14.581: International Trade
— Lecture 25 —
Trade Policy (Empirics I)

Plan for today's lecture on empirics of trade policy

1. Political economy of trade policy:
   - Emphasis here is on non-utilitarian governments (i.e. political economy of trade policy)
   - "First Generation": Baldwin (1985) and Trefler (1993)
   - "Second Generation": Goldberg and Maggi (1999)

2. Explaining trade policy with international interactions.
   - Emphasis here is on economies that exploit their ability to use trade policy to manipulate world prices.
   - Broda, Limao and Weinstein (2008); Bagwell and Staiger (2010)

Plan for today's lecture on empirics of trade policy

1. **Political economy of trade policy:**
   - **Emphasis here is on non-utilitarian governments (i.e. political economy of trade policy)**
   - **"First Generation": Baldwin (1985) and Trefler (1993)**
   - "Second Generation": Goldberg and Maggi (1999)

2. Explaining trade policy with international interactions.
   - Emphasis here is on economies that exploit their ability to use trade policy to manipulate world prices.
   - Broda, Limao and Weinstein (2008); Bagwell and Staiger (2010)

Explaining Trade Policy

- Gawande and Krishna (Handbook chapter, 2003) have a nice survey of this literature.
- "If, by an overwhelming consensus among economists, trade should be free, then why is it that nearly everywhere we look, and however far back, trade is in chains?" Broad answers:
  - Terms of trade manipulation: even in a neoclassical economy, protection might be optimal for a non-SOE. (Broda, Limao and Weinstein (2008) have recently improved support for this claim, as we will discuss shortly).
  - Second-best arguments: we live in an imperfectly competitive world where it is *possible* that even a SOE would want import tariffs/export subsidies. (Helpman and Krugman, 1987 book).
  - Political economy (lobbying/redistribution) motives: governments don't maximize utilitarian social welfare.

Gawande and Krishna (2003) Survey

- Divide empirical work on 'explaining trade policy' into two epochs:
  1. "First generation": pre-Grossman and Helpman (1994)
  2. "Second generation": post-GH (1994).

- Nice example of the influence of theory on empirical work.

"First Generation" Empirical work I

- This body of work was impressive and large, but it always suffered from a lack of strong theoretical input that would suggest:
  - What regression to run.
  - What the coefficients in a regression would be telling us.
  - What endogeneity problems seem particulary worth worrying about.

"First Generation" Empirical work II

- Still, theoretical ideas (not formal theory) provided some input, such as:
  - "Pressure Group model": Olson (1965) on collective action problems within lobby groups. Suggests concentration as empirical proxy.
  - "Adding machine model": Caves (1976) has workers voting for their industries. Suggests labor force as proxy.
  - "Social change model": governments aim to reduce income inequality. Suggests wage rate as proxy.
  - "Comparative cost model": lobbies have finite resources and decide what to lobby for (between protection and other policies). Suggests that the import penetration ratio should matter.
  - "Foreign policy model": governments have less international bargaining power if, eg, lots of its firms are investing abroad. Suggests FDI rate should matter.

GK (2003): Survey of First Generation work

Results summarize Baldwin (1985 book)

Variables	Tariffs		Tariff Cuts	
	Baldwin (85) (1)	Baldwin (85) (2)	Baldwin (85) (3)	Baldwin (85) (4)
CONCENTRATION				
Seller Concentration	0.0002		−0.65(−3)	
Seller Number of Firms	−.46(−5)**	−.32(−5)**		−.14(−4)
Scale (Output/firm)				
Buyer Concentration				
Buyer Number of Firms				
Geog. Concentration				
TRADE				
Import Penetration Ratio		−0.02		
Change in Import Penetration Ratio			0.26	0.03**
ln (Import Penetration Ratio)			0.54(−2)	−0.03**
Exports/ Value Added				
exports/ shipments	0.34(−1)			
CAPITAL				
Capital Stock			.62(−5)	
LABOR				
Wage	−0.16(−1)**			−0.13***
Unskilled Payroll/ Total Payroll		.14*	.97***	
Prodn.Workers/ Value Added		.03**		
Unionization				
Employment	.94(−4)*			0.51(−3)***
Tenure				
%change in employment	0.84(−2)			−0.11*
% Eng. And Scientists				
%White Collar				
% Skilled				
%Semi skilled				
% Unskilled				
%Unemployed				
Labor Intensity	0.19(−1)			
OTHER VARIABLES				
Industry Growth				
Foreign Tax Credit/Assets		1.1	9.90**	
Change in [(VA-Wages)/ K-Stock]			−0.02	
VA/Shipments		0.05		−0.14
Tariff level			−0.13	
NTB indicator	0.46(−2)**	.61(−2)*	.03*	
Constant	0.26	0.15(−1)	−0.81	−0.11
Adjusted R2	0.39	0.51	0.1	0.18
N	292	292	292	292

Trefler (JPE 1993)

- Trefler (1993) conducts a similar empirical exercise to Baldwin (1985), but for:
  - Focus on 'NTB coverage ratios' (the proportion of imports in an industry that are subject to any sort of NTB) rather than tariffs. This is attractive since US tariffs are so low in this period that there isn't much variation. Also true that tariffs (being under the remit of GATT/WTO) are constrained by international agreements in a way that NTBs are not.
  - Attention to endogeneity issues and specification issues:
    - Simultaneity: Protection depends on import penetration ratio (IPR) but IPR depends on protection.
    - Truncation: IPR can't go negative. NTB coverage ratio can't go negative.

Trefler (1993)

- Trefler (1993) estimates the following system by FIML:

$$N = \begin{cases} M\boldsymbol{\gamma}_M + \mathbf{X}_N\boldsymbol{\beta}_N + \boldsymbol{\varepsilon}_N & M^* > 0, N^* > 0 \\ 0 & M^* > 0, N^* \leq 0 \\ 0 & M^* \leq 0, \end{cases}$$

$$M = \begin{cases} N\boldsymbol{\gamma}_N + \mathbf{X}_M\boldsymbol{\beta}_M + \boldsymbol{\varepsilon}_M & M^* > 0, N^* > 0 \\ \mathbf{X}_M\boldsymbol{\beta}_M + \boldsymbol{\varepsilon}_M & M^* > 0, N^* \leq 0 \\ 0 & M^* \leq 0, \end{cases}$$

- Where $N^* = M\gamma_M + X_N\beta_N + \varepsilon_N$, $M^* = N\gamma_N + X_M\beta_M + \varepsilon_M$, N is the NTB coverage ratio and M is the import penetration ratio.
- X_N is Baldwin (1985) style variables explaining protection.
- X_M is H-O style variable explaining trade flows.
- Exclusion restrictions in X_N and X_M vectors necessary for identification of γ's.

Trefler (1993): Results

The equation for $N^* = M\gamma_M + X_N\beta_N + \varepsilon_N$

TABLE 2

NTB EQUATION

Dependent Variable: NTBs	Estimated Coefficient (1)	*t*-Statistic (2)	Beta Coefficient (3)	Sensitivity Analysis (4)
Comparative Advantage:				
Import penetration	.17	.46	.11	† ‡
Δ(import penetration)	3.31	2.58*	**1.74**	
Exports	−1.82	−5.26*	**−.94**	
Business:				
Seller concentration	.53	2.43*	**.42**	†
Seller number of firms	−.22	−1.86	**−.33**	
Buyer concentration	−1.13	−2.08*	**−.33**	
Buyer number of firms	−.06	−2.16*	**−.32**	
Scale	−1.83	−2.04*	**−.46**	
Capital stock	−.27	−2.02*	−.24	
Labor:				
Union	.10	.42	.05	† ‡
Employment size	.08	.31	.03	
Tenure	−.01	−.33	−.04	† ‡
Geographic concentration§	.11	.71	.07	‡
Broad-based:				
Occupation:				
Engineers, scientists	1.63	1.70	**.58**	
White-collar	.40	.67	**.34**	†
Skilled	−.31	−.61	−.21	†
Semiskilled	.15	.61	.16	†
Unskilled	.90	1.57	**.53**	†
Unemployment	1.22	1.96*	**.30**	
Industry growth	.03	.26	.03	† ‡

NOTE.—There are 322 observations, of which 144 have both positive NTBs and import penetration, 144 have zero NTBs and positive import penetration, and 34 have both zero NTBs and import penetration. Large beta coefficients (greater than .30) are set in boldface.

* Significant at the 5 percent level.

† The sign of the coefficient is sensitive to the choice of included regressors (see table 3 below and Sec. IIIA).

‡ The sign of the coefficient is sensitive to the omission of two-digit SIC observations (see Sec. IIIC).

§ Geographic concentration is relevant to all three interests.

Trefler (1993): Results

The equation for $M^* = N\gamma_N + X_M\beta_M + \varepsilon_M$

TABLE 4

THE IMPORT EQUATION

DEPENDENT VARIABLE: IMPORT PENETRATION	ESTIMATED COEFFICIENT (1)	t-STATISTIC (2)	BETA COEFFICIENT (3)	SENSITIVITY ANALYSIS (4)	SENSITIVITY ANALYSIS γ_N[a] (5)
NTBs (γ_N)	−.51	−11.56*	**−.80**		
Capital:					
Physical capital	−2.01	−4.44*	**−.44**		−.52
Inventories	1.71	1.69	.17		−.46
Labor:					
Engineers, scientists	.54	.98	.07	†	−.55
White-collar	−1.70	−4.90*	**−.45**		−.50
Skilled	−1.27	−3.44*	**−.34**		−.55
Semiskilled	−.59	−2.01*	−.15		−.52
Unskilled	.40	1.98*	.20		−.54
Land:					
Cropland	.26	.61	.11	‡	−.53
Pasture	.85	1.77	.15		−.53
Forest	1.19	.15	.01	† ‡	−.53
Subsoil:					
Coal	1.62	.39	.02		−.51
Petroleum	−.16	−.78	−.05	†	−.61
Minerals	1.29	.39	.02		−.50
Constant	.81	15.89*	.00		

NOTE.—There are 322 observations, of which 144 have both positive NTBs and import penetration, 144 have zero NTBs and positive import penetration, and 34 have both zero NTBs and import penetration. Large beta coefficients (greater than .30) are set in boldface.

* Significant at the 5 percent level.

† The sign of the coefficient is sensitive to the choice of regressors in the NTB equation (see table 3 and Sec. III*A*).

‡ The sign of the coefficient is sensitive to the omission of two-digit SIC observations (see Sec. III*C*).

[a] Alternative estimates of the coefficient on NTBs. Each row represents a different specification in which the regressor listed in the row is endogenized by estimating a separate equation for it. If the estimate of γ_N differs significantly from −.51 then there is evidence of regressor endogeneity. In every case the Hausman test rejects endogeneity (see Sec. III*B*).

Trefler (1993): Results

Does simultaneity of N and M matter?

TABLE 5

EVIDENCE OF SIMULTANEITY BIAS

DESCRIPTION OF THE MODEL	IMPORT EQUATION* γ_N (1)	t-Statistic (2)	R^2 (3)	TRADE LIBERALIZATION (4)†	(5)‡
Simultaneous equations	−.511	−11.56	.80	1.65%	$49.5
Single equation, Tobit	−.044	−2.01	.58	.19%	$5.5
Single equation, OLS§	−.081	−2.71	.49	. . .	. . .

* γ_N is the coefficient on NTBs in the import equation. The R^2 is the usual one based on positive-NTB observations and with $E[M_i|M_i^* > 0]$. The expectation is not conditional on NTBs, so the R^2 also reflects errors in predicting NTBs.

† The average percentage point change in import penetration as a result of eliminating all U.S. NTBs in manufacturing. It is calculated as $\Sigma\Delta M_i/144$, where ΔM_i is defined in the text and the summation is taken over the 144 industries with positive NTBs.

‡ The increase in imports (billions of 1983 dollars) as a result of eliminating all U.S. NTBs in manufacturing.

§ Ordinary least squares is estimated using observations with nonzero import penetration. It is presented as a simple data summary.

Plan for today's lecture on empirics of trade policy

1. **Political economy of trade policy:**
   - **Emphasis here is on non-utilitarian governments (i.e. political economy of trade policy)**
   - "First Generation": Baldwin (1985) and Trefler (1993)
   - **"Second Generation": Goldberg and Maggi (1999)**

2. Explaining trade policy with international interactions.
   - Emphasis here is on economies that exploit their ability to use trade policy to manipulate world prices.
   - Broda, Limao and Weinstein (2008); Bagwell and Staiger (2010)

"Second Generation" Empirical Work

- Grossman and Helpman ("Protection for Sale", AER 1994) provided a clean theoretical 'GE' (the economy is not really GE, but the lobbying of one industry does affect the lobbying of another) model that delivered an equation for industry-level equilibrium protection as a function of industry-level observables (as you saw with Arnaud):

$$\frac{t_i}{1+t_i} = -\frac{\alpha_L}{a+\alpha_L}\left(\frac{z_i}{e_i}\right) + \frac{1}{a+\alpha_L}\left(I_i \times \frac{z_i}{e_i}\right). \tag{1}$$

- Where:
  - t_i is the *ad valorem* tariff rate in industry i.
  - I_i is a dummy for whether industry i is organized or not.
  - $0 \leq \alpha_L \leq 1$ is the share of the population that is organized into lobbies.
  - $a > 0$ is the weight that the government puts on social welfare relative to aggregate political contributions (whose weight is normalized to 1).
  - z_i is the inverse import penetration ratio.
  - e_i is the elasticity of import demand.

Testing 'Protection for Sale'

- Two papers took this equation to the data:
  1. Goldberg and Maggi (AER, 1999)
  2. Gawande and Bandyopadhyay (ReStat, 2000)
- There are a lot of similarities but we will focus on GM (1999).

Goldberg and Maggi (1999)

- There a host of challenges in taking the GH (1994) equation to the data:
  - How to measure t_i? Ideally want NTBs (not set cooperatively under GATT/WTO) measured in tariff equivalents. Absent this, GM (1999) use coverage ratios, as in Trefler (1993). They experiment with different proportionality constants $(1/\mu)$ between coverage ratios and t and also correct for censoring of coverage ratios.
  - Data on e_i is obviously hard to get. GM (1999) use existing estimates but also consider them as measured with error, so GM (1999) take e_i over to the left-hand side of the estimation equation.

Goldberg and Maggi (1999)

- More challenges:
  - How to measure I_i? Can get data on *total* political contributions in the US by industry (by law these are supposed to be reported), but all 'industries' have at least some contributions, so all seem 'organized'. GM (1999) experiment with different cutoffs in this variable. This isn't innocuous since contributions are endogenous in the GH (1994) model. GM (1999) use as instruments for I_i a set of typical Baldwin (1985)-style regressors, ie Trefler's N equation.
  - z_i is endogenous (as Trefler (1993) highlighted). GM (1999) use Trefler-style instruments for z_i (Trefler's M equation).

Goldberg and Maggi (1999)

- This amounts to estimating the following system (via MLE—that is, with added assumptions about distribution of error terms):

$$(4) \quad y_i^* = \frac{t_i^* e_i}{1 + t_i^*} = \gamma \frac{X_i}{M_i} + \delta I_i \frac{X_i}{M_i} + \epsilon_i$$

$$(5) \quad t_i = \begin{cases} \frac{1}{\mu} t_i^* & \text{if } 0 < t_i^* < \mu \\ 0 & \text{if } t_i^* \leq 0 \\ 1 & \text{if } t_i^* \geq \mu \end{cases}$$

$$(6) \quad \frac{X_i}{M_i} = \zeta_1' \mathbf{Z}_{1i} + u_{1i}$$

$$(7) \quad I_i^* = \zeta_2' \mathbf{Z}_{2i} + u_{2i}$$

$$(8) \quad I_i = \begin{cases} 1 & \text{if } I_i^* > 0 \\ 0 & \text{if } I_i^* \leq 0 \end{cases}.$$

Goldberg and Maggi (1999)

- Where:
  - $z_i \equiv \frac{X_i}{M_i}$ (the inverse IPR).
  - $\gamma \equiv -\frac{\alpha_L}{a+\alpha_L}$ and $\delta \equiv \frac{1}{a+\alpha_L}$.
  - Z_1 is vector of instruments from Trefler's M equation.
  - Z_2 is vector of instruments from Trefler's N equation.
  - t_i is the measured NTB coverage ratio (with $0 \leq t_i \leq 1$), t_i^* is the true measure of protection, and μ is the unknown extent to which these variables are related.

GM (1999): Results

MLE estimates. NB: $\beta \equiv \frac{a}{1+a}$, so β is the true weight (where 'true weights' sum to one) that government puts on consumer welfare instead of lobbying contributions.

TABLE 1—RESULTS FROM THE BASIC SPECIFICATION (G-H MODEL)

Variable	$\mu = 1$	$\mu = 2$	$\mu = 3$
X_i/M_i	−0.0093	−0.0133	−0.0155
	(0.0040)	(0.0059)	(0.0070)
$(X_i/M_i) * I_i$	0.0106	0.0155	0.0186
	(0.0053)	(0.0077)	(0.0093)
Implied β	0.986	0.984	0.981
	(0.005)	(0.007)	(0.009)
Implied α_L	0.883	0.858	0.840
	(0.223)	(0.217)	(0.214)

GM (1999): Results

MLE results when including variables that should *not* matter

TABLE 2—ALTERNATIVE SPECIFICATIONS ($\mu = 1$)

Variable	Specification 1 Log-likelihood: −134.9	Specification 2 Log-likelihood: −132.06	Specification 3 Log-likelihood: −132.04	Specification 4 Log-likelihood: −130.61
X_i/M_i	—	−0.0093	−0.0096	−0.0109
		(0.0040)	(0.0043)	(0.0045)
$(X_i/M_i) * I_i$	—	0.0106	0.0105	0.0123
		(0.0053)	(0.0053)	(0.0055)
Constant	−0.0640	—	−0.0287	−0.2619
	(0.1104)		(0.1375)	(0.2559)
Unemployment	—	—	—	1.5722
				(1.5884)
Employment size	—	—	—	1.1836
				(0.8235)

Note: Dependent variable: $(t_i^* e_i/1 + t_i^*)$.

Subsequent Work

- A number of papers have extended this work in a number of directions:
  - Other countries: Mitra, Thomakos and Ulubasoglu (ReStat 2002) on Turkey and McCalman (RIE 2002) on Australia. Turkey paper has 'democracy vs dictatorship' element to it.
  - Mobarak and Purbasari (2006): firm-level import licenses and connections to Suharto in Indonesia.
  - Heterogeneous firms and how organized an industry's lobbying is: Bombardini (JIE 2008)
  - "What do governments maximize?" (ie estimates of a around the world): Gawande, Krishna and Olarreaga (2009).
  - Nunn and Trefler (2009): rich/growing countries appear to put tariffs relatively more on skill-intensive goods. Perhaps this is because countries with good institutions have low a, and they recognize that skill-intensive sectors (might) have more positive externalities (eg knowledge spillovers) to them.
  - Freund and Ozden (AER, 2008): GH (1994) with loss aversion and application to US steel price pass-through.

Plan for today's lecture on empirics of trade policy

1. Political economy of trade policy:
   - Emphasis here is on non-utilitarian governments (i.e. political economy of trade policy)
   - "First Generation": Baldwin (1985) and Trefler (1993)
   - "Second Generation": Goldberg and Maggi (1999)

2. **Explaining trade policy with international interactions.**
   - **Emphasis here is on economies that exploit their ability to use trade policy to manipulate world prices.**
   - **Broda, Limao and Weinstein (2008); Bagwell and Staiger (2010)**

Broda, Limao and Weinstein (2008)

- With quasi-linear preferences across goods g, social welfare is given by (where π is producer surplus, ψ is consumer surplus and r is tariff revenue):

$$W = 1 + \sum_g [\pi_g(p_g) + r_g(p_g) + \psi_g(p_g)] \tag{2}$$

- Then (as in Johnson, 1954) the optimal tariff is given by the inverse (of the rest of the world's) export supply elasticity:

$$\tau_g^{opt} = \omega_g \equiv \frac{dp_g^* m_g^*}{dm_g^* p_g^*} \tag{3}$$

- In Grossman and Helpman (JPE 1995)—basically GH (1994) extended to a 2-country, strategically interacting, non-SOE world—the prediction is (where z is the inverse IPR, I_g is a dummy for 'sector g is organized', and σ is the el. of import demand):

$$\tau_g^{GH} = \omega_g + \frac{I_g - \alpha}{a + \alpha} \frac{z_g}{\sigma_g} \tag{4}$$

BLW (2008): Estimating ω_g

- To test this, need estimates of ω_g. Postulate the following system of constant elasticity import demand and export supply (of variety v in good g into country i in year t) where s is a share (and $\Delta^{k_{ig}}$ differences across both time and an ig pair):

$$\Delta^{k_{ig}} \ln s_{igvt} = -(\sigma_{ig} - 1)\Delta^{k_{ig}} \ln p_{ivgt} + \Delta^{k_{ig}} \varepsilon_{ivgt}^{k_{ig}}$$

$$\Delta^{k_{ig}} \ln p_{igvt} = \frac{\omega_{ig}}{1 + \omega_{ig}} \Delta^{k_{ig}} \ln s_{ivgt} + \Delta^{k_{ig}} \delta_{ivgt}^{k_{ig}}$$

- BLW estimate this system through the same 'identification through heteroskedasticity' idea as Feenstra (AER, 1994) or Broda and Weinstein (QJE, 2006).

BLW (2008): Estimating ω_g

- This then implies:

$$(\Delta^{k_{ig}} \ln p_{igvt})^2 = \theta_{ig1}(\Delta^{k_{ig}} \ln s_{ivgt})^2 + \theta_{ig2}(\Delta^{k_{ig}} \ln p_{ivgt} \Delta^{k_{ig}} \ln s_{ivgt}) + u_{ivgt}$$

- Where:
  - $\theta_{ig1} \equiv \frac{\omega_{ig}}{(1+\omega_{ig})(\sigma_{ig}-1)}$
  - $\theta_{ig2} \equiv \frac{\omega_{ig}(\sigma_{ig}-2)-1}{(1+\omega_{ig})(\sigma_{ig}-1)}$
  - $u_{ivgt} \equiv \frac{\Delta^{k_{ig}} \delta_{ivgt} \cdot \Delta^{k_{ig}} \varepsilon_{ivgt}}{\sigma_{ig}-1}$
- If we assume that $E[\Delta^{k_{ig}} \varepsilon_{ivgt}^{k_{ig}} \Delta^{k_{ig}} \delta_{ivgt}^{k_{ig}}] = 0$ and that there is heteroskedasticity (and there are more than 3 exporting countries) then this is a simple regression that can identify θ_{ig1} and θ_{ig2}, and hence ω_{ig} and σ_{ig}.
  - An example of "identification through heteroskedasticity" (Leamer, 1981; Rigobon, 2003; Soderbery (2015))

BLW (2008): Sample

- BLW then, having estimated ω_{ig}, estimate the relationship between tariffs and ω_{ig}.
- But for which countries? They do this on countries that (in certain time periods) were not part of the GATT/WTO and hence were presumably free to charge their unilaterally optimal tariff.

BLW (2008): Sample countries

TABLE 1—DATA SOURCES AND YEARS

	GATT/WTO	Production data		Tariff data[a]	Trade data[b]
	Accession date	Source	Years		
Algeria				93	93–03
Belarus				97	98–03
Bolivia[c]	8-Sep-1990	UNIDO	93	93	93–03
China	11-Dec-2001	UNIDO	93	93	93–03
Czech[d]	15-Apr-1993			92	93–03
Ecuador	21-Jan-1996	UNIDO	93	93	94–03
Latvia	10-Feb-1999	UNIDO	96	97	94–03
Lebanon				00	97–02
Lithuania	31-May-2001	UNIDO	97	97	94–03
Oman	9-Nov-2000			92	94–03
Paraguay	6-Jan-1994			91	94–03
Russia				94	96–03
Saudi Arabia	11-Dec-2005			91	93–03
Taiwan	1-Jan-2002	UNIDO	96	96	92–96
Ukraine		UNIDO	97	97	96–02

[a] All tariff data are from TRAINS. Countries are included if we have tariff data for at least one year before accession (GATT/WTO).

[b] Except for Taiwan, all trade data are from COMTRADE. For Taiwan, data are from TRAINS.

[c] The date of the tariffs for Bolivia is post-GATT accession but those tariffs were set before GATT accession and unchanged between 1990–1993.

[d] The Czech Republic entered the GATT as a sovereign country in 1993. Its tariffs in 1992 were common to Slovakia with which it had a federation, which was a GATT member. So it is possible that the tariffs for this country do not reflect a terms-of-trade motive. Our results by country in Table 9 support this. Moreover, as we note in Section IVC, the pooled tariff results are robust to dropping the Czech Republic.

BLW (2008): Results

The elasticity estimates ω_{ig}

TABLE 3A—INVERSE EXPORT SUPPLY ELASTICITY STATISTICS

Statistic	Observations[a]	Median[b]			Mean		Standard deviation	
Sample	All	Low	Medium	High	All	W/out top decile	All	W/out top decile
Algeria	739	0.4	2.8	91	118	23	333	47
Belarus	703	0.3	1.5	61	85	15	257	36
Bolivia	647	0.3	2.0	91	102	23	283	49
China	1,125	0.4	2.1	80	92	17	267	35
Czech Republic	1,075	0.3	1.4	26	63	7	233	18
Ecuador	753	0.3	1.5	56	76	13	243	30
Latvia	872	0.2	1.1	9	52	3	239	8
Lebanon	782	0.1	0.9	31	56	7	215	18
Lithuania	811	0.3	1.2	24	65	6	235	16
Oman	629	0.3	1.2	25	209	7	3,536	21
Paraguay	511	0.4	3.0	153	132	67	315	169
Russia	1,029	0.5	1.8	33	48	8	198	18
Saudi Arabia	1,036	0.4	1.7	50	71	11	232	25
Taiwan	891	0.1	1.4	131	90	20	241	43
Ukraine	730	0.4	2.1	78	86	16	254	34
Median	782	0.3	1.6	54	85	13	243	30

[a] Number of observations for which elasticities and tariffs are available. The tariff availability did not bind except for Ukraine, where it was not available for about 130 HS4 goods for which elasticities were computed.

[b] The median over the "low" sample corresponds to the median over the bottom tercile of inverse elasticities. Medium and high correspond to the second and third terciles.

BLW (2008): Results

Are the elasticity estimates ω_{ig} sensible? By type of good.

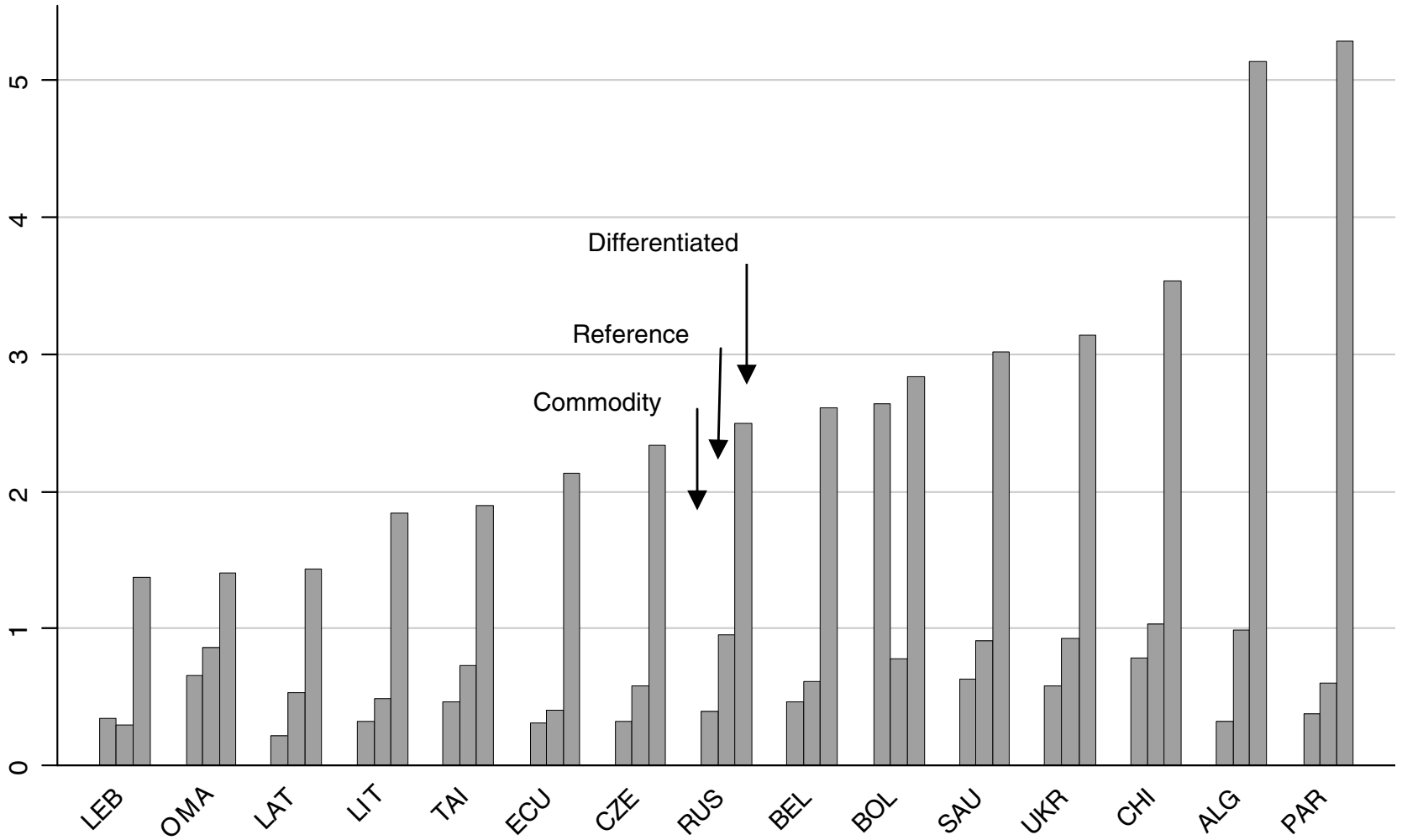

FIGURE 2. MEDIAN INVERSE ELASTICITIES BY PRODUCT TYPE
(*Goods classified by Rauch into commodities, reference priced products, and differentiated products*)

BLW (2008): Results

Are the elasticity estimates ω_{ig} sensible? Similarity within same good, across countries.

TABLE 4—CORRELATION OF INVERSE EXPORT SUPPLY ELASTICITIES ACROSS COUNTRIES

	Log inverse export supply			
Dependent variable: Statistic	Beta	Standard error	R^2	Number of observations
Algeria	0.80	(0.07)	0.13	739
Belarus	0.80	(0.07)	0.14	703
Bolivia	0.82	(0.09)	0.13	647
China	0.54	(0.06)	0.11	1,125
Czech Republic	0.61	(0.05)	0.12	1,075
Ecuador	0.73	(0.08)	0.12	753
Latvia	0.57	(0.07)	0.09	872
Lebanon	0.71	(0.08)	0.11	782
Lithuania	0.70	(0.07)	0.13	811
Oman	0.39	(0.08)	0.04	629
Paraguay	0.94	(0.11)	0.14	511
Russia	0.53	(0.05)	0.11	1,029
Saudi Arabia	0.48	(0.06)	0.08	1,036
Taiwan	0.31	(0.08)	0.02	891
Ukraine	0.83	(0.07)	0.17	730
Median	0.70	(0.07)	0.12	782

Note: Univariate regression of log inverse export supply elasticities in each country on the average of the log inverse elasticities in that good for the remaining 14 countries.

BLW (2008): Results

Are the elasticity estimates ω_{ig} sensible?

TABLE 6—INVERSE EXPORT SUPPLY ELASTICITIES, GDP, REMOTENESS, AND IMPORT SHARES

Dependent variable	Log inverse export supply		
Log GDP	0.17	0.18	
	(0.04)	(0.03)	
Log remoteness		0.40	
		(0.15)	
Share of world HS4 imports			7.19
			(1.48)
Observations	12,343	12,343	12,343
R^2	0.26	0.26	0.25
R^2 within	0.01	0.02	0.00

Notes: All regressions include four-digit HS fixed effects (1,201 categories). Robust standard errors in parentheses. In the log GDP regressions, standard errors are clustered by country. GDP is for 1996. Remoteness for country i is defined as $1/(\Sigma_j \text{GDP}_j/\text{distance}_{ij})$. The share of world imports is calculated in 2000.

BLW (2008): Results (Scatter of Country Averages)

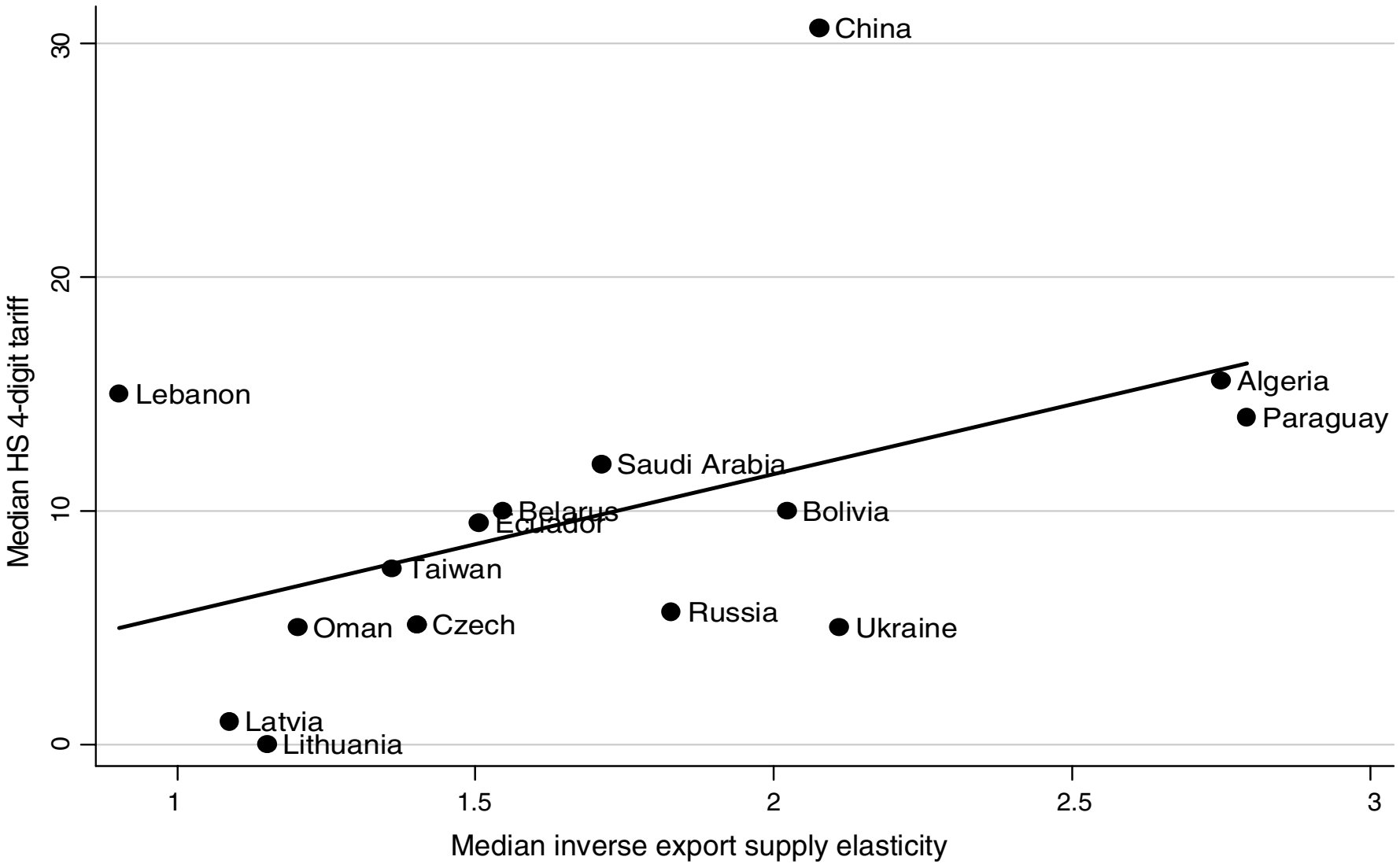

FIGURE 3. MEDIAN TARIFFS AND MARKET POWER ACROSS COUNTRIES

BLW (2008): Results (OLS)

TABLE 7— TARIFFS AND MARKET POWER ACROSS GOODS (WITHIN COUNTRIES): OLS AND TOBIT ESTIMATES

Dependent variable	Average tariff at four-digit HS (%)								
Fixed effects	Country			Country and industry					
Estimation method	OLS	OLS	OLS	OLS	OLS	OLS	Tobit	OLS[a]	OLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Inverse exp. elast.	0.0003			0.0004					
	(0.0001)			(0.0004)					
Mid and high inv exp elast		1.24			1.46			1.86	
		(0.25)			(0.24)			(0.31)	
Log(1/export elasticity)			0.12			0.17	0.17		
			(0.04)			(0.04)	(0.05)		
(Inv. exp. elast) × (1 − med hi)								1.45	
								(0.31)	
(Inv. exp. elast) × med hi								0.0003	
								(0.0001)	
Mid inv. exp. elast.									1.56
									(0.28)
High inv. exp. elast.									1.37
									(0.28)
Algeria	23.8	23.0	23.6	24.6	23.6	24.3	24.3	23.1	23.6
	(0.64)	(0.65)	(0.64)	(0.95)	(0.96)	(0.95)	(0.93)	(0.97)	(0.96)
Belarus	12.3	11.5	12.2	12.6	11.6	12.5	12.4	11.3	11.7
	(0.29)	(0.33)	(0.29)	(0.76)	(0.78)	(0.76)	(0.94)	(0.79)	(0.78)
Bolivia	9.8	9.0	9.7	10.1	9.2	10.0	10.0	8.8	9.2
	(0.03)	(0.17)	(0.06)	(0.73)	(0.75)	(0.73)	(0.95)	(0.77)	(0.75)
China	37.8	37.0	37.7	38.2	37.2	38.0	37.9	36.6	37.2
	(0.77)	(0.79)	(0.77)	(0.98)	(1.01)	(0.99)	(0.89)	(1.03)	(1.01)
Czech Republic	9.5	8.7	9.4	9.7	8.7	9.6	8.8	8.3	8.7
	(0.53)	(0.53)	(0.53)	(0.85)	(0.86)	(0.85)	(0.89)	(0.87)	(0.86)
Ecuador	9.8	9.0	9.7	10.3	9.4	10.2	10.1	9.0	9.4
	(0.19)	(0.26)	(0.20)	(0.73)	(0.74)	(0.73)	(0.93)	(0.76)	(0.74)
Latvia	7.3	6.4	7.2	7.3	6.3	7.2	6.9	6.0	6.3
	(0.35)	(0.40)	(0.35)	(0.76)	(0.78)	(0.76)	(0.91)	(0.79)	(0.78)
Lebanon	17.1	16.2	17.0	17.1	16.1	17.0	17.0	15.9	16.1
	(0.53)	(0.56)	(0.53)	(0.84)	(0.86)	(0.84)	(0.92)	(0.86)	(0.86)
Lithuania	3.6	2.8	3.6	3.6	2.6	3.5	−6.0	2.3	2.6
	(0.26)	(0.31)	(0.26)	(0.74)	(0.76)	(0.74)	(0.98)	(0.77)	(0.76)
Oman	5.6	4.9	5.6	5.7	4.8	5.6	4.9	4.4	4.8
	(0.34)	(0.37)	(0.34)	(0.77)	(0.79)	(0.77)	(0.94)	(0.79)	(0.79)
Paraguay	16.0	15.3	15.9	16.3	15.4	16.1	15.9	14.9	15.4
	(0.49)	(0.52)	(0.50)	(0.84)	(0.85)	(0.84)	(0.99)	(0.86)	(0.85)
Russia	10.6	9.8	10.5	10.8	9.9	10.7	10.0	9.4	9.9
	(0.34)	(0.38)	(0.34)	(0.77)	(0.79)	(0.77)	(0.89)	(0.82)	(0.79)
Saudi Arabia	12.1	11.3	12.0	12.4	11.4	12.2	12.1	10.9	11.4
	(0.08)	(0.18)	(0.09)	(0.71)	(0.74)	(0.72)	(0.89)	(0.76)	(0.74)
Taiwan	9.7	8.9	9.6	10.3	9.3	10.1	9.7	9.0	9.3
	(0.28)	(0.33)	(0.28)	(0.74)	(0.76)	(0.75)	(0.91)	(0.77)	(0.76)
Ukraine	7.4	6.6	7.2	8.1	7.1	7.9	6.8	6.6	7.1
	(0.28)	(0.33)	(0.29)	(0.74)	(0.76)	(0.74)	(0.93)	(0.78)	(0.76)
Observations	12,333	12,333	12,333	12,333	12,333	12,333	12,333	12,333	12,333
Number of parameters	16	16	16	36	35	36	35	38	36
Adj. R^2	0.61	0.61	0.61	0.66	0.66	0.66			0.66

Notes: Standard errors in parentheses (all heteroskedasticity robust except Tobit). Industry dummies defined by section according to Harmonized Standard tariff schedule.

[a] Optimal threshold regression based on minimum RSS found using a grid search over 50 points of the distribution of inverse exp. elast. (from first to ninety-ninth percentile in intervals of two). Optimal threshold is fifty-third percentile. Accordingly, med hi equals one above the fifty-third percentile and zero otherwise. Bruce E. Hansen (2000) shows that the dependence of the parameters on the threshold estimate is not of "first-order" asymptotic importance, so inference on them can be done as if the threshold estimate were the true value.

BLW (2008): Results (IV)

IV is average of other countries' export supply elasticities

TABLE 8—TARIFFS AND MARKET POWER ACROSS GOODS (WITHIN COUNTRIES): IV ESTIMATES

Dependent variable	Average tariff at four-digit HS (%)								
Fixed effects	Country			Country and industry			Industry by country		
Estimation method	IV GMM (1)	IV GMM (2)	IV GMM (3)	IV GMM (4)	IV GMM (5)	IV GMM (6)	IV GMM (7)	IV GMM (8)	IV GMM (9)
Inverse exp. elast.	0.040			0.089			0.075		
	(0.027)			(0.055)			(0.028)		
Mid and high inv. exp. elast.		3.96			8.88			9.07	
		(0.76)			(1.18)			(1.08)	
Log(1/export elasticity)			0.75			1.71			1.73
			(0.15)			(0.23)			(0.21)
Observations	12,258	12,258	12,258	12,258	12,258	12,258	12,258	12,258	12,258
No. of parameters	16	16	16	35	35	35	284	282	283
1st stage F	5	1649	1335	2	653	517	3	691	544

Notes: Standard errors in parentheses (heteroskedasticity robust). Industry dummies defined by section according to the Harmonized Standard tariff schedule.

BLW (2008): Results

Merging BLW (2008) approach with GM (1999) approach

TABLE 10— MARKET POWER VERSUS TARIFF REVENUE OR LOBBYING AS A SOURCE OF PROTECTION

Dependent variable	Average tariff at four-digit HS (%)					
Fixed effects	Industry by country					
Estimation method	IV GMM					
Sample	Pooled (all)		Pooled (all)		Pooled (7)	
Theory	Market power		Market power and tariff revenue		Market power and lobbying	
Mid and high inv. exp. elast.	9.07		9.04		10.20	
	(1.08)		(1.24)		(1.79)	
Mid and high inv. imp. elast.			−0.20			
			(2.08)			
Mid and hi inv. imp. pen/imp. elast.					6.28	
					(1.97)	
Log(1/export elasticity)		1.73		1.81		1.94
		(0.21)		(0.23)		(0.38)
Log(1/import elasticity)				−0.90		
				(0.81)		
Log(inv. imp. pen/imp. elas.)						1.59
						(0.55)
Observations	12,258	12,258	12,258	12,258	5,178	5,178
No. of parameters	282	283	283	284	132	133
First stage F (market power)	691	544	370	312	171	129
First stage F (other)	na	na	102	144	131	188

Notes: Standard errors in parentheses (heteroskedasticity robust). Industry dummies defined by section according to the Harmonized Standard tariff schedule. The countries with available data for the lobbying specifications are Bolivia, China, Ecuador, Latvia, Lithuania, Taiwan, and Ukraine. These data are not available for mining and agricultural products.

BLW (2008): Results

US non-tariff barriers, on which WTO agreements don't apply. More direct comparison with GM (1999)

TABLE 13— MARKET POWER AND LOBBYING AS A SOURCE OF PROTECTION IN THE US

Panel A: Nontariff barriers

Theory	*Market power*				*Market power and lobbying*			
Fixed effects	Industry				Industry			
Estimation method	IV Tobit				IV Tobit[b]			
Dependent variable	Coverage ratio (HS4)[a]		Advalorem equiv. (HS4, %)		Coverage ratio (HS4)		Advalorem equiv. (HS4, %)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Mid and high inv. exp. elast.	0.90		38.8		4.93		70.8	
	(0.31)		(15.73)		(1.52)		(21.99)	
Mid and hi inv. imp. pen./imp. elast					−0.08		3.99	
					(0.86)		(13.14)	
Log(1/export elasticity)		0.22		9.71		1.16		16.0
		(0.08)		(4.00)		(0.39)		(5.47)
Log(inv. imp. pen./imp. elas.)						0.19		4.74
						(0.34)		(4.94)
Observations[c]	804	804	804	804	708	708	708	708
Number of parameters	17	17	17	17	17	17	17	17
First stage z-stat (market power)	7.1	6.6	7.1	6.6	6.2	5.3	6.2	5.3
First stage z-stat (other)	na	na	na	na	10.1	11.4	10.1	11.4

BLW (2008): Results

Comparing US tariffs on WTO members and non-WTO members.

Panel B: Tariff barriers

Theory	*Market power*				*Market power and lobbying*			
Fixed effects	Industry				Industry			
Estimation method	IV Tobit				IV Tobit[b]			
Dependent variable	Non-WTO (HS4, %)		WTO (HS4, %)		Non-WTO (HS4, %)		WTO (HS4, %)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Mid and high inv. exp. elast.	21.2		1.52		26.9		1.89	
	(5.53)		(1.18)		(8.05)		(1.58)	
Mid and hi inv. imp. pen./imp. elast					10.8		−0.63	
					(4.91)		(0.96)	
Log(1/export elasticity)		5.07		0.36		5.58		0.45
		(1.36)		(0.28)		(1.86)		(0.38)
Log(inv. imp. pen./imp. elas.)						4.76		−0.18
						(1.69)		(0.34)
Observations[c]	870	870	869	869	775	775	774	774
Number of parameters	20	20	20	20	21	21	21	21
First stage z-stat (market power)	7.3	7.1	7.3	7.1	6.0	5.3	6.0	5.3
First stage z-stat (other)	na	na	na	na	10.0	11.6	10.0	11.6
Mean	30.6	30.6	3.4	3.4	33.0	33.0	3.7	3.7
Mid-hi inv. exp. elast. /mean (%)	69		45		81		51	
Elasticity (at mean)		0.17		0.11		0.17		0.12

Trade Agreements

- Given the strong and robust predictions made by theories of trade agreements (the GATT/WTO in particular) it is surprising how little empirical work there is on testing these theories.
- Recall that the key claim in a series of Bagwell and Staiger papers is that the key international externality that trade policies impose is the terms-of-trade externality, and further that the key principles of the GATT/WTO seem well designed to force member countries to internalize these externalities.
- Bagwell and Staiger (AER, 2010) takes a step towards filling this gap

Bagwell and Staiger (AER, 2011)

- BS (2011) look at countries who joined the WTO/GATT, and examine how their tariffs *changed* in the process.
- Using similar logic to that seen above, they show that if governments are utilitarian then (where 'BR' stands for 'best response'):

$$\tau^{BR} - \tau^{WTO} = \omega^{*BR} \tag{5}$$

- And if governments have political economy motives this generalizes to

$$\tau^{BR} - \tau^{WTO} = \eta^{BR} \equiv \sigma^{BR}\omega^{*BR}m^{BR} \tag{6}$$

Bagwell and Staiger (AER, 2011)

- This can be extended to allow for the possibility that WTO negotiations do not preserve perfect reciprocity (i.e. that $p^{w,BR} \neq p^{w,WTO}$). Letting $r \equiv p^{w,WTO}/p^{w,BR}$ we have (where $\phi_1 = 0$ if $r = 1$):

$$\tau^{WTO} = \phi_0 + \phi_1 \tau^{BR} + \phi_2 \eta^{BR} \tag{7}$$

- This forms BS (2011)'s estimating equation (with $\phi_1 > 0$ and $\phi_2 < 0$ expected). But for many countries they don't observe η so instead appeal to linear demand/supply case where η is proportional to m.

BS (2011): Results

TABLE 1—COUNTRIES IN THE SAMPLE

Country	Years of import data	Years of unbound tariff data	Year of WTO accession
Albania	1995–1999	1997	2000
Armenia	1995–1999	2001	2003
Cambodia	1995–1999	2001–2003	2004
China	1995–1999	1996–2000	2001
Ecuador	1995–1999	1993–1995	1996
Estonia	1995–1999	1995	1999
Georgia	1995–1999	1999	2000
Jordan	1995–1999	2000	2000
Kyrgyzstan	1995–1999	1995	1998
Latvia	1995–1999	1997	1999
Lithuania	1995–1999	1997	2001
Macedonia	1995–1999	2001	2003
Moldova	1995–1999	2000	2001
Nepal	1995–1999	1998–2000, 2002	2004
Oman	1995–1999	1997	2000
Panama	1995–1999	1997	1997

Notes: Unbound tariff data for each country come from the TRAINS database. Tariffs are MFN ad valorem, recorded at the HS6 level, and averaged over the sample period. Import data for each country come from the PC-TAS Database, a subset of the COMTRADE database. Import values are nominal and in millions of US dollars, and averaged over the sample period.

BS (2011): Results

TABLE 2A—SUMMARY STATISTICS FOR IMPORTS, UNBOUND TARIFFS, AND BOUND TARIFFS
(*Full sample and by sector*)

Sample (Observations)	Variable	Mean	SD	Median	Min	Max	Observations = 0
All	Imports	4.08	50.61	0.19	0.01	5,788.08	—
42,721	Unbound tariff	10.34	11.61	5.70	0.00	180.00	10,496
	Bound tariff	13.05	11.34	10.00	0.00	200.00	5,577
HS0	Imports	1.30	6.31	0.15	0.01	165.78	—
2,037	Unbound tariff	13.64	12.94	10.00	0.00	60.00	456
	Bound tariff	19.32	15.07	15.00	0.00	200.00	83
HS1	Imports	4.05	31.95	0.22	0.01	619.64	—
1,811	Unbound tariff	13.79	16.58	10.00	0.00	121.48	413
	Bound tariff	18.59	14.89	15.00	0.00	144.00	150
HS2	Imports	4.43	64.44	0.15	0.01	3,826.98	—
4,417	Unbound tariff	9.15	13.96	5.00	0.00	180.00	1,033
	Bound tariff	11.63	18.15	6.50	0.00	200.00	547
HS3	Imports	4.95	43.91	0.27	0.01	1,190.88	—
4,030	Unbound tariff	9.09	9.97	5.00	0.00	60.00	1,073
	Bound tariff	7.64	6.33	6.50	0.00	47.00	529
HS4	Imports	3.71	23.34	0.18	0.01	679.07	—
3,264	Unbound tariff	10.17	10.70	6.67	0.00	50.00	821
	Bound tariff	11.95	10.55	10.00	0.00	40.00	847
HS5	Imports	3.39	27.35	0.12	0.01	955.27	—
4,271	Unbound tariff	10.95	10.31	7.00	0.00	37.20	865
	Bound tariff	13.33	8.36	10.00	0.00	50.00	82
HS6	Imports	1.24	12.03	0.13	0.01	464.95	—
4,176	Unbound tariff	17.12	12.22	15.00	0.00	50.00	654
	Bound tariff	18.12	6.76	15.00	0.00	40.00	1
HS7	Imports	3.02	18.05	0.18	0.01	379.22	—
4,293	Unbound tariff	8.68	9.70	5.00	0.00	52.00	1,170
	Bound tariff	12.16	10.31	10.00	0.00	40.00	1,160
HS8	Imports	6.65	81.86	0.25	0.01	5,788.08	—
10,956	Unbound tariff	7.66	9.75	5.00	0.00	130.00	3,171
	Bound tariff	12.00	9.22	10.00	0.00	60.00	1,426
HS9	Imports	2.12	15.66	0.17	0.01	440.07	—
3,466	Unbound tariff	11.28	11.04	8.33	0.00	50.00	840
	Bound tariff	13.62	10.50	14.86	0.00	40.00	752

Notes: "Imports" represents the average yearly import value for each six-digit HS product over the period 1995–1999 in millions of US dollars. "Unbound tariff" represents the average pre-accession MFN applied tariff over the sample at periods noted in Table 1. "Bound tariff" represents the final negotiated post-accession tariff binding.

BS (2011): Results

TABLE 2B—SUMMARY STATISTICS FOR IMPORTS, UNBOUND TARIFFS, AND BOUND TARIFFS, BY COUNTRY

Sample (Observations)	Variable	Mean	SD	Median	Min	Max	Observations = 0
Albania	Imports	0.35	1.45	0.08	0.01	37.24	—
2,172	Unbound tariff	16.68	8.74	20.00	0.00	30.00	6
	Bound tariff	7.69	6.57	5.00	0.00	20.00	517
Armenia	Imports	0.36	2.06	0.06	0.01	42.42	—
1,213	Unbound tariff	2.98	4.54	0.00	0.00	10.00	843
	Bound tariff	8.66	6.71	10.00	0.00	15.00	402
Cambodia	Imports	0.62	4.34	0.08	0.01	153.85	—
1,632	Unbound tariff	16.18	12.32	15.00	0.00	96.00	81
	Bound tariff	19.33	10.16	15.00	0.00	60.00	13
China	Imports	27.96	120.66	3.35	0.01	3,826.98	—
4,646	Unbound tariff	18.72	13.03	16.00	0.00	121.48	64
	Bound tariff	9.76	6.66	8.50	0.00	65.00	250
Ecuador	Imports	1.23	4.63	0.23	0.01	99.48	—
3,601	Unbound tariff	11.64	5.71	12.00	0.00	32.33	14
	Bound tariff	21.70	7.93	20.00	5.00	85.50	0
Estonia	Imports	1.05	4.51	0.25	0.01	171.72	—
3,645	Unbound tariff	0.07	0.99	0.00	0.00	16.00	3,625
	Bound tariff	8.49	7.59	8.00	0.00	59.00	733
Georgia	Imports	0.36	2.40	0.05	0.01	48.29	—
1,388	Unbound tariff	9.83	3.24	12.00	5.00	12.00	0
	Bound tariff	6.94	5.54	6.50	0.00	30.00	383
Jordan	Imports	1.06	5.39	0.19	0.01	204.13	—
3,333	Unbound tariff	22.03	14.86	23.33	0.00	180.00	295
	Bound tariff	16.05	13.85	15.00	0.00	200.00	206
Kyrgyzstan	Imports	0.37	1.73	0.07	0.01	50.09	—
1,575	Unbound tariff	0.00	0.00	0.00	0.00	0.00	1,575
	Bound tariff	6.99	4.58	10.00	0.00	25.00	365
Latvia	Imports	0.83	4.74	0.18	0.01	215.56	—
3,253	Unbound tariff	4.78	8.35	0.50	0.00	75.00	131
	Bound tariff	12.03	11.83	10.00	0.00	55.00	502
Lithuania	Imports	1.30	9.35	0.26	0.01	449.43	—
3,515	Unbound tariff	3.62	7.41	0.00	0.00	50.00	2,611
	Bound tariff	9.49	7.99	10.00	0.00	100.00	747
Macedonia	Imports	0.52	1.94	0.14	0.01	68.21	—
2,643	Unbound tariff	14.98	11.42	12.00	0.00	60.00	17
	Bound tariff	7.33	7.69	5.75	0.00	60.00	843
Moldova	Imports	0.34	3.00	0.07	0.01	118.94	—
1,872	Unbound tariff	4.62	5.35	5.00	0.00	16.25	843
	Bound tariff	6.94	4.63	7.00	0.00	20.00	383
Nepal	Imports	0.41	1.75	0.07	0.01	48.59	—
1,517	Unbound tariff	14.89	13.96	15.00	0.00	130.00	40
	Bound tariff	25.78	13.99	25.00	0.00	200.00	55
Oman	Imports	2.04	11.60	0.19	0.01	290.76	—
2,824	Unbound tariff	4.69	1.21	5.00	0.00	5.00	177
	Bound tariff	13.23	15.62	15.00	0.00	200.00	85
Panama	Imports	3.73	101.05	0.25	0.01	5,788.08	—
3,691	Unbound tariff	12.10	11.26	9.00	0.00	60.00	122
	Bound tariff	23.36	10.61	30.00	0.00	144.00	75

Notes: See Table 2A.

BS (2011): Results

Based on linear supply/demand model

TABLE 3A—BASELINE RESULTS

Equation:	$\tau_{gc}^{WTO} = \alpha_G + \alpha_c + \beta_1 \tau_{gc}^{BR} + \beta_2 [V_{gc}^{BR}] + \epsilon_{gc}$					
		OLS			Tobit	
Sample	Observations	β_1	β_2	R^2	β_1	β_2
All	42,721	0.3702***	−0.0044***	0.804	0.3901***	−0.0065***
		(0.0174)	(0.0008)		(0.0051)	(0.0010)
HS0	2,037	0.3750***	−0.0733**	0.763	0.3925***	−0.0657
		(0.0284)	(0.0338)		(0.0291)	(0.0443)
HS1	1,811	0.2226***	−0.0476***	0.783	0.2376***	−0.0487***
		(0.0311)	(0.0104)		(0.0218)	(0.0095)
HS2	4,417	0.6502***	−0.0001	0.651	0.6781***	−0.0053
		(0.0707)	(0.0015)		(0.0210)	(0.0051)
HS3	4,030	0.2679***	−0.0044***	0.868	0.2805***	−0.0047***
		(0.0162)	(0.0008)		(0.0098)	(0.0015)
HS4	3,264	0.3285***	−0.0059***	0.919	0.3711***	−0.0061
		(0.0142)	(0.0017)		(0.0147)	(0.0048)
HS5	4,271	0.3136***	−0.0055***	0.955	0.3163***	−0.0055***
		(0.0104)	(0.0015)		(0.0083)	(0.0020)
HS6	4,176	0.1342***	−0.0134***	0.974	0.1342***	−0.0134***
		(0.0144)	(0.0044)		(0.0089)	(0.0041)
HS7	4,293	0.3705***	−0.0111***	0.906	0.3763***	−0.0088
		(0.0185)	(0.0025)		(0.0153)	(0.0057)
HS8	10,956	0.4013***	−0.0044***	0.872	0.4144***	−0.0057***
		(0.0159)	(0.0006)		(0.0080)	(0.0008)
HS9	3,466	0.3715***	−0.0112*	0.886	0.4123***	−0.0113
		(0.0176)	(0.0063)		(0.0179)	(0.0082)
Albania	2,172	0.2544***	−0.0085	0.870	0.3194***	−0.0183
		(0.0208)	(0.0512)		(0.0256)	(0.0690)
Armenia	1,213	0.2693***	0.0063	0.878	0.3066***	0.0058
		(0.0661)	(0.0666)		(0.0686)	(0.0789)
Cambodia	1,632	0.4979***	0.0453**	0.951	0.4985***	0.0450
		(0.0276)	(0.0186)		(0.0136)	(0.0304)
China	4,645	0.2584***	−0.0044***	0.862	0.2661***	−0.0073***
		(0.0214)	(0.0009)		(0.0079)	(0.0008)
Ecuador	3,601	0.5703***	−0.0607**	0.972	0.5703***	−0.0607***
		(0.0224)	(0.0244)		(0.0182)	(0.0146)
Estonia	3,645	0.2124**	−0.0900***	0.870	0.2456*	−0.1123***
		(0.1060)	(0.0289)		(0.1409)	(0.0195)
Georgia	1,388	−0.2285**	0.0457	0.901	−0.4986***	0.0441
		(0.0974)	(0.0280)		(0.1598)	(0.0436)
Jordan	3,333	0.6317***	−0.0546**	0.931	0.6504***	−0.0719***
		(0.0310)	(0.0273)		(0.0096)	(0.0214)
Kyrgyzstan	1,575	—	−0.0790	0.904	—	−0.0909*
		—	(0.0666)		—	(0.0506)
Latvia	3,253	0.1246***	−0.0616***	0.856	0.1286***	−0.1263***
		(0.0385)	(0.0184)		(0.0241)	(0.0487)
Lithuania	3,515	0.4990***	−0.0051	0.850	0.5179***	−0.0060
		(0.0445)	(0.0115)		(0.0223)	(0.0110)
Macedonia	2,643	0.4616***	−0.0188	0.859	0.6044***	−0.0183
		(0.0174)	(0.0602)		(0.0159)	(0.0544)
Moldova	1,872	0.4161***	0.0009	0.926	0.4755***	0.0243
		(0.0329)	(0.0031)		(0.0252)	(0.1509)
Nepal	1,517	0.3516***	−0.3998**	0.941	0.3527***	−0.4073***
		(0.0391)	(0.1810)		(0.0183)	(0.1150)
Oman	2,824	−0.4555	−0.0248**	0.765	−0.4662**	−0.0258
		(0.5301)	(0.0124)		(0.2351)	(0.0174)
Panama	3,691	0.1277***	−0.0031***	0.925	0.1300***	−0.0032**
		(0.0179)	(0.0010)		(0.0132)	(0.0012)

Notes: Standard errors are in parentheses (OLS are heteroskedasticity-robust). Industry fixed effects, α_G, are at the two-digit HS product level. Country fixed effects, α_c, included only for the full-sample and by-sector estimates. Fixed-effect estimates available upon request. See main text for variable definitions.

BS (2011): Results

Based on isoelastic supply/demand curves (estimates from BLW (2008))

TABLE 6—NONLINEAR SPECIFICATIONS

$\tau_{gc}^{WTO} = \alpha_G + \alpha_c + \phi_1 \tau_{gc}^{BR} + \phi_2 [\ln(\eta_{gc}^{BR})] + \upsilon_{gc}$				$\tau_{gc}^{WTO} = \alpha_G + \alpha_c + \phi_1 \tau_{gc}^{BR} + \phi_2 [\ln(\eta_{gc}^{BR})] + \phi_3[\Theta_{gc}^{BR}] + \upsilon_{gc}$			
		IV-GMM			IV-GMM		
Sample	Obs	ϕ_1	ϕ_2	Obs	ϕ_1	ϕ_2	ϕ_3
All	15,645	0.1984***	−0.4154***	15,645	0.1857***	−0.4671***	−2.2979***
		(0.0205)	(0.0515)		(0.0216)	(0.0662)	(0.6519)
HS0	789	0.0153	−1.8375***	789	−1.1907	−0.9786	−112.8735
		(0.0832)	(0.4212)		(5.9855)	(4.7322)	(520.5452)
HS1	607	0.0671**	−1.6040***	607	0.0758**	−1.4991***	0.7296
		(0.0296)	(0.4771)		(0.0362)	(0.4315)	(2.8101)
HS2	1,734	0.0237	−0.4269*	1,734	0.0266	−0.4144*	0.7462
		(0.0937)	(0.2358)		(0.0960)	(0.2328)	(2.5375)
HS3	1,516	0.3399***	−0.1342***	1,516	0.3684***	−0.0717	−1.1613*
		(0.0373)	(0.0482)		(0.0422)	(0.0588)	(0.6528)
HS4	1,193	0.3494***	−0.2099**	1,193	0.4345***	−0.0626	−3.1277
		(0.0298)	(0.0935)		(0.1172)	(0.1846)	(4.6537)
HS5	1,534	0.2956***	−0.4381***	1,534	0.2632***	−0.0680	0.9875**
		(0.0135)	(0.1150)		(0.0186)	(0.0821)	(0.3683)
HS6	1,550	0.1941***	−0.1404***	1,550	0.1964***	−0.1385**	−0.1556
		(0.0219)	(0.0512)		(0.0223)	(0.0495)	(0.2998)
HS7	1,449	0.4929***	−0.2027**	1,449	0.4820***	−0.2789***	1.7452
		(0.0353)	(0.0812)		(0.0364)	(0.0841)	(1.1590)
HS8	4,108	0.3291***	−0.3387***	4,108	0.3277***	−0.3382***	−0.1092
		(0.0293)	(0.0511)		(0.0297)	(0.0509)	(0.2329)
HS9	1,165	0.3589***	0.0674	1,165	0.3898***	0.3157*	2.7177***
		(0.0488)	(0.1243)		(0.0584)	(0.1753)	(0.6446)
China	4,371	0.2148***	−0.5384***	4,371	0.2145***	−0.5381***	−0.0284
		(0.0216)	(0.0499)		(0.0225)	(0.0480)	(0.4689)
Ecuador	3,108	0.5236***	−0.3149***	3,108	0.5416***	−0.4041***	−1.2416*
		(0.0242)	(0.0685)		(0.0308)	(0.1222)	(0.6728)
Latvia	2,983	0.1022**	−0.2994**	2,983	0.0907**	−0.2349	2.6329
		(0.0416)	(0.1200)		(0.0444)	(0.1629)	(1.8390)
Lithuania	3,088	0.4355***	−0.1625*	3,088	0.4420***	−0.1514*	−0.2955
		(0.0464)	(0.0941)		(0.0485)	(0.0899)	(0.5021)
Oman	2,095	−0.7157	−0.4886***	2,095	−1.2108*	−0.5428**	−5.5640
		(0.6267)	(0.1728)		(0.7000)	(0.2476)	(3.5050)

Notes: See Table 3A.