Exchange Rate and Bilateral Export: The Role of Third Country Competition

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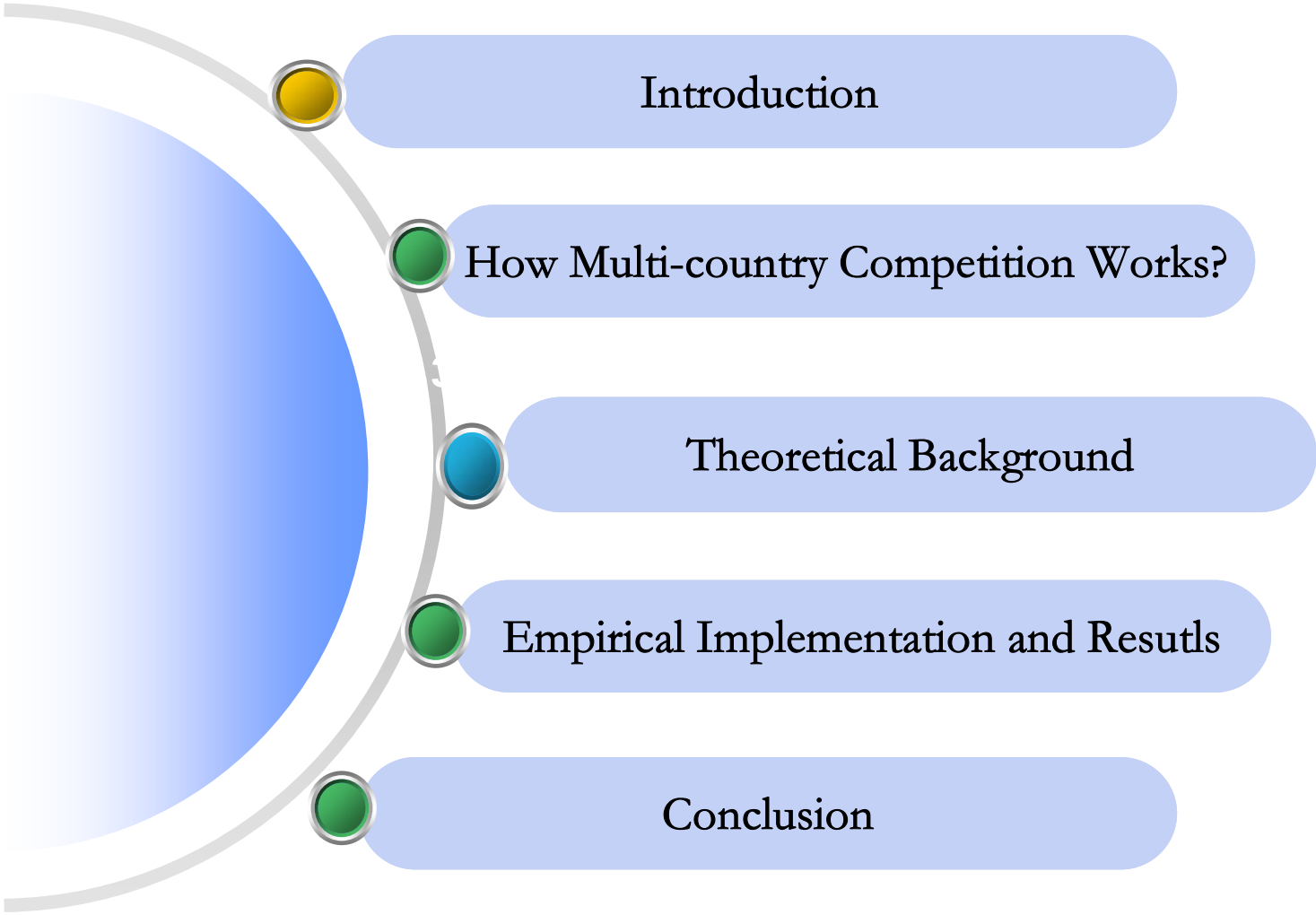
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Introduction

- How does exchange rate affect bilateral trade between countries? For example, will China's appreciation lower US-China trade deficit?

- It is quite common, and tempting, to adopt bilateral exchange rate to investigate the effect. However, the method, though intuitive in a two-country model, cannot be extended directly to the case of multi-country model.

Direct Bilateral Effect v.s. Third-Country Competition Effect

- In a multi-country framework, firms from multiple countries may compete in selling similar products in one destination market, say, the US. Therefore, two effects arise:
  - *Direct Bilateral Effect.* The exchange rate between exporting and importing countries affect the direct price competitiveness between the two bilateral countries.
  - *Third-Country Competition Effect.* The exchange rate between exporting and other competing countries also affect their relative competitiveness in the destination market.

Motivating Example

- The RMB has been pegged to the USD from 1998 to 2005. Thus, the depreciation of USD against the other countrie' currency also makes China to depreciate its currency against his competitors in the U.S. market. The relative price advantage with the competitors from the "third countries" increases.

- For example, China's bilateral exchange rate with its main competitors in the U.S. market, Japan, has depreciated nearly 18.7% during 1998 to 2005. In the meantime, Japan's market share in the US has decreased from 13.4% to 8.5%, while China's market share in the US has doubled from 6.7% to 12.8%.

What We Do?

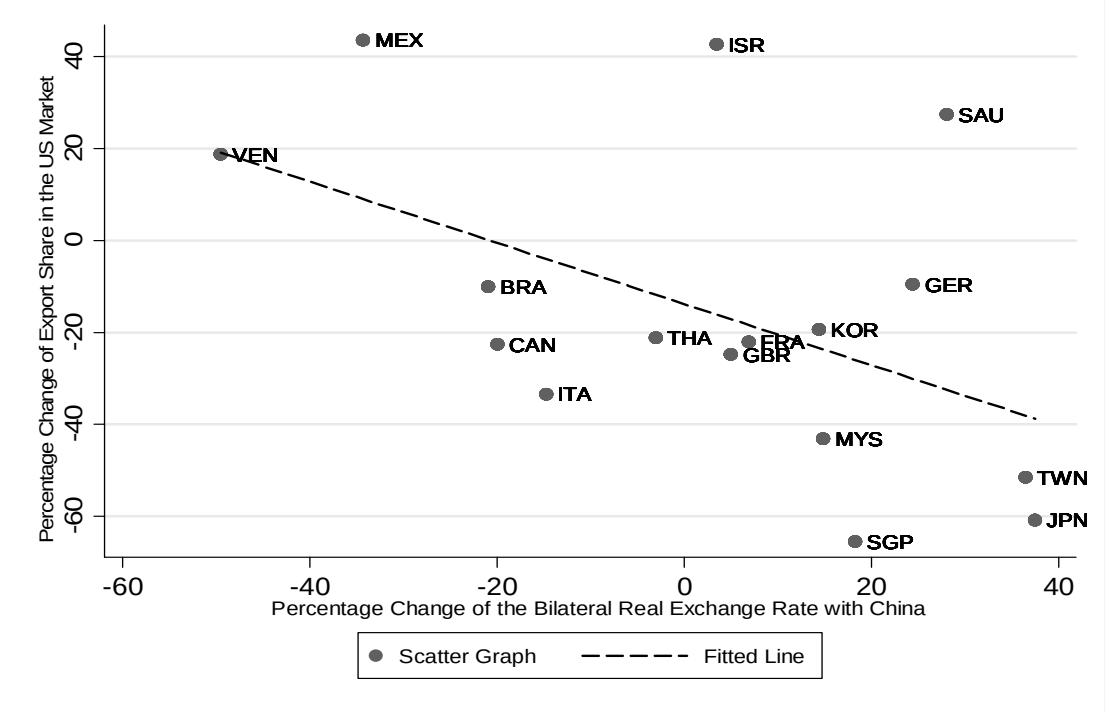
- Under Armington(1969) theoretical framework, we first show that the exchange rate effect on bilateral trade can be decomposed into two elements: *bilateral direct effect* and *third-country competition effect.*

- By using China's HS 2-digit level export as an example, we comprehensively evaluate the two effects on bilateral trade, and found that both two effects has negative effect on bilateral trade.

- Though on average *bilateral direct effect* dominates *third-country competition effect* in explaining bilateral trade, the relative magnitude does not hold for all countries at all times.

Exchange Rate Competition in the US Market

- Before moving on to a more rigorous theory-consistent econometric specification, we intuitively demonstrate how multi-country exchange rate competition shaped global market share in the US market.



Exchange Rate Competition in the US Market

- The relationship suggested by inspection of the Figure 1 are supported by a simple regression of the annual percentage change of US market share of a competing country, $SHARE_i$, on lagged percentage change in bilateral exchange rate against China, RER_i, controlling both country and year fixed effect.

$$SHARE_{it} = \underset{(-2.28)}{-0.77} - \underset{(0.08)}{0.25} \cdot RER_{it} + Country_i + Year_t + \varepsilon_{it}$$

- **Implication**: If the real exchange rate of the competing country against China increases by 1%, the market share in the US of that country will decrease by 0.25%.

A Disaggregate View of Multi-country Competition

- Differential cross-product responses to a common shock, such as exchange rate, require cross-section variation in market share at a disaggregate industry-level.

- The presence of global competition within industry is to be expected since there is evidence of a great deal of heterogeneity among industries.

Data

- Our data on HS2-level bilateral export value of each country come from CEPII trade database.

- The difficulty of constructing market share lies on the estimation of internal trade, which is not directly available.

Calculation of Internal Trade

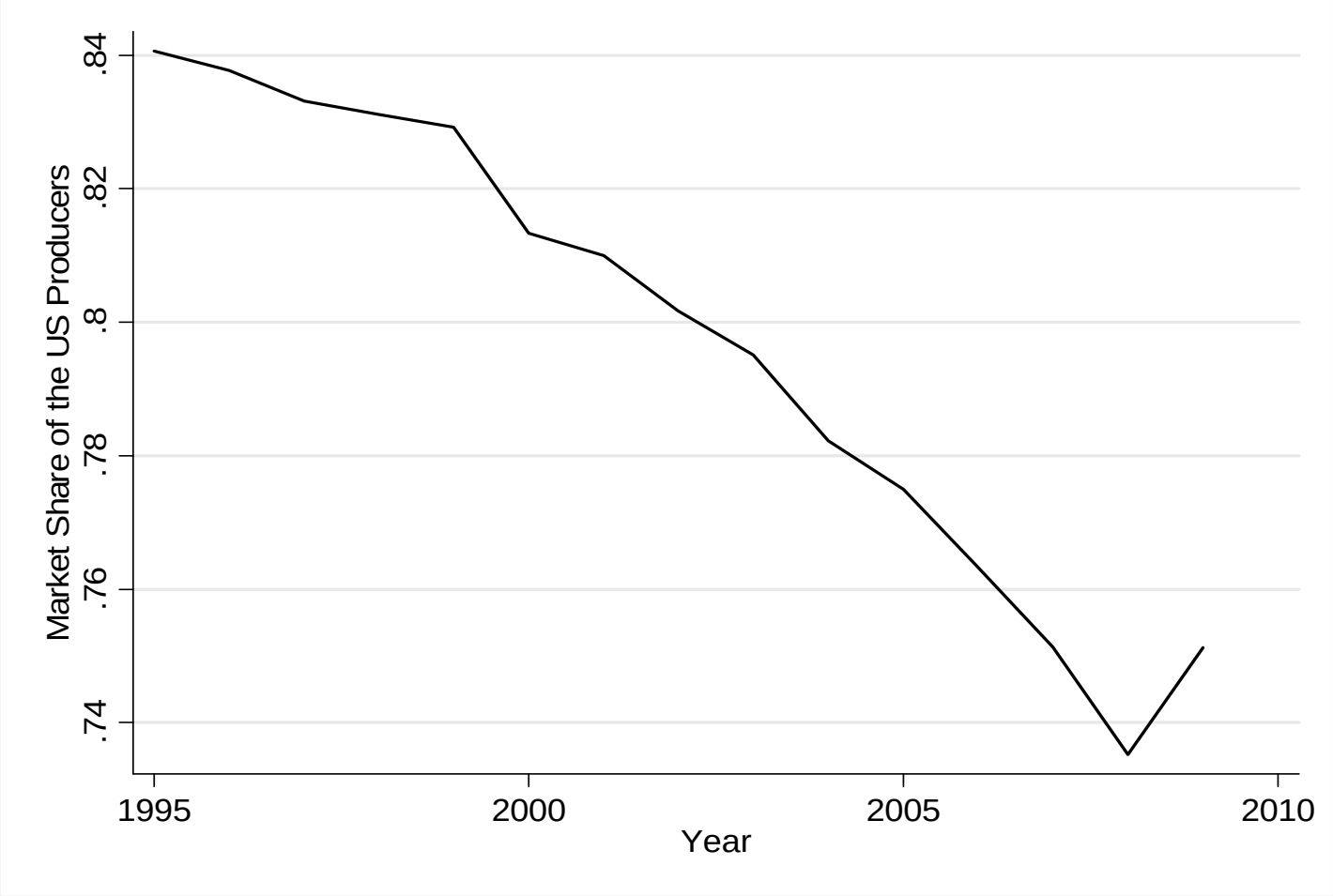
- By using WIOD input-output table, the share of internal trade was calculated as the difference between the gross output (GO) and export (X) of product *i*:

$$INT_i = GO_i - X_i$$

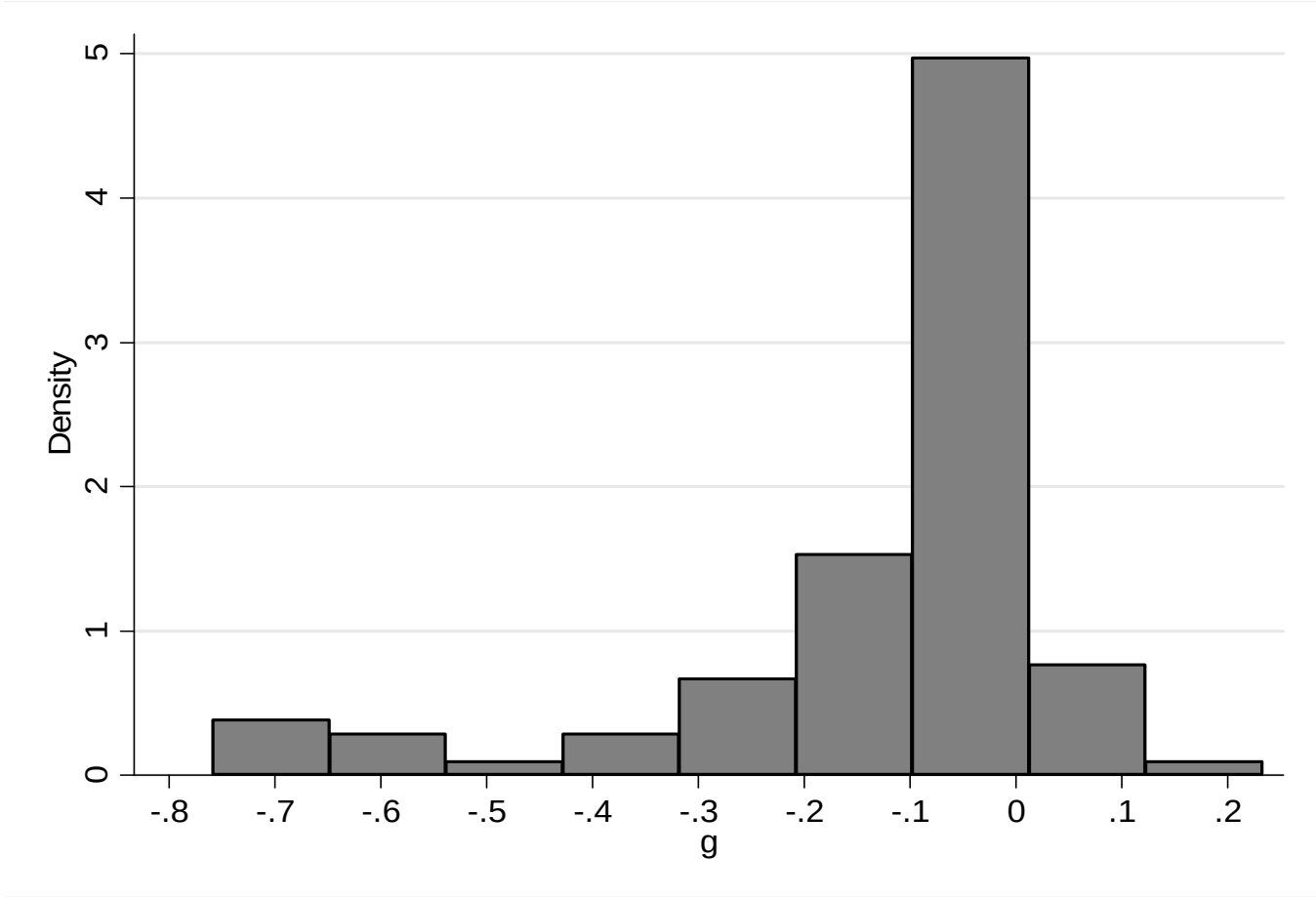
- The ratio of internal trade in the destination market was then calculated by dividing internal trade to total purchase (internal trade(INTi) plus import(Mi)) of each product,

$$Share_i = \frac{INT_i}{INT_i + M_i}$$

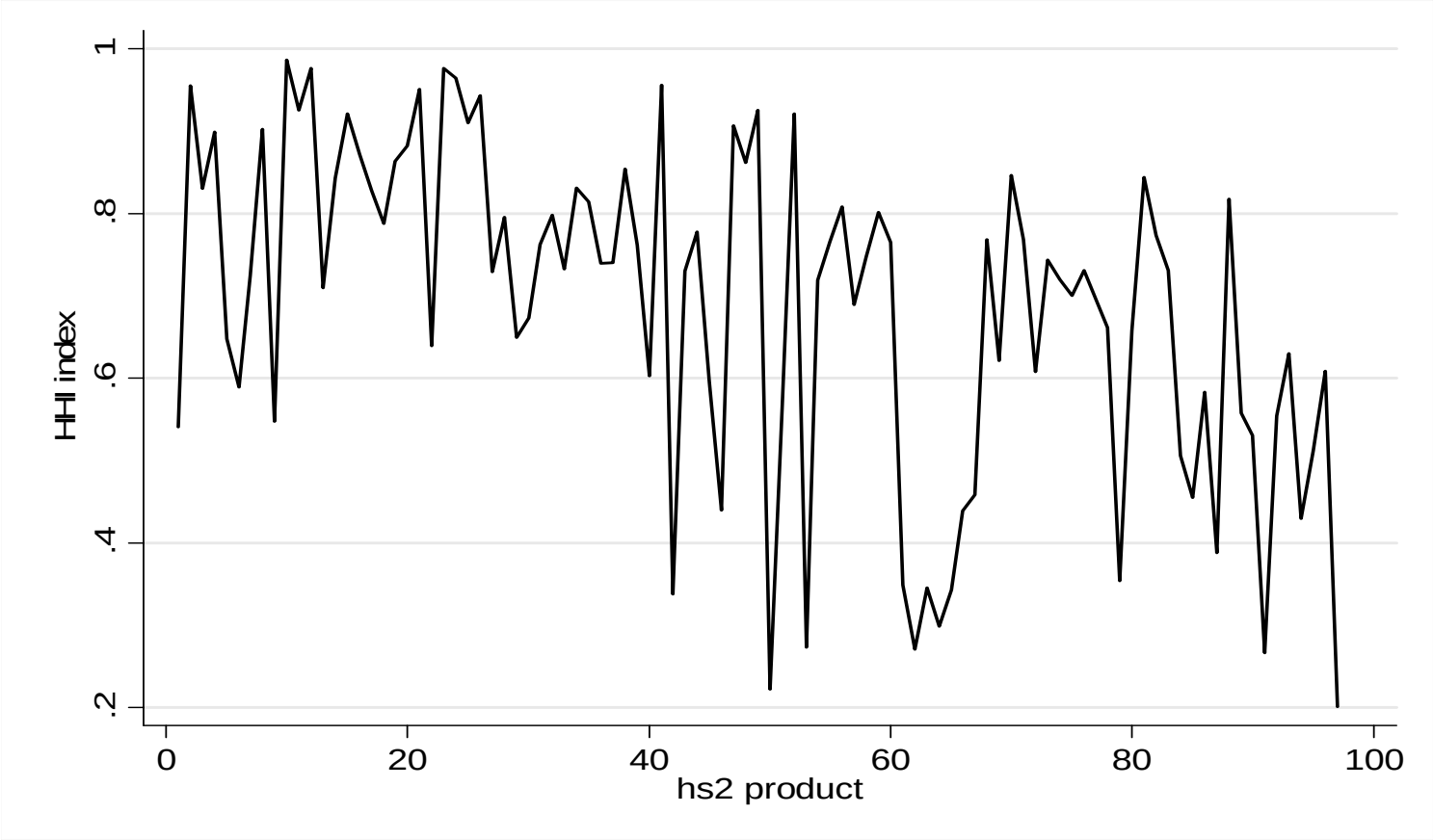
The Change of US Internal Market Share



The Change of Internal Trade Across Products



The Degree of Multi-Country Competition Across Products



Theoretical Background

- Under Armington(1969)'s framework, assume that there are imperfectly substituted goods produced by *n* countries, and the elasticity of substitution of products coming from different countries varies.

- The export demand function can then be derived as the following form: (Artus and McGuirk, 1981; McGuirk, 1987)

$$\ln X_{ij}^{k} = b_{ij}^{k} + \ln(X_{i}^{k}) + \sum_{l=1}^{n} \eta_{ij/il}^{k} (e_{jl} P_{il})$$

Theoretical Background

- Taking first difference of Equation (1) and assumes no change in the overall demand of product i in country k, the above equation can be simplified as:

$$\Delta \ln X_{ij}^{k} = \sum_{l=1}^{n} \eta_{ij/il}^{k} \Delta \ln(e_{jl} P_{il})$$

- Using the relationship between income-compensated elasticity, $\eta_{ij/il}^{k}$, and the Hicks-Allen elasticity of substitution, $\sigma_{ij/il}^{k}$, the export function can be further expressed as

$$\Delta \ln X_{ij}^{k} = \sum_{l \neq j} \sigma_{ij/il}^{k} s_{il}^{k} \Delta \ln(\frac{e_{jl}}{e_{jj}} \frac{P_{il}}{P_{ij}}) = \sum_{l \neq j} \sigma_{ij/il}^{k} s_{il}^{k} \Delta \ln(e_{jl} \frac{P_{il}}{P_{ij}})$$

Theoretical Background

- Assume that $P_{il} / P_{ij} = P_l / P_j$ holds, and denote the bilateral real exchange rate between country i and country l as $RER_{jl} = e_{jl} P_l / P_j$, equation (3) can be expressed as

$$\Delta \ln X_{ij}^k = \sum_{l \neq j} \sigma_{ij/il}^k s_{il}^k \Delta \ln RER_{jl}$$

- Particularly, we assume that the elasticity of substitution between foreign varieties and home variety is the same, i.e. $\sigma_{ij/ik}^k = \sigma_1$, and for any country j and k, and the elasticity between foreign varieties are also the same across countries, i.e. $\sigma_{ij/il}^k = \sigma_2$, then Equation (4) can be re-written as

$$\Delta \ln X_{ij}^k = \sigma_1 s_{ik}^k \Delta \ln RER_{jk} + \sum_{l \neq j,k} \sigma_2 s_{il}^k \Delta \ln RER_{jl}$$

Theoretical Background

❖ Two Effects:

➢ *Direct Bilateral Effect* is positive:

$$\frac{\partial \Delta \ln X_{ij}^{k}}{\partial \Delta \ln RER_{jk}} > 0$$

➢ *Third-Country Competition Effect* is positive:

$$\frac{\partial \Delta \ln X_{ij}^{k}}{\partial \Delta \ln RER_{jl}} > 0$$

❖ The Role of Market Share:

$$\frac{\partial \Delta \ln X_{ij}^{k}}{\partial \Delta \ln RER_{jl}} \propto s_{il}^{k}$$

Empirical Implementation

❖ Guided by equation (5), our main empirical specification is as follows:

$$\Delta \ln X_{ikt} = \alpha + \sigma_1 s_{ikt} \Delta \ln RER_{kt} + \sigma_2 \sum_{l \neq k} s_{ilt} \Delta \ln RER_{lt} + \gamma Z_{kt} + \lambda_{it} + \eta_{ik} + \varepsilon_{ikt}$$

❖ The identification of the equation (6) is at the importer-product-time level. Intuitively, larger depreciation of the currency of some exporting country against the RMB reduces Chinese exports to that country, and more so for products that the country competes more fiercely with China in its domestic market.

Regression Results

	(1)	(2)	(3)
Direct Effect	0.845***	0.812***	0.929***
	(11.04)	(10.20)	(10.42)
Third Country Competition Effect	0.509***	0.531***	0.458**
	(3.77)	(3.91)	(2.10)
Ln(GDP)	3.070***	3.197***	1.392***
	(25.14)	(24.01)	(7.89)
Constant	0.104***	0.100***	0.144***
	(20.18)	(18.47)	(7.67)
importer-product FE	no	yes	yes
product-time FE	no	no	yes
Observations	47,687	47,687	47,687
R-squared	0.027	0.065	0.132

Decomposition of Direct Bilateral Effect and Third Country Competition Effect

U.S.		
year	DE	TCE
1996	0.820776	0.071269
1997	0.052255	0.017997
1998	0.033314	0.031121
1999	0.251042	0.027632
2000	0.066273	0.002944
2001	0.142187	0.175121
2002	0.034598	0.01307
2003	0.048333	0.021795
2004	0.10268	0.00888
2005	0.015762	0.006104
2006	0.093184	0.003169
2007	0.692014	0.00626
2008	1.044791	0.108514
2009	0.009193	0.020561

Japan		
year	DE	TCE
1996	4.083771	0.074534
1997	0.904686	0.039577
1998	0.386932	0.03658
1999	1.173263	0.02478
2000	0.135512	0.005344
2001	3.039378	0.055385
2002	0.670281	0.039066
2003	0.126434	0.025714
2004	0.007033	0.004442
2005	0.326879	0.004747
2006	0.949665	0.007519
2007	0.988529	0.006152
2008	2.615072	0.695455
2009	0.233717	0.011594

Conclusion

- Prior studies usually capture international price competitiveness on bilateral trade using bilateral exchange rate. But according to traditional Armington framework, exchange rate with other competing countries should also be incorporated in the empirical work.

- This paper, using a comprehensive HS2-digit level trade dataset, justifies that both direct effect and third country competition effect significantly affect export.

- Though evidence pointed out that direct effect is larger than third country competition effect, in some cases the latter is large and even dominates the former.

Thanks!

COMMENTS WELCOME!