

# 세계무역체제의 유지와 불완전한 사적 정보의 역할

박지형

서울대학교 경제학부

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## China to endorse new tech law in bid to defuse Trump trade war

By Joe McDonald - Associated Press - Sunday, March 3, 2019



*President Donald Trump, right, with China's President Xi Jinping, left, during their bilateral meeting at the G20 Summit, Saturday, Dec. 1, 2018 in Buenos Aires, Argentina. (AP Photo/Pablo Martinez Monsivai)*

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- III. 세계무역체제의 유지와 불완전한 사적 정보의 역할
  - “Enforcing International Trade Agreements with Imperfect Private Monitoring” at ReStud (2011)
  - “Settlement with Second Order Uncertainty” with Beshkar, R&R at IER
  - “Understanding Non-litigated Disputes in the WTO Dispute Settlement System” with Ahn and Lee at JWT (2013)
- VI. 맺음말

## I. 세계무역체제와 관련 연구의 구성

세계무역체제: 세계무역(정책)에 영향을 미치는 법과 국제협정 등을 중심으로 이루어진 세계무역질서(World Trade Order)

- 다자간 무역협정
  - World Trade Organization (WTO): 국제무역기구
    - GATT체제하의 우루과이 라운드협상을 통해 1995년 발족
    - GATT의 상품무역과 관련된 협정을 유지 발전
    - General Agreement on Trade in Services (GATS)
    - Trade Related Aspects Intellectual Property Rights (TRIPS)
    - 지속적인 협상을 장을 제공하고 다양한 협상을 촉진
    - 분쟁의 해결: Dispute Settlement System
    - 각국의 무역관련 정책에 대한 보고서 작성 (TPRM)

# I. 세계무역체제와 관련 연구의 구성

- 주로 지역에 기반한 무역/경제 협정
  - European Union(EU), Mercosur(남미5개국): 관세동맹+
  - 한-EU FTA, 한미 FTA, 한중 FTA, NAFTA, ... : 자유무역협정
  - ASEAN, APEC, etc
- Mega FTAs
  - TPP(Trans Pacific Partnership)
    - CP(Comprehensive & Progressive)TPP
  - Transatlantic Trade and Investment Partnership (TTIP)
  - Regional Comprehensive Economic Partnership (RCEP)

기존 세계무역체제에 큰 영향을 미칠 수 있고, 이런 영향력 행사를 그 목적의 일부로 갖고 있음.
- Post Trump 세계무역체제?

트럼프 미 대통령이 주장하는 바와 같이 세계무역이 상당부분(특히, 중국) 불공정한가? 그러면 공정(?)한 무역을 위한 세계무역체제는?

## Handbook of Commercial Policy

Kyle Bagwell and Robert W. Staiger (eds), Elsevier,  
2016

### Part I. Commercial Policy: Empirical Facts, Determinants and Effects

Chapter 1: Bown & Crowley, **The Empirical Landscape of Trade Policy**

Chapter 2: McLaren, **The Political Economy of Commercial Policy**

Chapter 3: Goldberg & Pavcnik, **The Effects of Trade Policy**

Chapter 4: Ossa, **Quantitative Models of Commercial Policy**

### Part II. Trade Agreements: Legal Background, Purpose and Design

Chapter 5: Sykes, **Legal Aspects of Commercial Policy Rules**

Chapter 6: Mavroidis, **Dispute Settlement in the WTO: Mind over Matter**

Chapter 7: Grossman, **The Purpose of Trade Agreements**

Chapter 8: Bagwell & Staiger, **The Design of Trade Agreements**

### Part III. Trade Agreements: Issue Areas

Chapter 9: Park, **Enforcement and Dispute Settlement**

Chapter 10: Beshkar&Bond, **The Escape Clause in Trade Agreements**

Chapter 11: Blonigen&Prusa, **Dumping and Antidumping Duties**

Chapter 12: Lee, **Subsidies and Countervailing Duties**

Chapter 13: Ederington&Ruta, **Non-Tariff Measures and the World Trading System**

Chapter 14: Limao, **Preferential Trade Agreements**

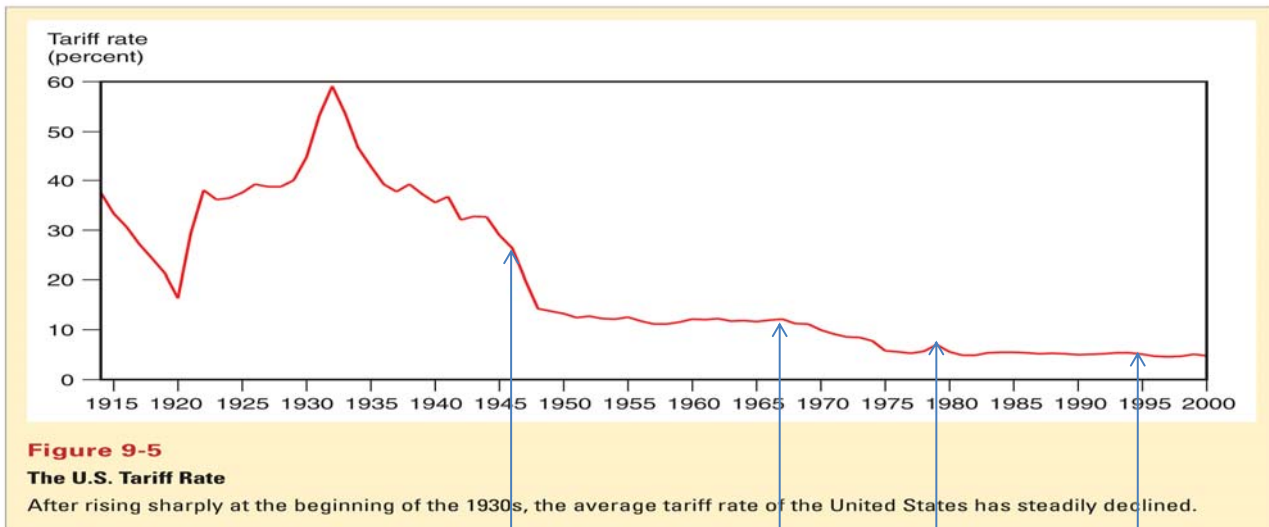
Chapter 15: Ornelas, **Special and Differential Treatment for Developing Countries**

Chapter 16: Saggi, **Trade, Intellectual Property Rights, and the World Trade Organization**

Chapter 17: Maggi, **Issue Linkage**

## II. 무역협상/협정에 대한 경제학적 분석

### 1) GATT/WTO 무역협상에 따른 관세율의 하락 - 미국의 경우



GATT (1947) Kennedy R.(1967) Tokyo R.(1997) WTO (1995)

(from Krugman, Obstfeld, and Melitz “International Economics”)

## II. 무역협상/협정에 대한 경제학적 분석

- **교역조건이론(Terms-of-trade theory): Bagwell and Staiger (1999)**

- **국내약속이론 (Domestic commitment theory)**

Maggi and Rodriguez-Clare (1998, 2007)

보호무역 로비에 취약한 정부가 외국과의 무역협정을 통해 무역자유화를 믿을 수 있게 약속함으로써 자원이동의 왜곡을 시정하여 이득을 봄

- **Firm-delocation externality theory: Ossa (2011)**

독점적경쟁모델(CES수요함수) → 수입관세의 교역조건 영향이 없음  
수입관세의 증가가 국내시장에서 활동하는 국내(외국)기업의 수를 증가(감소)시켜 국내(해외)시장의 가격지수를 낮추(높이)게 됨.

- **Trade-volume externalities due to bilateral bargaining**

Staiger and Antràs (2012)

Hold-up 문제가 존재하는 수직적 분업의 경우, 관세 등의 무역정책은 교역조건 뿐 아니라, 무역량의 변화를 통해 hold-up 문제와 관련된 bargaining power에 영향을 미쳐, 교역조건 이외의 외부효과가 발생.

## II. 무역협상/협정에 대한 경제학적 분석

### 교역조건이론 (Terms-of-Trade Theory)

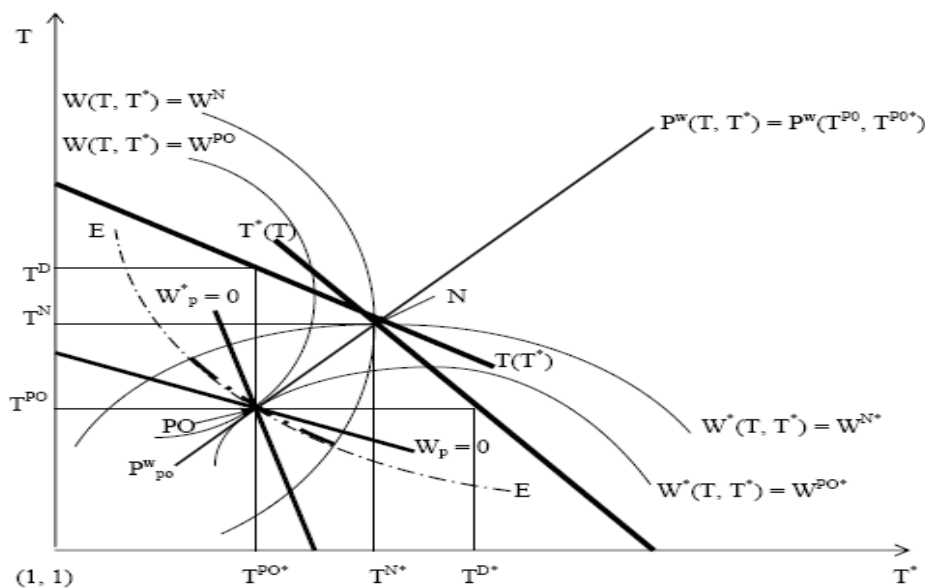
Bagwell and Staiger (1999, 2001)

수입상품에 대한 독점력 통해 관세부과는 교역조건을 변경 시킬 수 있고, 무역협정/협상은 오직 관세부과와 관련된 “**교역조건 외부효과**”를 국가간에 조절하기 위해서 이루어짐.

- 호혜성 원칙에 따른 무역협상 → 교역조건에 영향을 주지 않는 협상  
→ 정치적 최적 관세율 조합의 방향으로 협상결과가 유도 됨
- 무차별성 원칙(최혜국 대우)에 따른 무역협상 → 다자간 동일한 교역조건  
→ 정치적 최적 관세율 조합의 방향으로 협상결과가 유도 됨

## II. 무역협상/협정에 대한 경제학적 분석

교역조건이론 (Terms-of-Trade Theory): GATT/WTO의 역할



### III. 세계무역체제의 유지와 불완전한 사적 정보

#### 무역협정의 이행과 WTO의 역할

- 무역협정의 이행과 관련된 죄수의 딜레마

Payoffs (Country A, Country B)		Country B	
		Follow	Violate
Country A	Follow	(10, 10)	(6, 12)
	Violate	(12, 6)	(8, 8)

- 무역협정의 불이행에 대하여 무역제제를 가함  
→ 무역협정의 이행을 분석하기 위하여 반복적 게임이론 적용

방아쇠 전략의 사용: Dixit (1987)

무역협정의 불이행에 대하여 무역제제를 영원히 사용함:

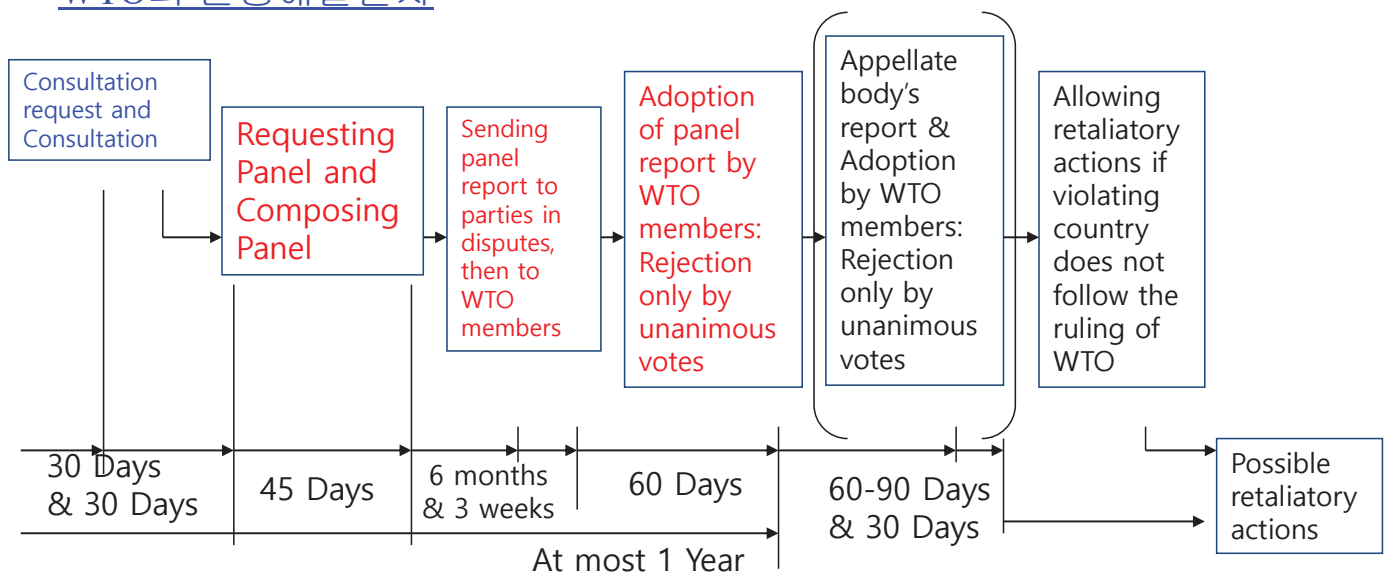
(IC) 협정 불이행의 payoff =  $12 + 8\delta^C / (1 - \delta^C)$  < 협정이행의 payoff =  $10 / (1 - \delta^C)$

If  $\delta^C$  (discount factor) > 1/2, 협정이행의 payoff > 협정 불이행의 payoff

→ 무역분쟁이 존재할 이유가 없음.

### III. 세계무역체제의 유지와 불완전한 사적 정보

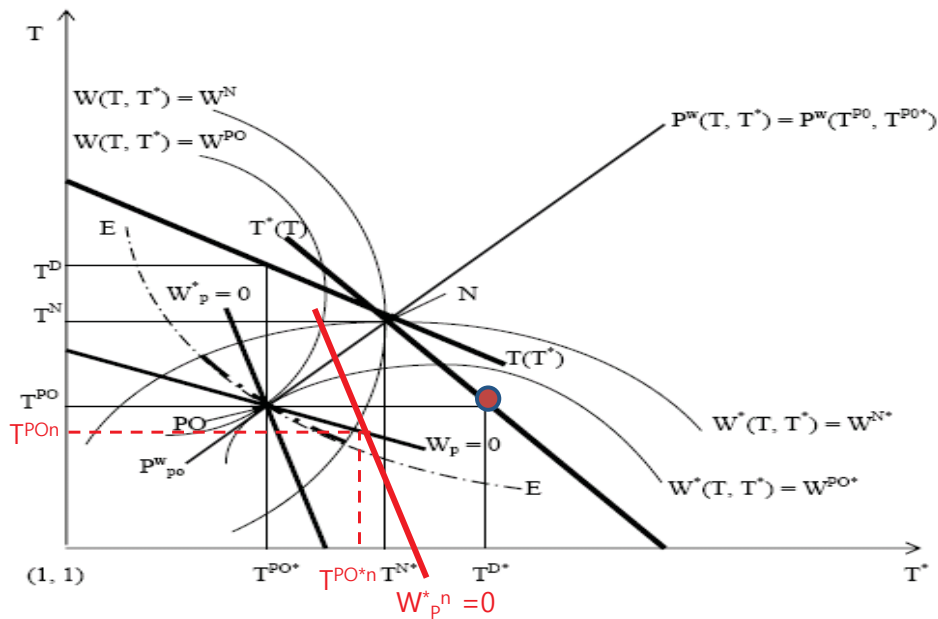
#### WTO의 분쟁해결절차



1995-2011년 동안 424개의 무역분쟁이 WTO에 제소되었고, 매년 평균적으로 0.5%의 world trade가 WTO에 제소된 분쟁에 의하여 영향을 받고 있음.



### III. 세계무역체제의 유지와 불완전한 사적 정보



- 상대방 국가가 비관세 장벽 등을 이용해  $T^D^*$  를 비밀리에 부과한다면?  
→ [Enforcing International Trade Agreements with Imperfect Private Monitoring \(2011\)](#)
- 상대방 국가의 보호무역에 대한 정치-경제적 압력이 이와 같이 높아지고 이에 대한 정보가 국가간 비대칭적이라면? → [Mostafa and Park \(2018\)](#)

#### Enforcing International Trade Agreements with Imperfect Private Monitoring

Jee-Hyeong Park  
Seoul National University



Review of Economic Studies (2011)



# 1. The WTO's Role in Enforcing Trade Agreements

- **Imperfect Private information** of Potential Violations of Trade Agreements

Ex) - Japan's use (?) of concealed trade barriers on importing US autos in 1980s

- Korea's use (?) of concealed trade barriers on importing US autos in 2000s

- China's enforcement effort in protecting foreign intellectual property rights (IPR)

- **Imperfect** information about possible violations of trade agreements:

- Imperfect information about (concealed) non-tariff barriers

- Possible disagreements over interpretation of trade agreements

- Imperfect **private** information (judgment) about potential violation:

**private** in the sense that the information is not known to other players (governments)

Ex) - The EU has imperfect **private** information of excessive AD duties of the US through EU companies' **private** reporting of their costs/sales information.

cf) The use of **Best Information Available** in determination of the US AD duties.

# 1. The WTO's Role in Enforcing Trade Agreements

- **Analyzing the WTO's role in a repeated game with imperfect private monitoring**

→ Represent the emergence of **the WTO** as a change in the observational structure of the repeated game,

which **changes** the nature of punishment-triggering signals from **private** to **public**.

1) What countries can do in the absence of third-party rulings, such as the WTO's?

→ **Characterizing the optimal Private Trigger Strategies (PTS)**

- *simple Private Trigger Strategies (PTS)*

- generality results of *simple PTS*

- characterization of the *optimal (simple) PTS*

2) How and by what degree that the WTO can be helpful in enforcing agreements?

→ **Characterizing the optimal Third-party Trigger Strategies (TTS)**

- *analytical* characterization of the *optimal TTS*

- *numerical* comparison between the *optimal TTS* and *optimal PTS*



## 2. Private Trigger Strategies (PTS)

### ■ A Model of Bilateral Trade in the presence of Concealed Trade Barriers

- Home (H) and Foreign (F) produce and trade two products, good 1 and good 2, under perfect competition, with H importing good 2 and F importing good 1.
- In each period, each country simultaneously set its action,  $\mathbf{a}^i \equiv (\tau^i, e^i) \in A^i$ , where  $\tau^i \in R^+$  and  $e^i \in E^i \subset R^+$  denotes the **total protection level** and **explicit tariff level**, respectively, with  $\tau^i - e^i \geq 0$ , representing levels of **concealed trade barriers**
- The expected value of a one-period payoff function for each country:

$$(3) \quad u^i(\tau_i^i, \tau_i^j) = \iint_{(\theta_i, \theta_i^*) \in (\Theta, \Theta^*)} w(\pi_i(\tau_i, \tau_i^*, \theta_i, \theta_i^*), \tau_i; \theta_i) f(\theta_i, \theta_i^*) d\theta_i d\theta_i^*$$

where  $\pi = p_1/p_2^*$  represents the terms of trade;  $\theta (\in \Theta)$  and  $\theta^* (\in \Theta^*)$  denote random variables for H and F, respectively, following an iid joint density function,  $f(\theta, \theta^*)$ ;  $w^i(\pi, \tau^i; \theta^i)$  represents each country's one-period payoff function that is affected by random shocks,  $\theta^i$ , where  $i \neq j$ .

## 2. Private Trigger Strategies (PTS)

- Focus on **symmetric equilibria** between **symmetric countries**:  $u(\tau^1, \tau^2) = u^*(\tau^2, \tau^1)$ .
- Properties of  $u(\tau, \tau^*)$  and  $u^*(\tau^*, \tau)$ :  
 $\partial u / \partial \tau > 0$  at  $\tau = 0$ ;  $\partial u^* / \partial \tau < 0$ ;  $\partial u / \partial \tau + \partial u^* / \partial \tau < 0$   
 → **Prisoner's Dilemma Situation**.  
 $\partial^2 u / \partial \tau^2 < 0$ ;  $\partial^2 u / \partial \tau \partial \tau^* = 0$ .  
 → A unique static optimal protection level for each country,  $h (> 0)$ .
- Privately Observed Signals of Concealed Trade Barriers (CTB)
  - At the end of period  $t$ , each country observes its payoff and random variable;  $(u_t^i, \theta_t^i)$
  - **Private signal**,  $\omega_t^i = (u_t^i, \theta_t^i) \in \Omega^i$  can serve as a measure for detecting the other country's potential use of CTB:

H can properly choose  $\Omega^P \subset \Omega$  so that  $\partial \Pr(\omega_t \in \Omega^P) / \partial \tau_t^* > 0$  with  $\Pr(\omega_t \in \Omega^P) \equiv \Pr(\omega_t \in \Omega^P | a_t, a_t^*)$  denoting the probability that  $\omega_t \in \Omega^P$  given  $(a_t, a_t^*)$ .

Ex) Setting the first element of  $\Omega^P$  to be the values of  $u_t$  that are less than  $u(l, l^*)$   
 ← Because  $\partial u(\tau_t, \tau_t^*) / \partial \tau_t^* < 0$ , it is possible to have  $\partial \Pr(\omega_t \in \Omega^P) / \partial \tau_t^* > 0$ .

  - $\Pr(\omega_t, \omega_t^* | a_t, a_t^*) > 0$  for each  $\omega_t \in \Omega$ ,  $\omega_t^* \in \Omega^P$ ,  $a_t \in A$ , and  $a_t^* \in A^*$ : Full support.

## 2. Private Trigger Strategies (PTS)

- **Focus** on symmetric strategies:  $s(t)=s^*(t)$  for all  $a^{t-1} \times \omega^{t-1} \times (e^*)^{t-1} = (a^*)^{t-1} \times (\omega^*)^{t-1} \times e^{t-1}$
- **Simple PTS with the cooperative protection level being  $l$**
- (a) If period  $t-1$  is a “cooperative” period with  $(e_{t-1}, e_{t-1}^*) = (0, 0)$ , then in period  $t$  H sets  $(\tau, e) = (l, 0)$  if  $\omega_{t-1} \notin \Omega^D$ , but sets  $(\tau, e) = (h, h)$  if  $\omega_{t-1} \in \Omega^D$ .
- (b) Given that a “punishment phase” is initiated in period  $t-1$  with  $(e_{t-1}, e_{t-1}^*) \neq (0, 0)$ , H sets  $(\tau, e) = (h, h)$  for  $T-2$  ( $\lambda$ ) periods if  $e_{t-1} > 0$  and  $e_{t-1}^* = 0$ ;  
H sets  $(\tau, e) = (h, h)$  for  $T^S-2$  ( $\lambda^S$ ) periods, if  $e_{t-1} > 0$  and  $e_{t-1}^* > 0$ ,  
where  $\lambda^{(S)} \in [0, 1]$  is the probability of extending the phase by one more period.
- (c) In period 1 and other “initial” periods right after the end of any punishment phase, H sets  $(\tau, e) = (l, 0)$  with prob.  $(1-Pr)$  and sets  $(\tau, e) = (h, h)$  with prob.  $Pr$ , and where  $Pr = Pr(\omega_t \in \Omega^D)$  with  $(\tau, e) = (l, 0)$ ,  $(\tau^*, e^*) = (l, 0)$ .

### Definition 2.

If (a) (b) and (c) describe a strategy profile  $(\underline{s}, \underline{s}^*)$ ,  
 $(\underline{s}, \underline{s}^*)$  are **simple PTS (Private Trigger Strategies)** with  $(l, \Omega^D, \delta, \delta^S)$  as **characterizing parameters**, where  $\delta = \lambda(\delta^C)^T + (1-\lambda)(\delta^C)^{T-1}$  and  $\delta^S = \lambda^S(\delta^C)^{T^S} + (1-\lambda^S)(\delta^C)^{T^S-1}$ .

## 3.2. Optimal (Simple) Symmetric PTS

- Two dimensions in the quality of private signals:  
the sensitivity:  $Pr'(\tau) \equiv \partial Pr(\tau) / \partial \tau$  and the stability:  $1 - Pr(\tau)$
- Expansion of  $\Omega^D$ , denoted by  $\omega^D$ , a trigger control variable  
increases the sensitivity of private signals in detecting deviations:  $\partial Pr'(\tau) / \partial \omega^D > 0$   
decreases the stability of private signals:  $\partial Pr(\tau) / \partial \omega^D > 0$
- Characterizing optimal symmetric PTS  $\rightarrow$  Choosing  $\omega^D$  that maximizes  $V_C$

$$(15) \quad \frac{dV_C}{d\omega^D} = \underbrace{\frac{\partial V_C}{\partial l} \frac{\partial l(\omega^D)}{\partial \omega^D}}_{(+)} + \underbrace{\frac{\partial V_C}{\partial \omega^D}}_{(-)} = 0$$

- The optimal choice of  $\omega^D$ : **balancing** the gain against the loss.

### Proposition 3

Under the optimal simple PTS, countries do not raise  $\omega^D$  to push down  $l$  to its minimum attainable level with  $\partial l / \partial \omega^D = 0$ . In particular, the optimal simple PTS will not entail free trade when  $\partial u(l, l) / \partial l = 0$  at  $l = 0$ .

Ex) “Priority Foreign Countries List” and “Priority Watch List” in Special Section 301

#### 4. Optimal Third-party Trigger Strategies (Optimal TTS)

- *How the presence of a third party, such as the WTO, with its own imperfect private signals  $(\omega, \omega^*)$  can facilitate enforcing international trade agreements.*
- Third-party Trigger Strategies with Cooperative Protection Levels being  $(l, l)$ 
  - If period  $t - 1$  is a “cooperative” period with  $(e_{t-1}, e^*_{t-1}) = (0, 0)$ , then in period  $t$  the WTO tells H to initiate a punishment by setting  $(\tau, e) = (h, h)$  iff  $\omega_{t-1} \in \Omega^D$ , & the WTO tells F to initiate a punishment by setting  $(\tau^*, e^*) = (h^*, h^*)$  iff  $\omega^*_{t-1} \in \Omega^D$ .
  - Given that a “punishment phase” is initiated in period  $t - 1$  with  $(e_{t-1}, e^*_{t-1}) \neq (0, 0)$ ,  $(\tau, e) = (h, h)$  &  $(\tau^*, e^*) = (h^*, h^*)$  for  $T - 2$  ( $\lambda$ ) periods if one country initiated it;  $(\tau, e) = (h, h)$  &  $(\tau^*, e^*) = (h^*, h^*)$  for  $T^S - 2$  ( $\lambda^S$ ) periods, if both countries started it, where  $\lambda^{(S)} \in [0, 1]$  is the probability of extending the phase by one more period.
  - In period 1 and other “initial” periods right after the end of any tariff war phase, H and F set  $(\tau^{(*)}, e^{(*)}) = (l, 0)$  with prob.  $(1 - Pr)$  & set  $(\tau^{(*)}, e^{(*)}) = (h, h)$  with prob.  $Pr$ , where  $Pr = Pr(\omega_t \in \Omega^D) = Pr(\omega^*_t \in \Omega^D)$  with  $(\tau, e) = (l, 0)$ ,  $(\tau^*, e^*) = (l, 0)$ .

##### Definition 4.

If (a) (b) and (c) describe strategy profile  $(\underline{s}^W, \underline{s}^{W*})$ ,  $(\underline{s}^W, \underline{s}^{W*})$  are *Third-party Trigger Strategies (TTS)* with  $(l^c, \Omega^D, T, T^S, \lambda, \lambda^S)$  as characterizing parameters.

#### 4. Optimal TTS

- Understanding the optimal choice of  $T^w$ :

$$\frac{dV_c^w}{dT^w} = \left( -\frac{\partial V_c^w}{\partial l} \right) \left[ \frac{\partial I^w}{\partial T^w} + A \frac{\partial I^w}{\partial \omega^D} \right], \text{ where } A = \frac{2 \ln(\delta^C)(\delta^C)^{T^w} Pr(1 - Pr) \left( \frac{\partial Pr(l)}{\partial \omega^D} \right)^{-1}}{1 - \delta^C + 2[\delta^C - (\delta^C)^{T^w}]},$$

$$\text{with } \left( -\frac{\partial V_c^w}{\partial l} / \frac{\partial I^w}{\partial l} \right) < 0, \frac{\partial I^w}{\partial T^w} < 0, \frac{\partial I^w}{\partial \omega^D} < 0, \text{ and } A \frac{\partial I^w}{\partial \omega^D} > 0.$$

→ Both  $T^w$  and  $\omega^D$  can relax  $IC^w$  with  $\partial I^w / \partial T^w < 0$  and  $\partial I^w / \partial \omega^D < 0$

##### Proposition 4

With  $\partial Pr^l(l) / \partial \omega^D > 0$ ,  $\partial Pr(\tau) / \partial \omega^D > 0$ ,  $\partial^2 Pr^l(l) / \partial (\omega^D)^2 < 0$ , and  $\partial^2 Pr(l) / \partial (\omega^D)^2 = 0$ ,

(a)  $T^w = 1$  under the optimal TTS if  $Pr(l) < \overline{Pr}$ , where

$$\overline{Pr} = \frac{-3(1 - \delta^C) + \sqrt{[3(1 - \delta^C)]^2 + 16\delta^C(1 - \delta^C)}}{8\delta^C}$$

with  $\partial \overline{Pr} / \partial \delta^C < 0$  and  $\lim_{\delta^C \rightarrow 0} \overline{Pr} / \partial \delta^C = 1/3$  so that  $\overline{Pr} \in (0, 1/3)$  for  $\delta^C \in (0, 1)$

(b)  $T^w \rightarrow \infty$  under the optimal TTS if  $Pr(l) > \underline{Pr}$ , where

$$\underline{Pr} = \frac{2 - [u(l, l) - u(h, h)] / [u(l, l) - u(l, h)]}{4 - [u(l, l) - u(h, h)] / [u(l, l) - u(l, h)]},$$

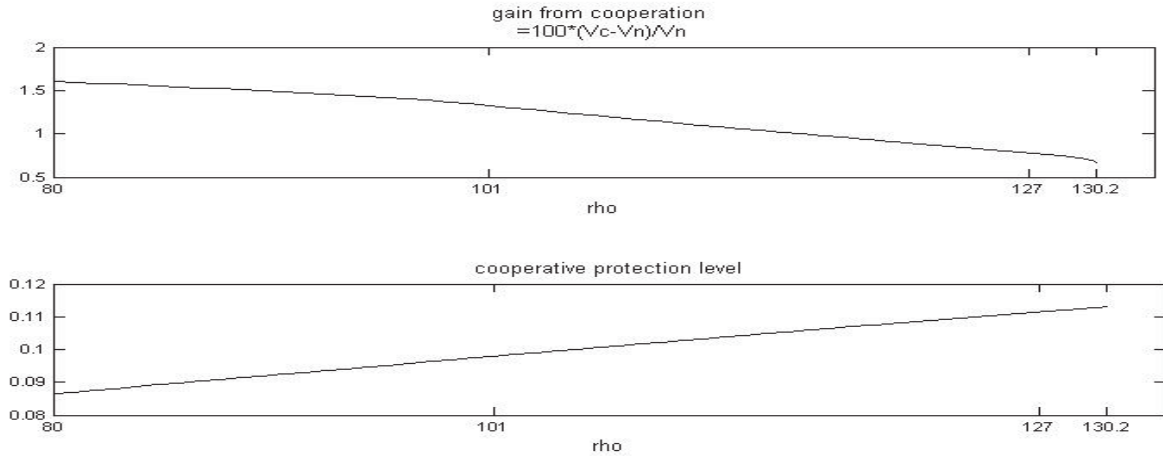
with  $[u(l, l) - u(h, h)] / [u(l, l) - u(l, h)] \in (0, 1)$  for  $l \in [0, h]$  so that  $\underline{Pr} \in (1/3, 1/2)$ .

## 4. Optimal TTS

### ■ A Numerical Analysis of the optimal TTS

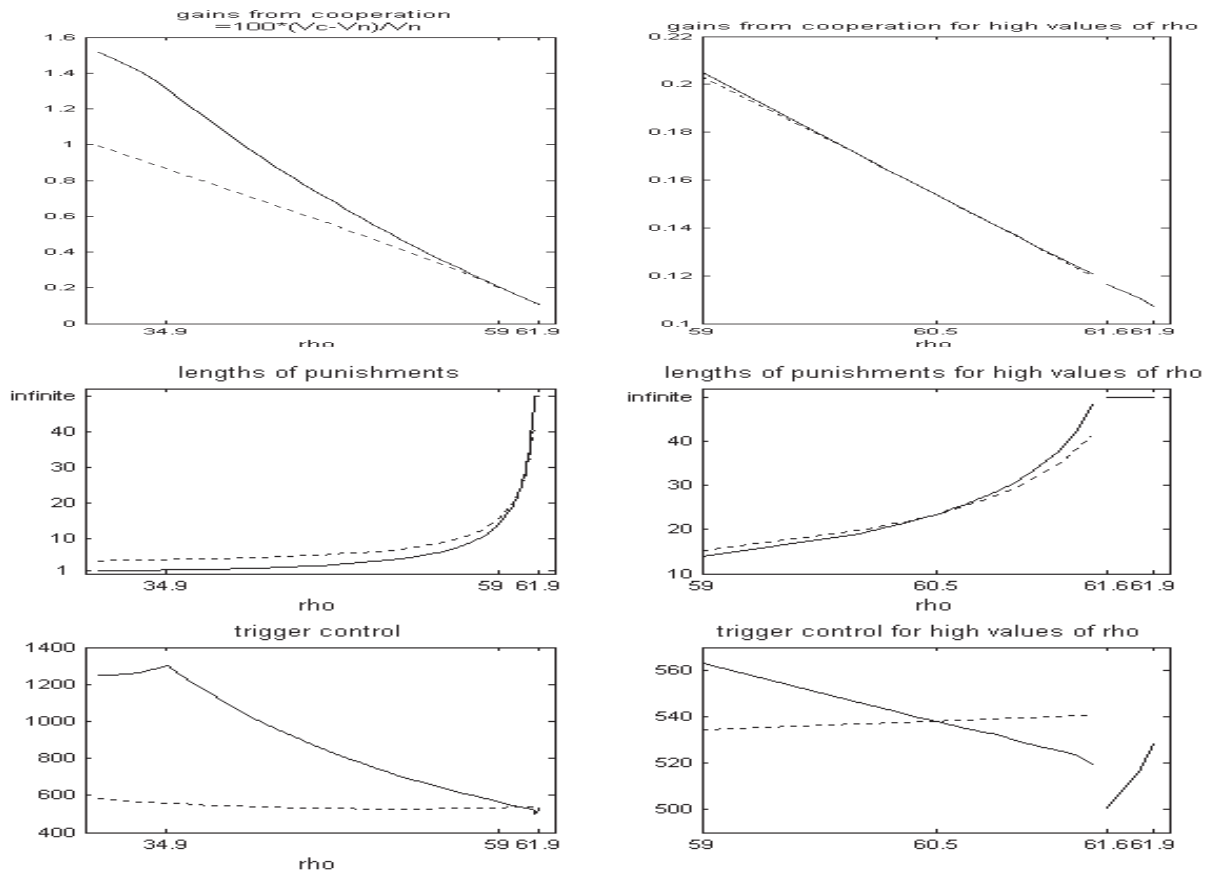
$Pr(l)$  takes the following functional form:

$$\begin{aligned}
 (23) \quad Pr(l) &= Pr(l|\omega^D; \rho, \chi) = \omega^D [l^2 / (2\chi) + \rho] \text{ for } l \leq \underline{l}/2, \\
 &= \omega^D [(\underline{l} \times l) / \chi - l^2 / (2\chi) + \rho - \underline{l}^2 / (4\chi)] \text{ for } \underline{l}/2 < l \leq \underline{l}, \\
 &= 1 \text{ for } l > \underline{l} \equiv 2\sqrt{\chi / \omega^D - \chi\rho}, \\
 &1/\chi \in (0, \infty) \text{ represents the sensitivity of the signal in detecting concealed protection,} \\
 &\rho \in [0, \infty) \text{ represents the level of errors in detecting concealed trade barriers}
 \end{aligned}$$



## 4. Optimal TTS

### ■ A Numerical Comparison of the optimal TTS and optimal PTS



### III. 세계무역체제의 유지와 불완전한 사적 정보

#### 무역협정의 이행과 WTO의 역할

- **WTO의 제3자 분쟁해결절차**는 분쟁당사자 간 정보의 비대칭성이 클 때 무역분쟁에 따른 관세부과와 같은 **무역전쟁의 기간을 줄이게 하고**, **협정위반에 대해 좀 더 민감하게 대응하는 것을 가능하게 해 줌**.
- 따라서 **WTO 체제가** 미국을 중심으로 한 신보호주의로 인해 **붕괴**된다면, 무역분쟁에 따른 관세부과와 같은 **무역전쟁의 기간이 늘어날 것이며**, **협정위반에 대해 좀 더 민감하게 대응하는 것이 어려워 질 수 있음**.
- 하지만, 기존의 **WTO의 분쟁해결절차**가 **국제지적재산권 보호문제** 혹은 **국가보조금 문제** 등의 매우 **큰 규모의 협정위반에 적절히 대응하지 못해** 온 것이 사실일 경우, **WTO의 분쟁해결절차**가 이러한 문제를 보다 적절히 해결할 수 있도록 강화되지 못한다면, **세계무역체제 자체가 흔들릴 수 있음**.

## Dispute Settlement with Second-Order Uncertainty: The Case of International Trade Disputes

Mostafa Beshkar

Jee-Hyeong Park

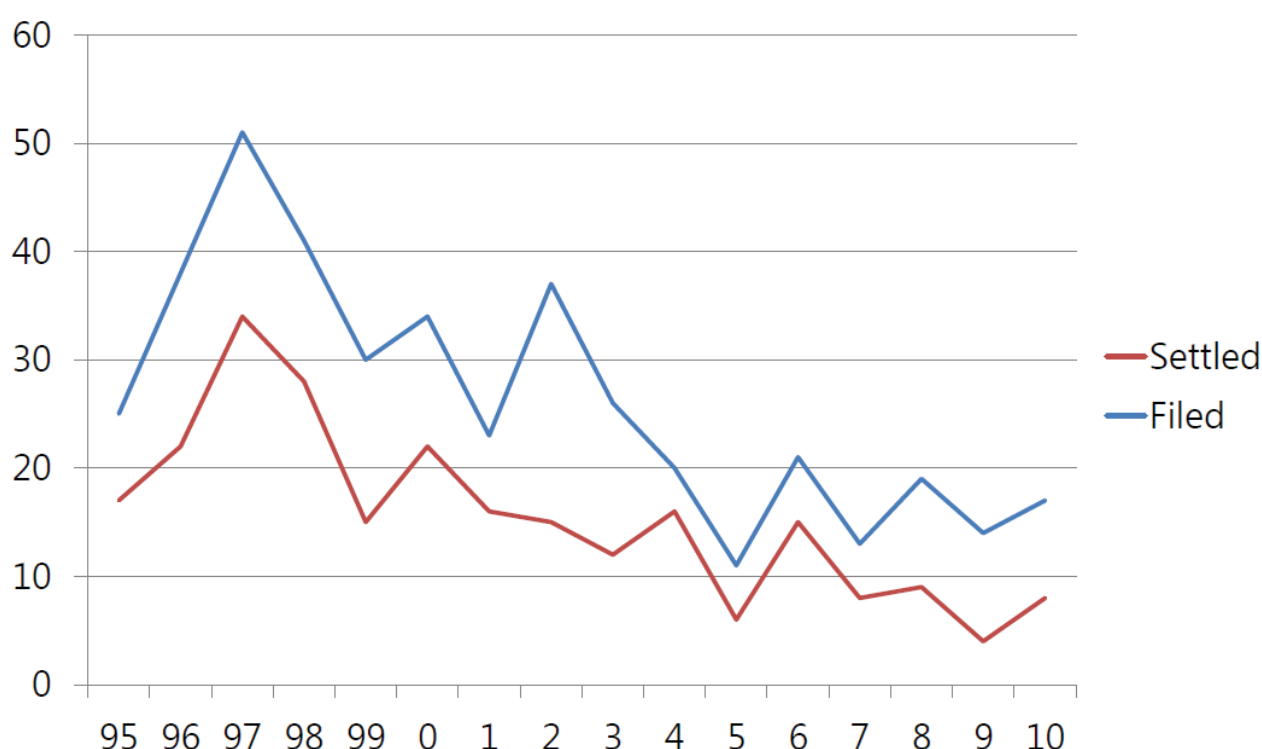
Indiana University

Seoul National University

May 19, 2018

Midwest International Trade Meeting

# WTO Disputes



## Model of the Pretrial Settlement (as a Signaling Game)

- A pretrial settlement bargaining game in which one player receives a *private and noisy* signal of another player's private type, thereby generating second-order uncertainty.
  - A complaining government may have noisy and private signal about the legitimacy of contingent protection of a defending government.
- ① Defendant government ( $D$ ) is subject to random & private pressure for protection (high or low).
- ② Complainant government ( $C$ ) receives an imperfect signal (high or low) of  $D$ 's protection pressure (high or low), which can be either private (only known to  $C$ ) or public (known to both  $C$  and  $D$ ).
- ③  $D$  ( $D_l$  or  $D_h$ ) makes a take-it-or-leave-it tariff pair offer based on its private protection pressure.
- ④  $C$  ( $C_l$  or  $C_h$ ) decides upon settlement/litigation based on its imperfect signal of  $D$ 's type.
- ⑤ Upon litigation, DSB gives a ruling based on its own imperfect signal of  $D$ 's pressure: uncertain DSB rulings.



# Main Results

- ① The complainant's signal totally loses its informational value if it is revealed publically prior to a settlement offer being made (*anti-transparency* result).  
→ The lack of transparency in the pretrial stage of the WTO trade dispute  
cf) Publicization of information in the trial stage of the WTO dispute  
← Park (2011)
- ② The equilibrium entails a fully separating and *Pareto-inefficient settlement offer* with excessively high protection.  
→ The pro-trade bias in the DSB's rulings
- ③ Reduction in the noise of a complaint's signal about the type of a defendant will reduce the probability of litigation.  
→ The number of WTO dispute cases decreased from 335 during its first 10 years (1995-2005) to 165 during the next 10 years (2015).  
cf) Ahn et al. (2014)

Navigation icons: back, forward, search, etc.

## Government Objective Functions (An Example)

- An extra welfare weight ( $\theta \geq 0$ ) is given to an import-competing sector.
- A government's payoff drawn from its import-competing sector:

$$u(\tau; \theta) \equiv \psi_x(\tau) + (\theta + 1)\pi_x(\tau) + T(\tau).$$

$\psi$ : consumers' surplus;  $\pi$ : producers' surplus;  $T$ : tariff revenue;  $\tau$ : import tariff

- A government payoff drawn from its export sector:

$$v(r) \equiv \psi_y(r) + \pi_y(r).$$

$r$ : a foreign government's import tariff

- A government payoff function:

$$W(\tau, r; \theta) \equiv u(\tau; \theta) + v(r).$$

Navigation icons: back, forward, search, etc.

# Government Objective Functions

- Defendant ( $D$ )'s payoff function:  $W^D((\tau, r); \theta)$ , is increasing (decreasing) in  $\tau$  ( $r$ ) at  $\tau = 0$  ( $r \geq 0$ ), and is concave in  $\tau$ .
  - $W_{\tau\theta}^D > 0$ : a higher  $\theta$  raises the incentive to increase protection.
- Complainant ( $C$ )'s payoff function,  $W^C((\tau, r))$  is decreasing (increasing) in  $\tau$  ( $r$ ) at  $\tau \geq 0$  ( $r = 0$ ), and is concave in  $r$ .
- The joint payoff,  $W^J((\tau, r); \theta) = W^D((\tau, r); \theta) + W^C((\tau, r))$ , is increasing in  $\tau$  at  $\tau = 0$  if and only if  $\theta > 0$ .
  - $W_{\tau\theta}^J > 0$ : a higher protection in response to a higher  $\theta$  is optimal.
  - For  $\theta = 0$ ,  $W_{\tau}^J((\tau, r); \theta) = 0 < 0$ : distortional losses associated with protection.
- $P_\theta$  denoting a set of Pareto-efficient tariff pairs given  $\theta$ .
- $T^C(t)$  and  $T^{D_\theta}(t)$ : indifference curves of  $C$  and  $D_\theta$  that crosses  $t$ .

## Private Protection Pressure

- Two levels of protection pressure: low ( $l$ ) and high ( $h$ ).
- Realization of  $\theta$  is **private information** of  $D$
- Prior distribution of  $\theta$ :

$$\begin{aligned}\Pr(\theta = h) &= \rho, \\ \Pr(\theta = l) &= 1 - \rho,\end{aligned}$$

where,  $0 < \rho < 1$ .

# Imperfect Signal of Protection Pressure

- $C$  receives an imperfect signal of  $D$ 's protection pressure ( $\theta$ ), denoted by  $\theta^C$ , which can either be low ( $l$ ) or high ( $h$ ).
- $\theta^C$  can be either private information to  $C$  or public information (through publicizing)
- $C$ 's **signal accuracy** is  $\gamma \in (\frac{1}{2}, 1)$ :

$$\Pr(\theta^C = l | \theta = l) = \Pr(\theta^C = h | \theta = h) = \gamma.$$

## DSB's Role

- Governments resort to DSB's ruling if they fails to reach a mutually accepted solution in trade disputes.
- Assume that DSB can facilitate governments to obtain higher ex ante payoffs than the ones under the no-court and no-information case.
- Some notations:

$W^D(t_h^{\min}; h) \equiv W_L^D(h)$ :  $D_h$ 's expected payoff under litigation

$W^D(t_l^{\min}; l) \equiv W_L^D(l)$ :  $D_l$ 's expected payoff under litigation

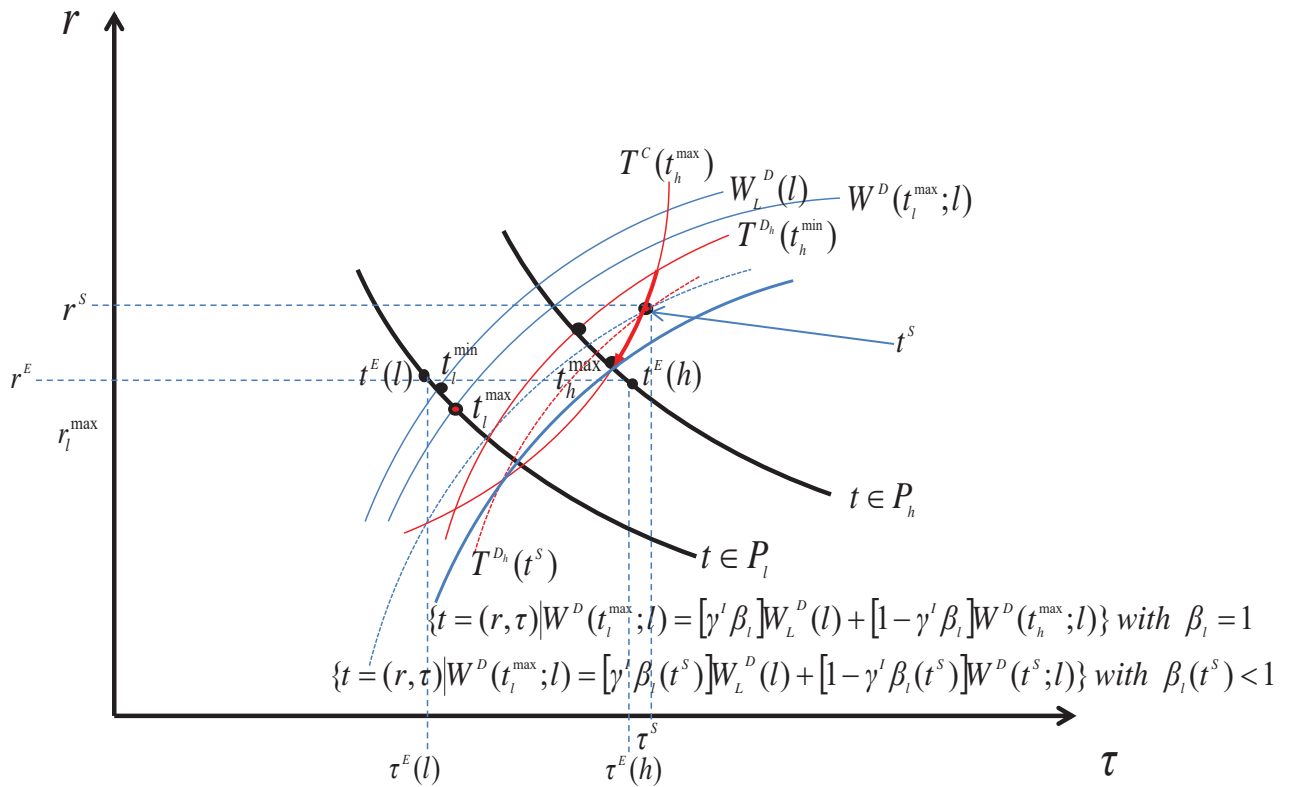
$W^C(t_h^{\max}) \equiv W_L^C(h)$ :  $C$ 's expected payoff under litigation with  $\theta = h$

$W^C(t_l^{\max}) \equiv W_L^C(l)$ :  $C$ 's expected payoff under litigation with  $\theta = l$

where  $t_l^{\min}, t_l^{\max} \in P_l$  and  $t_h^{\min}, t_h^{\max} \in P_h$ .







**Characteristics of the Divine Equilibrium with Private Signals**

## A Fully Separating PBE with an Imperfect Private Signal

**Proposition 2** *The Divine PBE has one of the following three types of litigation strategies on  $D_h$ 's settlement proposal,  $t_b$ , with distinctive properties, depending on the accuracy of  $C$ 's private information,  $\gamma$  :*

- (a) If  $\gamma < \gamma^{III}$ ,  $\beta_l(t_b) = 1$  and  $\beta_h(t_b) > 0$ , with  $\frac{\partial t_b}{\partial \gamma} = 0$  and  $\frac{\partial \beta_h(t_b)}{\partial \gamma} < 0$ ;
- (b) If  $\gamma^{III} \leq \gamma < \gamma^{II}$ ,  $\beta_l(t_b) = 1$  and  $\beta_h(t_b) = 0$ , with  $\frac{\partial t_b}{\partial \gamma} < 0$ ;
- (c) If  $\gamma \geq \gamma^{II}$ ,  $\beta_l(t_b) \leq 1$  and  $\beta_h(t_b) = 0$ , with  $\frac{\partial t_b}{\partial \gamma} < 0$ , and  
if  $\gamma \geq \gamma^I (> \gamma^{II})$ ,  $\beta_l(t_b) < 1$ , with  $\lim_{\gamma \rightarrow 1} (t_b) = t_h^{\max}$  and  $\lim_{\gamma \rightarrow 1} \beta_l(t_b) > 0$ .

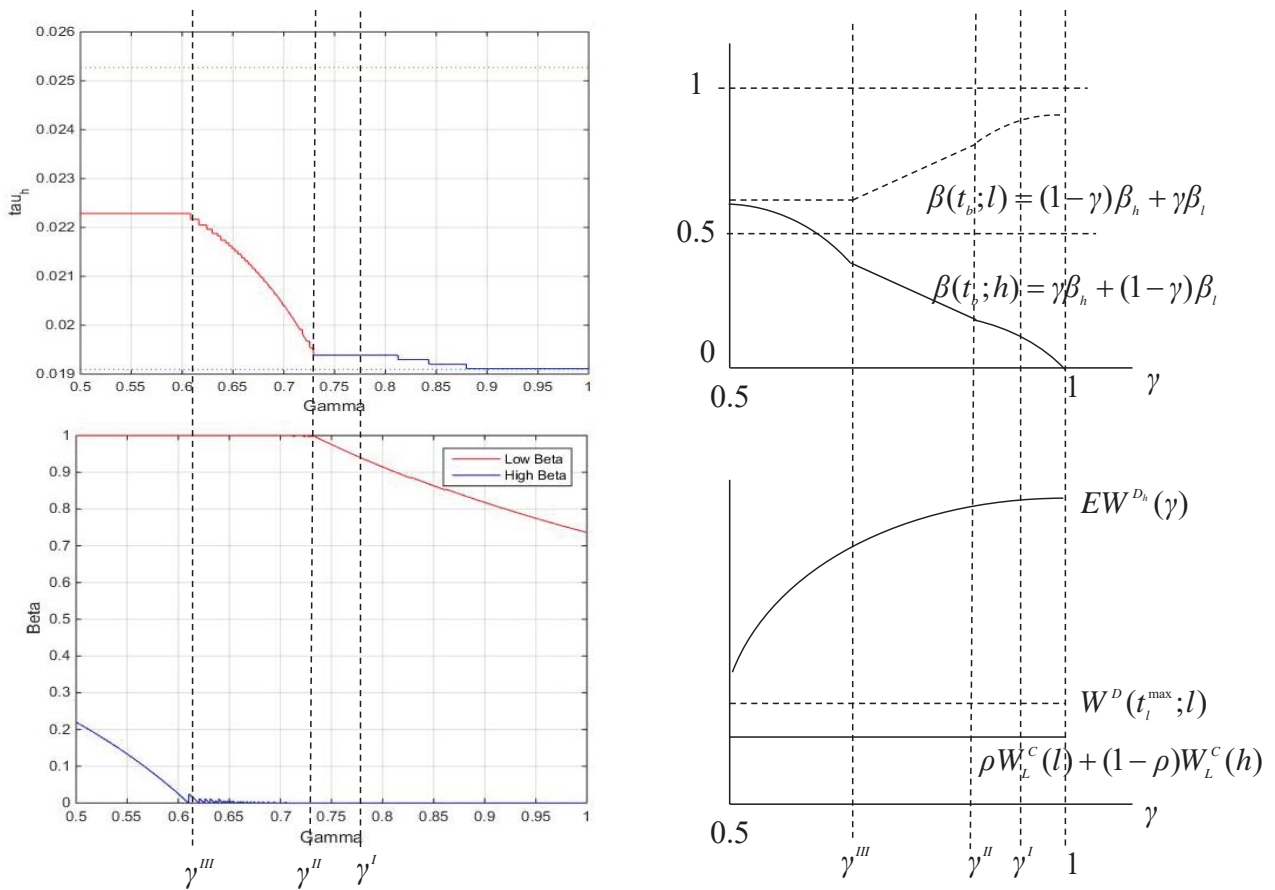


Figure 4. Numerical analysis with Linear Demands and Supplies

## A Fully Separating PBE with an Imperfect Public Signal

$D_h$ 's maximization problem:

$$t^S \in \underset{t}{\operatorname{Argmax}} \{ \beta(t) W_L^D(h) + [1 - \beta(t)] W^D(t; h) \} \quad (3)$$

$$\text{s.t. } W^D(t_l^{\max}; l) \geq \beta(t) W_L^D(l) + [1 - \beta(t)] W^D(t; l), \quad (4)$$

with  $\beta(t^S) \in [0, 1]$ .

**Proposition 3** *The exists a separating PBE that maximizes  $D_h$ 's expected payoff (by solving the above constrained maximization problem), having  $t^S = t_b(> t_h^{\max}) \in T^C(t_h^{\max})$  with  $\alpha_h(t_b) = 1$  and  $\alpha_l(t_l^{\max}) = 1$ ;  $\beta(t^S) \in (0, 1)$  being uniquely determined by (4) with equality.*

- The Divine equilibrium does not depend on  $\gamma$ .
- The solution to (3) is identical to the solution to (1) with private information with  $\gamma = 0.5$ .
- The Divine equilibrium with a private signal Pareto-dominates the one with a public signal.



### III. 세계무역체제의 유지와 불완전한 사적 정보

WTO 분쟁해결절차가 무력화 되어, 무역분쟁과 관련된 협상 결렬이 WTO의 조정(arbitration) 대신 상당히 긴 무역전쟁으로 이어질 가능성이 높아진다면, 무역분쟁이 협상으로 해결될 가능성(the likelihood of settlement)에는 어떤 영향을 미칠 것으로 예상되는가?

- 상대적으로 그 결과가 예상 가능한 WTO 조정과정에 비해, 무역전쟁에서 상대방이 얼마나 강하게 나올지에 대한 예상의 정확성은 낮아질 가능성 ↑  
→ 무역분쟁이 협상으로 해결될 가능성(the likelihood of settlement)을 낮춤
- 협상 결렬이 WTO 조정과정 대신 긴 무역전쟁으로 이어진다면 결렬 비용을 높이는 효과가 있음  
→ 무역분쟁이 협상으로 해결될 가능성(the likelihood of settlement)을 높임

### III. 세계무역체제의 유지와 불완전한 사적 정보

“Understanding Non-litigated Disputes in the WTO Dispute Settlement System” with Ahn and Lee at JWT (2013)

- Non-litigated Disputes  $\approx$  Settled Disputes  
Factors affecting the likelihood of settlement:
  - 1) An increase in the informational asymmetry between disputing parties with regard to the outcome of litigation will reduce the likelihood of settlement.  
→ A larger difference in the size of disputing countries (GDP Diff)  
→ If the complainant is a smaller country than the defendant (D-dummy)
  - 2) A higher degree of reputational concern of a defendant about its potential future dispute with a complainant will reduce the likelihood of settlement.  
→ A larger amount of imports of a defendant from a complainant (D-import)
  - 3) A stronger retaliatory power of a complainant against a defendant may magnify the effect of informational asymmetry, reducing the likelihood of settlement.  
→ A higher export share of a defendant export to a complainant over its total export (Export-Share)
  - 4) Use of common language (L-dummy) may increase the likelihood of settlement

### III. 세계무역체제의 유지와 불완전한 사적 정보

“Understanding Non-litigated Disputes in the WTO Dispute Settlement System”  
with Ahn and Lee at JWT (2013)

Table 4. Logistic Regression Results

Non-litigation	(1)	(2)	(3)	(4)	(5)
GDP Diff.	-8.01e-14 (2.17e-14)***	-7.61e-14 (2.20e-14)***	-7.31e-14 (2.28e-14)***	-6.57e-14 (2.30e-14)***	-7.09e-14 (2.35e-14)***
D-dummy		-.6539801 (.2025215)***	-.573636 (.2093156)***	-.885459 (.224587)***	-.5774425 (.209614)***
D-Import			-3.07e-09 (1.28e-09)**		-3.20e-09 (1.33e-09)**
Export-Share				-1.783413 (.7955965)**	
L-Dummy					.0834284 (0.708)
Observations	419	419	403 <sup>32</sup>	411 <sup>33</sup>	403
R-Squared	0.0244	0.0427	0.0525	0.0537	0.0527

Note: Standard deviation is inside parenthesis; \* represents significance at 10% level, \*\* represents significance at 5% level and \*\*\* represents significance at 1% level.

### IV. 맺음말 (미래 연구 방향)

- 세계무역체제의 유지와 관련 다국 무역분쟁 및 분쟁해결모형 개발
  - 현존하는 무역분쟁 및 분쟁해결모형은 주로 2국 모형임
  - 실재 무역분쟁은 이해가 중첩된 다국적인 이슈인 경우가 많고, 다 국가간 상이한 불완전한 사적정보를 가정한 이론 모형은 없음.
- WTO 무역분쟁 및 분쟁해결과 관련된 실증분석
  - 현존하는 무역분쟁 관련 실증분석은 주로 reduced form 분석임.
  - 무역분쟁 및 분쟁해결 관련 이론에 근거한 실증분석 개발이 필요.
- 세계무역체제와 관련한 다양한 이론적 실증적 연구
  - New Handbook on Commercial Policy!
  - 이질적 기업모형에 기반한 New New Trade Theory와 융합한 영향력이 큰 이론의 개발 및 실증분석을 수행할 여지가 많음.