

Emerging Economies, Trade Policy, and Macroeconomic Shocks

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Overview

1. Do **macroeconomic shocks** determine emerging economy changes to time-varying trade policy under the WTO system?
 - Is there a **counter-cyclical** relationship between growth and protection?
 - Do relationships **change** during the **Great Recession**?
 - How does policy formation **compare** to **high-income** economies?

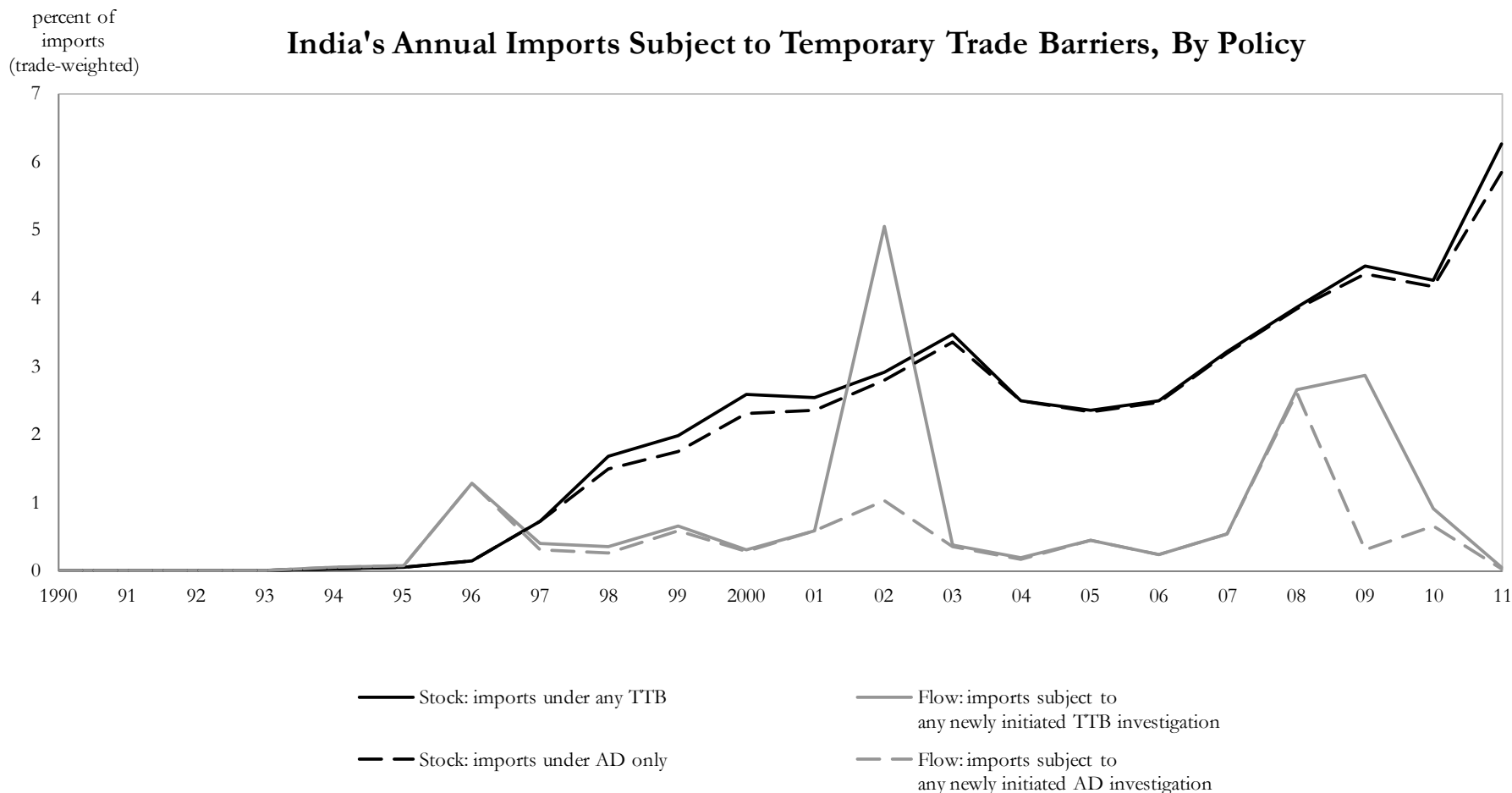
2. What role do **WTO tariff commitments** play in the use of time-varying import protection?

3. How is the use of time-varying trade policy affected by **exchange rate** movements?
 - Does the type of **exchange rate regime** matter?

The Evolution of Trade Policy under the GATT/WTO System

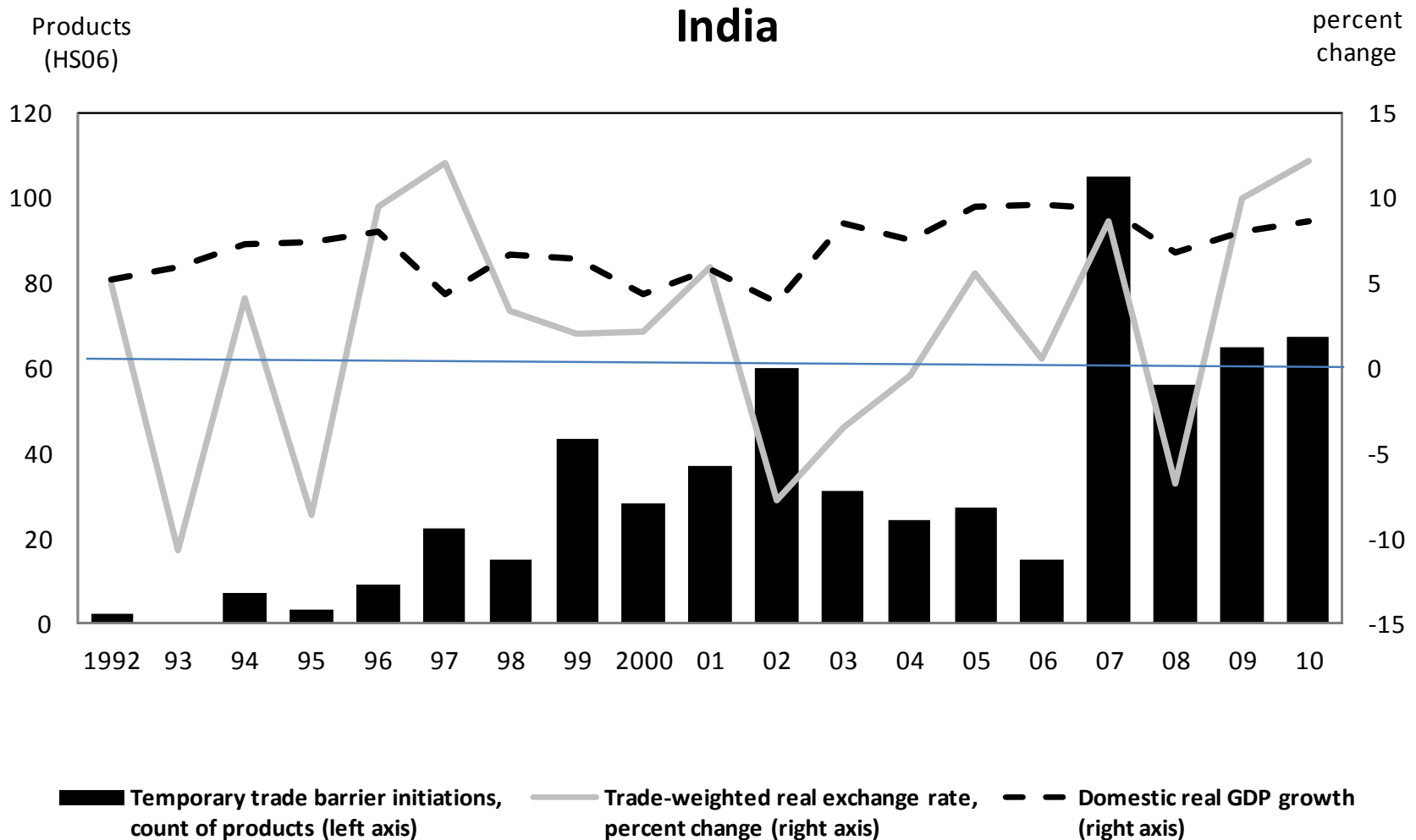
- **Emerging Economies** since the 1980s...
 - If weren't already party to GATT; they joined the WTO
 - They liberalized by reducing “tariffs” through many routes: *unilateral* liberalization, *preferential* trade agreements, *WTO accession* terms, etc
 - Legally “bound” some of those applied MFN tariffs at the WTO
 - **Established** new domestic institutional infrastructure for how to apply **new** import protection in (potentially) WTO-consistent ways
 - Policy instruments collectively referred to as **temporary trade barriers (TTBs)**: antidumping (AD), countervailing duties (CVDs), and safeguards
 - **Result by mid-2000s...**
 - Relatively low applied MFN import tariffs, though with legal scope to raise them (scope is heterogeneous across countries)
 - Time-varying trade policy increases frequently arise through use of **TTBs**

Motivation: TTB import restrictions under the WTO are economically important for many major emerging economies

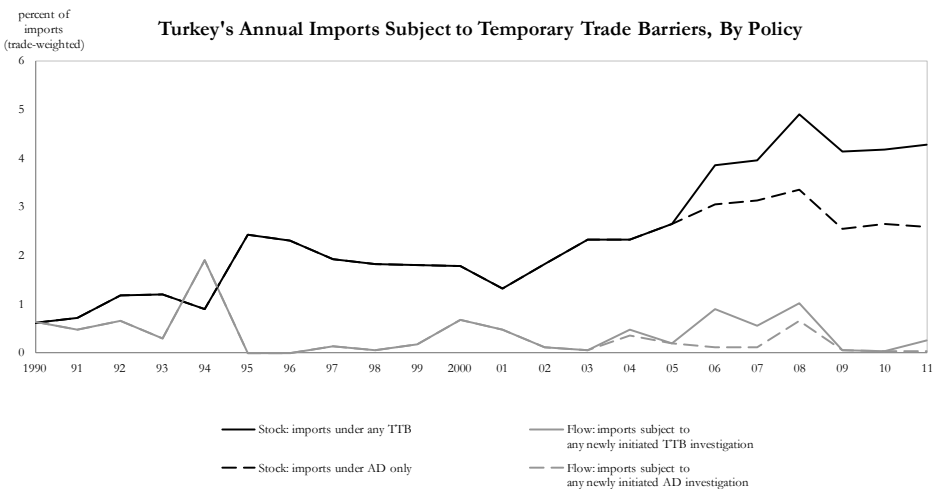
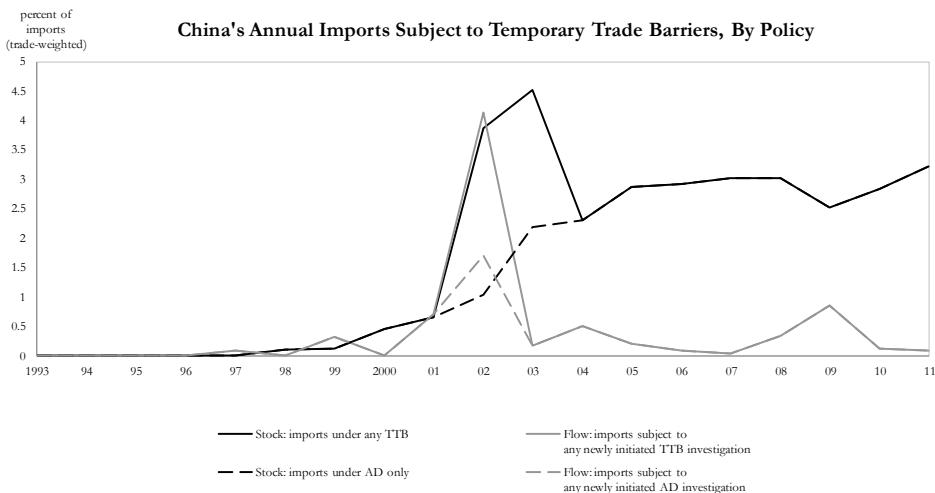
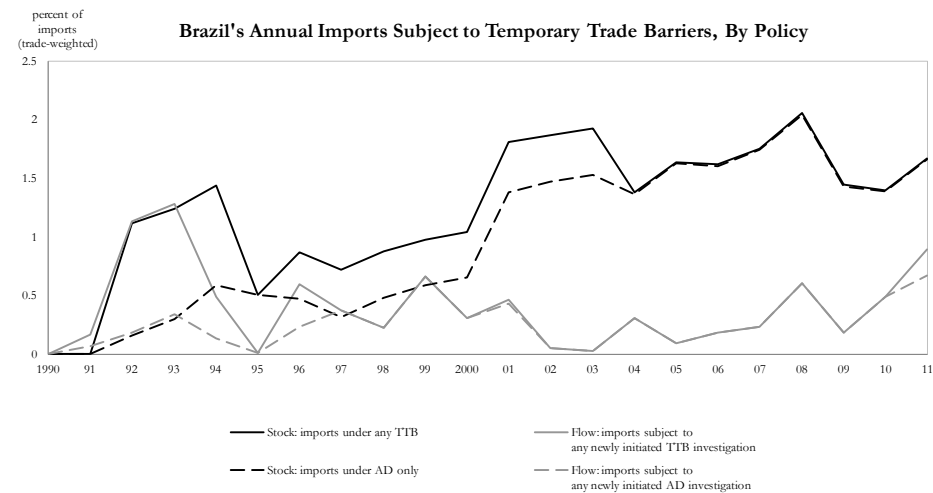
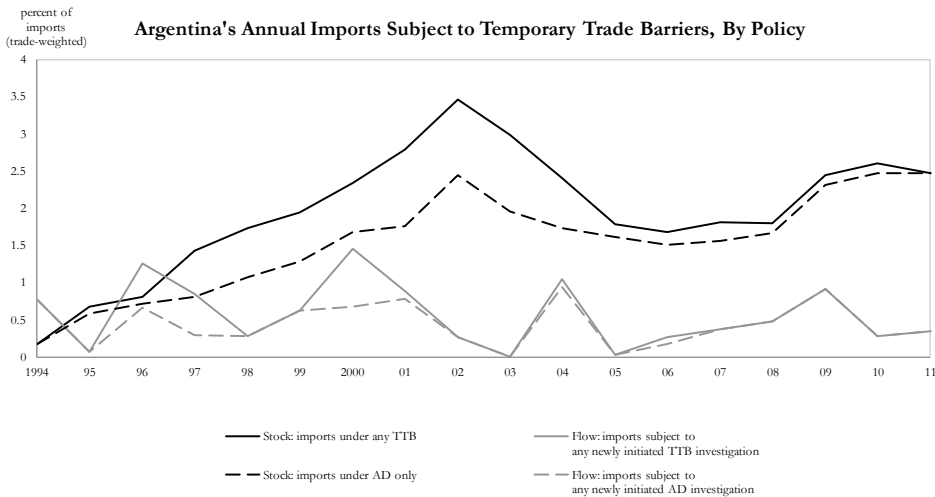


Source: Figure 1 of Chad P. Bown (2013) "Emerging Economies and the Emergence of South-South Protectionism," *Journal of World Trade*.

Figure 1. Import Protection, Real Exchange Rates, and Domestic Real GDP Growth: Emerging Economy G20 Members

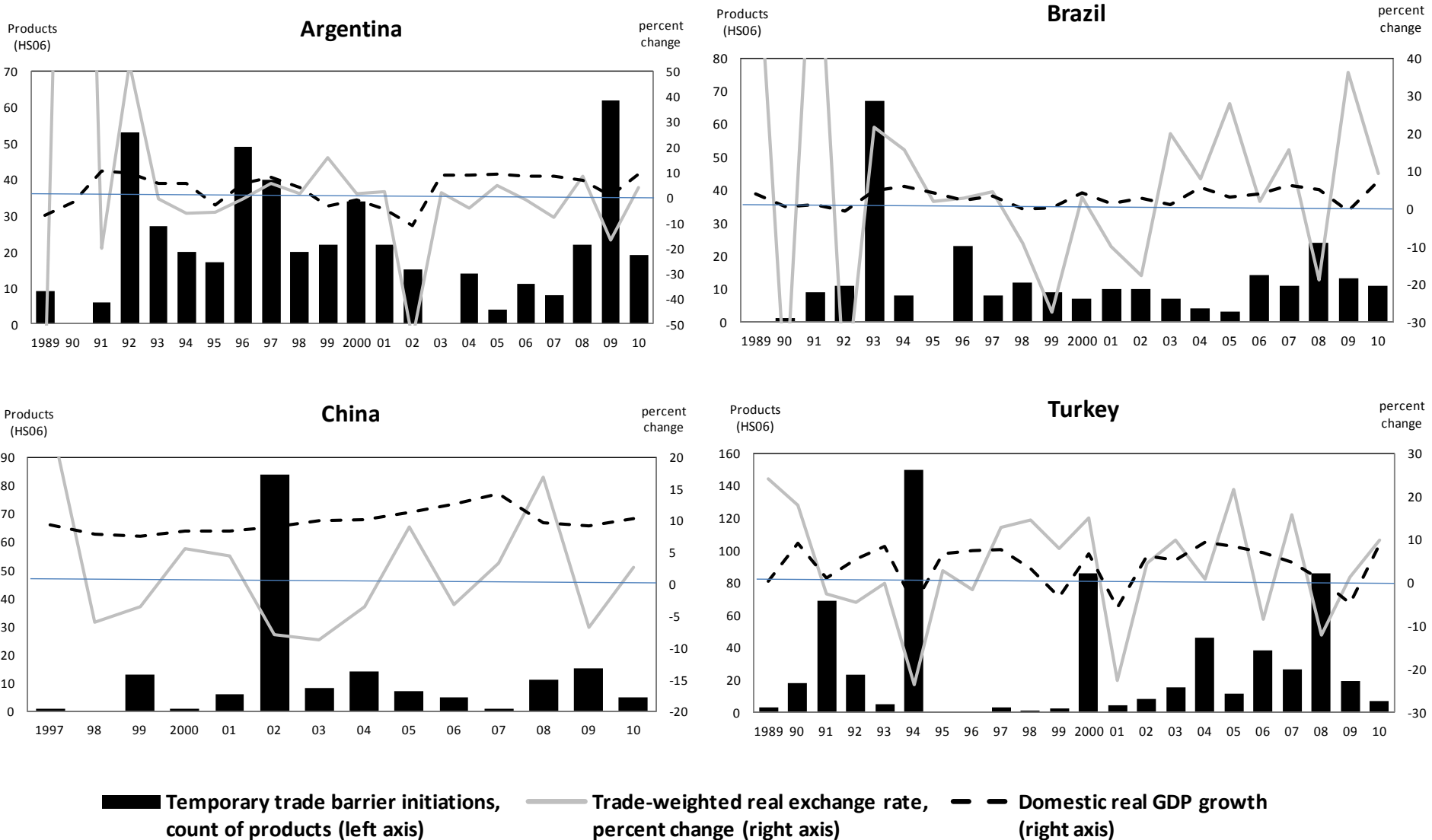


Motivation: TTB import restrictions under the WTO are economically important for many major emerging economies



Source: Figure 1 of Chad P. Bown (2013) "Emerging Economies and the Emergence of South-South Protectionism," *Journal of World Trade*.

Figure 1. Import Protection, Real Exchange Rates, and Domestic Real GDP Growth: Emerging Economy G20 Members (cont)



Approach and Results

We examine 13 major emerging economies over 1989-2010:

- *Argentina, Brazil, China, Colombia, India, Indonesia, Malaysia, Mexico, Peru, Philippines, South Africa, Thailand, and Turkey*
- *Collectively by 2010, 21 percent of world merchandise imports and 22 percent of world GDP*

We find that trade policy implemented through TTBs in emerging economies is *generally* **counter-cyclical**

Counter-cyclical import protection is associated with the WTO era.

Temporary trade barriers (TTBs) arise from...

- Weak domestic GDP growth - A one s.d. decrease led to a 21% increase in TTBs.
- Weak foreign GDP growth - A one s.d. decline led to a 20% increase in TTBs.

Approach and Results

TTBs tend to increase when **more** imported products come under WTO tariff discipline

- An increase in the number of products under strict WTO disciplines - A one s.d. increase in the percent of products with applied tariff rates at the WTO maximum binding tariff rate led to a 31% increase in TTBs.

A real **appreciation** of the domestic currency leads to more TTBs

- A one s.d. increase leads to a 19% increase in TTBs.
- **Switching XR regime from a currency peg to a float**, in conjunction with a real currency depreciation, leads to fewer TTBs

Why does this matter?

- **Optimal design of trade agreements:**
 - Theoretical models of trade agreements (Bagwell and Staiger, 1990 *AER*) suggest that the sustainability of a self-enforcing trade agreement depends on flexibility over tariffs in response to import volume shocks.
 - Cross-industry empirical evidence from the US (Bown and Crowley, 2013 *AER*) finds that the US utilizes this flexibility.
 - It is important to understand what types of shocks drive use of contingent tariffs in emerging economies so that we can design appropriate trade agreements.
- **Understanding why emerging economies join trade agreements:**
 - Trade agreements can address terms of trade inefficiencies or political economy inefficiencies (Maggi and Rodriguez-Clare, 2007 *AER*).
 - Using data on TTBs, MFN applied rates, and WTO tariff caps, we can try to determine which problems are solved by participation in a trade agreement.

Literature: Time-varying Trade Barriers

Knetter and Prusa (2003, *JIE*)

- Four high-income countries – US, EC, Australia, Canada
- Antidumping policy only, coarse measure of policy changes
- Annual data for 1980-1998

Bown and Crowley (2013, *JIE*)

- Five high-income economies – US, EU, Australia, Canada, South Korea
- All temporary trade barriers (TTBs), not only antidumping
- More detailed measures of trade policy changes (at the trading partner, product level)
- Quarterly data for 1988:Q1-2010:Q4

Table 1. Temporary Trade Barriers and WTO Disciplines Over Tariffs

Economy	MFN tariff binding coverage (1)	Average bound MFN tariff rate (2)	Average applied MFN tariff rate in 1995* (3)	Average applied MFN tariff rate in 2010 (4)	TTB import product coverage in 1995 (5)	TTB import product coverage in 2010 (6)
<i>Emerging economy G20 members in sample</i>						
Argentina	100.0	31.9	12.1	12.5	1.3	3.3
Brazil	100.0	31.4	13.0	13.7	0.4	1.6
China	100.0	10.0	15.9	9.6	0.0	1.4
India	73.8	49.4	14.5	12.4	0.2	6.6
Indonesia	95.8	37.2	15.3	6.7	0.0	0.6
Mexico	100.0	35.0	13.1	8.9	24.1	1.2
South Africa	96.6	19.2	14.2	7.6	0.4	0.6
Turkey	50.4	28.5	9.4	9.9	0.7	6.9
<i>Emerging economy non-G20 members in sample</i>						
Colombia	100.0	42.9	13.7	12.5	0.1	0.8
Malaysia	84.3	14.6	8.1	7.0	0.0	0.1
Peru	100.0	30.1	16.5	5.4	0.2	2.5
Philippines	67.0	25.7	20.3	6.3	0.0	0.2
Thailand	75.0	25.7	23.1	9.7	0.0	0.5
<i>Industrialized economies as comparison</i>						
United States	100.0	3.6	5.2	3.6	3.3	5.7
European Union	100.0	4.2	6.0	4.2	3.4	2.9

Empirical model

Estimate counts of HS-06 products subject to new TTBs

- Panel data: Importing country j , trading partner i , in year t (1989-2010)
- Negative binomial regression model:
 - Estimate using maximum likelihood
 - With bilateral, importing country-trading partner fixed effects
 - Identification
 - Inter-temporal variation in domestic real GDP growth and changes in products under WTO discipline
 - Inter-temporal and cross-sectional variation in bilateral real exchange rates, foreign GDP growth and bilateral import growth
 - Report Incidence Rate Ratios (IRRs)

Data

Dependent variable (defined at year t):

- Count of 6-digit Harmonized System (HS) products subject to new TTB investigations per trading partner per year
- Source: World Bank's *Temporary Trade Barriers Database*

Explanatory variables (defined at year $t-1$):

- Percent change in the bilateral real exchange rate (ij)
- Domestic real GDP growth (j)
- Foreign real GDP growth (i)
- Bilateral import growth (ij)
- **Change in the share of products for which the MFN applied tariff rate is equal to the WTO maximum tariff rate (i)**
- Indicators to interact explanatory variables with exchange rate regime (float or peg), Great Recession years (1995-2008 or 2009-2010) or GATT (1989-1994) vs. WTO (1995-2008) years

4. Results

Table 3. Negative Binomial Model Estimates of Determinants of Import Protection, 1995-2010

Explanatory Variables	Baseline specification (1)
Percent change in bilateral real exchange rate <i>ijt-1</i>	1.01 ^a (2.59)
Domestic real GDP growth <i>jt-1</i>	0.96 ^a (2.17)
Domestic unemployment rate change <i>jt-1</i>	--
Real GDP growth of trading partner <i>jt-1</i>	0.96 ^a (2.06)
Bilateral import growth from trading partner <i>ijt-1</i>	1.27 ^b (1.98)
Change in the share of imported products under WTO discipline <i>jt-1</i>	1.07 ^a (5.13)
Outstanding stock of TTBs imposed on <i>ijt-1</i>	--
Time trend	yes
Importer-exporter combined indicators	yes
Separate importer and exporter indicators	no
Observations	1778

Interpretation

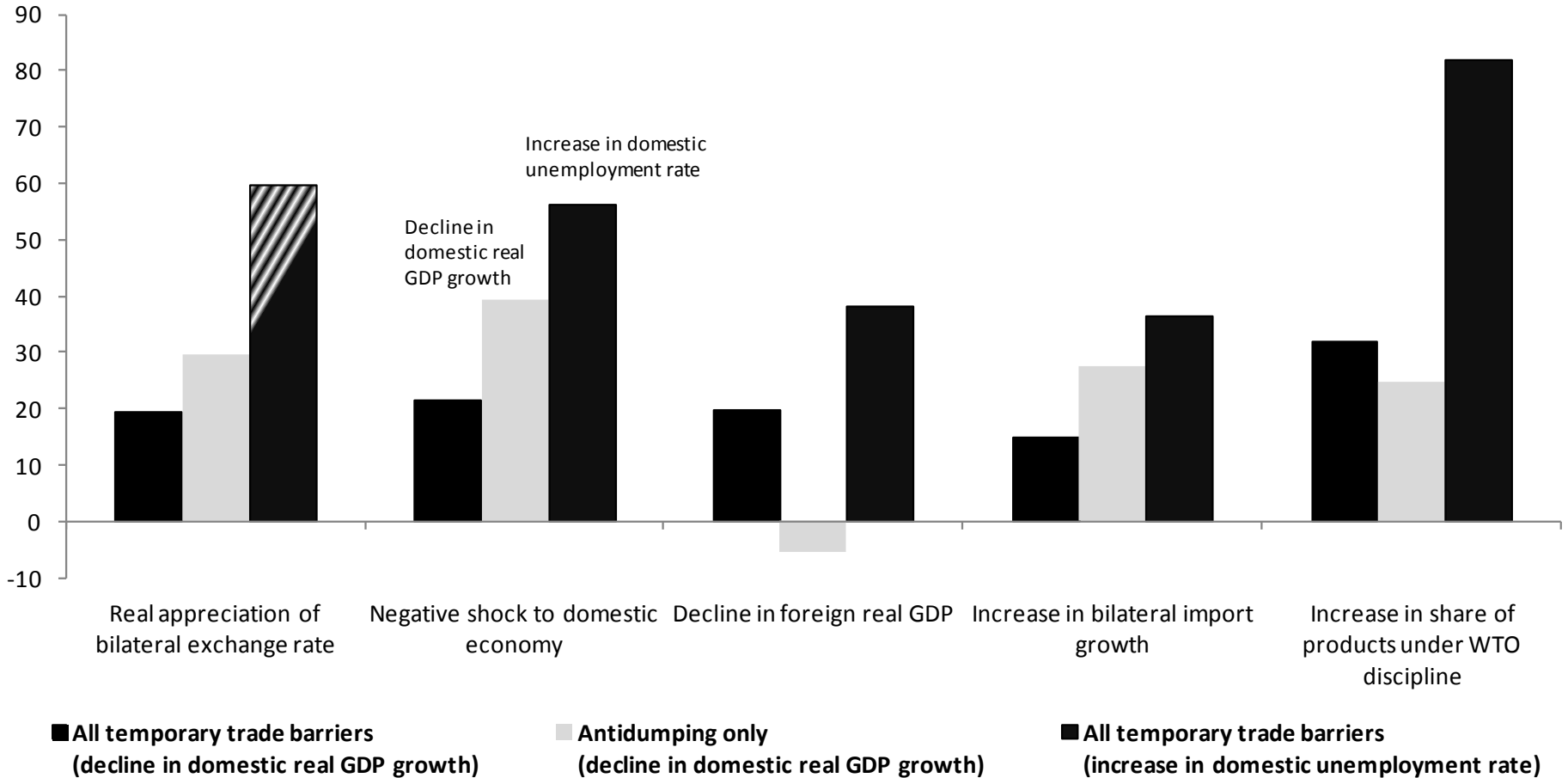
- We report **Incidence Rate Ratios (IRRs)** and ***t*-statistics** (in parentheses)
- **IRR estimate > 1 is positive effect**
- **IRR estimate < 1 is negative effect**

Table 3. Negative Binomial Model Estimates of Determinants of Import Protection, 1995-2010

Dependent variable: Bilateral (<i>ij</i>) count of products initiated under all temporary trade barrier policies in year <i>t</i>								
Explanatory Variables	Baseline specification (1)	Modify country indicators (2)	Change tariff variable (3)	Drop import growth (4)	Add TTB stock (5)	Redefine dependant variable to AD only (6)	Substitute domestic un-employment (7)	G20 emerging economies only (8)
Percent change in bilateral real exchange rate <i>ijt-1</i>	1.01 ^a (2.59)	1.01 ^a (2.77)	1.01 ^b (2.33)	1.01 ^a (2.63)	1.01 ^b (2.55)	1.01 ^a (3.65)	1.02 ^a (3.06)	1.02 ^a (5.06)
Domestic real GDP growth <i>jt-1</i>	0.96 ^b (2.17)	0.96 ^c (1.67)	0.95 ^b (2.32)	0.97 ^c (1.66)	0.96 ^b (1.93)	0.92 ^a (3.63)	--	0.93 ^a (3.36)
Domestic unemployment rate change <i>jt-1</i>	--	--	--	--	--	--	1.23 ^a (3.12)	--
Real GDP growth of trading partner <i>jt-1</i>	0.96 ^b (2.06)	0.97 ^c (1.80)	0.96 ^b (1.98)	0.97 ^c (1.72)	0.96 ^b (1.98)	1.02 (1.02)	0.96 (1.43)	0.99 (0.71)
Bilateral import growth from trading partner <i>ijt-1</i>	1.27 ^b (1.98)	1.17 (1.58)	1.28 ^b (2.04)	--	1.25 ^c (1.85)	1.56 ^a (2.94)	1.30 (1.58)	1.41 ^b (2.48)
Change in the share of imported products under WTO discipline <i>jt-1</i>	1.07 ^a (5.13)	1.07 ^a (5.36)	1.06 ^a (5.67)	1.07 ^a (5.19)	1.07 ^a (4.90)	1.08 ^a (5.48)	1.07 ^a (3.62)	1.06 ^a (4.13)
Time trend	0.97 (1.58)	0.97 (1.51)	0.98 (1.28)	0.97 ^b (2.01)	0.97 ^b (1.97)	0.93 ^a (3.83)	0.93 ^a (2.94)	1.02 (1.03)
Outstanding stock of TTBs imposed on <i>ijt-1</i>	--	--	--	--	1.00 (0.07)	--	--	--
Importer-exporter combined fixed effects	yes	no	yes	yes	yes	yes	yes	yes
Separate importer and exporter fixed effects	no	yes	no	no	no	no	no	no
Observations	1778	1778	1778	1791	1767	1778	1198	1168

Figure 4. Temporary Trade Barrier Responsiveness to Macroeconomic Shocks

Percent change in HS-06 products subject to new import protection in response to one s.d. shock



Summary of Table 3 results

Temporary trade barriers (TTBs) arise from...

1. A relatively weak domestic economy
 - A one s.d. decrease (4.03 percentage points) in real GDP growth leads to a 21% increase in TTBs.
2. Real appreciations in bilateral exchange rates
 - A one s.d. increase (17.9 percent appreciation) leads to a 19% increase in TTBs.
3. Weak GDP growth in a foreign trading partner
 - A one s.d. decrease (4.04 percentage points) leads to a 20% increase in TTBs.
4. Strong bilateral import growth
 - A one s.d. increase (55 percentage points) leads to a 15% increase in TTBs.
5. An increase in the number of products under strict WTO disciplines
 - A one s.d. increase (6.08 percent) in the percent of products with applied tariff rates at the WTO maximum binding tariff rate leads to a 31% increase in TTBs.

Comparison to High-Income Economies and Changes alongside the Great Recession

1. Bown and Crowley (2013, *JIE*) evidence from high-income economies

- Domestic macroeconomic shock, sharp RRR appreciation (and then sharp depreciation) of the Great Recession impacted TTB import protection in ways consistent with pre-crisis estimates (though less than expected magnitudes)
- Difference from pre-crisis: high-income economies “switched” and no longer targeted trading partners going through economic contraction during the Great Recession but instead targeted those experiencing greater economic growth

2. Bown (2013, *JWT*): TTB import coverage change differs across countries

- Despite quicker macroeconomic recovery relative to the high-income economies alongside the Great Recession, many emerging economies collectively increased TTB import coverage by much more than high-income economies

Table 4. Emerging Economies, the Great Recession, and a Comparison to High-Income Economies

Dependent variable: Bilateral (*ij*) count of products initiated under all temporary trade barrier policies in year *t*

Explanatory variables	Emerging economies, 1995-2010			High income economies, 1989-2010
	Full sample, domestic real GDP (1)	G20 emerging, domestic real GDP (2)	G20 emerging, domestic un- employment (3)	Domestic real GDP (4)
Percent change in bilateral real exchange rate <i>ijt-1</i> x (pre-2009)	1.01 (1.46)	1.02 ^a (4.18)	1.03 ^a (4.80)	1.01 ^b (2.30)
Percent change in bilateral real exchange rate <i>ijt-1</i> x (2009-2010)	1.02 ^c (1.91)	1.02 ^b (2.04)	1.01 (0.62)	1.00 (0.10)
[Test statistic]	[1.10]	[0.74]	[3.56] ^c	[0.65]
Domestic economy <i>jt-1</i> x (pre-2009)	0.93 ^a (3.14)	0.92 ^a (4.29)	1.30 ^a (3.75)	0.86 ^a (3.31)
Domestic economy <i>jt-1</i> x (2009-2010)	1.11 ^a (3.06)	1.14 ^a (3.45)	0.71 ^c (1.92)	1.00 (0.02)
[Test statistic]	[27.22] ^a	[18.66] ^a	[8.18] ^a	[1.58]
Real GDP growth of trading partner <i>it-1</i> x (pre-2009)	1.00 (0.16)	1.04 ^c (1.85)	0.99 (0.29)	0.93 ^a (2.74)
Real GDP growth of trading partner <i>it-1</i> x (2009-2010)	0.99 (0.36)	1.02 (0.60)	1.00 (0.03)	1.06 (1.11)
[Test statistic]	[0.08]	[0.37]	[1.59]	[6.24] ^b
Import growth from trading partner <i>ijt-1</i> x (pre-2009)	1.43 ^a (2.65)	1.77 ^a (3.03)	1.73 ^b (2.28)	1.00 (0.74)
Import growth from trading partner <i>ijt-1</i> x (2009-2010)	0.35 ^b (2.39)	0.23 ^a (3.62)	0.29 ^b (2.17)	0.99 (0.52)
[Test statistic]	[9.79] ^a	[7.59] ^a	[3.24] ^c	[0.50]
Time trend included	yes	yes	yes	yes
Import and exporter combined fixed effects	yes	yes	yes	yes
Observations	1778	1168	708	1133

Pre-Great Recession

- IRRs for **real exchange rates** and **domestic macroeconomic shocks** are similar for emerging economies and high-income economies of Bown and Crowley (2013)

Table 4. Emerging Economies, the Great Recession, and a Comparison to High-Income Economies

Dependent variable: Bilateral (*ij*) count of products initiated under all temporary trade barrier policies in year *t*

Explanatory variables	Emerging economies, 1995-2010			High income economies, 1989-2010
	Full sample, domestic real GDP (1)	G20 emerging, domestic real GDP (2)	G20 emerging, domestic un- employment (3)	Domestic real GDP (4)
Percent change in bilateral real exchange rate <i>ijt-1</i> x (pre-2009)	1.01 (1.46)	1.02 ^a (4.18)	1.03 ^a (4.80)	1.01 ^b (2.30)
Percent change in bilateral real exchange rate <i>ijt-1</i> x (2009-2010)	1.02 ^c (1.91)	1.02 ^b (2.04)	1.01 (0.62)	1.00 (0.10)
[Test statistic]	[1.10]	[0.74]	[3.56] ^c	[0.65]
Domestic economy <i>jt-1</i> x (pre-2009)	0.93^a (3.14)	0.92^a (4.29)	1.30^a (3.75)	0.86 ^a (3.31)
Domestic economy <i>jt-1</i> x (2009-2010)	1.11^a (3.06)	1.14^a (3.45)	0.71^c (1.92)	1.00 (0.02)
[Test statistic]	[27.22]^a	[18.66]^a	[8.18]^a	[1.58]
Real GDP growth of trading partner <i>it-1</i> x (pre-2009)	1.00 (0.16)	1.04 ^c (1.85)	0.99 (0.29)	0.93^a (2.74)
Real GDP growth of trading partner <i>it-1</i> x (2009-2010)	0.99 (0.36)	1.02 (0.60)	1.00 (0.03)	1.06 (1.11)
[Test statistic]	[0.08]	[0.37]	[1.59]	[6.24]^b
Import growth from trading partner <i>ijt-1</i> x (pre-2009)	1.43 ^a (2.65)	1.77 ^a (3.03)	1.73 ^b (2.28)	1.00 (0.74)
Import growth from trading partner <i>ijt-1</i> x (2009-2010)	0.35 ^b (2.39)	0.23 ^a (3.62)	0.29 ^b (2.17)	0.99 (0.52)
[Test statistic]	[9.79] ^a	[7.59] ^a	[3.24] ^c	[0.50]
Time trend included	yes	yes	yes	yes
Import and exporter combined fixed effects	yes	yes	yes	yes
Observations	1778	1168	708	1133

Pre-Great Recession vs. 2009-2010

- IRRs for and **domestic macroeconomic shock** flips for **emerging** and **foreign macro-economic shock** flips for **high-income** economies of Bown and Crowley (2013)
- However, IRR for 2009-2010 mainly driven off cross-country variation
- Interpreting IRRs on **real exchange rates** in light of RXR movements in 2008 and 2009

Emerging Economy use of TTB import protection under the WTO

- ***Is it different from how emerging economies used TTB import protection under the GATT?***

Table 5. Comparing the WTO Period with the GATT

Dependent variable: <i>Bilateral (ij) count of products initiated under all temporary trade barrier policies in year t</i>		
G20 emerging economies only, 1989-2008		
	Domestic real GDP (1)	Domestic un-employment (2)
Percent change in bilateral real exchange rate <i>ijt-1</i> x GATT	0.98 (1.40)	0.99 ^b (2.29)
Percent change in bilateral real exchange rate <i>ijt-1</i> x WTO	1.01^a (2.77)	1.03^a (3.65)
[Test statistic]	[9.74]^a	[16.78]^a
Domestic economy <i>jt-1</i> x GATT	1.14 ^a (3.29)	0.64 ^b (2.45)
Domestic economy <i>jt-1</i> x WTO	0.94^a (3.20)	1.51^a (5.93)
[Test statistic]	[19.91]^a	[17.58]^a
Real GDP growth of trading partner <i>it-1</i> x GATT	0.99 (0.18)	0.95 (0.91)
Real GDP growth of trading partner <i>it-1</i> x WTO	1.02 (1.13)	0.99 (0.12)
[Test statistic]	[0.59]	[0.64]

TTB import protection under the WTO

Combine the countries of this analysis with those of Bown and Crowley (2013, *JIE*)

- **18 Emerging and High-Income Economies**
- **Combined, roughly 75% of world merchandise imports and world GDP in 2010**
- ***On average, is TTB import protection applied counter-cyclically?***

Table 5. WTO-Era Results, 18 policy-imposing economies, 1995-2008

<i>Dependent variable: Bilateral (ij) count of products initiated under all temporary trade barrier policies in year t</i>		
	All emerging and high-income economies, 1995-2008	
	Domestic real GDP (3)	Domestic unemployment (4)
Percent change in bilateral real exchange rate <i>ijt-1</i>	1.01^b (2.21)	1.02^a (3.40)
Domestic economy <i>jt-1</i>	0.93^a (4.25)	1.34^a (5.50)
Real GDP growth of trading partner <i>it-1</i>	0.96^a (2.78)	0.93^a (3.16)
Import growth from trading partner <i>ijt-1</i>	1.00 (0.37)	1.01 (0.92)
Change in the share of imported products under WTO discipline <i>jt-1 x WTO</i>	1.02^b (2.14)	1.02 (1.41)
Time trend included	yes	yes
Import and exporter combined fixed effects	yes	yes
Observations	2917	1985

Exchange Rate Regimes

- ***Is there a differential impact of how macroeconomic shocks feed into new TTB import protection depending on the economy's exchange rate regime?***
- **Pegged vs. Float classifications based on updates to Shambaugh (2004, *QJE*)**

Table 6. Exchange Rate Regime Differentials for Emerging Economies, 1995-2010

Dependent variable: Bilateral (<i>ij</i>) count of products initiated under all temporary trade barrier policies in year <i>t</i>				
Explanatory variables	All emerging economies		G20 emerging economies	
	Domestic real GDP (1)	Domestic un-employment (2)	Domestic real GDP (3)	Domestic un-employment (4)
Percent change in bilateral real exchange rate <i>ijt-1</i> x float	1.01 ^c (1.68)	1.01 ^b (2.31)	1.02 ^a (4.18)	1.03 ^a (4.38)
Percent change in bilateral real exchange rate <i>ijt-1</i> x peg	1.01 (0.55)	1.00 (0.04)	1.01 (0.99)	1.01 (0.35)
[Test statistic]	[0.00]	[0.34]	[0.44]	[1.19]
Percent change in bilateral real exchange rate <i>ijt-1</i> x float adopted in <i>t-1</i>	1.05^a (2.85)	1.04^b (2.01)	1.05^a (2.95)	1.03 (1.47)
Domestic economy <i>jt-1</i> x float	0.97 (1.22)	1.19 ^b (2.11)	0.94 ^b (2.42)	0.99 (0.12)
Domestic economy <i>jt-1</i> x peg	0.90 ^a (3.25)	1.37 ^a (2.59)	0.90 ^a (3.70)	1.39 ^a (3.21)
[Test statistic]	[4.58]	[0.93]	[2.35]	[6.04]
Real GDP growth of trading partner <i>it-1</i> x float	0.95 ^b (2.18)	0.97 (1.04)	0.99 (0.48)	0.99 (0.16)
Real GDP growth of trading partner <i>it-1</i> x peg	1.03 (0.69)	0.92 (1.19)	1.02 (0.47)	0.94 (0.91)
[Test statistic]	[2.66]	[0.57]	[0.48]	[0.64]
Import growth from trading partner <i>ijt-1</i> x float	1.10 (0.59)	1.17 (0.73)	0.97 (0.14)	0.84 (0.77)
Import growth from trading partner <i>ijt-1</i> x peg	1.87 ^c (1.79)	1.72 (1.27)	1.96 ^b (2.35)	1.96 ^c (1.74)
[Test statistic]	[1.89]	[0.64]	[4.31]	[3.56]
Change in the share of imported products under WTO discipline <i>jt-1</i> x WTO	1.07 ^a (4.95)	1.07 ^a (3.15)	1.06 ^a (4.36)	1.04 (0.91)
Observations	1745	1165	1168	708

Conclusions

Temporary trade barriers (TTBs) in emerging economies arise from...

- Weak domestic GDP growth - A one s.d. decrease led to a 21% increase in TTBs.
- Real appreciations in bilateral exchange rates - A one s.d. increase led to a 19% increase.
- Weak foreign GDP growth - A one s.d. decline led to a 20% increase in TTBs.
- Strong bilateral import growth – A one s.d. increase led to a 15% increase.
- An increase in the number of products under strict WTO disciplines - A one s.d. increase in the percent of products with applied tariff rates at the WTO maximum binding tariff rate led to a 31% increase in TTBs.

Conclusions

Some evidence that trade policy determination was different alongside the Great Recession in terms of the channel of domestic macroeconomic shocks

- Before the crisis, a decline in GDP growth led to more TTBs.
- During the crisis, a decline in GDP growth led to fewer TTBs. However, since there is only 2 years worth of data, this is mainly driven off **cross-country** differences

Some evidence that trade policy determination through TTBs under the WTO is “more” counter-cyclical and responsive to macro shocks than under the GATT

- GATT: RXR depreciations and domestic GDP growth led to TTBs
- WTO: RXR appreciations and domestic GDP declines led to TTBs, similar to estimated relationship for high-income economies (Bown and Crowley, 2012)

Exchange rate regimes impact trade policy choices

- Abandoning a peg and allowing the real exchange rate to depreciate 15% leads to a 70% decline in new TTBs in the following year.