Beggar-thy-Neighbor Effects of Exchange Rates? A Study of the Renminbi

Aaditya Mattoo, World Bank
Prachi Mishra, IMF and Government of India
Arvind Subramanian, Peterson Institute

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The views expressed in this paper are those of the authors and do not necessarily represent those of any of the institutions to which the authors belong.

Motivation

- The real effects of exchange rate movements is one of the oldest questions in the international economics literature.

- A vast theoretical and empirical literature (using both macro and micro data) focuses on effects of exchange rate movements **on the country themselves** (Goldstein and Khan, 1985; Berman, Martin and Mayer (2011))

Motivation (contd.)

- Scarce evidence on *spillover effects* of exchange rate movements

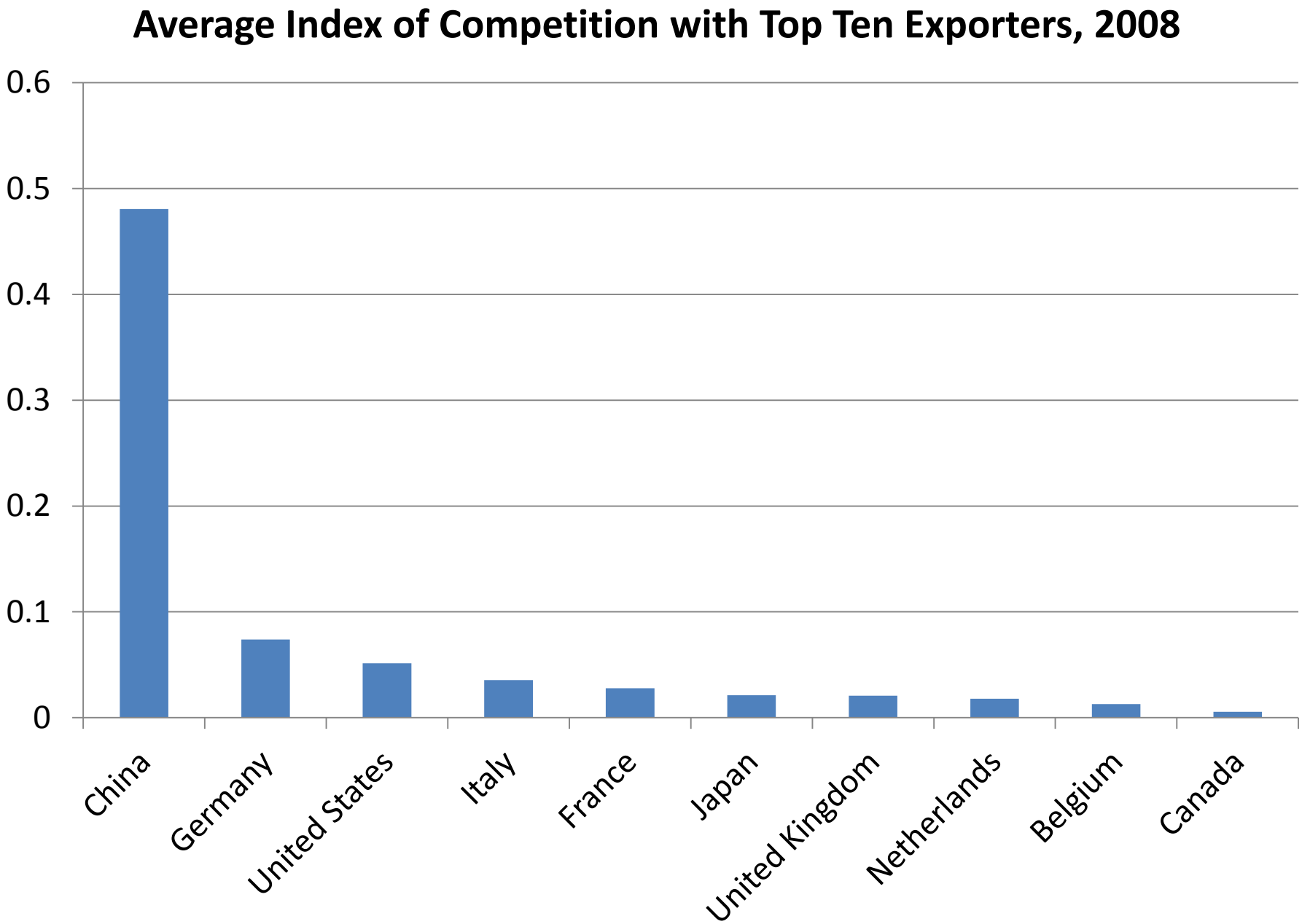
- Beggar-thy-neighbor effects
  - Robinson (1947) observations about macroeconomic mercantilism

Why China?

- China's exchange rate policy has been in discussion
  - Bernanke (2005) "global savings glut" hypothesis
  - High unemployment and low capacity utilization in industrial countries

- Discussions focused on industrial countries
  - Little attention on emerging and developing/emerging countries who compete closely with China in international markets

- China's size
  - Potential spillover effects for many countries.
    - Largest exporter of goods in 2009.
    - Broadly diversified in the product space


Average Index of Competition with Top Ten Exporters, 2008
0.6
0.5
0.4
0.3
0.2
0.1
0
China
Germany
United States
Italy
France
Japan
United Kingdom
Netherlands
Belgium
Canada

Anecdotal evidence: falling competitiveness of China affecting developing countries

- **"Bangladesh, With Low Pay, Moves In on China" (New York Times, July, 2010)**
  - **……** As costs have risen in China, long the world's shop floor, it is slowly losing work to countries like Bangladesh, Vietnam and Cambodia…"

Question

- Do movements in China's exchange have spillover effects for developing countries?

- Can we estimate the magnitude of "competitor-country" effect?
  - China's exchange rate depreciates vis-à-vis say the US, how does it affect a developing country, which exports to the US market?

Preview of Findings

- Robust evidence for the existence of a statistically and economically significant competitor-country effect.
  - Exports to third-markets of countries with a greater degree of competition with China increases/decreases significantly more as the renminbi appreciates/depreciates.
  - 10% appreciation is associated with a 1.5-2% increase in developing country exports at the product level.

Roadmap

- Literature / contribution
- Theoretical framework
- Identification strategy
- Empirical specification
- Data
- Results
- Conclusions

Literature

- Macro literature on exchange rates and export volumes
  - Deardorff (1984); Hooper, Johnson and Marquez (2000); Thursby and Thursby (1987)
- Rising micro evidence
  - Dekle and Royoo (2002); Das, Roberts and Tybout (2001); Forbes (2002); Berman, Martin and Mayer (2011)
- Rising literature specific to China
  - Eichengreen and Tong (2004), Ahearne et. al., 2003
    - Add China's exports in a gravity/total trade model
  - Eichengreen and Tong (2011)
    - Effect of renminbi revaluation on stock markets

Our contribution

- Focus on quantifying a very specific channel
  - Effect of China's exchange rate movements on exports of countries competing with China in international markets

- To our knowledge, first paper to provide systematic empirical evidence on the channel

Theoretical framework – based on Feenstra, Obstfeld and Russ (2011)

- J countries, G different goods;
  - each country produces a range of distinct varieties of each good

- Constant elasticity of substitution consumption index for representative consumer in country j (**η**)

- Armington assumption: goods differentiated by their country of origin;
  - constant elasticity of substitution between domestically produced and foreign varieties of good g (**ωg**)
  - constant elasticity of substitution between different varieties of good g originating in different exporters (**σg**)

Import demand function

$$V_g^{ij} = [\kappa_g^{ij}(\frac{P_g^{ij}}{P_g^{F_j}})^{1-\sigma_g}]*[(1-\beta_g^j)(\frac{P_g^{Fj}}{P_g^j})^{1-\omega_g}]*[\alpha_g^j(\frac{P_g^j}{P^j})^{1-\eta}]*P^jC^j$$

$$\boxed{\begin{aligned}\frac{\partial \ln V_g^{ij}}{\partial \ln E^{Cj}} &= \frac{\partial \ln V_g^{ij}}{\partial \ln P_g^{Fj}} * \frac{\partial \ln P_g^{Fj}}{\partial \ln P_g^{Cj}} * \frac{\partial \ln P_g^{Cj}}{\partial \ln E^{Cj}} \\ &= -(\sigma_g - \omega_g) * s_g^{Cj} * \mu_g^{Cj}\end{aligned}}$$

$P_g^{Cj} = \text{Price of Chinese goods in } j$

$= P_g^C * (1/E^{Cj})^{\mu_g^{Cj}}$

$E^{Cj} = \text{Renminbi/importer currency}$

$s_g^{Cj} = \text{Share of China in } j\text{'s total imports of good } g$

$\mu_g^{Cj} = \text{Pass-through of Chinese exchange rate to import prices}$

of Chinese goods in country j

$$V_{g(4)}^{ij} = \sum_{g=1}^{G} V_g^{ij}$$

$$\boxed{\frac{\partial \ln V_{g(4)}^{ij}}{\partial \ln E^{Cj}} = -\sum_{g=1}^{G} [(\frac{V_g^{ij}}{V_{g(4)}^{ij}}) * s_g^{Cj}] * \mu_g^{Cj} * (\sigma_g - \omega_g)}$$

Assume $\mu_g^{Cj} = \mu_{g(4)}^{Cj}$

$\sigma_g - \omega_g = \sigma_{g(4)} - \omega_{g(4)}$

[constant for all 6 digit products within the 4 - digit]

$$\frac{\partial \ln V_{g(4)}^{ij}}{\partial \ln E^{Cj}} = I_{g(4)}^{ijC} * [-\mu_{g(4)}^{Cj} * (\sigma_{g(4)} - \omega_{g(4)})] \text{------} (\mathrm{I})$$

$$I_{g(4)}^{ijC} = \sum_{g=1}^{G} [(\frac{V_g^{ij}}{V_{g(4)}^{ij}}) * s_g^{Cj}] =$$

Value - based Index of competition for good

g with China for exporter i in importing country j

Under symmetry assumption

$$V_g^{ij} = K_{g(4)}^{ij}$$

$$s_g^{Cj} = s_{g(4)}^{Cj}$$

$$\boxed{\frac{\partial \ln V_{g(4)}^{ij}}{\partial \ln E^{Cj}} = CI_{g(4)}^{ijC} * [-s_{g(4)}^{Cj} * \mu_{g(4)}^{Cj} * (\sigma_{g(4)} - \omega_{g(4)})] \text{---(II)}}$$

$$CI_{g(4)}^{ijC} = \frac{N_g^{ij}}{N_{g(4)}^{ij}} = \text{Count-based index of competition with China}$$

$$= \frac{\text{Number of 6-digit lines which both } i \text{ and China export to } j,}{\text{Total number of 6-digit lines which } j \text{ imports from } i \text{ within 4-digit category}}$$

Summary of Key Predictions

1. Assuming $s_g > w_g$

$$\frac{\P \ln V_g^{ij}}{\P \ln E^{Cj}} < 0$$

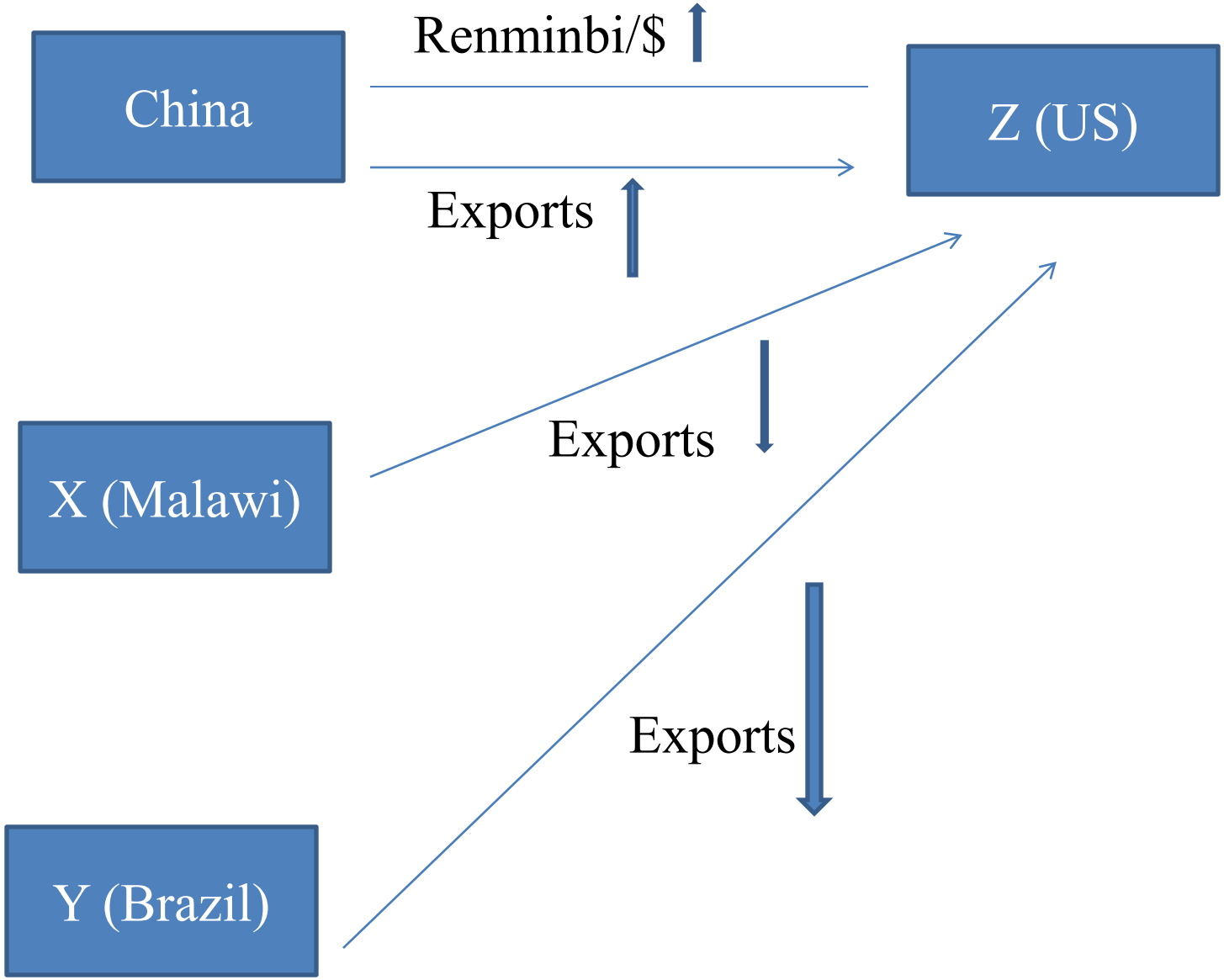
2. The magnitude of the competitor country effect depends on the index of competition. Higher the index of competition, larger the magnitude of the third market effect.

3. The magnitude of the third market effect is higher

(i) Higher the s_g,

(ii) lower the w_g,

(iii) higher m_g^{Cj};


China
Renminbi/$
Z (US)
Exports
X (Malawi)
Exports
Y (Brazil)
Exports

Empirical specification

$$\ln X_{ijpt} = \beta I_{ijp} * \ln ER_{jt} + v_{jpt} + s_{ipt} + \gamma_{ijt} + \theta_{ijp} + \varepsilon_{ijpt}$$

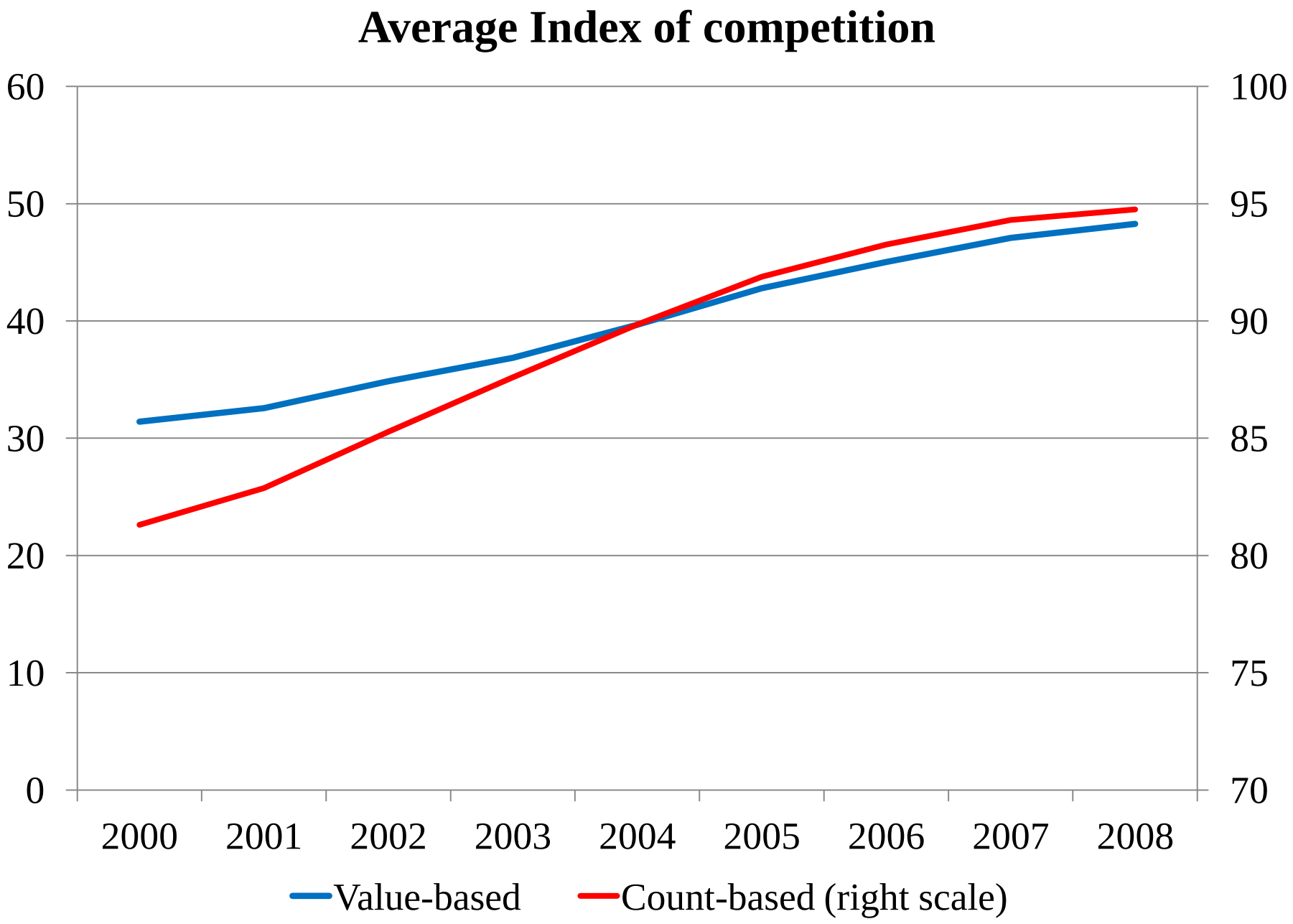
Hypothesis:

β is significant

$\beta < 0$

Data

- Bilateral exports – UN Comtrade
  - Exporter, importer, product (HS-6 digit) year level
  - Deflated by US CPI
  - 57 importers (constituting 95% of total developing country exports 2008), 124 developing country exporters
- Exchange rates from the IFS
  - Renminbi/importer currency
  - Deflated by China's CPI
- Information on product types
  - UN Broad Economic Classification (Pula, Gabor, and Peltonen, 2009) : Consumer/capital+intermediate
  - Rauch (1999) classification (homogenous/differentiated)
  - Peneder (2001) – skill intensity
- Period covered: 2000-2008


Average Index of competition
60
50
40
30
20
10
0
100
95
90
85
80
75
70
2000
2001
2002
2003
2004
2005
2006
2007
2008
Value-based
Count-based (right scale)

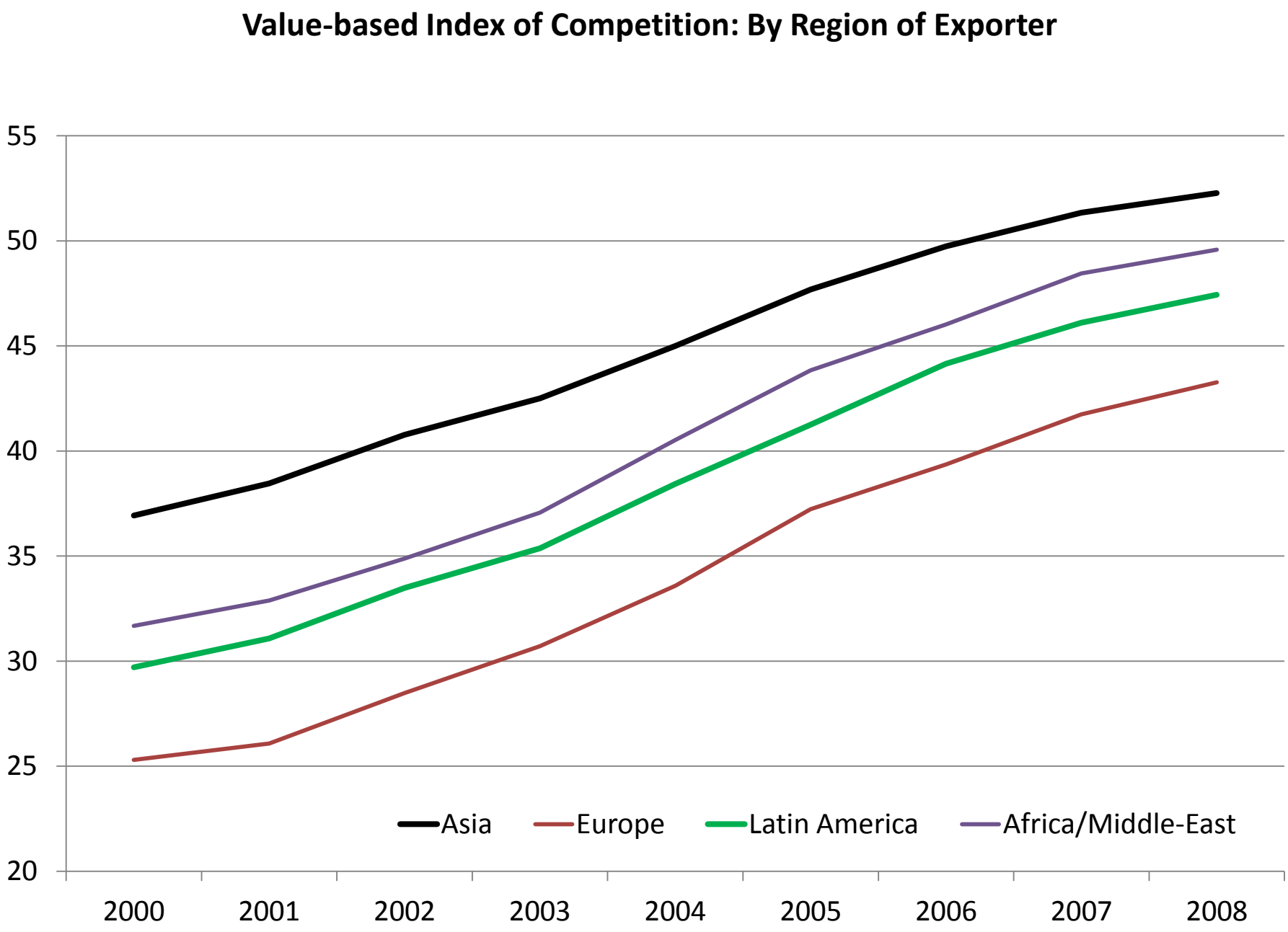

Value-based Index of Competition: By Region of Exporter
55
50
45
40
35
30
25
20
2000
2001
2002
2003
2004
2005
2006
2007
2008
Asia
Europe
Latin America
Africa/Middle-East

Figure 2: China's nominal bilateral exchange rate, 2000-08 (index, 2000=100; increase denotes depreciation)

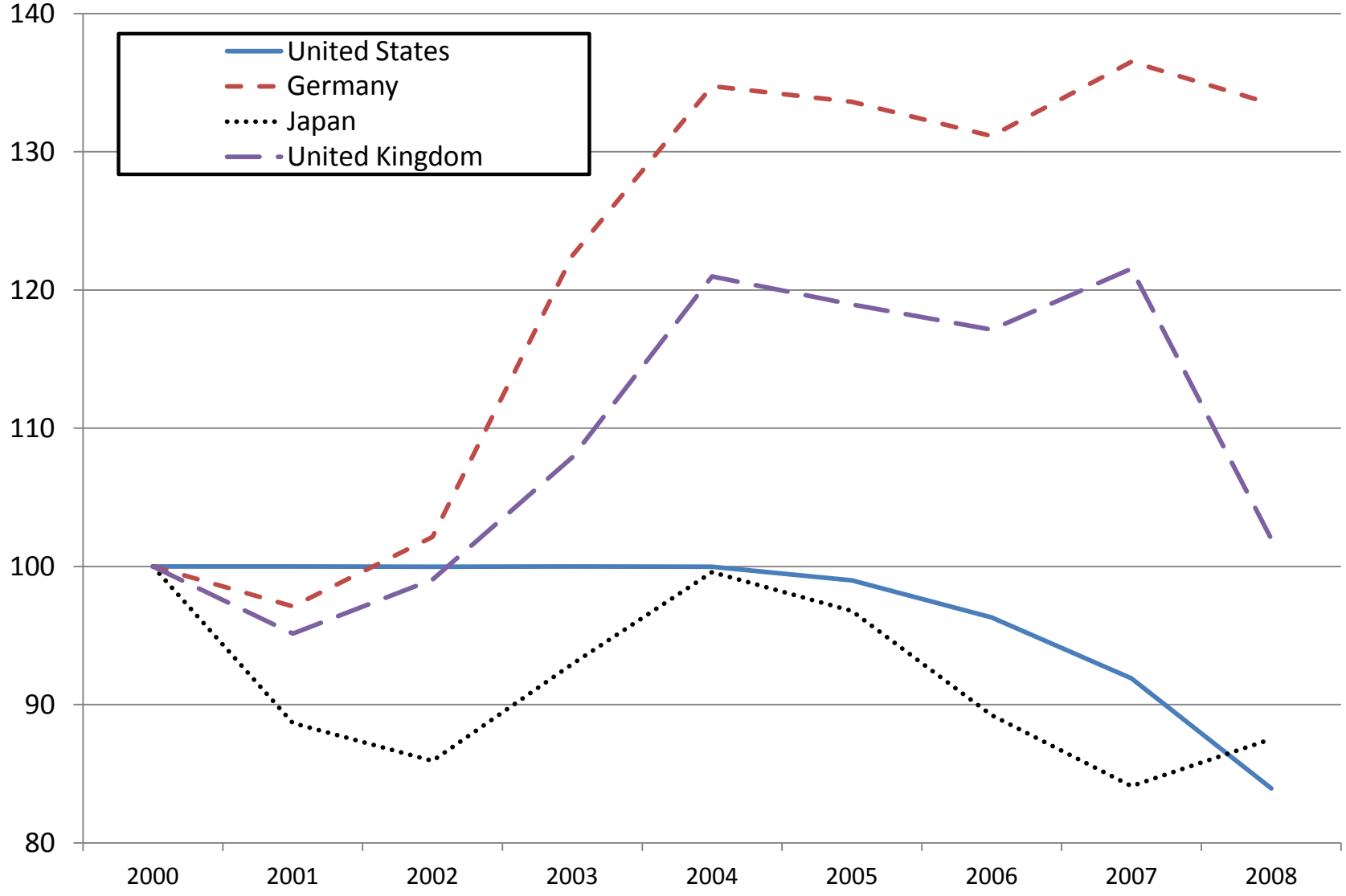


Table 1. Exports from Developing Countries and Chinese Exchange Rates: Product-Level Evidence

Dependent variable = log(exports) at (exporter,importer,4-digit product, year) level				
	Value-based index of competition			
	[1]	[2]	[3]	[4]
Index of competition with China*log(exchange rate of importer with respect to China)	**-0.18*** **	**-0.23*** **	**-0.13*** **	**-0.35*** **
	[0.002]	[0.001]	[0.001]	[0.004]
N	3,586,936	3,586,936	3,586,936	3,586,936
Fixed effects				
exporter*importer*product	N	N	N	Y
exporter*importer*time	N	N	Y	Y
exporter*product*time	N	Y	Y	Y
importer*product*time	N	Y	Y	Y

Table 1 (contd). Exports from Developing Countries and Chinese Exchange Rates: Product-Level Evidence

Dependent variable = log(exports) at (exporter,importer,4-digit product, year) level				
	Count-based index of competition			
	[5]	[6]	[7]	[8]
Index of competition with China*log(exchange rate of importer with respect to China)	**-0.25*** **	**-0.23*** **	**-0.16*** **	**-0.22*** **
	[0.001]	[0.001]	[0.000]	[0.002]
N	3,586,936	3,586,936	3,586,936	3,586,936
Fixed effects				
exporter*importer*product	N	N	N	Y
exporter*importer*time	N	N	Y	Y
exporter*product*time	N	Y	Y	Y
importer*product*time	N	Y	Y	Y

Robustness tests

- Drop outliers
- Alternative clustering
- Different years for initial index of competition
- Finger-Krenin index of export similarity
- Alternative measures of the exchange rate variable
- Control for other countries' exchange rate
- Across regions of exporters
- Degree of product disaggregation
- Long differencing (2000 and 2008)
- Lags of exchange rate
- Long-run effects

Discussion of magnitudes

- “Competitor-country effect” of 1.5-2 percent due to a 10% depreciation of Chinese exchange rate, evaluated at the average index of competition

Range of Estimated Spillover Effect of a 10 percent Depreciation of Chinese Exchange Rate

Beta coefficients → / Percentile of the index of competition ↓	Value-based index			Count-based index		
	Baseline	Min	Max	Baseline	Min	Max
10	-0.01	0.00	-0.01	0.00	0.00	0.00
50	-1.30	-0.47	-2.52	-1.99	-1.39	-3.74
90	-3.12	-1.13	-6.03	-2.22	-1.55	-4.17

Interpretation of the magnitudes: what should we expect based on theory? (contd.)

(1) $\sigma = 3$ (Feenstra, Obstfeld and Russ, 2011)

(2) $\omega = 1$ (Feenstra, Obstfeld and Russ, 2011)

(3) $\mu = 0.4$ (Gopinath et. al., 2011; Campa and Goldberg, 2005)

(4) $\mathrm{s} = 0.4$

$$I_{g(4)}^{ijC} * \beta^{Theory,Value} = -0.32$$

$$CI_{g(4)}^{ijC} * \beta^{Theory,Count} = -0.29$$

Table 8. Products Distinguished by Degree of Differentiation

Dependent variable = log(exports) at (exporter,importer, 4-digit product, year) level

	Value-based index		
	Homogenous	Differentiated	Interaction
	[1]	[2]	[3]
Index of competition with China*log(exchange rate of importer with respect to China)	-0.339***	-0.312***	-0.101***
	[0.010]	[0.004]	[0.002]
Index of competition with China*log(exchange rate of importer with respect to China)*Dummy for homogenous			-0.040***
			[0.003]
N	981,310	2,679,680	1,326,035

Table 9. Products Distinguished by Domestic Value Added

Dependent variable = log(exports) at (exporter,importer, 4-digit product, year) level

	Value-based index		
	High domestic value added	Low domestic value added	Interaction
	[1]	[2]	[3]
Index of competition with China*log(exchange rate of importer with respect to China)	-0.329***	-0.285***	-0.283***
	[0.005]	[0.005]	[0.007]
Index of competition with China*log(exchange rate of importer with respect to China)*Dummy for high domestic value added			-0.125***
			[0.013]
N	1,511,450	1,830,310	3,341,760

Conclusions

- Use detailed product-level data to develop an index of competition with China, based on the extent of a country's overlap with China in its exports to third markets.
  - Two indices based on value and count
- Adaptation of the Feenstra, Obstfeld and Russ (2011) framework to derive the indices of competition and develop a novel identification strategy
- Robust evidence that an appreciation of China's exchange rate benefits developing country exports.
- To our knowledge, first paper to provide systematic empirical evidence on "competitor country" effect.

Thank you!