
(When) Does Tit-for-Tat Diplomacy in Trade Policy Pay Off?

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The Paper in a Nutshell

- in international relations, short run incentives often dominate
- national sovereignty often hampers external institutions (that try to enforce cooperation)
- this may strengthen the role of internal institutions
- this paper
 - examines the role of internal institutions for trade policy
 - focus on self-enforcing mechanisms (as contingent protection, aka tit-for-tat, TFT)
 - theory: shows that TFT behavior leads to a more liberal trade regime
 - empirics:
 - creates a new data set
 - in line with the theoretical results: countries frequently adopting TFT behavior provide a more liberal trade regime at the end of the day

Overview...

- Introduction / Literature
- Theoretical Framework
- Empirical Analysis
- Conclusion

Introduction

- TFT behavior has been with human kind for a long time
 - for revenge (in the short run)
 - to enforce cooperative behavior (in the long run)
- since Axelrod (1984), TFT strategies are an important variant of internal institutions, leading to a market-led evolution of cooperation
 - especially when external institutions are weak, TFT may work as a “societal pillar”
- in the international realm
 - non-cooperative behavior is often tempting
 - external institutions are weak

Introduction

- however, TFT in international relations is not undisputed
 - since Adam Smith's “Wealth of Nations” (1776), trade theorists argue often in favor of unilateralism
 - that is to adopt cooperative strategies, no matter what others do
 - Joan Robinson: “Even if others throw rocks into their harbors, there is no reason to throw rocks into your own” (see Bhagwati and Panagariya, 2002)
 - retaliation narrows the area enclosed by the offer curves of trading countries and, thus, shrinks trade volumes (Meade, 1952)

Introduction

- but the reality of trade relations tells a different story
 - there are attempts to liberalize markets
 - but protectionism and retaliation prevails
 - in order to discipline trading partners, TFT is a legitimate, extensively used instrument
 - bilateral: e.g. the protectionist behavior as consequence of the economic crisis 2007 / 2008 (see e.g. Baldwin, 2009 or Evenett, 2010)
 - multilateral: Dispute Settlement Process (DSP) of the WTO

Introduction

- however, as in traditional trade theory, retaliations are very much disputed
 - they are often seen as obstacle and not as stepping stone to trade liberalization (see e.g. Anderson, 2002)
- but also some evidence emerges arguing that
 - multilateral retaliations provide information and transparency of violations of the rules of the game
 - and, thus, ensure that it is not destructive
 - (see Schwartz and Sykes, 2002; Nzelibe, 2005; Bown and Ruta, 2010)

Introduction

- this paper
 - looks at international trade policy through the prism of Axelrod's TFT strategy
 - Is it possible that TFT acts as internal institution promoting trade?
 - If so, can we identify crucial parameters for trade liberalization to obtain? Is TFT evolutionary stable?
- questions like these have been examined in the abstract and in experimental studies
- but only to a minor extent in international trade literature

Introduction

- Melese et al. (1989) explicitly modeled the incentive-compatibility of TFT with trade
 - tariffs are solely motivated by the revenue objective
 - small open economy, redistributive effects within-country
 - TFT works through demand channel, lowers income and thus the potential for redistribution
- however, in current trade conflicts, threat of retaliation is usually in terms of market access

Introduction

- Bagwell and Staiger (2002)
 - assume imperfect competition
 - suppose that trade policy is driven by terms of trade considerations
- Magee and Magee (2008) and Mrázová (2009)
 - criticize terms of trade as primary concern of trade policy
- Bagwell and Staiger (2010)
 - claim that their analysis is translatable into matters of market access (but do not provide an explicit model)

Introduction

- this paper
 - theoretical framework
 - considers that retaliation works in limiting market access (and thus profits) of producers
 - does not neglect terms of trade issues
 - Empirical analysis
 - creates a data set in order to examine TFT behavior in trade policy
 - presents first empirical results (consistent with the theory)
 - countries more often involved in TFT behavior provide on average a more liberal trade regime at the end of the day

Overview...

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Theoretical Framework

– Basic Model

- consumers have preferences over three goods
 - numéraire c_0 (supplied in perfect competition)
 - two sorts of monopolistically supplied goods
 - c_1 supplied domestically
 - c_2 imported

- preferences in home and foreign:

$$U = c_0 + \alpha (c_1 + c_2) - \frac{\beta}{2} (c_1^2 + c_2^2)$$

$$U^* = c_0^* + \alpha (c_1^* + c_2^*) - \frac{\beta}{2} ((c_1^*)^2 + (c_2^*)^2)$$

- with c_0 , c_1 , and c_2 quantities consumed in home or foreign (*)

Theoretical Framework

– Basic Model

- utility is maximized subject to constraints

$$Y = c_0 + p_1 c_1 + (p_2 + t) c_2$$

$$Y^* = c_0^* + (p_1^* + T) c_1^* + p_2^* c_2^*$$

- with aggregate incomes Y taken as given
- producers are able to price discriminate between home and foreign, thus, p and p^* may differ

Theoretical Framework

– Basic Model

- utility maximization yields demand of the three goods

$$\begin{aligned}c_0 &= Y - p_1 c_1 - (p_2 + t) c_2 & c_0^* &= Y^* - (p_1^* + T) c_1^* - p_2^* c_2^* \\c_1 &= \frac{\alpha - p_1}{\beta} & c_1^* &= \frac{\alpha - (p_1^* + T)}{\beta} \\c_2 &= \frac{\alpha - (p_2 + t)}{\beta} & c_2^* &= \frac{\alpha - p_2^*}{\beta}\end{aligned}$$

- producers face a 1:1 linear input-output function and, thus, obtain profits

$$\pi_1 = p_1 c_1 + p_1^* c_1^* - (c_1 + c_1^*)$$

Theoretical Framework

– Basic Model

- profit maximization subject to demand functions yields

$$\begin{aligned} p_1 &= \frac{\alpha + 1}{2} & p_2 &= \frac{\alpha + (1 - t)}{2} \\ p_1^* &= \frac{\alpha + (1 - T)}{2} & p_2^* &= \frac{\alpha + 1}{2} \end{aligned}$$

- inserting prices into the demand functions yields

$$\begin{aligned} c_1 &= \frac{\alpha - 1}{2\beta} & c_1^* &= \frac{\alpha - (1 + T)}{2\beta} \\ c_2 &= \frac{\alpha - (1 + t)}{2\beta} & c_2^* &= \frac{\alpha - 1}{2\beta} \end{aligned}$$

- consumption decreases with tariffs, but profits are not affected by tariffs on imports
- this changes if we allow for retaliation...

Theoretical Framework

– Basic Model

- but consider first a one-shot game
- suppose that tariff revenue is redistributed in lump sum
- policy makers' objective function is

$$V = CS + tc_2 + \pi_1 = \alpha(c_1 + c_2) - \frac{\beta}{2}(c_1^2 + c_2^2) - p_2c_2 + p_1^*c_1^* - (c_1 + c_1^*)$$

Theoretical Framework

– Basic Model

- this yields payoffs associated to different tariff settings

		A	
		$t = 0$	$t = t$
B	$T = 0$	$\frac{3(\alpha-1)^2}{4\beta}$ $\frac{3(\alpha-1)^2}{4\beta}$ Cell I	$\frac{6\alpha^2 - 12\alpha + 2\alpha t - 3t^2 - 2t + 6}{8\beta}$ $\frac{3\alpha^2 - 6\alpha - 2\alpha t + t^2 + 2t + 3}{4\beta}$ Cell II
	$T = T$	$\frac{3\alpha^2 - 6\alpha - 2\alpha T + T^2 + 2T + 3}{4\beta}$ $\frac{6\alpha^2 - 12\alpha + 2\alpha T - 3T^2 - 2T + 6}{8\beta}$ Cell III	$\frac{6\alpha^2 - 12\alpha + 2\alpha t - 3t^2 - 2t + 6 - 4\alpha T + 2T^2 + 4T}{8\beta}$ $\frac{6\alpha^2 - 12\alpha + 2\alpha T - 3T^2 - 2T + 6 - 4\alpha t + 2t^2 + 4t}{8\beta}$ Cell VI

Figure 1. Payoffs in Trade Conflicts in a One-shot Game

Theoretical Framework

– Basic Model

- considering consumer surplus and profits, tariffs are set as

$$\tilde{t} = \frac{\alpha - 1}{3}; \quad \tilde{T} = \frac{\alpha - 1}{3}$$

- what yields payoffs

		A	
		$t = 0$	$t = \tilde{t}$
B	$T = 0$	$\frac{3(\alpha-1)^2}{4\beta}$ $\frac{3(\alpha-1)^2}{4\beta}$ Cell I	$\frac{19(\alpha-1)^2}{24\beta}$ $\frac{11(\alpha-1)^2}{18\beta}$ Cell II
	$T = \tilde{T}$	$\frac{11(\alpha-1)^2}{18\beta}$ $\frac{19(\alpha-1)^2}{24\beta}$ Cell III	$\frac{47(\alpha-1)^2}{72\beta}$ $\frac{47(\alpha-1)^2}{72\beta}$ Cell VI

Theoretical Framework

– Basic Model

- results so far
 - in a short sighted one-shot game
 - setting tariffs is the dominant strategy
 - no matter what the exact numerical values of α and β are
 - despite payoffs being clearly higher in cell 1
 - typical Nash equilibrium

Theoretical Framework

– Sustaining Cooperation via TFT?

- suppose that foreign plays TFT
- home has three strategies to respond (see Axelrod and Hamilton, 1981):
 1. adopt TFT as well
 2. defect all of the time in imposing a tariff
 3. alternate between defection and cooperation

Theoretical Framework

– Sustaining Cooperation via TFT?

- this yields expected pay offs for Home

$$1. \quad E(TFT, TFT) = \frac{3(\alpha - 1)^2}{4\beta} \frac{1}{(1 - q)}$$

$$\begin{aligned} 2. \quad E(D, TFT) &= \frac{(6\alpha^2 - 12\alpha + 2\alpha t - 3t^2 - 2t + 6)}{8\beta} \\ &\quad + \frac{(6\alpha^2 - 12\alpha + 6 + 2\alpha t - 2t - 3t^2 - 4\alpha T + 2T^2 + 4T)}{8\beta} \frac{q}{(1 - q)} \\ &= \frac{6(\alpha - 1)^2 + t(2\alpha - 3t - 2) - 2Tq(2\alpha - T - 2)}{(1 - q)8\beta} \end{aligned}$$

$$\begin{aligned} 3. \quad E(D, TFT; TFT, D) &= \frac{(6\alpha^2 - 12\alpha + 2\alpha t - 3t^2 - 2t + 6)}{8\beta} \frac{1}{(1 - q^2)} \\ &\quad + \frac{(3\alpha^2 - 6\alpha - 2\alpha t + t^2 + 2t + 3)}{4\beta} \frac{q}{(1 - q^2)} \end{aligned}$$

Theoretical Framework

– Sustaining Cooperation via TFT?

- with

$$E(TFT, TFT) > E(D, TFT) \quad \forall q > .3$$

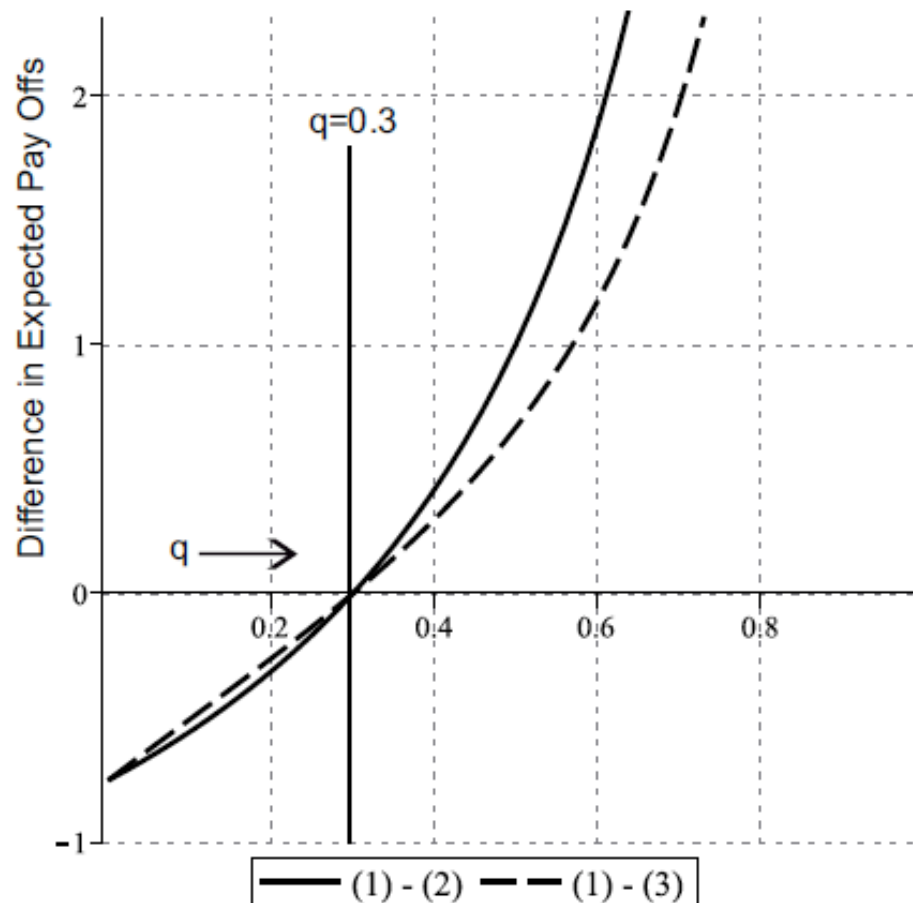
and

$$E(TFT, TFT) > E(D, TFT; TFT, D) \quad \forall q > .3$$

- TFT outperforms all other strategies
 - if the probability of facing each other again ($q > .3$)

Theoretical Framework

– Sustaining Cooperation via TFT?



Theoretical Framework

– Sustaining Cooperation via TFT?

- results so far:
 - results are in line with Axelrod and Hamilton (1981)
 - thus, their results apply to trade policies as well:
 - TFT indeed foster trade liberalization
 - as long as parties face each other frequently enough
 - demand and supply parameters are irrelevant for this result.

Theoretical Framework

– Stability of TFT in Trade Policy

- some countries may not follow TFT starting cooperatively
 - this is a question of evolution:
Will the subset of cooperative TFT countries prevail?
 - Assume a fraction of countries starting out friendly Q
 - As higher Q , as lower may q be
 - When endogenizing Q ,
 - countries will switch to cooperative TFT if Q attains a critical mass
 - fraction of countries cooperating grows through time

Overview...

- Introduction / Literature
- Theoretical Framework
- Empirical Analysis
- Conclusion

Empirical Analysis

- Meeting the Data

- theoretical findings in a nutshell
 - TFT fosters trade liberalization as long as countries meet frequently enough
- hypothesis for testing
 - countries that are more often involved in TFT conflicts provide a more liberal trade regime at the end of the day

Empirical Analysis

- Meeting the Data

- we construct a data set, using
 1. WTO dispute settlement gateway
 2. economic freedom indices (provided by Heritage foundation)
 3. Penn World Tables
- WTO dispute settlement gateway:
 - collects data on trade conflicts (TFT conflicts)
 - lists the date the conflict emerges
 - reason behind the dispute
 - and the countries involved

Empirical Analysis

- Meeting the Data

- we count the data up to a specific year and obtain three TFT variables (all at the country level)
 - total = all TFT conflicts a country has been involved in up to year x
 - complainant = number of TFT conflicts where country acts as complainant
 - respondent = number of conflicts where country is respondent

Empirical Analysis

- Meeting the Data

- to focus on protection we use the freedom indices (provided by the Heritage foundation)
 - “trade freedom” with grade between 0 and 100
 - Measures the absence of tariff and non-tariff barriers
 - that affect exports and imports of goods and services
- to control for macroeconomic aspects we use PWT
 - Real GDP per capita
 - Population
 - consumption, investment and government share of GDP

Empirical Analysis

- Meeting the Data

- overall
 - annual information at the country level
 - restricted to WTO members for years 1995 – 2010
 - containing
 - trade freedom (how liberal the trade regime of a country is)
 - number of trade conflicts the country has been involved in
 - total
 - complainant
 - respondent
 - population, GDP per capita, investment, consumption and government share of GDP

Empirical Analysis

- Descriptive Statistics

Table 1. Descriptive Statistics: Dispute Variables (year = 2010)

Variables	N	mean	sd	min	max
total disputes	71	20.07	43.00	0	240
-high income economies	23	33.22	59.45	1	207
-low income economies	29	8.14	11.15	0	58
complainant	71	14.86	29.05	0	166
-high income economies	23	23.61	38.17	0	140
-low income economies	29	6.34	8.08	0	40
respondent	71	5.24	15.74	0	108
-high income economies	23	9.61	23.96	0	98
-low income economies	29	1.79	3.69	0	18
difference	71	9.62	18.20	-4	92
-high income economies	23	14.00	22.98	-2	73
-low income economies	29	4.55	5.77	-4	22

difference = number of complainants - number of respondents

high income economies: GDP per capita > 20,000

low income economies: GDP per capita < 10,000

Source: Information from the WTO Dispute Settlement Gateway, own calculations

Empirical Analysis

- Descriptive Statistics

Table 2. Descriptive Statistics: Dispute Variables for Specific Economies in 2010

Variables	EC	US	Canada	China	India	Japan	Australia	Mexico	Brazil
total disputes	240	228	112	32	60	98	67	73	58
complainant	166	120	97	15	44	83	57	59	44
respondent	74	108	15	17	18	15	10	14	14
difference	92	12	82	-2	26	68	47	45	30

difference = number of complainants - number of respondents

Source: Information from the WTO Dispute Settlement Gateway, own calculations

Empirical Analysis

- Descriptive Statistics

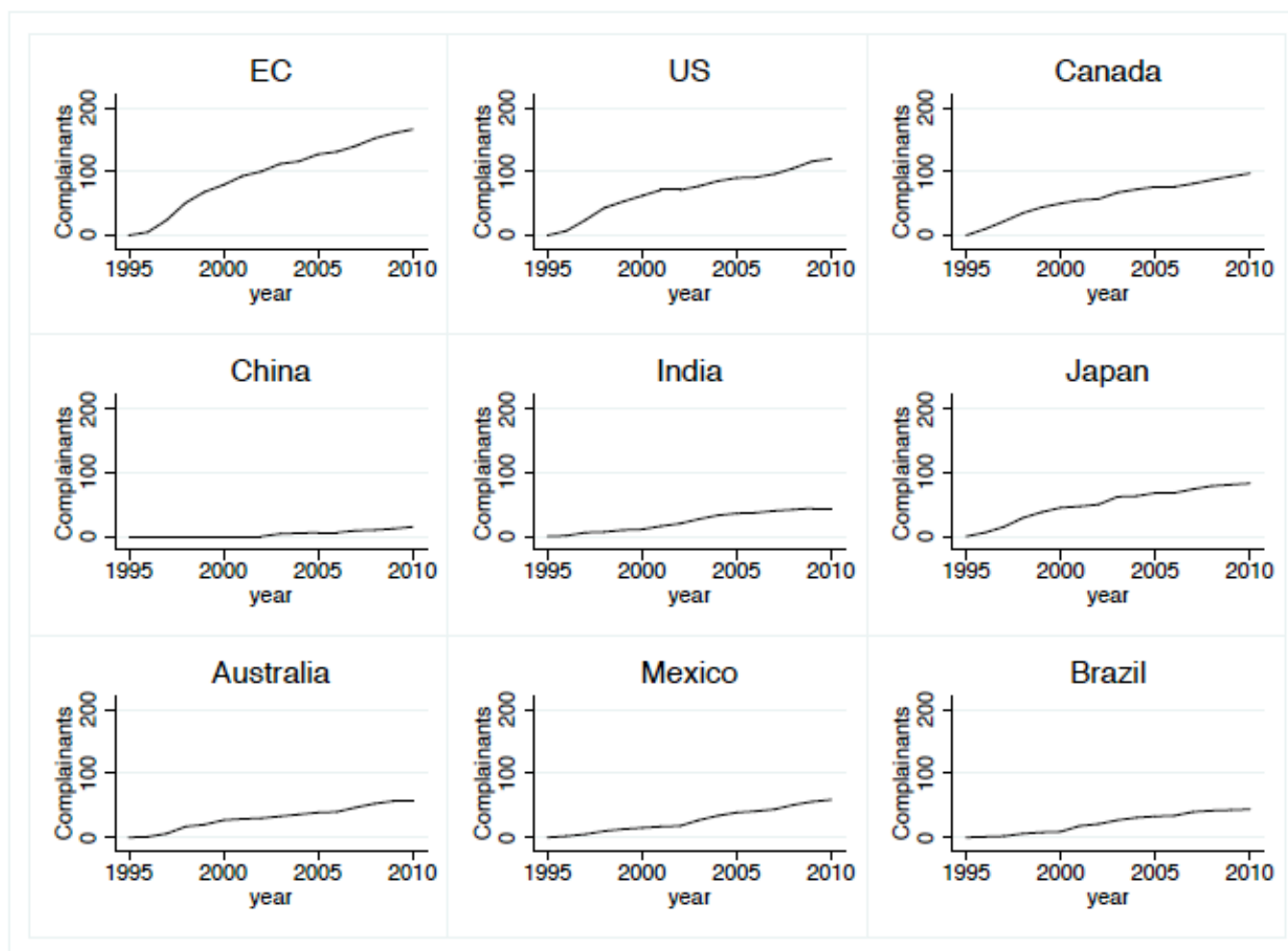


Figure 9. Number of Complainants by Selected Countries Over Time

Empirical Analysis

- Descriptive Statistics

Table 3. Descriptive Statistics: Trade Freedom

variable	N	mean	sd	min	max
trade freedom	71	78.56	9.76	44.8	95
- high-income economies	23	84.05	6.92	57	95
- low-income economies	28	70.61	9.11	51.2	85.6

high-income economies: GDP per capita > 20,000

low-income economies: GDP per capita < 10,000

Source: Heritage Foundation (www.heritage.org/index), own calculations.

Table 4. Descriptive Statistics: Trade Freedom for Specific Economies in 2010

variable	EC	US	Canada	China	India	Japan	Australia	Mexico	Brazil
trade freedom	86.9	86.9	88.1	72.2	67.9	82.4	85.1	82.0	69.2

Source: Heritage Foundation (www.heritage.org/index), own calculations.

Empirical Analysis

- Econometric Analysis

- core hypothesis:
 - Do countries that are more frequently involved in trade conflicts pursue a more liberal trade regime at the end of the day
- Thus: Pooled OLS Analysis

$$\text{Trade Freedom}_i = \beta_0 + \beta_1 \text{Disputes}_i + \gamma X_i + \epsilon_i$$

- no endogeneity problem with respect to disputes
- but maybe concerning the macro controls (using lags)
- Huber / White / Sandwich estimator (outliers, consistency)

Empirical Analysis

- Econometric Analysis

Table 5. Effects of Trade Disputes on the Countries' Trade Freedom (Pooled Analysis)
 – *Endogenous Variable: Trade Freedom* –

	(1)	(2)	(3)	(4)	(5)	(6)
total disputes	.1177*** (13.26)	-	-	.0320** (2.31)	-	-
complainants	-	.1954*** (13.71)	-	-	.0607*** (3.14)	-
respondents	-	-	.2194*** (11.19)	-	-	.0331 (.90)
population (lag)	-	-	-	-.0000*** (-6.65)	-.0000*** (-6.82)	-.0000*** (-6.44)
GDP per capita	-	-	-	.0007*** (11.62)	.0007*** (11.50)	.0007*** (12.69)
consumption	-	-	-	.1574*** (3.13)	.1534*** (3.09)	.1720*** (3.42)
investment	-	-	-	.2411*** (3.99)	.2343*** (3.86)	.2512*** (4.20)
government share	-	-	-	.1186 (1.32)	.1127 (1.25)	.1312 (1.47)
d (lowest income)	-	-	-	-8.5788*** (-3.52)	-8.6273*** (-3.55)	-8.6065*** (-3.53)
obs	930	930	930	703	703	703
R-squared	.0641	.0792	.0306	.4598	.4613	.4578
Prob>chi2	.0000	.0000	.0000	.0000	.0000	.0000

(t-Statistics in parentheses)

* / ** / *** significant at 10 / 5 / 1 percent

Empirical Analysis

- Econometric Analysis

Table 6. Effects of Trade Disputes on the Countries' Trade Freedom (Pooled Analysis)
– *Endogenous Variable: Trade Freedom* –

	Income Level			Number of Trade Disputes		
	Total (1)	Compl. (2)	Resp. (3)	Total (4)	Compl. (5)	Resp. (6)
low	.1350** (2.03)	.2182*** (2.64)	.1312 (.57)	1.4010*** (4.67)	1.4619*** (5.30)	2.1745*** (5.55)
middle	.0790 (1.45)	.1600** (2.08)	–.0009 (–.01)	.4850*** (5.46)	.3728*** (4.48)	–.0121 (–.11)
high	.0234* (1.65)	.0415** (2.05)	.0315 (.86)	.0428*** (3.02)	.0738*** (3.72)	.0185 (.51)
population (lag)	–.0000*** (–6.56)	–.0000*** (–6.78)	–.0000*** (–6.12)	–.0000*** (–6.69)	–.0000*** (–6.67)	–.0000*** (–6.59)
GDP per capita	.0007*** (11.11)	.0007*** (11.06)	.0007*** (12.06)	.0008*** (12.13)	.0007*** (11.88)	.0008*** (13.31)
consumption	.1678*** (3.26)	.1654*** (3.27)	.1722*** (3.33)	.1757*** (3.51)	.1674*** (3.34)	.2175*** (4.31)
investment	.2464*** (4.09)	.2362*** (3.94)	.2530*** (4.11)	.2316*** (4.03)	.2146*** (3.65)	.2950*** (5.05)
government share	.1325 (1.43)	.1311 (1.42)	.2377*** (2.64)	.1303 (1.41)	.1558* (1.70)	.2513*** (2.70)
d (lowest income)	–8.0689*** (–3.27)	–8.0482*** (–3.28)	–8.4980*** (–3.42)	–6.8839*** (–2.86)	–7.8806*** (–3.31)	–6.5581*** (–2.62)
obs	703	703	703	703	703	703
R-squared	.46.24	.4650	.4580	.4817	.4793	.4771
Prob>chi2	.0000	.0000	.0000	.0000	.0000	.0000

(t-Statistics in parentheses)

* / ** / *** significant at 10 / 5 / 1 percent

Empirical Analysis

- Econometric Analysis

- as a second step: Panel data analysis

$$\text{d Trade Freedom}_{it} = \beta_0 + \beta_1 \text{d Disputes}_{it} + \beta_2 \text{time}_t + \gamma dX_{it} + v_i + \epsilon_{it}$$

- this focus on the dynamics of the process
- Breusch Pagan and Hausman Tests (FE estimator)
- Huber / White / Sandwich estimator (autocorrelation, groupwise heteroscedasticity)

Empirical Analysis

- Econometric Analysis

Table 7. Effects of Trade Disputes on the Countries' Trade Freedom (Panel Analysis)
 – *Endogenous Variable: Trade Freedom (percentage change)* –

	All Economies			Income Level (Interaction Variables)		
	Total (1)	Compl. (2)	Resp. (3)	Total (4)	Compl. (5)	Resp. (6)
dispute	.0002 (.09)	.0001 (.04)	.0008 (.16)	-	-	-
low	-	-	-	.0142** (2.15)	.0169* (1.86)	.0581*** (2.68)
middle	-	-	-	-.0058 (-.60)	-.0110 (-.75)	-.0054 (-.21)
high	-	-	-	-.0002 (-.08)	-.0002 (-.06)	-.0010 (-.18)
time	.0181 (.84)	.0180 (.83)	.0183 (.85)	.0167 (.80)	.0180 (.85)	.0145 (.70)
population	2.0189* (1.86)	2.0047* (1.82)	2.0244* (1.90)	1.3740 (1.26)	1.4061 (1.25)	1.4022 (1.35)
GDP per capita	.7158* (1.81)	.7114* (1.77)	.7157* (1.85)	.6702* (1.74)	.6700* (1.70)	.6381* (1.73)
consumption	.8097 (1.30)	.8040 (1.28)	.8097 (1.32)	.8534 (1.41)	.8107 (1.31)	.9340 (1.59)
investment	.1511 (1.23)	.1517 (1.23)	.1508 (1.23)	.1714 (1.43)	.1689 (1.39)	.1737 (1.48)
government share	.2604 (.81)	.2587 (.80)	.2628 (.81)	.1916 (.61)	.1812 (.57)	.2397 (.78)
d (low income)	-.0072 (-.29)	-.0073 (-.30)	-.0071 (-.29)	.0011 (.04)	-.0006 (-.02)	.0026 (.11)
obs	694	694	694	694	694	694
groups	59	59	59	59	59	59
Prob>chi2	.2170	.2174	.2158	.1081	.1437	.0560

(z-Statistics in parentheses)

* / ** / *** significant at 10 / 5 / 1 percent

Overview...

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Conclusion

- international trade relations are often characterized by short run incentives, biased towards non-cooperation
- external institutions for limiting short-run interests are weak
- internal mechanisms carry importance
- in this paper we examine TFT behavior within the political economy of international trade
 - theoretically
 - empirically

Conclusion

- theoretical model
 - shows that TFT fosters world wide trade liberalization (if countries meet frequently enough and / or if there is a fraction of countries starting cooperatively)
- empirical section
 - create a new data set
 - econometric analysis is consistent with theory
 - as more often countries are involved in TFT conflicts, the more market access they guarantee at the end of the day
 - particular relevant for low income economies and economies not yet involved in too many conflicts

... thank you very much

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Empirical Analysis

- Descriptive Statistics

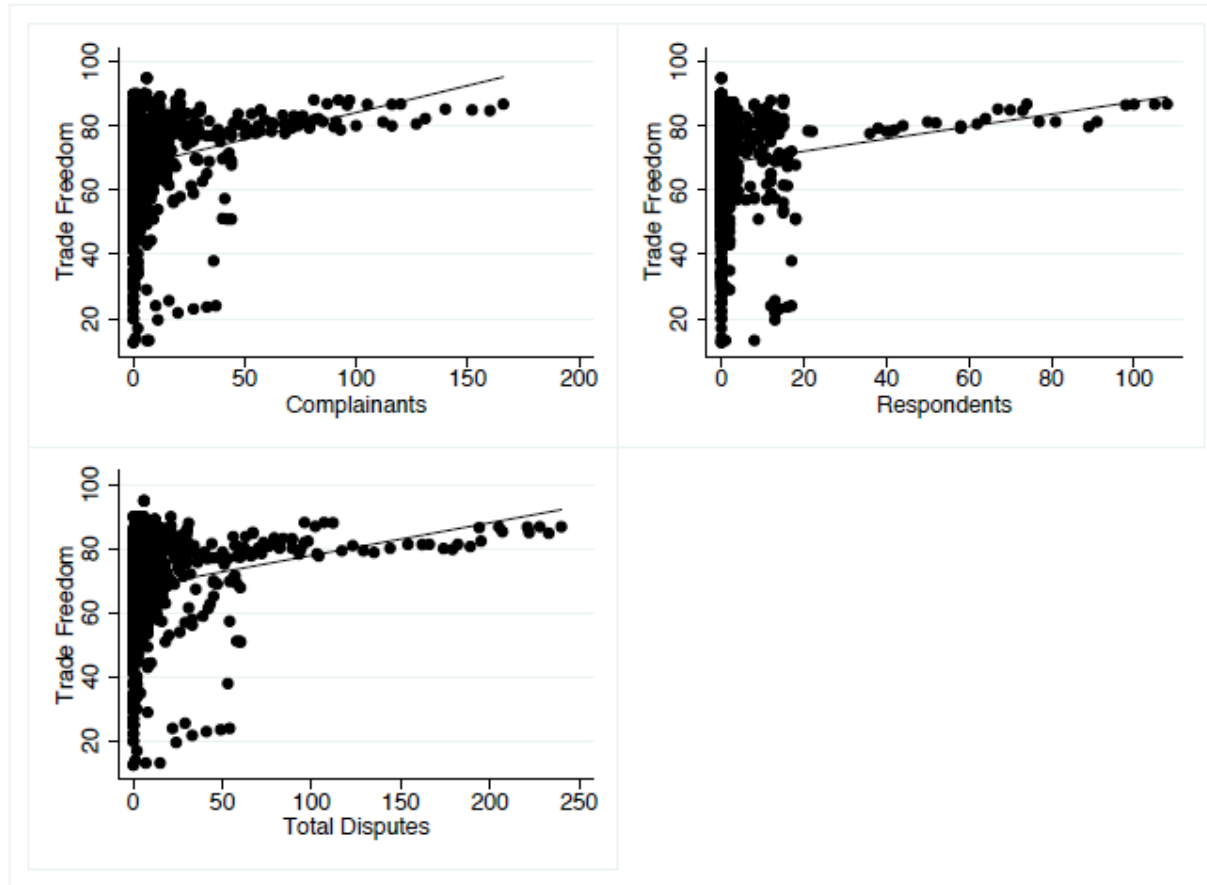


Figure 7. Scatter Plots with Fitted Values: Trade Freedom and Dispute Variables