

Import Protection, Business Cycles, and Exchange Rates:

Evidence from the Great Recession

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Figure 1. Import Protection, Real Exchange Rates, and Unemployment, 1988:Q1-2010:Q4

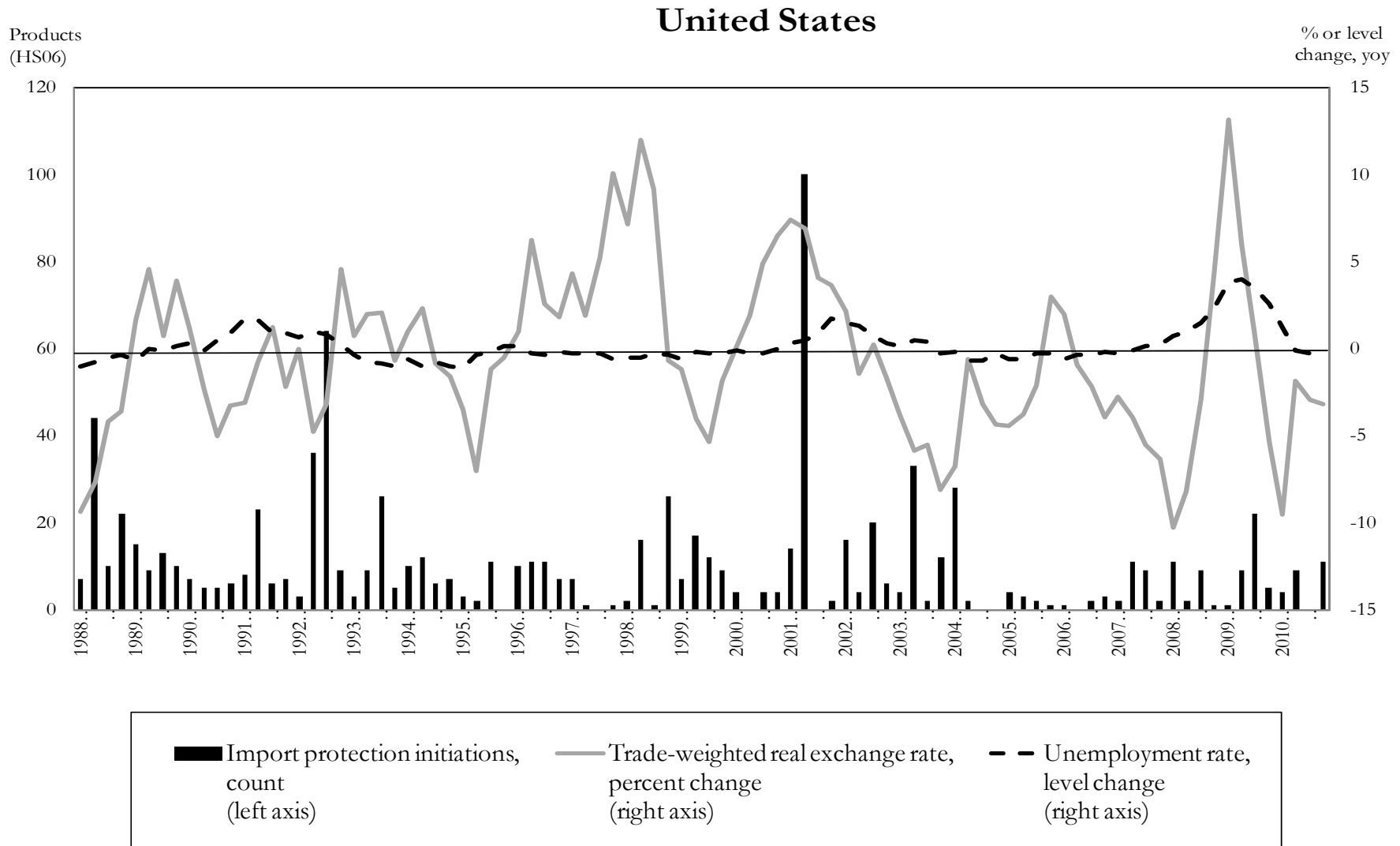
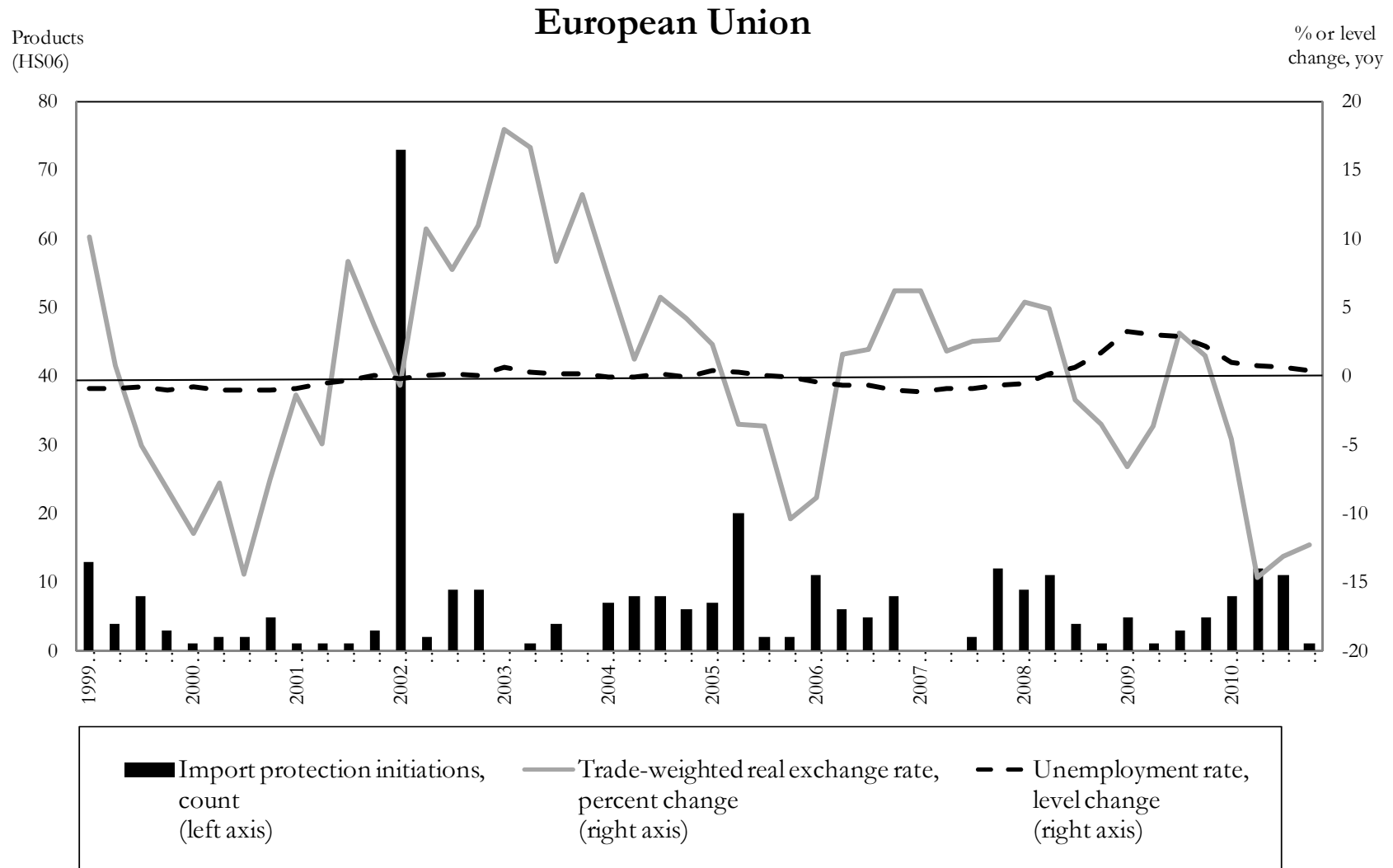


Figure 1. Import Protection, Real Exchange Rates, and Unemployment, 1988:Q1-2010:Q4



Overview

Questions:

For the United States, European Union , South Korea, Australia, Canada...

1. Historically, what has been the relationship between macro shocks and import barriers?
2. What did this relationship predict for the Great Recession?
3. What actually happened to trade policy during the Great Recession?

Approach:

1. We **estimate** models of import protection as a function of macroeconomic fluctuations **prior to** the crisis (1988:Q1-2008:Q3)
2. We use those models to **predict out-of-sample** import protection for 2008:Q4-2010:Q4, which we compared to realized import protection
3. We **re-estimate** the models on the **longer sample** (through 2010:Q4) and test for changes in the responsiveness of import protection to macroeconomic shocks across the two periods

Results

Trade policy: 1988:Q1 – 2008:Q3

More temporary trade barriers (TTBs) arise from...

- Rising domestic unemployment
 - A one s.d. increase (0.86 percentage points) leads to a 52% increase in TTBs.
- Real appreciations in bilateral exchange rates
 - A one s.d. increase (15 percent appreciation) leads to a 33% increase in TTBs.
- Weak GDP growth in a foreign trading partner
 - A one s.d. decrease (3.5 percentage points) leads to a 60% increase in TTBs.

Results

Predicted trade policy during the Great Recession

Pre-Great Recession models predict...

- 15.4 percent of US non-oil imports would face new TTBs
- 14.0 percent of EU non-oil import would face new TTBs.

Realized trade policy was...

- 0.9 percent of US non-oil imports subject to new TTBs.
- 1.9 percent of EU non-oil imports subject to new TTBs.

Results

What happened to trade policy during the Great Recession?

1. Importing economies stopped targeting weak trading partners

Pre-crisis model: TTBs were directed toward exporters with weak GDP growth

Great Recession: In the TTB determination model, the parameter on foreign GDP growth changed.

Policy-imposing economies refrained from imposing new import barriers against trading partners with weak or negative GDP growth during the Great Recession.

2. Exchange rate depreciations

Both the US dollar and Euro experienced sharp and persistent real depreciations; this relieved economic pressure for new US and EU TTBs.

Empirical Studies of tariff determination

- Political economy models
Trefler (1993), Goldberg and Maggi (1999) and Gawande and Bandyopadhyay (2000)
- Terms-of-trade and trade agreement models
Broda, Limao and Weinstein (2008), Bagwell and Staiger (2011), Bown and Crowley (forthcoming)
- Macroeconomic determinants of time-varying trade barriers
Feinberg (1989), Knetter and Prusa (2003), Crowley (2011)

Trade Agreements Models

What do terms-of-trade models predict about trade policy changes in response to macro fluctuations?

1. The (static) welfare gain of a tariff hike increases when trade volume increases.
2. Tariff increases are less costly in a welfare sense during persistent recessions because the cost of trade war is relatively low during a recession.

Empirical Models of Time-varying Trade Barriers

How to incorporate bilateral variation into the trade agreements framework?

- Knetter and Prusa (2003) – Pricing behavior in model with imperfect competition.
- Crowley (2011) – Foreign demand shocks in model with imperfect competition.

Empirical model and data

Estimate counts of products subject to new TTBs

- Panel data: Importing country j , trading partner i , in quarter t (1988:Q1-2010:Q4)
- Negative binomial model:
 - with pairwise importing country- trading partner fixed effects

Dependent variable (defined at quarter t):

- Count of 6-digit Harmonized System (HS) products subject to new TTB investigations per trading partner per quarter

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

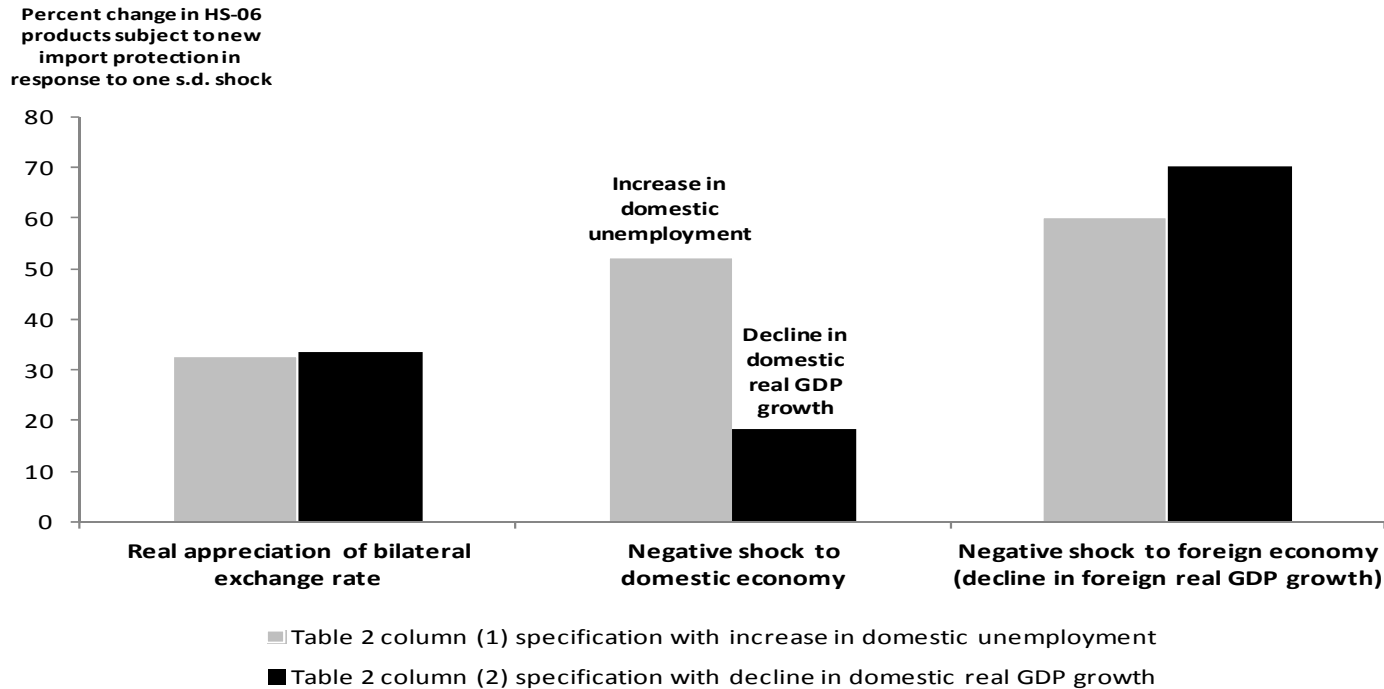
- Percent change in bilateral real exchange rate
- Change in domestic unemployment rate
- Foreign real GDP growth

Table 2. Negative Binomial Model Estimates of Macroeconomic Determinants of Import Protection, 1988:Q1-2008:Q3

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

Explanatory variables	Baseline (1)	Substitute real GDP for un- employment (2)	Modify country fixed effects (3)	Substitute second lag for macro variables (4)	AD only (5)	Interaction of domestic and foreign shocks (6)	Add tariffs and TTB stock (7)	Same restricted subsample (8)
Percent change in bilateral real exchange rate <i>ijt-1</i>	1.02 ^a (3.97)	1.02 ^a (3.98)	1.02 ^a (4.54)	1.02 ^a (4.92)	1.00 (0.29)	1.02 ^a (4.01)	1.02 ^a (3.60)	1.02 ^a (4.08)
Domestic unemployment rate change <i>jt-1</i>	1.62 ^a (6.61)	--	1.62 ^a (6.57)	1.18 ^b (2.05)	1.36 ^a (4.30)	1.54 ^a (3.71)	1.81 ^a (5.14)	1.78 ^a (5.05)
Domestic real GDP growth <i>jt-1</i>	--	0.93 ^b (2.28)	--	--	--	--	--	--
Real GDP growth of trading partner <i>it-1</i>	0.88 ^a (6.13)	0.86 ^a (6.70)	0.97 ^c (1.96)	0.90 ^a (4.58)	0.93 ^a (3.82)	0.88 ^a (5.95)	0.90 ^a (3.91)	0.89 ^a (4.07)
Time trend	0.99 ^a (2.99)	0.99 ^a (3.84)	0.99 ^c (1.80)	0.99 ^a (2.95)	0.99 ^a (3.24)	0.99 ^a (2.99)	0.96 ^a (7.01)	0.96 ^a (7.20)
Domestic unemployment rate change <i>jt-1</i> x Real GDP growth of trading partner <i>it-1</i>	--	--	--	--	--	1.01 (0.59)	--	--
Change in the share of imported products under WTO discipline in <i>jt-1</i>	--	--	--	--	--	--	1.04 (1.58)	--
Stock of TTBs against trading partner <i>ijt-1</i>	--	--	--	--	--	--	0.99 ^b (2.47)	--
Import and exporter combined fixed effects	yes	yes	no	yes	yes	yes	yes	yes
Importer and exporter separate fixed effects	no	no	yes	no	no	no	no	no
Observations	4406	4406	4406	4380	4406	4406	3218	3218

Pre-Crisis Model: Quantifying the Estimates



1. A 15 percent **real appreciation of the domestic currency** is associated with
 - 33 (34) percent more TTBs per trading partner per quarter
2. A 0.86 percentage point **increase to the unemployment rate** is associated with
 - 52 percent more TTBs per partner per quarter
 A 2.3 percentage point **decline in domestic real GDP growth** is associated with
 - 18 percent more TTBs per partner per quarter
3. A 3.5 percent **decline in foreign real GDP growth** leads to 60 (70) percent more TTBs

**Table 3. Model Estimates of Import Protection,
1988:Q1-2008:Q3 for the United States**

Explanatory variables	Dependent variable: <i>Bilateral (ij) count of products initiated under all temporary trade barrier policies or antidumping (AD) in quarter t</i> United States		
	Baseline (1)	Second lag (macro variables) (2)	AD only (3)
Percent change in bilateral real exchange rate <i>ijt-1</i>	1.03 ^a (3.53)	1.04 ^a (5.26)	1.00 (0.15)
Domestic unemployment rate change <i>jt-1</i>	2.16 ^a (4.62)	1.69 ^a (2.72)	2.00 ^a (4.70)
Real GDP growth of trading partner <i>it-1</i>	0.86 ^a (4.69)	0.94 ^b (2.03)	0.88 ^a (4.01)
Time trend	0.98 ^a (3.74)	0.98 ^a (3.61)	0.98 ^a (4.42)
China as trading partner	22.66 ^a (6.01)	10.58 ^a (4.52)	32.18 ^a (6.78)
Import and exporter combined fixed effects	yes	yes	yes
Observations	1060	1053	1060

Interpretation

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

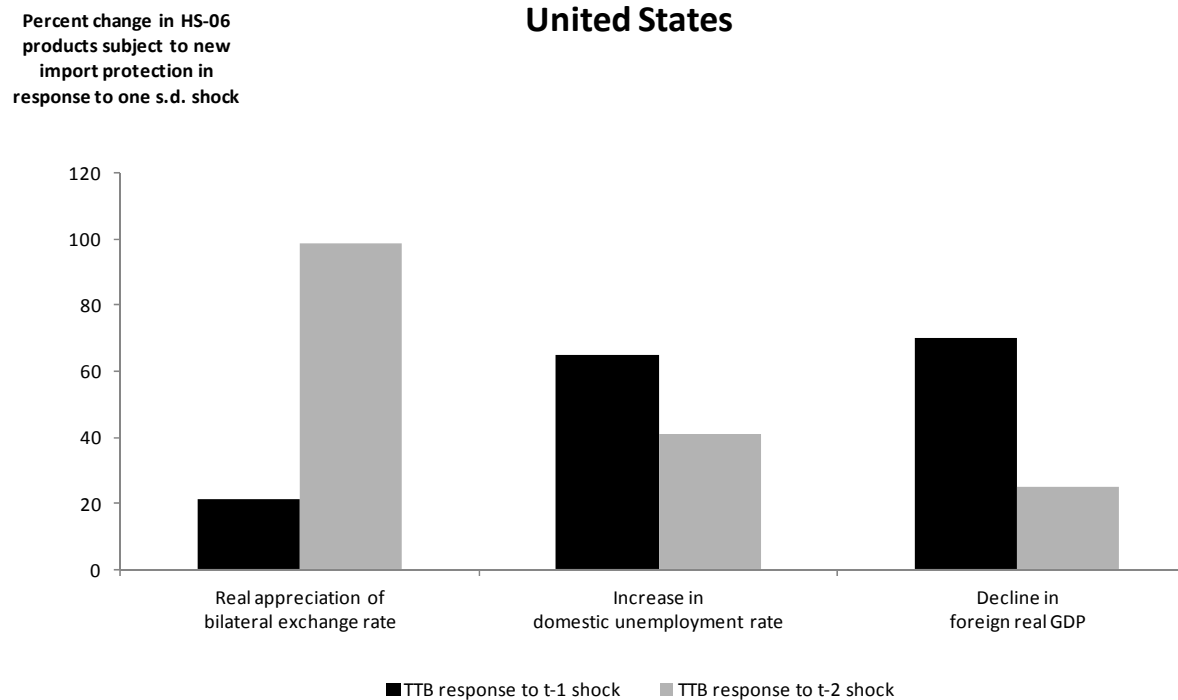
**Table 3. Model Estimates of Import Protection,
1988:Q1-2008:Q3 for the European Union**

Explanatory variables	Dependent variable: <i>Bilateral (ij) count of products initiated under all temporary trade barrier policies or antidumping (AD) in quarter t</i> European Union		
	Baseline (4)	Second lag (macro variables) (5)	AD only (6)
Percent change in bilateral real exchange rate <i>ijt-1</i>	1.03 ^b (2.28)	1.05 ^a (3.91)	1.02 (1.61)
Domestic unemployment rate change <i>jt-1</i>	10.80 ^a (6.33)	1.61 (1.17)	0.95 (0.16)
Real GDP growth of trading partner <i>it-1</i>	0.90 ^c (1.65)	0.81 ^a (2.65)	1.01 (0.29)
Time trend	0.93 ^a (4.96)	0.95 ^a (3.33)	0.98 ^c (1.78)
China as trading partner	65.66 ^a (5.02)	66.58 ^a (4.54)	72.85 ^a (4.78)
Import and exporter combined fixed effects	yes	yes	yes
Observations	584	583	584

Interpretation

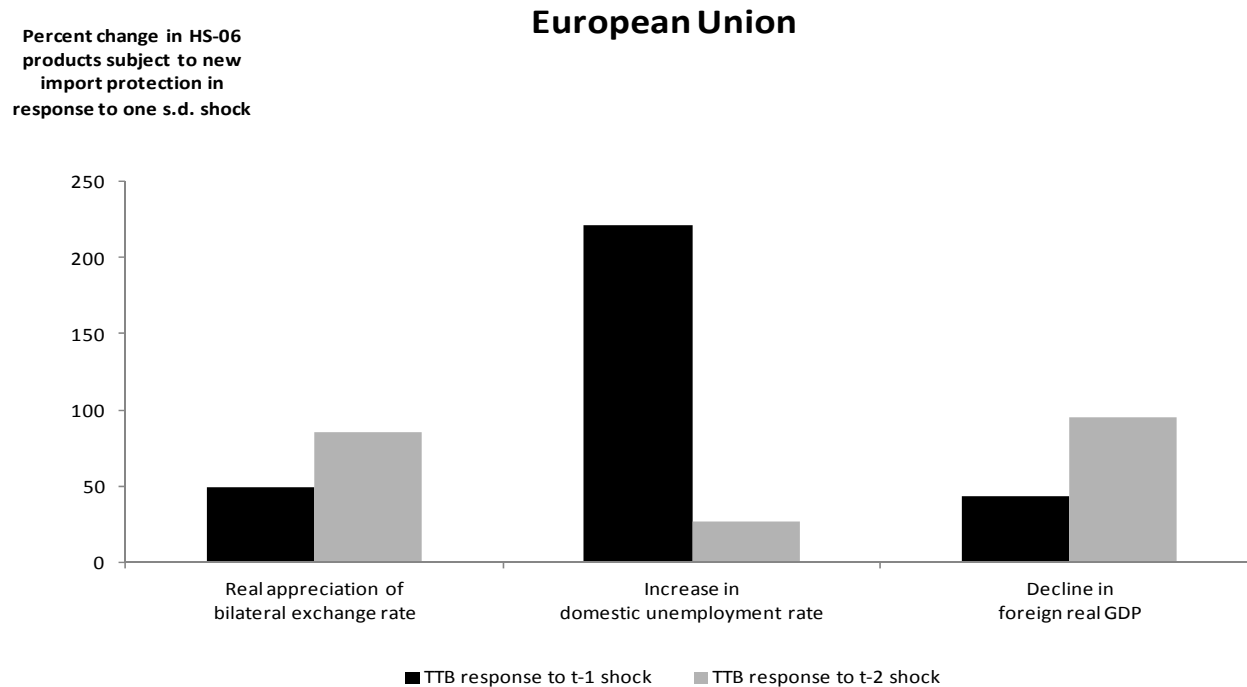
- We report **Incidence Rate Ratios (IRRs)** and t-statistics (in parentheses)
- IRR estimate **> 1** is **positive effect**
- IRR estimate **< 1** is **negative effect**

Pre-Crisis Model: Quantifying the US Estimates



1. A 16 percent **real appreciation of the domestic currency** is associated with
 - 21 (99) percent more TTBs per trading partner per quarter
2. A 0.64 percentage point **increase to the unemployment rate** is associated with
 - 41 (65) percent more TTBs per partner per quarter
3. A 3.5 percent **decline in foreign real GDP growth** leads to
 - 25 (70) percent more TTBs per partner per quarter

Pre-Crisis Model: Quantifying the EU Estimates



1. A 13 percent **real appreciation of the euro** is associated with
 - 49 (85) percent more TTBs per trading partner per quarter
2. A 0.49 percentage point **increase to the unemployment rate** is associated with
 - 26 (221) percent more TTBs per partner per quarter
3. A 3.2 percent **decline in foreign real GDP growth** leads to
 - 43 (95) percent more TTBs per partner per quarter

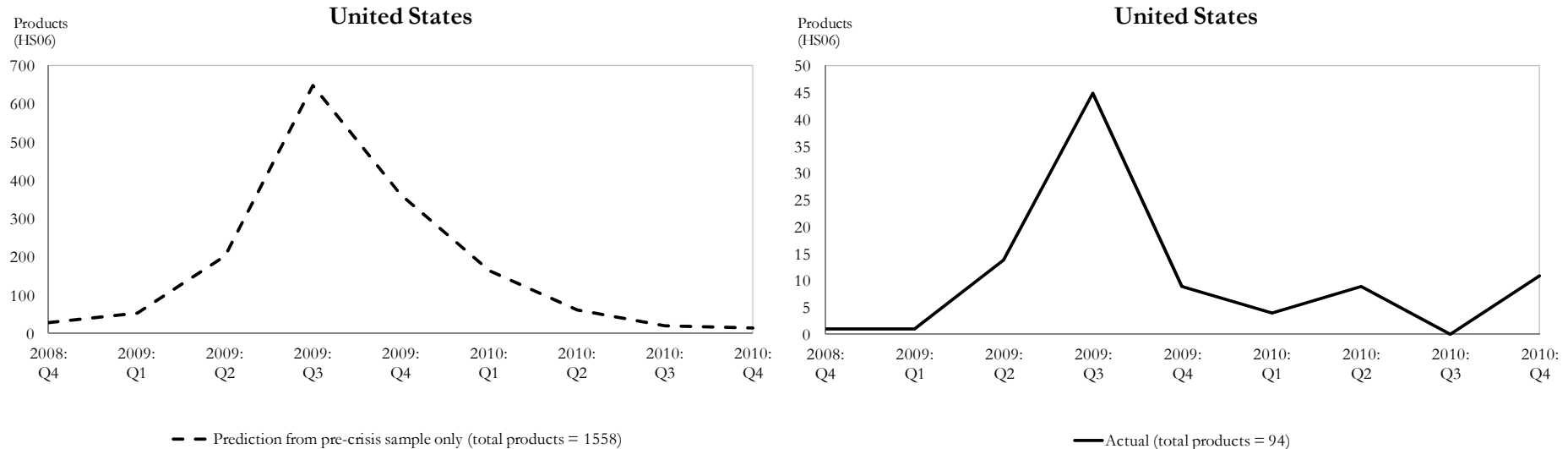
**Table 3. Model Estimates of Import Protection,
1988:Q1-2008:Q3 for Australia, Canada, South Korea**

Explanatory variables	Dependent variable: <i>Bilateral (ij) count of products initiated under all temporary trade barrier policies or antidumping (AD) in quarter t</i> Australia, Canada, South Korea		
	Baseline (7)	Second lag (macro variables) (8)	AD only (9)
Percent change in bilateral real exchange rate <i>ijt-1</i>	1.00 (0.64)	1.00 (0.04)	1.00 (0.54)
Domestic unemployment rate change <i>jt-1</i>	1.43 ^a (4.36)	1.12 (1.29)	1.27 ^a (2.61)
Real GDP growth of trading partner <i>it-1</i>	0.94 ^b (1.97)	0.94 ^b (2.13)	0.96 (1.16)
Time trend	1.00 (0.26)	1.00 (0.05)	1.00 (0.81)
China as trading partner	62.25 ^a (3.46)	66.15 ^a (3.48)	39.37 ^a (3.05)
Import and exporter combined fixed effects	yes	yes	yes
Observations	2762	2744	2762

Interpretation

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

Using Pre-Crisis Models to Predict Trade Policy during the Great Recession



- **Out-of-sample prediction:**

1558 products from trading partners i subject to new TTBs over 2008:Q4-2010:Q4

Estimated value: **15 percent** of US non-oil imports from top 15 trading partners

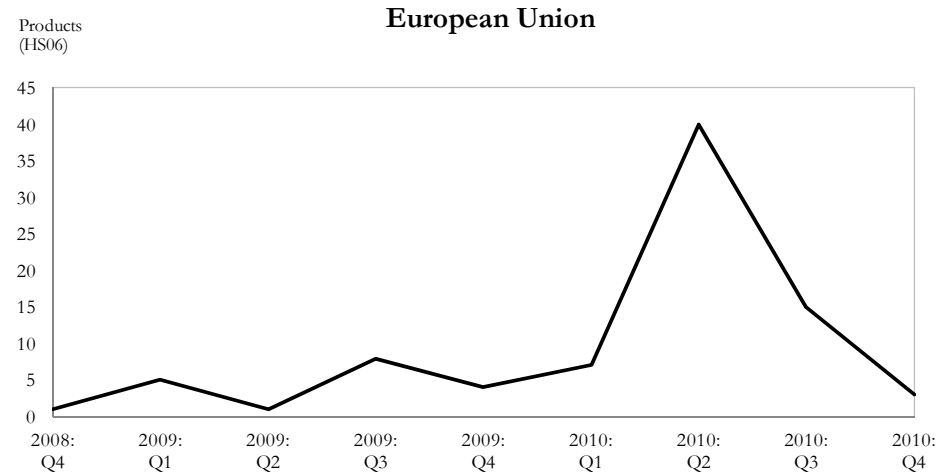
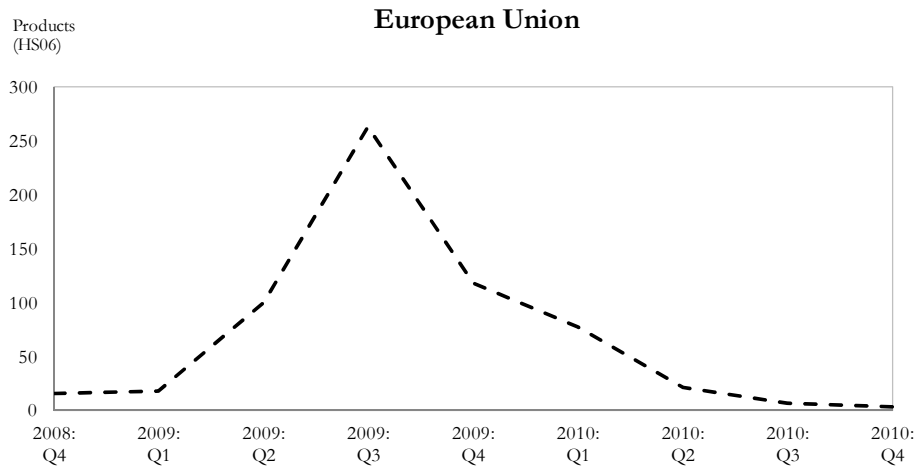
Relative measure: **3 percent** of US non-oil imports were under TTBs by end of 2007

- **Actual trade barriers imposed:**

94 products from trading partners i subject to new TTBs over 2008:Q4-2010:Q4

Estimated value: **1 percent** of US non-oil imports from top 15 trading partners

Using Pre-Crisis Models to Predict Trade Policy during the Great Recession



-- Prediction from pre-crisis sample only (total products = 623)

— Actual (total products = 84)

- **Out-of-sample prediction:**

623 products from trading partners i subject to new TTBs over 2008:Q4-2010:Q4

Estimated value: **14 percent** of EU non-oil imports from top 15 trading partners

Relative measure: **3 percent** of EU non-oil imports under TTBs by end of 2007

- **Actual trade barriers imposed:**

84 products from trading partners i subject to new TTBs over 2008:Q4-2010:Q4

Estimated value: **2 percent** of EU non-oil imports from top 15 trading partners

Table 4. Differential Impacts during the Great Recession: All countries

Dependent variable: *Bilateral count of products initiated under all TTBs*

Explanatory Variables	First lag (1)	Second lag (2)	Second lag (3)
Percent change in bilateral real exchange rate <i>ijt-1</i>, 1988:Q1-2008:Q3	1.02 ^a (4.23)	1.02 ^a (5.00)	1.02 ^a (5.03)
Percent change in bilateral real exchange rate <i>ijt-1</i>, 2008:Q4-2010:Q4	1.00 (0.26)	1.00 (0.34)	1.01 (0.90)
[Test statistic]	[4.23] ^b	[3.17] ^c	[1.38]
Domestic unemployment rate change <i>jt-1</i>, 1988:Q1-2008:Q3	1.63 ^a (6.72)	1.17 ^b (2.01)	1.16 ^c (1.87)
Domestic unemployment rate change <i>jt-1</i>, 2008:Q4-2010:Q4	1.06 (0.46)	1.16 (1.05)	0.96 (0.24)
[Test statistic]	[8.34] ^a	[0.00]	[1.01]
Real GDP growth of trading partner <i>it-1</i>, 1988:Q1-2008:Q3	0.88 ^a (6.41)	0.90 ^a (4.90)	0.90 ^a (4.64)
Real GDP growth of trading partner <i>it-1</i>, 2008:Q4-2010:Q4	1.03 (0.90)	1.01 (0.37)	1.04 (1.14)
[Test statistic]	[19.56] ^a	[10.70] ^a	[13.02] ^a
Import growth from trading partner <i>it-1</i>, 1988:Q1-2008:Q3	--	--	1.00 (0.48)
Import growth from trading partner <i>it-1</i>, 2008:Q4-2010:Q4	--	--	0.98 ^c (1.82)
[Test statistic]	--	--	[2.65]
Time trend included	yes	yes	yes
Import and exporter combined fixed effects	yes	yes	yes
Observations	5036	5010	5007

1. Exchange rates

- Pre-crisis: appreciations lead to TTBs
- Crisis: some evidence that the relationship is weaker

2. Unemployment rates

- Increase in unemployment rate is associated with more import protection in both periods

3. Foreign GDP growth

- **Statistically different IRRs in two periods**
- Pre-crisis: import protection was more likely against those with weak growth
- Crisis: more import protection against trading partners that were growing
- During the crisis, very few partners were growing so this helped dampen new import barriers

Note: results robust to also controlling for **import growth** from trading partner *i*

Table 4. Differential Impacts during the Great Recession: **United States**

Dependent variable: <i>Bilateral count of products under all TTBs</i>		
Explanatory Variables	First lag (4)	Second lag (5)
Percent change in bilateral real exchange rate <i>ijt-1</i>, 1988:Q1-2008:Q3	1.03 ^a (3.58)	1.04 ^a (5.31)
Percent change in bilateral real exchange rate <i>ijt-1</i>, 2008:Q4-2010:Q4	1.06 (1.59)	1.06 ^c (1.94)
[Test statistic]	[0.63]	[0.15]
Domestic unemployment rate change <i>jt-1</i>, 1988:Q1-2008:Q3	2.16 ^a (4.55)	1.67 ^a (2.58)
Domestic unemployment rate change <i>jt-1</i>, 2008:Q4-2010:Q4	1.87 ^b (2.56)	1.77 ^b (2.20)
[Test statistic]	[0.22]	[0.03]
Real GDP growth of trading partner <i>it-1</i>, 1988:Q1-2008:Q3	0.84 ^a (5.31)	0.92 ^a (2.62)
Real GDP growth of trading partner <i>it-1</i>, 2008:Q4-2010:Q4	1.09 (1.24)	1.08 (1.30)
[Test statistic]	[12.17] ^a	[6.15] ^b
Import growth from trading partner <i>it-1</i>, 1988:Q1-2008:Q3	--	--
Import growth from trading partner <i>it-1</i>, 2008:Q4-2010:Q4	--	--
[Test statistic]	--	--
Time trend included	yes	yes
Import and exporter combined fixed effects	yes	yes
Observations	1195	1188

1. Exchange rates

- No statistical difference in IRRs
- Real appreciation of the US dollar leads to more TTBs

2. Unemployment rates

- No statistical difference in IRRs
- Increase in unemployment rate leads to more TTBs

3. Foreign GDP growth

- **Statistically different IRRs in two periods**
- Pre-crisis: import protection was more likely against those with weak growth
- Crisis: more import protection against trading partners that were growing
- During the crisis, very few partners were growing so this helped dampen new import barriers

Note: results robust to also controlling for **import growth** from trading partner *i*

Table 4. Differential Impacts during the Great Recession: European Union

Dependent variable: *Bilateral count of products under all TTBs*

Explanatory Variables	First lag (6)	Second lag (7)
Percent change in bilateral real exchange rate <i>ijt-1</i> , 1988:Q1-2008:Q3	1.03 ^a (2.60)	1.05 ^a (4.45)
Percent change in bilateral real exchange rate <i>ijt-1</i> , 2008:Q4-2010:Q4	0.93 ^b (2.46)	0.94 ^b (2.53)
[Test statistic]	[10.65] ^a	[16.84] ^a
Domestic unemployment rate change <i>jt-1</i> , 1988:Q1-2008:Q3	10.00 ^a (6.60)	1.58 (1.19)
Domestic unemployment rate change <i>jt-1</i> , 2008:Q4-2010:Q4	0.59 (1.29)	2.31 ^c (1.94)
[Test statistic]	[26.84] ^a	[0.44]
Real GDP growth of trading partner <i>it-1</i> , 1988:Q1-2008:Q3	0.91 ^c (1.66)	0.85 ^b (2.46)
Real GDP growth of trading partner <i>it-1</i> , 2008:Q4-2010:Q4	1.08 (1.01)	1.09 (1.07)
[Test statistic]	[4.34] ^b	[8.30] ^b
Import growth from trading partner <i>it-1</i> , 1988:Q1-2008:Q3	--	--
Import growth from trading partner <i>it-1</i> , 2008:Q4-2010:Q4	--	--
[Test statistic]	--	--
Time trend included	yes	yes
Import and exporter combined fixed effects	yes	yes
Observations	719	718

1. Exchange rates

- Statistically different IRRs
- During crisis, real **depreciation** of Euro leads to more TTBs

2. Unemployment rates

- Mixed results are not robust to small changes

3. Foreign GDP growth

- **Statistically different IRRs in two periods**
- Pre-crisis: import protection was more likely against those with weak growth
- Crisis: more import protection against trading partners that were growing
- During the crisis, very few partners were growing so this helped dampen new import barriers

Note: results robust to also controlling for **import growth** from trading partner *i*

Conclusions

Before the Great Recession (1988:Q1-2008:Q3), import restrictions were countercyclical.

Temporary trade barriers (TTBs) arose from...

- Rising domestic unemployment - A one s.d. increase led to a 52% increase in TTBs.
- Real appreciations in bilateral exchange rates - A one s.d. increase led to a 33% increase in TTBs.
- Weak GDP growth in a foreign trading partner - A one s.d. led to a 60% increase in TTBs.

Pre-Great Recession models over-predicted the use of trade barriers during the Great Recession.

What changed?

- During the Great Recession, importing economies stopped targeting trading partners with weak or negative GDP growth.
- Exchange rate depreciations helped dampen the trade policy response.