Tariff Reductions, Entry, and Welfare

Theory and Evidence for the Last Two Decades

Lorenzo Caliendo
Yale University, NBER

Robert C. Feenstra
UC. Davis, NBER

John Romalis
University of Sydney, NBER

Alan M. Taylor
UC. Davis, NBER

Introduction

- Since 2001 dominant foundation for international trade models has moved from Krugman's (1979, 1980) "new" trade theory based on monopolistic competition to:
    - Melitz's (2003) monopolistically competitive model with heterogeneous firms and a richer set of fixed trade costs; or
    - Eaton and Kortum's (2002) multi-country perfectly-competitive Ricardian Model with a continuum of products and a rich set of bilateral variable trade costs.
- Both models better match certain micro-features of trade
- Both models lend themselves to quantitative trade modelling (esp. after Chaney 2008).
- Despite different model foundations, Arkolakis, Costinot and Rodriguez-Clare (ACR 2012) show that the gains from trade in both models (and Krugman 1980) reduce to the same simple summary statistic involving the share of expenditure spent on domestic goods, and the elasticity of trade with respect to variable trade costs.

Introduction

- **Quantitative evaluation** *of Uruguay Round and PTA tariffs cuts*:
  - Many different tariff sources (e.g. TRAINS), including hand collection from the International Customs Tariffs Bureau (BITD)
  - Annual 1984-2011 ($T = 28$); World ($M = 189$ countries); SITC 4-digit
  - Major tariff reductions in advanced & emerging/developing
  - Bigger in the latter countries, and the real action starts circa 1990
  - Merge with global IO tables (EORA) with 15 industries

- **Theory**: We build on recent advances in trade and present a quantitative heterogeneous firms model for tariff policy evaluation
  - Multiple-country, multiple-sectors, intermediate goods and I-O linkages
  - Importantly, commercial policy influences **entry of firms** within sectors

Uruguay Round as a Policy Experiment

- The 8th round of multilateral trade negotiations under the General Agreement on Tariffs and Trade (GATT), ran from 1986 to 1994 and involved 123 countries
- New comprehensive annual tariff dataset (early 1980s on), taken from five primary sources:
  1. Raw tariff schedules from the TRAINS and IDB databases accessed via the World Bank's WITS website
  2. Manually collected tariff schedules published by the International Customs Tariffs Bureau (BITD)
  3. U.S. tariff schedules from the U.S. International Trade Commission from 1989 onwards
  4. U.S. tariff schedules derived from detailed U.S. tariff revenue and trade data from 1974 to 1988 maintained by the Center for International Data at UC Davis
  5. Texts of preferential trade agreements primarily sourced from the WTO's website, the World Bank's Global Preferential Trade Agreements Database, or the Tuck Center for International Business Trade Agreements Database

Preview of main results

- Analytical results from very simplified model
  - ➢ Firm entry an exit
    - Sensitive to how tariffs and other trade costs are modelled
    - Quantitative model reveals that this is also very sensitive to assumptions on substitutability of local and imported varieties
  - ➢ Welfare effects of tariffs
    - "Optimal" tariffs for a country setting tariffs unilaterally can be quite high in traditional trade models. Optimal tariffs are much lower in our model, and can even be negative (import subsidies)
    - Too little entry in our model, and without other policies to deal with this, low tariffs (or even import subsidies) can help correct the problem
    - Lower costs of imported intermediate inputs expand export opportunities for local firms
    - Implications for trade policy and negotiations

Preview of main results

- ## Results from full quantitative model
  - ➤ Firm entry an exit
    - Has been a very active margin of adjustment to actual changes on trade policy; especially in developed countries
    - Size of effect very sensitive to assumptions on substitutability of local and imported varieties
  - ➤ Trade and welfare effects of actual tariff reductions from 1990-2010
    - MFN tariff reductions ("Uruguay Round") caused a substantial increase in trade and a fairly large increase in welfare for many countries
    - Welfare gains from regional or preferential tariff reductions are typically quite modest
  - ➤ Trade and welfare effects of further tariff reductions
    - Move to free trade has slight benefits for most countries, but a substantial number lose (probably "preference erosion")

Model Structure

- ## Consumers
  - ➢ Cobb-Douglas preferences over final goods
    - Constant expenditure shares
- ## Production
  - ➢ Finished goods are produced using local and imported intermediate goods.
    - Nested-CES production function. Home-country intermediates are closer substitutes for each other than for imports
    - Finished goods can be consumed by consumers or used as inputs into the production of intermediate goods.
  - ➢ Intermediate goods production
    - Heterogeneous firms model (Melitz-Chaney)
    - Firms in each sector produce intermediate goods using a Cobb-Douglas aggregate of labour and finished goods from each sector as inputs
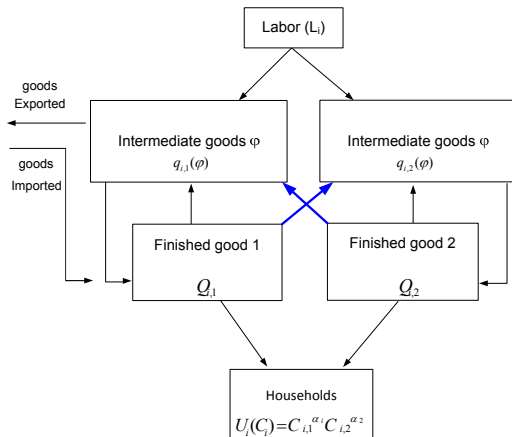   - Input-output structure

Model Structure

- **Fixed operating costs**
  - In addition to marginal costs, firms must incur fixed operating costs each period to operate in each market
    - These costs are higher in export markets than in domestic markets
    - The higher these costs, the higher the ability firms must have to make profits

- **Trade costs**
  - Cost of shipping each item internationally
    - Tariffs (ad-valorem; rebated as a lump-sum to consumers)
    - Other trade costs (ad-valorem; modelled as "iceberg" costs)
    - Analysis of effect of different types of trade costs.

Model Structure

- Countries
  - Model allows for any number of countries
    - With constructed tariff database and EORA input-output tables, cover almost all countries

- Sectors
  - Model allows for any number of sectors
    - We use the 15-sector EORA input-output database. 10 of these are goods; 5 are services.

Production Structure

The diagram shows: Labor (L_i) at the top, connecting to two boxes "Intermediate goods φ $q_{i,1}(\varphi)$" and "Intermediate goods φ $q_{i,2}(\varphi)$". On the left: "goods Exported" and "goods Imported". Below are "Finished good 1 Q_{i1}" and "Finished good 2 $Q_{i,2}$". At the bottom: "Households $U_i(C_i) = C_{i,1}{}^{\alpha_i} C_{i,2}{}^{\alpha_2}$".

Analytical results from simplified model

- **Gains from trade**
  - ➢ Gains from trade in our model can be decomposed into three components
    - Increased imports (like ACR term)
    - Increased firm entry
    - Increased output
  - ➢ Welfare effects of tariffs
    - Some detailed analysis of how different assumptions about modelling tariffs affects firm entry. Modelling decisions here are not innocuous.
    - In greatly simplified 2-country x 2-sector model with symmetric trade policies, optimal trade policy is an import subsidy. Too little firm entry according to our model, import subsidies can help correct the problem.
    - With unilateral tariff setting, optimal tariffs can be very low or even negative (subsidies). This is especially likely if there are strong input-output linkages; or if a country is very remote from the rest of the world.
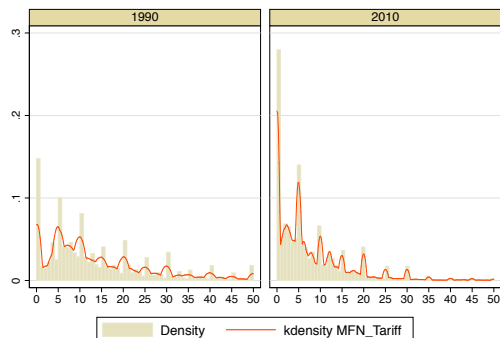
Bring New Tariff Data to Table

- Look at the raw MFN tariffs
  - About 1m obs per year in 1980s, rising to 2m by 2000s!
- Can see that both MFN and preferential tariffs fell, by about the same amount (7 pct.pt.: note that)
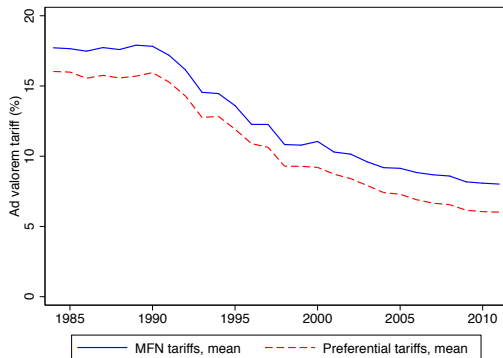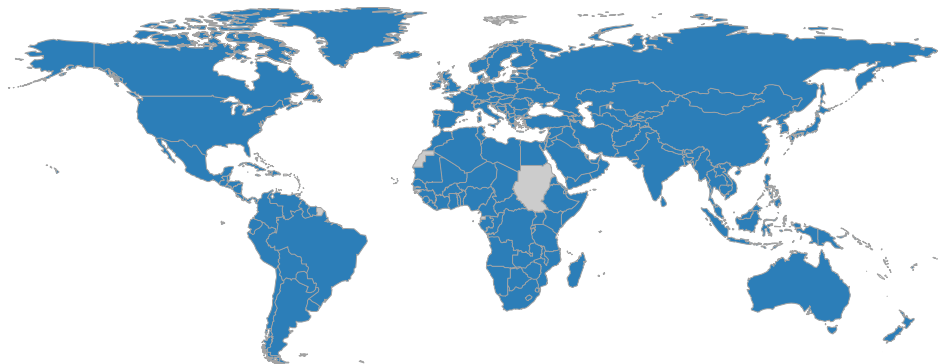
Tariff Data

- Large samples
  - 1990: many high tariffs, some over 100% (not shown here)
  - 2010: more heaping of tariffs in zero-to-20% range

Observations in 1990 = 1,119,930. Observations in 2010 = 2,724,754. Truncated to values <=50.

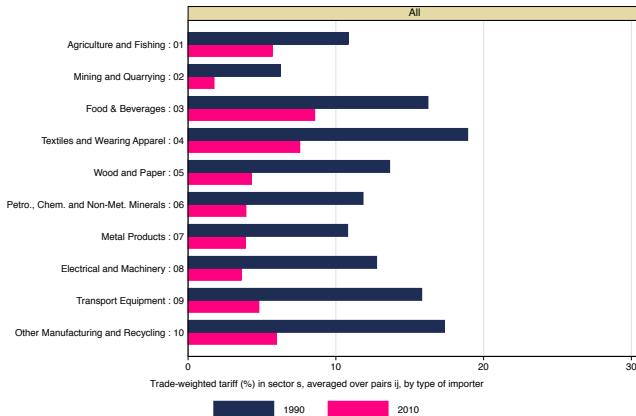# Quantitative Model - taking the model to the data

- Use 1990 EORA dataset (http://worldmrio.com)
  - ▸ Input-Output Matrix Data put to use for many countries
  - ▸ 189 countries, 15 sectors, with national input-output tables

Tariff policy variation - sectors
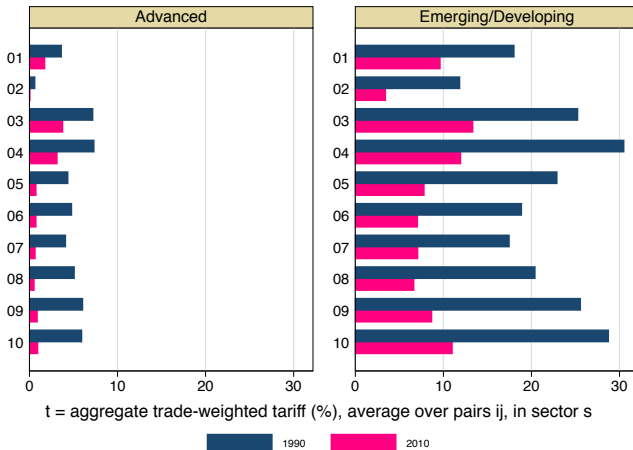
By sector and year

- Remark: big declines in most sectors

Trade-weighted tariff (%) in sector s, averaged over pairs ij, by type of importer

1990   2010

Tariff policy variation - sectors
By Region, Sector, and Year

- Remark: big declines in Em./Dev. all sectors

t = aggregate trade-weighted tariff (%), average over pairs ij, in sector s

■ 1990   ■ 2010

Quantitative Model - taking the model to the data

- Calibrate the model to assess the gains from tariff changes
  - In principle we need information on fixed costs: $f_{ij,s}$ and $f_{i,s}^E$ for all i, j, s
  - But compute the model in changes (hat notation $\hat{y} = y'/y$) ▶ hat
  - $M + 4SM + SM^2 = 547344$ equations and unknowns

- Need estimates of θ_s, σ_s, and ω_s
  - Eaton, Kortum, and Kramarz (2008): $\frac{\theta_s}{\sigma_s - 1} \approx 1.5$
  - Caliendo and Parro (2015) sectoral elasticities: $\frac{\sigma_s \theta_s}{\sigma_s - 1} - 1$
  - Back out θ_s and σ_s, but lower in services (Gervais and Jensen, 2013).

Sectors	$\frac{\sigma_s \theta_s}{\sigma_s - 1} - 1$	θ_s	σ_s
Agriculture and Fishing (1 sector)	9.1	8.6	6.7
Mining and Quarrying (1 sector)	13.5	13.0	9.7
Manufacturing Sectors (all 8 sectors)	5.5	5.0	4.4
Nontraded services (all 5 sectors)	—	2.7	2.8

Importance of Nested CES

- Results from actual tariff changes
  - We fix σ_s and θ_s, and vary ω_s

Comparing across models

	Welfare effects			
	$\sigma_s/\omega_s = 2$	$\sigma_s/\omega_s = 1.25$	$\sigma_s/\omega_s = 1.1$	$\sigma_s/\omega_s = 1$
Average	0.64%	1.56%	3.138%	5.93%
Median	0.27%	0.54%	1.74%	3.66%
Max	9.89%	26.87%	35.01%	41.11%
Min	-0.96%	-1.93%	-4.95%	-5.39%

|	Trade effects (growth in imports/GDP)			
Median	8%	31%	73%	143%

- Over the sample period, the growth in imports/GDP was 35%
- We present results for $\sigma_s/\omega_s = 1.25$

Four Policy Experiments

- **Baseline** levels
  - 1990 actual = min(preference 1990, MFN 1990)

- **Uruguay Round** only
  - min(preference 1990, MFN 2010)

- **Uruguay Round + Preference**
  - 2010 actual = min(preference 2010, MFN 2010)

- **Free Trade** = set all tariffs to zero

- **Negative (optimal) Tariffs** = check country-by-country

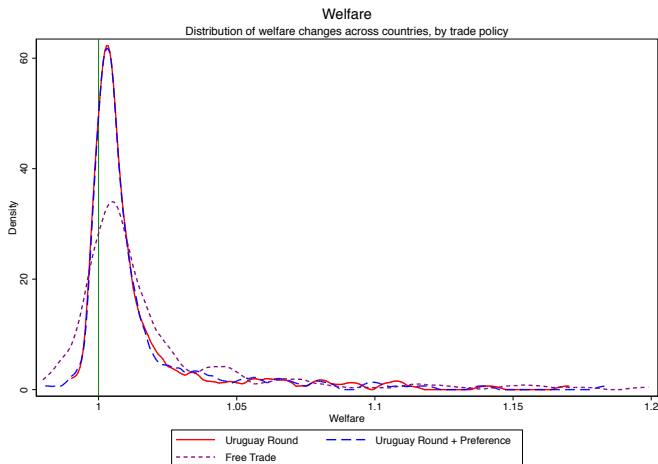# Welfare gains from actual tariff changes

Years 1990 - 2010, percentage change

■	> 13
■	11.3 to 13
■	9.6 to 11.3
■	7.9 to 9.6
■	6.1 to 7.9
■	4.4 to 6.1
■	2.7 to 4.4
■	1 to 2.7
■	< 1
■	No data
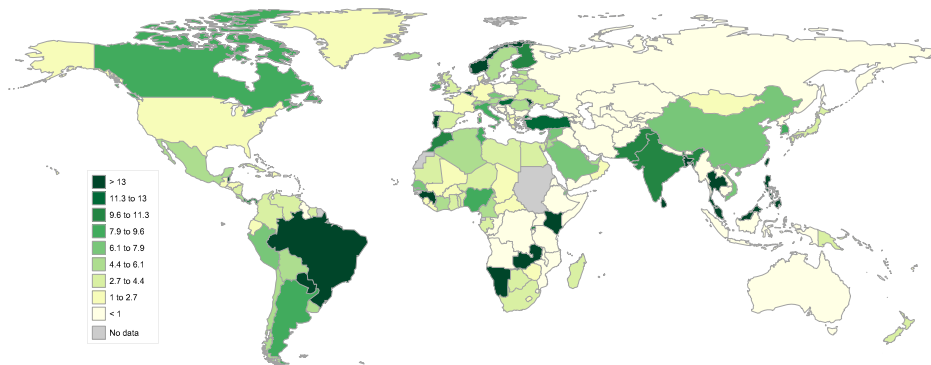
Welfare Histogram

- Remark: Most of the gains are from Uruguay Round

Welfare
Distribution of welfare changes across countries, by trade policy

Entry Effects

- Remark: entry (+ exit) operative. Entry is an important and nontrivial margin, but weighted sum is zero.

Entry
Distribution of entry across countries/sectors, by trade policy

Truncated to [0.5,1.5]
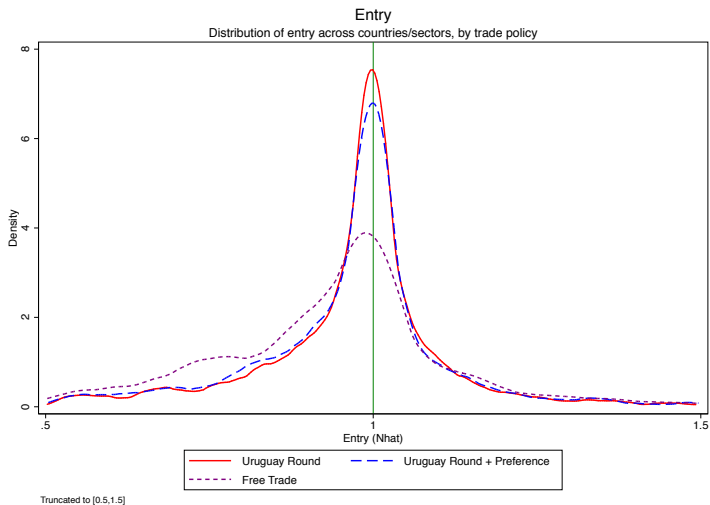
Negative Optimal Tariffs

- **Due to Strong Linkages:**
  - ▶ Belgium, France, Italy, Luxembourg, Portugal, Sweden, and also Malaysia and the Philippines (with Hungary on the borderline with a zero optimal tariff).

- **Due to Remoteness:**
  - ▶ Andorra, Angola, Aruba, Bahamas, Bahrain, Belarus, Belize, Brazil, British Virgin Islands, Brunei, Cameroon, Cayman Islands, Croatia, Cyprus, Czechia, Congo, Greenland, Haiti, Jamaica, Latvia, Liberia, Libya, Macao, Maldives, Mauritius, Moldova, Morocco, Namibia, Netherlands Antilles, New Caledonia, Palestine, Rwanda, San Marino, Sao Tome and Principe, Saudi Arabia, Slovenia, Syria and Yemen.

- It appears that (some of) the countries with largest welfare gains are benefitting from their own tariff cuts rather than RoW tariff cuts

Welfare gains from unilateral tariff changes

- Unilateral tariff changes for Advanced vs. Emerging/Dev groups

Unilateral tariff changes				
	Welfare effects			
	Advanced reduce tariffs		Emerging reduce tariffs	
	Advanced	Emerging	Advanced	Emerging
Average	1.23%	0.40%	1.37%	1.36%
Median	0.27%	0.15%	0.60%	0.30%
		Both/actual		
		Advanced	Emerging	
	Average	1.57%	1.55%	
	Median	0.57%	0.52%	

-

Implications

- ## For policymakers
  - ➢ Countries have much less economic incentive to impose tariffs than traditional models imply
    - Importance of production linkages: competiveness depends on ready access to imported inputs
    - A richer model may suggest the importance of access to global production chains
    - Even if some political leaders find it hard to appreciate this; large firms increasingly will (and will make this clear). This argument is less convincing when electorate gets a direct say on trade policy
  - ➢ MFN tariff reduction much greater effect than the multitude of regional arrangements from 1990-2010
    - Old arguments about "trade creation" and "trade diversion" still affecting results in the quantitative model.
  - ➢ Unilateral trade liberalization potentially an appealing policy: especially for goods that are not solely finished consumption goods.

Implications

- ## For trade negotiations
  - ➤ MFN tariff reductions agreed to by groups of countries can produce sizeable welfare gains
    - You don't need the whole world to agree to get a good trade outcome: "plurilateral" agreements?
    - Even unilateral trade liberalization often seems welfare enhancing
    - With international production linkages, imposing tariffs is much more likely to harm your most productive firms
  - ➤ More effort to getting MFN tariff reductions and reductions to other barriers to trade (and probably also investment) - even if some countries hold out
  - ➤ Some countries are adversely affected by a global move to free trade
    - Most likely reason is "preference erosion"
    - May need to be compensated in future WTO negotiations

Implications

- For trade modellers
  - How you model trade costs and production linkages is critically important to quantitative analysis of trade liberalization.