world $s$ is realized
Stage 2  The importer gov chooses policy $T \in \{FT, P\}$
Stage 3  The exporter gov decides whether to file with the DSB
Stage 4  If invoked, the DSB issues a ruling $T^{DSB} \in \{FT, P\}$
Stage 5  Payoffs are realized
Analysis

Disputes with an Activist DSB

- Exporter gov files a complaint iff $T = P$ and

$$\Pr(\text{DSB ruling is } FT \mid s) \cdot \gamma^*(s) > c^*$$

\hspace{1cm} (F)

- Importer gov chooses $T = P$ if either (F) fails, or if (F) holds but

$$\Pr(\text{DSB ruling is } P \mid s) \cdot \gamma(s) > c$$

- Focus on small filing costs:

$$\frac{1}{2} \gamma^*(s) > c^* \text{ and } \frac{1}{2} \gamma(s) > c \text{ for all } s$$
Disputes with an Activist DSB

- Consider the $D_g$ institution
- In states $s \in \sigma^{FT}$: if $q_k(s) < \frac{c}{\gamma(s)}$ then $T = FT$ and DSB not invoked; if instead $q_k(s) > \frac{c}{\gamma(s)}$ then $T = P$ and DSB invoked
- In states $s \in \sigma^P$: if $q_k(s) < \frac{c^*}{\gamma^*(s)}$ then $T = P$ and DSB not invoked; if instead $q_k(s) > \frac{c^*}{\gamma^*(s)}$ then $T = P$ and DSB invoked
- Notice: equilibrium motives that trigger DSB filing are inefficient from an ex-ante perspective
  - *off-equilibrium* impacts of activist DSB are efficiency-enhancing
- Notice: two kinds of disputes
  - importer opportunistically exploits incompleteness of contract, tries to “get away with protection”
  - exporter opportunistically exploits incompleteness of contract, tries to “get away with forcing free trade”
Proposition 1  There exist critical levels $q_1$ and $q_2$ (with $0 < q_1 \leq q_2 \leq 1$) such that: for $q < q_1$ the optimal institution is $D_g$; for $q_1 < q < q_2$ the optimal institution is $V_i$; and for $q > q_2$ the optimal institution is either $V_n$ or $R_n$.

- Leave governments with greater discretion and provide DSB with mandate to reign in that discretion the better the DSB information
- If $q$ sufficiently small, the first-best outcome achieved even though
  - the contract is highly incomplete
  - the use of DSB is costly
  - DSB rulings are imperfect
  - but DSB must be given activist mandate
- No “modification” role for the DSB in the optimal institution
- Non-monotonic relationship between frequency of equilibrium disputes and performance of optimal institution relative to first best
Empirically, an apparent “pro-trade bias” in DSB rulings

- both under the GATT (82%) and the WTO (88%) complainants have mostly won their cases

What can account for this?

Consider the direction of the selection bias in DSB rulings (and assume away other sources of bias)

When $c^*$ is high relative to $c$, DSB rulings exhibit a “pro-trade bias” (i.e. the DSB ruling is $FT$ with prob $> 1/2$)

- because then disputes mostly triggered by importer trying to get away with protection

But notice: in this case the equilibrium policies exhibit an “anti-trade bias” (i.e. the equilibrium policy is $P$ with prob $> 1/2$)

Fig 1
Figure 1

Typical dispute: Home trying to get away with Protection.

Typical dispute: Foreign trying to force Free Trade.
Precedent Setting

- Should DSB rulings set legal *precedent* for future rulings?
  - govs create the contract ("civil law") and provide DSB with a mandate
  - DSB can help complete the contract within its mandate through precedent-setting rulings ("common law")

- Consider a two-period version of the static model developed above
  - in a prior *Period* 0, the institution is created
  - *Period* 1 and *Period* 2 then proceed as in the static model

- The state $s$ is *iid* across the two periods

- Discount factor: $\delta \geq 0$ (since the "future" is collapsed into *Period* 2, $\delta$ may be arbitrarily large)

- If rulings set precedent, a *Period*-1 ruling for the realized state $s'$ will apply also in *Period* 2 if the realized state is again $s'$
Consider the $D_g$ institution

For $s \in \sigma^{FT}$:
- if $q_k(s) < \frac{c}{(1+\delta p(s))\gamma(s)}$ then $T_1 = FT$, DSB not invoked in Period 1
- if $q_k(s) > \frac{c}{(1+\delta p(s))\gamma(s)}$ then $T_1 = P$, DSB invoked in Period 1

For $s \in \sigma^P$:
- if $q_k(s) < \frac{c^*}{(1+\delta p(s))\gamma^*(s)}$ then $T_1 = P$, DSB not invoked in Period 1
- if $q_k(s) > \frac{c^*}{(1+\delta p(s))\gamma^*(s)}$ then $T_1 = P$, DSB invoked in Period 1

Trade-off: precedent induces more filings (bad); saves on duplicative filing costs in states where filing would occur anyway (good)
Let $k(s) = \frac{1}{2}$ for all $s$, so DSB signal goes from perfect to uninformative as $q$ goes from 0 to 1

**Proposition 3:** Consider a given activist DSB role ($g$ or $i$). As $q$ increases from 0, first the introduction of precedent has no effect, then it becomes strictly undesirable, and finally it is strictly desirable as $q$ approaches 1.

**Intuition:**
- when DSB sufficiently well-informed, little chance of equilibrium filing absent precedent, so little expected savings of duplicative filing costs
- when sufficiently poorly informed, DSB invoked in most every state, so little chance that precedent will induce additional filings

**Proposition 4:** There exists an intermediate range of $q$ such that, for a given activist DSB role ($g$ or $i$), it is optimal to give the DSB precedent-setting authority if $\delta$ is sufficiently low, while it is preferable not to do so if $\delta$ is sufficiently high.

**Intuition:** high $\delta$ magnifies additional filing that comes with precedent
Design of contract and design of DSB modeled as components of an over-arching institutional design problem

A contract that has gaps or is vague, and a gap-filling/interpretive DSB, is optimal if quality of DSB information sufficiently high

A contract that is vague or rigid, and a non-activist DSB, is optimal if quality of DSB information sufficiently low

A non-monotonic relationship between observed frequency of DSB disputes and performance of optimal institution

Selection effects can explain “pro-trade bias” in WTO DSB rulings if dispute costs are high for complainant relative to defendant

but same conditions imply an “anti-trade bias” in policy outcomes

Giving the DSB precedent-setting authority is sub-optimal unless:

the DSB is poorly informed/govs care little about the future

Extensions: more sophisticated DSB; enforcement; other legal systems
When govs make international commitments, what is the optimal structure for their contract?

In answering this question, important to allow for *renegotiation*, especially given its empirical relevance in GATT/WTO.

- Contract does not directly determine policy outcome
- But w/ transaction costs it does so indirectly by shaping disagreement point for ex-post negotiations: hence, efficiency consequences

Existing models of trade agreements abstract from renegotiation.

Study optimal design of trade agreements in presence of renegotiation.

Focus on a distinguishing transaction cost of trade-agreement setting:

- Gov-to-gov compensation takes form of “self-help” / tariff retaliation
- Transfers entail DWL
Broadly speaking, commitments can take one of two possible contractual forms.

One type of contract assigns *rights*, e.g., right to protect assigned to importer or right of free trade to exporter.

- Rights can be transferred between governments only through voluntary transaction – a renegotiation.
- In effect, assigns *ownership* of rights concerning trade policy: a *property rule* in the legal literature.

The second type of contract presents importer with option to practice free trade, or to protect and pay *damages*.

- Assigns entitlement of free trade to exporter, and while voluntary renegotiation can always occur.
- Importer can also remove this entitlement unilaterally by paying damages ("efficient breach"): a *liability rule* in the legal literature.

A vast law-and-economics literature on this issue in domestic setting. Initiate formal analysis in context of international trade agreements.
Considerable research more generally on optimal design of contracts in presence of renegotiation

We follow broad approach of this literature:

- non-verifiable information, contract designed ex-ante, can be renegotiated ex post through Nash bargaining

But two departures:

- gov-to-gov transfers involve DWL, so utility is non-transferable
- focus on binary policy choice; do this for tractability; but captures many trade-related policies that are discrete in practice
The Model

- A single industry; importing/Home gov chooses a binary policy $T \in \{FT, P\}$
- $b$ a pos/neg transfer from Home to Foreign; $c(b)$ the DWL associated with $b$ (borne by Home); $c(0) = 0$, $c(b) > 0$ for $b \neq 0$, smoothly convex; $b + c(b)$ increasing in $b$
- Home gov’s payoff is $\omega(T, b) = v(T) - b - c(b)$
- Foreign gov is passive in this industry; its payoff is $\omega^*(T, b) = v^*(T) + b$
- Joint payoff of the two govs: $\Omega(T, b) = v(T) + v^*(T) - c(b)$
- Home gov’s gain from protection: $\gamma \equiv v(P) - v(FT) > 0$
- Foreign gov’s loss from protection: $\gamma^* \equiv v^*(FT) - v^*(P) > 0$
- Joint (positive or negative) gain from protection: $\Gamma \equiv \gamma - \gamma^*$
“First best” outcome (joint surplus maximizing): if $\Gamma > 0$, $T = P$ and $b = 0$; if $\Gamma < 0$, $T = FT$ and $b = 0$

$\Gamma$ is uncertain ex-ante. Both govs observe $\Gamma$ ex-post, but $\Gamma$ is not verifiable by the DSB, so govs cannot write a complete contingent contract.

Assume $\gamma^*$ is ex-ante known to all (so all uncertainty in $\Gamma$ comes from $\gamma$), and $\gamma$ is not verifiable.

- this is the best possible scenario for the “efficient breach” argument

Assume $\gamma^*$ is in the interior of the support of $\gamma$, so the first-best is $P$ in some states ($\gamma > \gamma^*$) and $FT$ in others ($\gamma < \gamma^*$).

Density $h(\gamma)$ defined over $\gamma \in [0, \infty)$; let $\underline{\gamma} = \inf \{ \gamma : h(\gamma) > 0 \}$ and $\bar{\gamma} = \sup \{ \gamma : h(\gamma) > 0 \}$

Look for contract that maximizes ex-ante joint surplus.
The Contracting Options

- Two types of contracts
- Property rule: assigns right of $FT$ to exporter ("prohibitive" property rule) or right of $P$ to importer ("discretionary" property rule)
- Liability rule: an option contract giving Home a choice between (i) $FT$ and (ii) $P$ and payment $b^D$ to Foreign
  - consider possibility of transfer also associated with $FT$ (see paper)
- At formal level focus on family of liability contracts and optimize $b^D$:
  - prohibitive property rule outcome-equiv to liability with $b^D$ set prohibitively high
  - discretionary property rule outcome-equiv to liability rule at other extreme with $b^D = 0$
- Note: $b^D$ can be interpreted as payment specified under explicit escape clause, or remedy for contract breach
Timing of the Game

0. Governments write the contract
1. $\gamma$ is realized and observed by the governments
2. Governments can renegotiate the terms of the contract ($b$ and $T$)

Assume symmetric bargaining power (see paper for asymmetric case); abstract from enforcement issues
Given a contract specifying $b^D$, when does renegotiation occur, and in what direction?

For any $b^D$, contract provides threat point for any renegotiation

Threat point gives importer option to choose between $(T = FT, b = 0)$ and $(T = P, b = b^D)$

- importer indifferent between options when $\gamma = b^D + c(b^D) \equiv S(b^D)$
- for $\gamma < S(b^D)$ threat point is $(T = FT, b = 0)$
- for $\gamma > S(b^D)$ threat point is $(T = P, b = b^D)$

Fig 1
Figure 1
Consider first $\gamma < S(b^D)$ where threat point is $(T = FT, b = 0)$

Renegotiation from $(T = FT, b = 0)$ to $(T = P, b = b^e)$ requires:
- $\gamma > S(b^e)$ (for the importer) and $b^e > \gamma^*$ (for the exporter)

Renegotiation toward $P$ iff $S(\gamma^*) < \gamma < S(b^D)$. Region $P_R$ in Fig 1

Note: never strictly optimal to set $b^D > \gamma^*$; Fig 1
- Implies in equilibrium contract never renegotiated towards $P$

Consider next $\gamma > S(b^D)$ where threat point is $(T = P, b = b^D)$

Renegotiation from $(T = P, b = b^D)$ to $(T = FT, b = b^e)$ requires:
- $S(b^D) - S(b^e) > \gamma$ (for importer) and $\gamma^* > b^D - b^e$ (for exporter)

Renegotiation toward $FT$ iff $\gamma < S(b^D) - S(b^D - \gamma^*) \equiv R(b^D)$. Region $FT_R$ in Fig 1
The Pattern and Direction of Renegotiation

Summary of findings on pattern and direction of renegotiation:

**Proposition 1:** (i) If \( b^D < \gamma^* \), the contract is renegotiated for \( \gamma \in (S(b^D), R(b^D)) \), and the governments agree on \( FT \) and the exporter compensates the importer. (ii) If \( b^D > \gamma^* \), the contract is renegotiated for \( \gamma \in (S(\gamma^*), S(b^D)) \), and the governments agree on \( P \) and the importer compensates the exporter; however, setting \( b^D > \gamma^* \) is weakly dominated, and this kind of renegotiation does not happen in equilibrium.

- Note what is ruled out if damages set optimally: importer’s threat point is \( FT \), but govs agree to a policy \( P \) and level of damages to exporter less than contractually specified level \( b^D \)

- Note that renegotiation can occur in equilibrium only for intermediate values of \( \gamma \), not “extreme” states of world
The Optimal Agreement with Renegotiation

- Next, What “allocations” \( \hat{\gamma} \) can be implemented, and what level of \( b^D \) implements a given \( \hat{\gamma} \)?

- Renegotiation limits implementable range of \( \hat{\gamma} \) (Lemma 1):
  - if no cost of transfers, only \( \hat{\gamma} = \gamma^* \) implementable (Coase)
  - w/ costly transfers, any \( \hat{\gamma} \in [R(0), S(\gamma^*)] \) is implementable (Fig 1)
  - still, renegotiation beneficial for ex-ante joint surplus

- And from Fig 1, level of \( b^D \) that implements a given \( \hat{\gamma} \) is
  \[ b^D(\hat{\gamma}) = R^{-1}(\hat{\gamma}) \]

- Finally, How does \( b^e \) change with \( b^D \)? \( \frac{\partial |b^e|}{\partial b^D} < 0 \)
  - Intuitively, increasing \( b^D \) strengthens the bargaining position of the exporter and hence decreases \( b^e \) in absolute size (Lemma 2)

- Now ready to study optimal level of \( b^D \):
  - property rules (\( b^D = 0 \), or \( b^D \geq \bar{b}^{prohib} \) where \( \bar{b}^{prohib} \) determined by \( S(\bar{b}^{prohib}) = \bar{\gamma} \)); vs. liability rules (\( b^D \in (0, \bar{b}^{prohib}) \))
Figure 1
The Optimal Agreement with Renegotiation

- Small uncertainty:
  - Property rule not renegotiated, hence no equilibrium transfers; Fig 2
  - A liability rule can make policy contingent on $\gamma$, but benefit small when uncertainty small, cost not small; Fig 2

- Hence property rule optimal for small uncertainty: $b^D = 0$ if $E\gamma > \gamma^*$ and $b^D \geq \bar{b}^{prohib}$ if $E\gamma < \gamma^*$

- Large uncertainty: suppose $\gamma < R(0)$ and $\bar{\gamma} > S(\gamma^*)$; back to Fig 1
  - $\bar{b}^{prohib} > \gamma^*$, so $b^D \geq \bar{b}^{prohib}$ cannot be optimal by Prop 1; Fig 1
  - What about $b^D = 0$?
    - For $\gamma > R(0)$, contract not renegotiated, outcome is $(P, b = 0)$, increasing $b^D$ slightly from zero entails second-order loss
    - But for all $\gamma < R(0)$, contract renegotiated when $b^D = 0$, exporter pays sizable $b^e$, and hence with $\frac{\partial |b^e|}{\partial b^D} < 0$, increasing $b^D$ slightly from zero gives first-order benefit. Fig 1

- Liability rule optimal for large uncertainty
Figure 2
The Optimal Agreement with Renegotiation

**Proposition 2**: (i) If the support of $\gamma$ is sufficiently small, a property rule is optimal (specifically, the optimum is $b^D = 0$ if $E\gamma > \gamma^*$ and $b^D \geq \bar{b}^{prohib}$ if $E\gamma < \gamma^*$). (ii) If the support of $\gamma$ is sufficiently large (on both sides of $\gamma^*$), the optimum is a liability rule, and in particular the optimal $b^D$ satisfies $0 < b^D < \gamma^* < \bar{b}^{prohib}$.

- Opt. liability rule never makes injured party “whole,” i.e., $b^D < \gamma^*$
  - Intuition: compensation inefficient, so use it sparingly; a feature consistent with GATT *reciprocity* norm

- Empirical prediction if uncertainty primarily about political-economy shocks: liability rules for issue areas where political-economy shocks more intense; property rules where political-economy less important
  - GATT/WTO: tarrification channeled political pressures from QRs to tariffs; exporters less politically active than import-competing sectors
  - $\implies$ export subsidies/QRs prohibited by property rule; tariffs and production subsidies regulated through liability rules
Renegotiation under the Optimal Agreement

A prediction that derives from underlying pattern of equilibrium renegotiation:

- Prohibitive property rule \( b^D \geq \bar{b}^{prohib} \) implies threat point of \( FT \) for all \( \gamma \) in support, and Prop 1 says no renegotiation from \( FT \) to \( P \).
- Discretionary property rule \( b^D = 0 \) renegotiated only for \( \gamma < R(0) \), but if \( \gamma < R(0) \) then liability rule optimal by Prop 2.

**Proposition 3**: When a property rule is optimal, it is never renegotiated, and therefore entails no equilibrium transfers.

- Note: frequency of renegotiation/compensation in GATT/WTO has diminished through time; GATT/WTO has evolved towards system of property rules through time; Prop 3 links these observations.
- Evolution of GATT/WTO towards property rules may account for decline in frequency of renegotiation/compensation over time.
Summary

- Argued that renegotiation and inefficient gov-to-gov transfers figure prominently in the GATT/WTO and other trade agreements.
- Derived predictions concerning the optimal form of the agreement, the conditions under which the agreement will be renegotiated in equilibrium, and the form that such renegotiation will take.
- Forged a link between the theory of trade agreements and the law-and-economics theory of optimal legal rules.
- Extensions: harm not perfectly verifiable, DSB can observe noisy signal (2nd paper); private information; continuous policies.
- Finally, in a multi-country setting, all propositions extend. But new question: How does expansion of membership affect tradeoff between liability/property rules?
  - if more members increases bargaining frictions, then property rules favored by expanding membership (see paper).
  - could help explain evolution of legal rules in GATT/WTO.
Many features of real-world trade agreements are hard to square with complete contracts perspective

...Design of rules
  
  mix of rigidity and discretion (GATT/WTO: tariff bindings, escape clause, domestic policies, national treatment)

...Settlement of disputes
  
  role of court (GATT/WTO: interpretive, gap-filling, modification)

...Prominence of renegotiation
  
  against backdrop of property and liability rules (GATT/WTO: quantitative restrictions, domestic subsidies)

Incomplete contracts perspective provides a promising approach
Trade Disputes and Settlement

Giovanni Maggi and Robert W. Staiger

Yale and Wisconsin

October 2013
On September 24 2012, the New York Times reported that “[t]he EU says it has obeyed WTO rulings by eliminating the harmful effect of government loans to Airbus, but Washington disagrees and is threatening up to $10 billion in sanctions.”

- Not the outbreak of a non-cooperative U.S.-EU trade war
- Washington is threatening WTO-authorized trade sanctions to achieve compensation for the harmful trade effects of EU subsidies
- The Times report describes current status of a legal process of dispute resolution within the WTO

Will the EU remove the trade effects of its subsidies?

Or will the two governments negotiate a settlement?

Or will the United States follow through on its threat to impose WTO-authorized tariffs on $10 billion of imports from the EU?
Introduction

- How to understand rich variation of outcomes in trade disputes?
  - For example, in GATT/WTO: early settlement; DSB ruling and implementation; post-ruling settlement

- Study trade agreements in a world of imperfectly verifiable political/economic shocks

- Highlight role of transaction costs, renegotiation “in the shadow of the law,” and renegotiation “after the court has spoken”

- A key transaction cost: gov-to-gov compensation typically achieved through “self-help” (raising one’s own tariffs)
  - Entails a deadweight loss
Optimal contract can take different forms

- Small uncertainty/accurate DSB $\implies$ “property rule” with/without exceptions optimal
- Large uncertainty/inaccurate DSB $\implies$ “liability rule” with/without exceptions optimal

A rich set of possibilities for outcomes of trade disputes

- Govs may reach “early settlement” or trigger DSB ruling; and in latter case ruling can be implemented or lead to post-ruling settlement

Interaction between optimal contract and dispute outcome

- Both early and post-ruling settlement possible when liability rule optimal; neither possible when property rule optimal
- If DSB accuracy $\uparrow$: for fixed contract, rate of early settlement should $\uparrow$, but if contract evolves to property rule, settlement rate should $\downarrow$

We examine these predictions in light of data on actual GATT/WTO disputes
Related Literature

- Maggi and Staiger (2012): focuses on optimal contract form under renegotiation, but no trade disputes in equilibrium (because govs have no uncertainty about DSB ruling).


- Law-and-economics literature on settlement (e.g. Bebchuck, 1984, Reinganum and Wilde, 1986) and on property/liability rules (e.g. Calabresi and Melamed 1972, Schwartz, 1979, Shavell, 1984, Ulen, 1984, Kaplow and Shavell, 1996). But these models allow for cash transfers, so not directly applicable to trade agreements.
The basic model

- A single industry; importing gov (H) chooses policy $T \in \{FT, P\}$; exporting gov (F) is passive in this industry

- Gov-to-gov transfers are costly: $b$ a pos/neg transfer from H to F; $c(b)$ the associated DWL (borne by H)
  - For tractability, assume $c(b) = c \cdot |b|$, with $c \in (0, 1)$

- Importer’s payoff: $v(T) - b - c(b)$
- Exporter’s payoff: $v^*(T) + b$

- Importing gov’s gain from protection: $\gamma \equiv v(P) - v(FT) \geq 0$
- Exporting gov’s loss from protection: $\gamma^* \equiv v^*(FT) - v^*(P) \geq 0$

- First best: $P$ if $\gamma > \gamma^*$, $FT$ if $\gamma < \gamma^*$ (and $b = 0$ regardless)
Information Structure

- $\gamma^*$ is ex-ante known to all

- $\gamma$ is ex-ante uncertain but observed ex-post by govs. Not verifiable by DSB, so govs cannot write complete contingent contract, but DSB can observe a noisy signal $\gamma^{dsb}$ (DSB investigation)

- Assume the joint density of $(\gamma, \gamma^{dsb})$ is log-supermodular
Contracts and bargaining

- Focus on menu contracts that allow H to choose between (i) setting \( FT \) and (ii) setting \( P \) and compensating F with payment \( b^C \) (damages)
  - \( b^C \) can be contingent on \( \gamma^{dsb} \), so the contract is a schedule \( b^C(\gamma^{dsb}) \)
  - If invoked, DSB announces “ruling” \( b^C(\hat{\gamma}^{dsb}) \), where \( \hat{\gamma}^{dsb} \) is realization of signal

- We allow govs to negotiate before DSB ruling (bargaining “in the shadow of the court”) and, if DSB invoked, after DSB ruling (bargaining “after the court has spoken”). Assume:
  - Govs have symmetric bargaining powers
  - Contracts are perfectly enforceable
Timing of events

0 Governments write contract $b^C(\gamma^{dsb})$

1 $\gamma$ is realized and observed by governments

2 Governments Nash-bargain over policy $T$ and transfer $b$

3 If negotiation fails: DSB steps in and issues ruling $b^C(\hat{\gamma}^{dsb})$

4 If DSB ruling issued: governments Nash-bargain over $T$ and $b$ with disagreement point given by DSB ruling

Note possibilities for dispute resolution:

— “early settlement” (at stage 2)
— DSB invoked, ruling implemented
— DSB invoked, post-ruling settlement (at stage 4)
Proposition 1: (i) The optimal $b^C (\gamma^{dsb})$ is a weakly decreasing schedule; (ii) An increase in $\gamma^*$ weakly increases the optimal $b^C$ for given $\gamma^{dsb}$.

Some interesting possibilities: Figure 2
- Bottom-left: “property rule without escape”
- Top-left: “property rule with escape”
- Bottom-right: “liability rule with escape”
- Top-right: mixed rule (reminiscent of WTO safeguards)
Figure 2: possible types of contract
Optimal contract

- Under what conditions do we obtain each type of contract?
- If DSB signal precise or ex-ante uncertainty about $\gamma$ small (support of $\gamma | \gamma^{dsb}$ sufficiently small for all $\gamma^{dsb}$), then property rule optimal (Proposition 2)
- If support of $\gamma | \gamma^{dsb}$ sufficiently large for all $\gamma^{dsb}$, then liability rule optimal (Proposition 3)
- Basic argument:
  - If support of $\gamma | \gamma^{dsb}$ large, then for highest $\gamma$’s $P$ is implemented regardless of rule (renegotiation): liability rule optimal, b/c can minimize expected cost of compensation/retaliation
  - If support of $\gamma | \gamma^{dsb}$ small, then for highest $\gamma$’s $P$ is implemented only w/ liability rule: but permitting $P$ not so important for efficiency; and a property rule does not induce any compensation in equilibrium
- Cross-issue and time-series predictions about optimal rules
Now consider disputes and their resolution under optimal contract

To keep results sharp, add more structure. Assume:

- $\gamma^{dsb} = \gamma + \varepsilon$, where $\varepsilon$ is independent of $\gamma$
- Support of $\varepsilon$ symmetric around zero, $[-\bar{\varepsilon}, \bar{\varepsilon}]$, and $E(\varepsilon) = 0$
- DSB signal not too inaccurate ($\bar{\varepsilon}$ not too large)
When is there post-ruling settlement?

**Proposition 4:** Suppose a DSB ruling has been triggered. (i) If the optimal contract is a property rule (with or without escape), post-ruling settlement never occurs, so the ruling is always implemented. (ii) If the optimum is a liability (or mixed) rule, either outcome is possible.

Intuition for (i). Suppose ruling is $b^C(\hat{\gamma}^{dsb}) = b^{prohib}$ (similar argument for $b^C(\hat{\gamma}^{dsb}) = 0$):

- Govs will renegotiate the ruling and agree on $P$ (with H compensating F) only if ruling is “way off,” so that it’s worth incurring the transfer cost to correct the DSB mistake.
- This can happen only if true $\gamma$ much higher than DSB estimate; but by Prop 2, DSB errors cannot be large if property rule optimal.

**Example**
Define “no dispute” outcome: stage-2 agreement with $b = 0$
When is there early settlement?

- Define “no dispute” outcome: stage-2 agreement with $b = 0$
- **Proposition 6:** (i) If the optimum is a property rule (with or without escape), the outcome can be “no dispute” or “DSB ruling” (with the latter always implemented), but never “early settlement.” (ii) If the optimum is a liability (or mixed) rule, any of the outcomes including “early settlement” may occur.
When is there early settlement?

- Intuition for (i). With a property rule, DSB ruling (if reached) is either (i) $FT$ or (ii) $P$ with $b = 0$. Two possibilities: either govs are uncertain about direction of ruling (possible if property rule has escape), or not (e.g. property rule has no escape):
When is there early settlement?

• Intuition for (i). With a property rule, DSB ruling (if reached) is either (i) $FT$ or (ii) $P$ with $b = 0$. Two possibilities: either govs are uncertain about direction of ruling (possible if property rule has escape), or not (e.g. property rule has no escape):

  • If govs are uncertain, benefit of early settlement is to avoid DSB errors. But transfers are costly, so settling + sharing surplus entails $DWL \implies$ may not Pareto-improve over disagreement point (expected DSB ruling) if cost of DSB errors not large. And DSB errors cannot be large, otherwise (by Prop 2) property rule could not be optimal
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- Graphically, bargaining frontier must look as in Fig 3 (can be shown), so disagreement point lies outside frontier, hence DSB invoked
Figure 3
When is there early settlement?

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  - If govs are certain, they stay with existing contract and exchange no transfer, hence “no dispute”
When is there early settlement?

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  - If govs are certain, they stay with existing contract and exchange no transfer, hence “no dispute”

- Overall prediction: rates of early settlement and post-ruling settlement should be lower for property rules than for liability rules
Changes in DSB accuracy

- Reasonable to expect that accuracy of DSB rulings increases over time:
  - Learning associated with accumulation of GATT legal decisions
  - Introduction of appeals process with inception of WTO

- In reality, the contract is re-optimized only periodically during negotiation rounds. So we distinguish between a “short run,” where the contract is fixed, and a “long run”

- Remark: If DSB accuracy increases over time:
  1. In the “short run” with the contract held fixed, the probability of early settlement rises (weakly)
  2. In the “long run,” if the contract switches from a liability (or mixed) rule to a property rule, there will be a drop in the probability of early settlement

We maintain two assumptions:

- GATT-I a system of liability rules, WTO a system of mostly property rules with a few liability rules, GATT-II a transitional system (Hudec 1993, Jackson 1997, Pauwelyn 2008). See Table 1 for WTO-era classification of rules
- Accuracy of DSB rulings increases over time

We examine two key predictions of the model:

- Rates of early and post-ruling settlement should be lower for property rules than for liability rules
- Under the two assumptions above, the early settlement rate should follow a non-monotonic path, increasing initially and eventually decreasing
Descriptive Findings

- Overall rates of settlement in GATT-I, GATT-II and WTO:

Table 2

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<tbody>
<tr>
<td>Early</td>
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<tr>
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<td>0.28</td>
<td>0.15</td>
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<tr>
<td>Decline from Early to Post-Ruling</td>
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<td>0.32</td>
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- the model can explain non-monotonicity across eras if (a) increase in DSB accuracy the dominant change from GATT-I to GATT-II and (b) shift from liability to property rules the dominant change in WTO
Descriptive Findings

- Overall rates of settlement in GATT-I, GATT-II and WTO:

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- the model can explain non-monotonicity across eras if (a) increase in DSB accuracy the dominant change from GATT-I to GATT-II and (b) shift from liability to property rules the dominant change in WTO
- the model can explain decline in early to post-ruling settlement rates as reflecting a selection effect: property-rule disputes are more likely to reach DSB ruling, and less likely to get settled post-ruling (with this effect growing over time as importance of property rules grows)
Descriptive Findings

- Mean rates of early settlement for
  - all WTO-era property rule claims \( (ES_{P_{WTO}}) \) and
  - all WTO-era liability rule claims \( (ES_{L_{WTO}}) \)
- across the GATT-I, GATT-II and WTO eras: Figure 4
Figure 4

Note: Bars represent the claim-weighted average rates of early settlement in a given era for claims that are classified as property (ESₜ,WTO) and liability (ESₜ,WTO) rules in the WTO era; see text for precise definitions.
Focus on prediction that early settlement less likely for property rules than for liability rules

- Regress log odds of early settlement for dispute $j$ on dummies for whether each type of claim was raised in dispute $j$
  - Controls: year, industry, multiple-claimant dispute, claimant-is-a-developing-country, respondent-is-a-developing-country
  - Columns 1-3 of Table 3

Diff-in-diffs specification: pool GATT-I and WTO data, include WTO-era dummy and interaction terms between each claim variable and WTO dummy
  - Expect coefficients on property-rule interaction terms to be more negative than coefficients on liability-rule interaction terms
  - Column 4 of Table 3
Table 3: Logit Coefficients

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<tr>
<th>Dependent variable:</th>
<th>Early Settlement</th>
<th>Early Settlement</th>
<th>Early Settlement</th>
<th>Early Settlement</th>
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<th>Early Settlement</th>
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<td><strong>Explanatory variables:</strong></td>
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<tr>
<td>Constant</td>
<td>0.4347*** (0.2213)</td>
<td>0.4409 (0.3348)</td>
<td>0.7187*** (0.2680)</td>
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<td>-</td>
<td>0.5410*** (0.1710)</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td><strong>WTO-era property rules:</strong></td>
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<td></td>
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</tr>
<tr>
<td>National treatment</td>
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<td>-0.6081 (0.5193)</td>
<td>-0.7399 (0.5031)</td>
<td>-0.6098 (0.5227)</td>
<td>-0.0974 (0.5853)</td>
<td>-0.8902 (0.6159)</td>
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<tr>
<td>Antidumping/countervailing duty</td>
<td>-0.8940*** (0.3202)</td>
<td>-1.2446 (1.2324)</td>
<td>-0.4345 (0.7687)</td>
<td>-1.1916 (1.2298)</td>
<td>0.3695 (1.2696)</td>
<td>-0.9701 (1.1541)</td>
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<tr>
<td>Admin of trade regs/fees/formalities</td>
<td>-0.5581* (0.2858)</td>
<td>0.4485 (0.8704)</td>
<td>-2.0284** (0.8687)</td>
<td>0.5043 (0.8666)</td>
<td>-0.9701 (0.9112)</td>
<td>1.7472 (1.3006)</td>
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<tr>
<td>Escape clause</td>
<td>-0.7795* (0.4150)</td>
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<td>-0.9145 (1.3375)</td>
<td>0.7856 (0.8677)</td>
<td>-1.4822 (0.9596)</td>
<td>1.2222 (1.4436)</td>
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<td>Export subsidies</td>
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<td>a</td>
<td>-0.0173 (0.7428)</td>
<td>a</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td><strong>WTO-era liability rules:</strong></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Nonviolation</td>
<td>0.5507* (0.2952)</td>
<td>-17.484*** (0.5706)</td>
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<td>2.3497*** (0.6450)</td>
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<td>Domestic subsidies</td>
<td>0.1721 (0.6017)</td>
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<td>-0.7125 (0.7197)</td>
<td>0.3301 (0.8900)</td>
<td>-1.5726 (0.9754)</td>
</tr>
</tbody>
</table>

**Observations:** 348 109 133 457 242 916

χ² (d.f.) 37.92 (14) 48.89 (13) 63.91 (2)

Pseudo R² 0.079 0.0907 0.1465 0.0611

**Note:**
Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1
'a' denotes claim omitted due to lack of use.
1: interaction terms represent the product of the associated base group variable and an indicator variable that takes value 1 if the dispute was a WTO-era dispute and zero otherwise.
2: interaction terms represent the product of the associated claim variable and its claim-specific experience variable.
Focus next on impact of DSB accuracy on early settlement rate
If DSB accuracy increases with DSB experience, then model predicts that, if contract is of liability type and is held fixed, early settlement rate should increase with DSB experience

Focus on GATT-I & GATT-II period
- Proxy claim-specific DSB experience with \# of times a particular claim was raised in previous GATT disputes
- Augment regressions by including interactions between each claim variable and the associated experience variable
- If a claim is a liability rule throughout GATT-I and GATT-II, coefficient on interaction term should be positive; for claims that evolve to property rule, either sign is consistent with the model
  - Column 5 of Table 3
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Note:
Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1
'a' denotes claim omitted due to lack of use.
1: interaction terms represent the product of the associated base group variable and an indicator variable that takes value 1 if the dispute was a WTO-era dispute and zero otherwise.
2: interaction terms represent the product of the associated claim variable and its claim-specific experience variable.
Claim-Level Evidence

As robustness check, we use claim-level data from WTO Dispute Settlement Database, which records claims made at two stages:

- request for “consultation” and
- request for a “panel”
- also records the claims that are ruled upon in each dispute

We assume: If a claim is not ultimately ruled upon, it must have been settled prior to DSB ruling (“early settlement”)

Unit of observation is now the claim made at either stage (request-for-consultation and/or request-for-panel)

- Column 6 of Table 3

Property-rule claims have lower odds of early settlement than liability-rule claims, as the model predicts.
## Table 3: Logit Coefficients

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Note:

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1
'a' denotes claim omitted due to lack of use.

1: interaction terms represent the product of the associated base group variable and an indicator variable that takes value 1 if the dispute was a WTO-era dispute and zero otherwise.
2: interaction terms represent the product of the associated claim variable and its claim-specific experience variable.
What explains the wide variation that is observed in the resolution of trade disputes?

A model of trade agreements with renegotiation and imperfectly verifiable information, which can generate a variety of dispute outcomes in equilibrium.

Govers may reach “early” settlement, they may trigger a DSB ruling and implement it, or they may reach a post-ruling settlement.

Predictions on how the dispute outcome depends on the contracting environment and how it correlates with the optimal contract form.

Initial support for the model’s predictions from data on the outcomes of actual trade disputes in the GATT/WTO.
Example

Suppose:

- $\gamma^* = $100 million
- $\hat{\gamma}^{d_{sb}} = $90 million
- and $b^C(\hat{\gamma}^{d_{sb}})$ is prohibitive, so that threat point to post-ruling settlement negotiations is $FT$ and no transfer

For successful post-ruling settlement (implementing $P$ instead of $FT$), must have:

- $b > \gamma^* = $100 million
- $\gamma > b + c \cdot b \implies \gamma > (1 + c) \cdot $100 million

But if $\gamma = (1 + c) \cdot $100 million possible when $\hat{\gamma}^{d_{sb}} = $90 million so that DSB ruling could be this far off, then

- by Prop 2 a property rule/prohibitive $b^C(\hat{\gamma}^{d_{sb}})$ could not be optimal
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Note: See Data Appendix for specific GATT/WTO Articles associated with each claim.
A fundamental question for modern research on commercial policy: What is the purpose of international trade agreements?

Answer has implications for understanding the design and operation of trade agreements that we observe.

Two broad views:
- Internalize international policy externalities
- Help governments make commitment to their own private sectors

International externality view dominates in accounting for observed features and operation of trade agreements.

But what form does the international externality take? And if the form of the externality changes, must trade agreements change to remain successful?
Theme 1: Nature of international price determination a key determinant of the nature of the international externality, can have profound impact on the design of an effective trade agreement.

Theme 2: Rise of offshoring may alter the design of effective trade agreements through its impact on the nature of price determination.

First discuss trade agreements and the nature of price determination (Antràs and Staiger, 2012a).

Then through this lens discuss implications for trade agreements of rise in offshoring (Antràs and Staiger, 2012b).
Terms-of-Trade Theory of Trade Agreements:
- in the Nash equilibrium, tariffs are inefficiently high but domestic policies are internationally efficient
- negotiations over tariffs alone, coupled with a “market access preservation rule,” can bring governments to the efficiency frontier – “shallow” integration

Nature of international price determination is important for these predictions:
- “deep” integration needed when prices are not fully disciplined by market clearing (bilateral bargaining)
Perfectly competitive trade model: Foreign (‘*’) exports a single good to Home

- Measure $\frac{1}{2}$ of H consumers with demand $D(p)$
- Measure $\frac{1}{2}$ of F consumers with demand $D(p^*)$
- Measure 1 of firms in F with increasing-concave production technology $y^* = F(L^*)$
- Measure $\Lambda$ of workers in each country paid a wage of 1 (pinned down by outside sector)
Market Clearing with Perfect Competition

- H has import tariff $\tau$, F has both export tax $\tau^*$ and labor subsidy $s^*$ (applied only to the export sector), all defined in specific terms
- Governments are social welfare maximizers ($W$ and $W^*$)
- Efficient policies maximize world welfare and deliver
  $T^e \equiv \tau^e + \tau^{*e} = 0$, $s^{*e} = 0$. No surprise (no frictions)
- Nash policies: FOCs $\Rightarrow \tau^N = \hat{p}^*/\eta^*_E$, $\tau^{*N} = \hat{p}/\eta^*_M$ and $s^{*N} = 0$
  (where all prices and elasticities are evaluated at the Nash policies)
- Why isn’t $s^{*N}$ distorted? $\tau^*$ is first best for terms of trade
  manipulation in this setting
**Shallow integration:** Suppose H agrees to eliminate its tariff and F agrees to eliminate its tariff and in addition F agrees to a “market access preservation” constraint on its future choices of \( s^* \):

\[
\frac{d\tau^*}{ds^*} = \frac{-d\hat{p}/ds^*}{d\hat{p}/d\tau^*}
\]

Reflects essential mission of GATT/WTO rules: provide secure property rights over negotiated market access

Then F solves

\[
\frac{dW^*}{ds^*} = \frac{\partial W^*}{\partial s^*} - \frac{\partial W^*}{\partial \tau^*} \frac{d\hat{p}/ds^*}{d\hat{p}/d\tau^*} = 0
\]

with \( W^* \) evaluated at \( \tau = 0 \)

Delivers \( s^{*R} = 0 \) and \( \tau^{*R} = 0 \). Hence, with \( \tau = 0 \), efficiency frontier achieved
Does this result depend on absence of market power?

A monopoly firm in F; H and F markets segmented

special form of imperfect competition, but insights are more general

Efficient policies $T^e = 0, s^e = 1/\eta^*_D$: No role for tariffs, but F subsidizes labor to ensure that price in each market is equated to marginal cost

Nash policies: FOCs $\Rightarrow \tau^N = -\hat{x} / (d\hat{x}/d\tau) - \hat{p}/\eta_D$, $\tau^N = \hat{p}^* / \eta^*_D$

and $s^N = 1/\eta^*_D$ (with all prices/elasticities evaluated at the Nash policies)

Note: $s^N \neq s^e$, but conditional on trade volume $s^N$ (and $s^R$) is efficient
**Shallow integration:** Suppose H agrees to eliminate its tariff and F
agrees to set its tariff at a level $\bar{\tau}^*$ s.t. $\hat{x}(s^N, 0 + \bar{\tau}^*) = \hat{x}(s^e, T^e)$, and F agrees to constrain its future choices of $s^*$ according to

$$
\frac{d\tau^*}{ds^*} = -\frac{d\hat{x}/ds^*}{d\hat{x}/d\tau^*}
$$

Then F solves

$$
\frac{dW^*}{ds^*} = \frac{\partial W^*}{\partial s^*} - \frac{\partial W^*}{\partial \tau^*} \frac{d\hat{x}/ds^*}{d\hat{x}/d\tau^*} = 0
$$

with $W^*$ evaluated at $\tau = 0$

Delivers $s^R = s^e$ and $\tau^R = 0$. Hence, with $\tau = 0$, efficiency frontier again achieved (key: $s^R = s^e$ *conditional* on efficient trade volume)
Matching Model

- Now suppose international prices determined by bilateral bargaining
- Measure 1 of consumers each matched with measure 1 of producers; no possibility of rematching (0 outside option of the agents)
  - extreme assumption but results generalize to any pricing not fully disciplined by market clearing
- Each producer produces an amount of $x$ with the production function $F(L)$ in anticipation of payoff obtained upon matching
- Consumer utility $u(x)$, where $u$ is increasing and concave
- With cost of producing $x$ sunk at time of matching, consumer and producer Nash bargain over the surplus, with producer capturing share $\alpha \in (0, 1)$
**International match:** F seller takes her good to H market; tariff costs not sunk at time of bargaining, so ex-post surplus over which parties negotiate is

\[
S(L, \tau + \tau^*) \equiv u(F(L)) - (\tau + \tau^*) F(L)
\]

- Labor \( L \) hired by F selling to H is then determined by maxing

\[
\alpha S(L, \tau + \tau^*) - (1 - s^*) L, \text{ which defines } \hat{L}(s^*, \tau + \tau^*) \text{ and trade volume } F(\hat{L})
\]

- **Local (F) match:** tariffs irrelevant to bargaining surplus, so labor hired by F selling to F is \( \hat{L}^*(s^*) \) and production for local sales is \( F(\hat{L}^*) \)
Efficient policies $T^e = 0$, $s^* = 1 - \alpha$: no role for tariffs, and F labor subsidy resolves the under-investment in $L$

Nash policies: FO Cs $\Rightarrow \tau^N + \tau^*N > 0$, $s^*N > 1 - \alpha$

Hence, $T^N > T^e$, but now $s^*N$ is inefficient even conditional on trade volume
Matching Model: Shallow Integration

- Consider F’s preferred $\tau^*$ and $s^*$ to deliver efficient trade volume.
- Efficient trade volume is $F(\hat{L}(1 - \alpha, 0))$, so starting from efficient policies changes in $\tau^*$ and $s^*$ must satisfy
  \[
  \frac{d\tau^*}{ds^*} = -\frac{d\hat{L}}{ds} \frac{d\hat{L}}{d\tau^*}
  \]
- Then F solves
  \[
  \frac{dW^*}{ds^*} = \frac{\partial W^*}{\partial s^*} - \frac{\partial W^*}{\partial \tau^*} \frac{d\hat{L}}{ds} \frac{d\hat{L}}{d\tau^*} = 0
  \]
- Delivers $s^{*R} > s^{*e}$. Hence, shallow negotiations cannot achieve the efficiency frontier.
Matching Model: Another Interpretation

- “World”/exporter price:

\[
\hat{p}^w = \frac{\alpha u(F(\hat{L}))}{F(\hat{L})} + (1 - \alpha) \tau^* - \alpha \tau
\]

- But \( \frac{-d\hat{L}/ds^*}{d\hat{L}/d\tau^*} > 0 \), so \( F \) maintains trade volume with an increase in \( \tau^* \) and \( s^* \) while raising \( \hat{p}^w \) and improving its terms of trade.

- Shallow integration cannot fully eliminate terms-of-trade manipulation when international prices are determined through bargaining.

- But if negotiations impose \( s^* = s^{*e} \) (i.e., “deep” integration), then efficiency frontier is immediately achieved.
According to ToT theory, Nash tariffs inefficiently high but domestic policies internationally efficient, market access/shallow integration approach can achieve efficiency.

But when prices are not fully disciplined by market clearing (bilateral bargaining), deep integration needed.

How much are international prices disciplined by market clearing?
- arguably less and less so with the increase in offshoring (Antràs and Staiger 2012b)

How sensitive is the performance of the market-access/shallow integration approach to the nature of international price determination?
- some suggestive evidence: rise of deep-integration FTAs (Orefice and Rocha 2014)

Important questions for the architecture of the WTO moving forward.
Offshoring and the Role of Trade Agreements

- Offshoring the production of inputs an increasingly dominant feature of the world economy
  - has come to symbolize the current wave of “globalization”
- Now examine the role and design of trade agreements in the presence of offshoring
Offshoring

- Intermediate inputs often customized/involve costly search, and hence exhibit lock-in for buyers and sellers
- Contractual safeguards for international transactions difficult to enforce
- Two features of offshoring implied:
  - terms of trade determined by *bilateral bargaining* between foreign suppliers and domestic producers, not disciplined by market clearing considerations
  - potential for *international hold up*
- Show that second feature can give rise to activist role for trade policy, but first feature has fundamental implications for the role and design of trade agreements
Main Findings

- The rise in offshoring complicates the task of trade agreements in two ways:
  - mechanism for international cost-shifting is more complex and extends to wider set of policies, so negotiations must extend to wider set of policies as well
  - underlying problem that a trade agreement must address in the presence of offshoring varies with the political preferences of member governments

- Implication of rise in offshoring for design of trade agreements:
  - increasingly difficult for governments to rely on traditional GATT/WTO concepts and rules – such as market access, reciprocity and non-discrimination – to help them solve their trade-related problems

- Some suggestive evidence:
  - signs of greater difficulty liberalizing trade through WTO negotiations in sectors where customized inputs are especially prevalent (Figure 1)
Plan for Remainder of Talk

- Sketch of the Benchmark Model
- Nash Trade Policy
- Trade Agreements: Beyond Market Access
- Benchmark Model with Political Economy
- Trade Agreements: Beyond the Terms of Trade
- Sensitivity
- Final Thoughts & Some Open Questions
Two small countries, $H$ and $F$, face fixed price at which a final good 1 is available on world markets.

Consumer preferences in country $j \in \{H, F\}$ given by $U^j = c_0^j + u(c_1^j); u'>0$ and $u''<0$.

Numeraire good 0 is costlessly traded / always consumed in both $H$ and $F$.

Choose units so (fixed) price of good 1 on world markets is 1; with free trade, price is 1 everywhere.
Setup

- Good 1 produced with customized input $x$ according to concave $y(x)$
- Producers in $H$ must import $x$ from suppliers in $F$
- Choose units so (fixed) marginal cost of $x$ in $F$ is 1; for now trade in $x$ is free
- Note: production efficiency requires $y'(x^E) = 1$
- Ex-ante contracts ruled out (e.g., unverifiable quality), hence:
  - the price at which each supplier in $F$ sells its inputs to a producer in $H$ is decided ex-post (through bargaining) once investment in $x$ has been made
- All agents have ex-ante zero outside option
- Unit measure of producers in $H$ and suppliers in $F$ randomly matched
stage 1. Match occurs; if both agents stay with the match, producer provides supplier with list of customized input specifications; otherwise both exit and receive zero outside option.

stage 2. Each supplier decides on amount $x$ of customized input to produce.

stage 3. Each producer-supplier pair (Nash) bargains over price of the input, with bargaining weights $\alpha$ and $(1 - \alpha)$ for home producer and foreign supplier, resp.

stage 4. Each producer in $H$ imports $x$ from its partner-supplier; produces the final good with the acquired $x$; payments agreed in stage 3 are settled.
Consider *stage 3* for producer in *H* and supplier in *F* matched in *stage 1*

<table>
<thead>
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<th><em>y(x)</em></th>
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<td><em>agm. jt. p/o</em></td>
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<tr>
<td><em>d/agm. p/o</em></td>
<td>pr: 0</td>
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<tr>
<td><em>quasi-rents</em></td>
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<tr>
<td><em>stage-3 p/o</em></td>
<td>pr: (\alpha y(x))</td>
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<td>pr: 0</td>
<td>spl: 0</td>
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<tr>
<td>(1 - \alpha)</td>
<td>(y(x))</td>
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In *stage 2*, input supplier chooses \(x\) to maximize \((1 - \alpha)y(x) - x\), so the optimal quantity \(\hat{x}\) of input satisfies \((1 - \alpha)y'(\hat{x}) = 1\)

Note: \(\hat{x} < x^E\) for \(\alpha > 0\); under-investment associated with hold up

**Proposition 1** In the *Benchmark Model*, a hold-up problem exists under free trade, leading to an inefficiently low volume of input trade \((\hat{x} < x^E)\).
Constrained-Efficient Trade Policy

- International nature of hold-up problem makes organizational/contractual remedies especially problematic

In the absence of these remedies, can trade policy help to alleviate hold-up?

stage 0. A social planner selects a home-country trade tax $\tau^H_1$ on the final good 1, a home-country import tax $\tau^H_x$ on home imports of the input $x$, and a foreign-country export tax $\tau^F_x$ on foreign exports of the input $x$.

Note: $p^H_1 = (1 + \tau^H_1)$

Define $\tau_x \equiv (\tau^H_x + \tau^F_x)$
Constrained-Efficient Trade Policy

Consider stage 3 for producer in $H$ and supplier in $F$ matched in stage 1

<table>
<thead>
<tr>
<th>agm. jt. p/o</th>
<th>$(1 + \tau_1^H) y(x) - \tau_x x$</th>
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<td>stage-3 p/o</td>
<td>pr: $\alpha q.r.$</td>
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In stage 2, input supplier chooses $x$ according to FOC

$$(1 - \alpha) \left(1 + \tau_1^H\right) y' (\hat{x}) = 1 + (1 - \alpha) \tau_x,$$

implicitly defining $\hat{x}(\tau_1^H, \tau_x)$. Note: If $\tau_1^H = 0$, then $\tau_x^E \equiv -\alpha / (1 - \alpha)$ achieves $\hat{x} = x^E$ w/o consumption distortion

**Proposition 2** In the Benchmark Model, the constrained-efficient trade policy choices maintain free trade in the final good and subsidize importation of the input so as to solve the hold-up problem and achieve an efficient volume of input trade ($\hat{x} = x^E$).
Unilateral Home Policy

- Does $H$ have a unilateral incentive to “do the right thing?”

  stage 0. The home government $H$ selects a trade tax $\tau_1^H$ on the final good 1, and a trade tax $\tau_x^H$ on the imported input $x$; the foreign government $F$ remains passive, i.e., $\tau_x^F \equiv 0$

- Two goals for $H$: achieve the desired $\hat{x}$; and extract inframarginal surplus from $F$’s supplier
Unilateral Home Policy

- Inframarginal surplus extraction:
  \[
  \left. \frac{d\pi_F^F(\tau^H_1, \tau^H_x(\tau^H_1))}{d\tau^H_1} \right|_{d\hat{x}=0} = (1 - \alpha) \hat{x} \left[ \frac{y(\hat{x})}{\hat{x}} - y'(\hat{x}) \right]
  \]

- What stops \( H \) from extracting all surplus from foreign suppliers?
  \[
  \left. \frac{dW^H(\tau^H_1, \tau^H_x(\tau^H_1))}{d\tau^H_1} \right|_{d\hat{x}=0} = \tau^H_1 \frac{\partial D^H_1}{\partial p^H_1} - (1 - \alpha) \hat{x} \left[ \frac{y(\hat{x})}{\hat{x}} - y'(\hat{x}) \right]
  \]

- Negative at \( \tau^H_1 = 0 \) due to concavity of \( y(x) \). Hence, \( \hat{\tau}^H_1 < 0 \)

- Note: \( \tau^H_1 = 0 \) efficient for any level of \( \hat{x} \):
  \[
  \left. \frac{dW^W(\tau^H_1, \tau^H_x(\tau^H_1))}{d\tau^H_1} \right|_{d\hat{x}=0} = \tau^H_1 \frac{\partial D^H_1}{\partial p^H_1}
  \]

- Hence, \( p^H_1 = (1 + \tau^H_1) \) inefficiently low for any level of \( \hat{x} \)
Desired $\hat{x}$ satisfies

$$y' (\hat{x}) = 1 - (1 - \alpha) \frac{\hat{x}}{\partial \hat{x} / \partial \tau^H_x} > 1$$

Hence, $\hat{x} < x^E$
Nash Equilibrium Policies

stage 0. The home government $H$ selects a trade tax $\tau^H_1$ on the final good $1$, and a trade tax $\tau^H_x$ on the imported input $x$; simultaneously, the foreign government $F$ selects a trade tax $\tau^F_x$ on the exported input $x$.

- $F$ has no reason to distort $\tau^F_1$, and can pass cost of $\tau^F_x > 0$ on to producers in $H$ who accept lower bargaining surplus.

- **Proposition 3** In the Nash equilibrium of the Benchmark Model, $F$ maintains free trade in the final good and taxes the exports of the input, while $H$ intervenes in both the final-good and input markets, resulting in (i) an inefficiently low volume of input trade ($\hat{x} < x^E$), and (ii) an inefficiently low local price for the final good in $H$’s market.
Two inefficiencies to correct: inefficiently low volume of input trade, and inefficiently low local price for the final good in $H$'s market.

Hence, an agreement on input trade volume alone cannot achieve efficiency frontier in presence of offshoring.

To see why, suppose $F$ agrees to $\tau^F_x$ and $H$ may choose $\tau^H_1$ and $\tau^H_x$ to satisfy $\hat{x}(\tau^H_1, \tau^H_x + \tau^F_x) = x^E$. Then $H$'s choices satisfy

$$\frac{dW^H(\tau^H_1, \tau^H_x(\tau^H_1), \tau^F_x)}{d\tau^H_1} \bigg|_{d\hat{x}=0} = \tau^H_1 \frac{\partial D^H_x}{\partial \rho^H_1} - (1 - \alpha) x^E \left[ \frac{y(x^E)}{x^E} - y'(x^E) \right] = 0$$

implying $\tau^H_1 < 0$.

So efficiency requires negotiations over $\tau^H_x$, $\tau^F_x$ and $\tau^H_1$. 
Interpreting Inadequacy of Market Access Focus

- Define $p^*_x$, the international (untaxed) price negotiated in stage 3 for exchange of inputs between foreign supplier and home producer:

$$p^*_x(\tau_1^H, \tau_x^H, \tau_x^F) \equiv (1 - \alpha) (1 + \tau_1^H) \frac{y(\hat{x}(\tau_1^H, \tau_x))}{\hat{x}(\tau_1^H, \tau_x)} - (1 - \alpha) \tau_x^H + \alpha \tau_x^F$$

- But

$$\frac{dp^*_x(\tau_1^H, \tau_x^H(\tau_1^H), \tau_x^F)}{d\tau_1^H} \bigg|_{d\hat{x}=0} = (1 - \alpha) \left[ \frac{y(\hat{x})}{\hat{x}} - y'(\hat{x}) \right] > 0$$

$$\Rightarrow \frac{dW^H(\tau_1^H, \tau_x^H(\tau_1^H), \tau_x^F)}{d\tau_1^H} \bigg|_{d\hat{x}=0}$$

$$= \tau_1^H \frac{\partial D_1^H}{\partial p_1^H} - xE \frac{dp^*_x(\tau_1^H, \tau_x^H(\tau_1^H), \tau_x^F)}{d\tau_1^H} \bigg|_{d\hat{x}=0} = 0$$

- Evidently, market access focus inadequate because $H$ retains policy flexibility to manipulate its ToT
Absent offshoring and the bilateral bargaining over international price that offshoring implies, an agreement over input trade volume would work (ToT theory)

**Proposition 4** *In the presence of offshoring, an efficient trade agreement must achieve deep integration, requiring governments to agree to constraints on policies that extend beyond market access commitments.*

Note: Propositions 3 and 4 hold for $\alpha \to 0$, and hence regardless of whether lock-in effect leads to hold-up problem

Key for the results is bilateral determination of prices resulting from lock-in effects
Introduce political economy weights:

\[ W^j = CS^j + \gamma^j \pi^j + \text{Trade Tax Revenue}^j, \text{ with } \gamma^j \geq 1, \text{ for } j \in \{H, F\} \]

- Can ensure that model predicts import tariffs and export subsidies with sufficient political economy forces
- Focus on different point: in the presence of offshoring, political economy leads to new inefficiencies that are not associated with international cost-shifting
To establish this point, useful to express home and foreign government welfare in terms of local and international prices that policies induce:

\[
W^H = \bar{W}^H \left( p^H_1(\tau^H_1), \ p^H_x(\tau^H_1, \tau_x), \ p^F_x(\tau^H_1, \tau_x), \ p^*_x(\tau^H_1, \tau^H, \tau^F) \right)
\]

and

\[
W^F = \bar{W}^F \left( p^H_1(\tau^H_1), \ p^H_x(\tau^H_1, \tau_x), \ p^F_x(\tau^H_1, \tau_x), \ p^*_x(\tau^H_1, \tau^H, \tau^F) \right)
\]

And world welfare:

\[
W^W = \bar{W}^W \left( p^H_1(\tau^H_1), \ p^H_x(\tau^H_1, \tau_x), \ p^F_x(\tau^H_1, \tau_x) \right)
\]
Efficient policies satisfy:

\[
\begin{align*}
\bar{W}^W_{p^H_1} \frac{\partial p^H_x}{\partial \tau^H_1} + \bar{W}^W_{p^F_x} \frac{\partial p^F_x}{\partial \tau^H_x} &= 0 \\
\bar{W}^W_{p^H_1} + \bar{W}^W_{p^H_x} \left( \frac{\partial p^H_x}{\partial \tau^H_1} + \frac{\partial p^H_x}{\partial \tau^H_x} \frac{d\tau^H_x}{d\tau^H_1} \bigg|_{dp^*_x=0} \right) &= 0
\end{align*}
\]

- At efficient policies, a small change in \(\tau_x\) must have no first-order impact on world welfare.
- And small changes in \(\tau^H_1\) and \(\tau^H_x\) that hold fixed \(p^*_x\) and hence \(p^F_x\) must have no first-order impact on world welfare either.
Note. An increase in $\tau_H^1$ that is accompanied by a change in $\tau_H^x$ which prevents $p_x^*$ from changing must alter the equilibrium volume of input trade $\hat{x}$:

$$\frac{\partial \hat{x}(\tau_H^1, \tau_x)}{\partial \tau_H^1} + \frac{\partial \hat{x}(\tau_H^1, \tau_x)}{\partial \tau_x} \frac{d\tau_H^x}{d\tau_H^1}\bigg|_{dp_x^*=0} = \frac{\left[ \frac{y(\hat{x})}{\hat{x}} - y'(\hat{x}) \right] \hat{x}}{p_1^H \left( \left[ \frac{y(\hat{x})}{\hat{x}} - y'(\hat{x}) \right] + \hat{x}y'' \right)} \neq 0$$

This is why efficiency requires that the impacts of small changes in $\tau_H^1$ and $\tau_H^x$ that hold fixed $p_x^*$ must have no first-order impact on home and foreign welfare.

Different from ToT theory, where foreign welfare automatically unaffected; comes from bilateral bargaining over $p_x^*$
Nash policies satisfy:

$$\bar{W}_p \frac{\partial p^H}{\partial \tau} + \bar{W}_F \frac{\partial p^F}{\partial \tau} = -\hat{x}^N$$

and

$$\bar{W}_{p_1^H} + \bar{W}_{p_x^H} \left( \frac{\partial p^H}{\partial \tau_1} + \frac{\partial p^H}{\partial \tau} \frac{d \tau^H}{d \tau_1} \bigg|_{dp^*_x=0} \right) = 0$$

Easy to see: Nash not efficient; not surprising, as international cost-shifting motive still active when political economy motives present.

More interesting question: Is international cost-shifting still the only source of inefficiency?
Political Optimum: unilateral choices “as if” $\tilde{W}_{p_x^*}^H \equiv 0 \equiv \tilde{W}_{p_x^*}^F$. If efficient, then int. cost-shifting (“ToT manipulation”) is the problem.

Politically Optimal policies imply:

\[
\tilde{W}_{p_x^*}^W \frac{\partial p_x^H}{\partial \tau_x} + \tilde{W}_{p_x^*}^W \frac{\partial p_x^F}{\partial \tau_x} = 0
\]

\[
\tilde{W}_{p_x^H}^H + \tilde{W}_{p_x^H}^F \left( \frac{\partial p_x^H}{\partial \tau_1^H} + \frac{\partial p_x^H}{\partial \tau_x} \frac{d\tau_x^H}{d\tau_1^H} \bigg|_{dp_x^*=0} \right) = 0
\]

But at political optimum, also have

\[
\tilde{W}_{p_x^F}^F + \tilde{W}_{p_x^F}^F \left( \frac{\partial p_x^H}{\partial \tau_1^F} + \frac{\partial p_x^H}{\partial \tau_x} \frac{d\tau_x^H}{d\tau_1^F} \bigg|_{dp_x^*=0} \right) = \left( \gamma^F - 1 \right) \hat{x} \left[ \frac{y(\hat{x})}{\hat{x}} - y'(\hat{x}) \right] > 0
\]

When $\gamma^F > 1$, PO inefficient; ToT manipulation not the only problem.
A trade agreement can generate additional Pareto gains beyond providing governments with an avenue of escape from a ToT-driven Prisoners’ Dilemma.

Beginning from PO, a small increase in $\tau_H^1$ coupled with a change in $\tau_H^x$ that leaves $p_x^*$ unchanged implies second-order loss for $H$ but first-order gain for $F$.

$\tau_H^x$ and $\tau_F^x$ can then be adjusted holding $\tau_x$ fixed to compensate $H$ and still leave $F$ with gain.

What is new problem to solve?
Recall: trade volume $\hat{x}$ will be altered as a result of the policy adjustments described above and at PO, F’s politically motivated government is offering an export subsidy to its input producers.

Impact on $W^H$ is second-order, but impact on $W^F$ is

$$dW^F = \gamma^F [p_x^* - 1] d\bar{x} + \tau_x^F d\bar{x}.$$  

When $\gamma^F = 1$, PO implies $p_x^* = 1$ and $dW^F$ simplifies to $dW^F = \gamma^F [p_x^* - 1] d\bar{x} = 0$.

But when $\gamma^F > 1$, $dW^F > 0$ because $H$’s policies can help provide a more efficient means of redistributing income toward input suppliers in $F$ than is possible with $F$’s own policies alone.

$\implies$ a need for additional international policy coordination beyond that required to eliminate ToT manipulation.
Proposition 5: In the presence of offshoring, an efficient trade agreement must serve two roles: it must provide governments with an avenue of escape from a terms-of-trade driven Prisoners’ Dilemma; and when the foreign government objectives include political economy considerations, it must coordinate the setting of policies across countries so as to reduce the deadweight loss associated with export promotion programs for traded intermediate inputs.
Sensitivity

- Secondary Market
- Ex-Ante Lump-Sum Transfers
- Other Extensions:
  - Vertical Integration
  - Multiple Foreign Countries and Search Costs
  - Ad Valorem Tariffs
  - Domestic Suppliers
  - Two-sided Investments

Antràs and Staiger (Harvard & Wisconsin)
Final Thoughts & Some Open Questions

- How much are international prices disciplined by market clearing?
  - arguably less and less so with the increase in offshoring

- How sensitive is the performance of the market-access/shallow integration approach to the nature of international price determination?

- And how sensitive is the performance of reciprocity/non-discrimination rules to the nature of international price determination?
  - novel “political externalities”

- Some suggestive evidence
  - rise of deep-integration FTAs (Figure 1, Orefice and Rocha 2014)
  - signs of greater difficulty liberalizing trade through WTO negotiations in sectors where customized inputs are especially prevalent (Figure 1, Antràs and Staiger 2012b)

- Important questions for the architecture of the WTO moving forward
good over which the negotiations occur. Specifically, for a sample of 16 countries that joined the WTO after its creation in 1995, Figure 1 shows that tariff concessions were markedly greater in sectors with low levels of input customization – which we measure, following Nunn (2007), as the share of an industry’s inputs not traded in organized exchanges – than in sectors with high levels of input customization. While only suggestive, the pattern displayed in Figure 1 points to the possibility that countries have more difficulty liberalizing trade through WTO negotiations in sectors where customized inputs are especially prevalent, broadly in line with our message above.

Our paper is related to several literatures. First, as emphasized above, by exploring the role of trade agreements in a model with intermediate input trade and in an environment with relationship-specific investments and incomplete contracting, we complement and extend an established literature on international trade agreements (see Bagwell and Staiger, 2010, for a recent review). In suggesting a novel rationale for trade agreements, our paper also complements the recent papers of Ossa (2011) and Mrazova (2009). Second, by considering endogenous trade policy choices in this

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5 Figure 1 is constructed using the same data and methodology as Figure 1 in Bagwell and Staiger (2011) (see that paper for details). Nunn’s (2007) input contractibility measure was merged into the dataset using a concordance available from the BEA website. Nunn (2007) also proposes an alternative measure that treats goods referenced in trade publications as homogenous goods. With that alternative measure, the relationship between tariff concessions and the degree of input customization is less clear-cut.

6 This possibility is reinforced from a different angle by the empirical results of Oreife and Rocha (2011). They find that the importance of trade in parts and components between two countries as a share of their total trade is a significant predictor that the two countries will sign a “deep” preferential agreement containing provisions of a domestic regulatory nature. As we discuss further in the conclusion, such findings suggest that WTO-member governments whose countries have experienced significant increases in offshoring may see preferential agreements as a way to achieve the deep integration and idiosyncratic bargains that WTO commitments in their current form cannot adequately provide.
Finally, we examine whether the impact of production networks trade on the likelihood of signing deeper agreements is more pronounced for countries belonging to the Asia region. Papers such as Ando and Kimura (2005), Kimura et al. (2007) and Athukorala and Menon (2010) show that production networks are an extremely important phenomenon for this region. In addition, one feature that makes Asian production networks distinctive is that they take place between countries of different income levels. In the region, the growth of production sharing first took place through de facto economic integration. However, deep integration is necessary for production networks to continue to prosper.

Results show that higher levels of trade in production networks increase the likelihood of signing deeper agreements containing provisions of regulatory nature such as TRIPS, intellectual property rights and movement of capital. This effect is still significant after taking into account other PTA determinants, such as the economic similarity between countries and their differences in relative factor endowments. As expected, the probability of signing deeper agreements is higher for country pairs involved in North–South production networks or belonging to the Asia region.

The paper is organised as follows. Section 2 discusses the definition and measurement of deep integration, presents the data sources and shows some descriptive evidence. Section 3 analyses the effect of deep integration on production networks trade. Section 4 investigates the impact of production networks on the likelihood of signing deeper agreements. Section 5 concludes.

2. DATA SOURCES AND VARIABLE DEFINITIONS

For our investigations, we use WTO data on the content of preferential trade agreements based on a comprehensive mapping and coding of 96 PTAs signed during the time interval 1958–2010. The agreements included in this mapping represent almost 90 per cent of world trade and cover most regions from around the world. Due to the availability of trade data,

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5 This data set has been created by the Research division of the WTO for the World Trade Report (2011) (available at http://www.wto.org/english/res_e/publications_e/wtr11_dataset_e.htm).

6 The regions covered are North America, the EU, South, East and West Africa, Middle East, Oceania, Asia, Central and South America.
good over which the negotiations occur. Specifically, for a sample of 16 countries that joined the WTO after its creation in 1995, Figure 1 shows that tariff concessions were markedly greater in sectors with low levels of input customization – which we measure, following Nunn (2007), as the share of an industry’s inputs not traded in organized exchanges – than in sectors with high levels of input customization. While only suggestive, the pattern displayed in Figure 1 points to the possibility that countries have more difficulty liberalizing trade through WTO negotiations in sectors where customized inputs are especially prevalent, broadly in line with our message above.6

Our paper is related to several literatures. First, as emphasized above, by exploring the role of trade agreements in a model with intermediate input trade and in an environment with relationship-specific investments and incomplete contracting, we complement and extend an established literature on international trade agreements (see Bagwell and Staiger, 2010, for a recent review). In suggesting a novel rationale for trade agreements, our paper also complements the recent papers of Ossa (2011) and Mrazova (2009). Second, by considering endogenous trade policy choices in this

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6 This possibility is reinforced from a different angle by the empirical results of Oreife and Rocha (2011). They find that the importance of trade in parts and components between two countries as a share of their total trade is a significant predictor that the two countries will sign a “deep” preferential agreement containing provisions of a domestic regulatory nature. As we discuss further in the conclusion, such findings suggest that WTO-member governments whose countries have experienced significant increases in offshoring may see preferential agreements as a way to achieve the deep integration and idiosyncratic bargains that WTO commitments in their current form can not adequately provide.