Industry-Level Competitiveness, Productivity, and Effective Exchange Rates in East Asia

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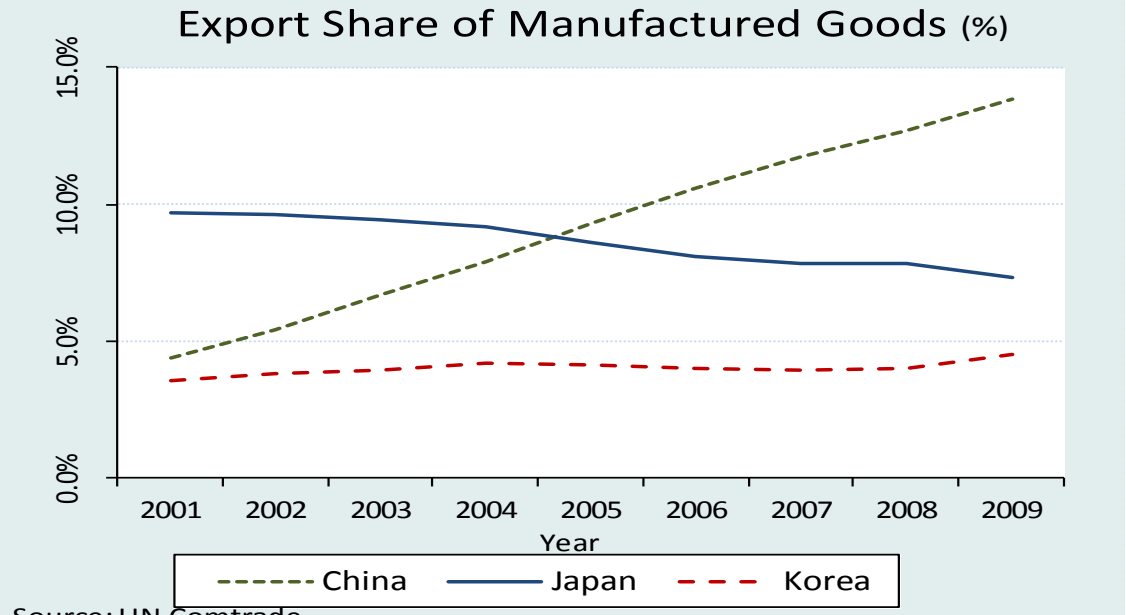
1. Introduction

- Japan's presence in global export markets has been waning relative to China and Korea (Figure 1).



Source: UN Comtrade.
Note: Authors' calculation. Export share of manufactured goods include SITC code 6 (Manufactured goods classified chiefly by materials) and 7 (Machinery and Transport Equipment).

- Production fragmentation, technological development and catch-up of emerging Asian countries, different exchange rate regimes adopted by East Asian countries

1. Introduction --- continued ---

- What are the determinants of export competitiveness?

- Price competitiveness --- reflecting production costs, nominal exchange rate, and markups → Real effective exchange rate (RER), i.e., nominal exchange rate adjusted by the prices of domestic products relative to those of products overseas
  - RER based on CPI is available for many countries, but at the macro level. (CPI-based RER is not a good measure of export competitiveness. ←Bayoumi et al. 2011)
  - RER based on PPI or ULC, especially at industry level, is not readily available for most developing countries. ← Macro-level RER should be very different from industry-level RERs due to large differences in prices across industries (due to different growth rates of productivity or technological development). ←Lewney et al. 2012, Thorbecke and Kato 2012a, 2012b

1. Introduction --- continued ---

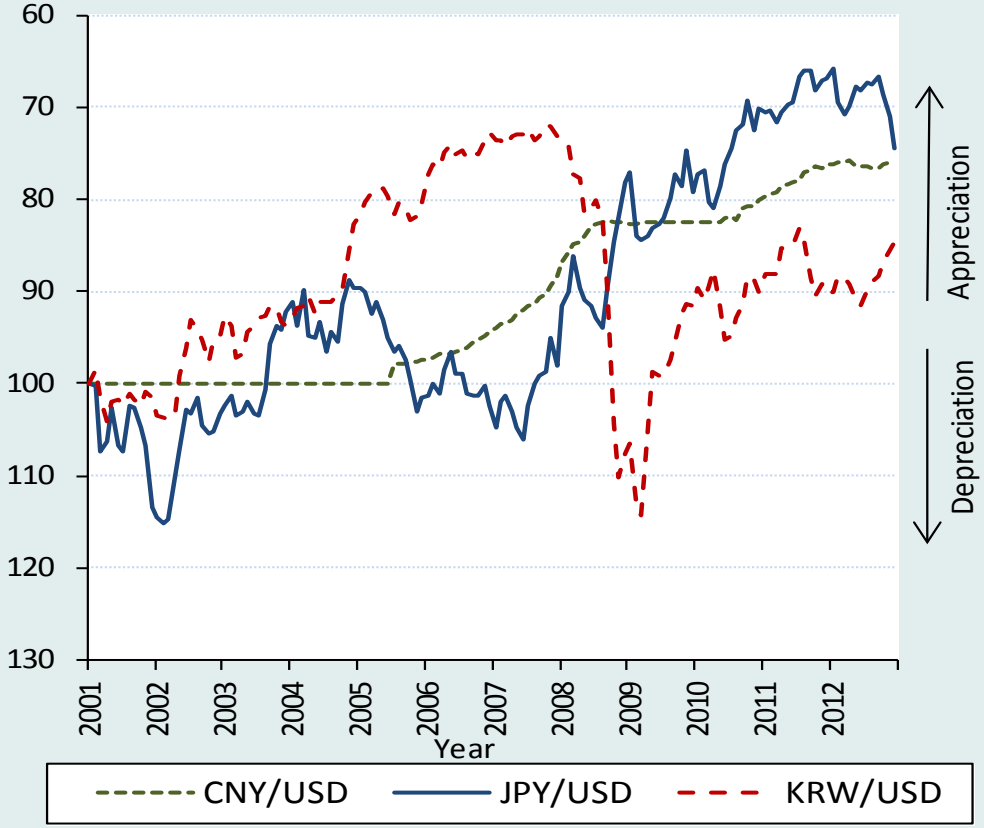
- Cross-country comparative studies on export competitiveness for Asian countries at disaggregated level are still very scarce.

- This study investigates **industry-level** export competitiveness based on ULCs and nominal **effective** exchange rate (NEER) in Japan, China, and Korea. (12 mfg. industries)
- We try to disentangle the complex effects of nominal exchange rates and cost competitiveness (ULCs) on export competitiveness.

2. An Overview of Factors Explaining Countries' International Competitiveness (1)

- In the last decade, one of the most volatile movements was observed for the Japanese yen and the Korean won.
- Chinese RMB was pegged to USD until July 2005, but started to appreciate gradually since then.

Nominal Exchange rate vis-à-vis the USD (2001/1=100) for China, Japan, and Korea

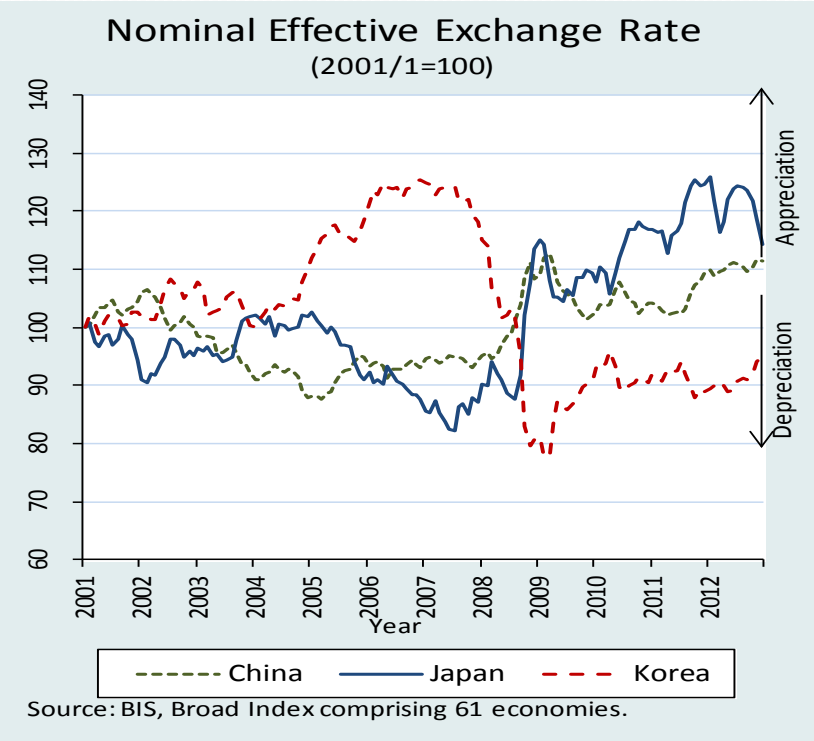


Source: Authors' calculation. Exchange rate data are from Datastream.

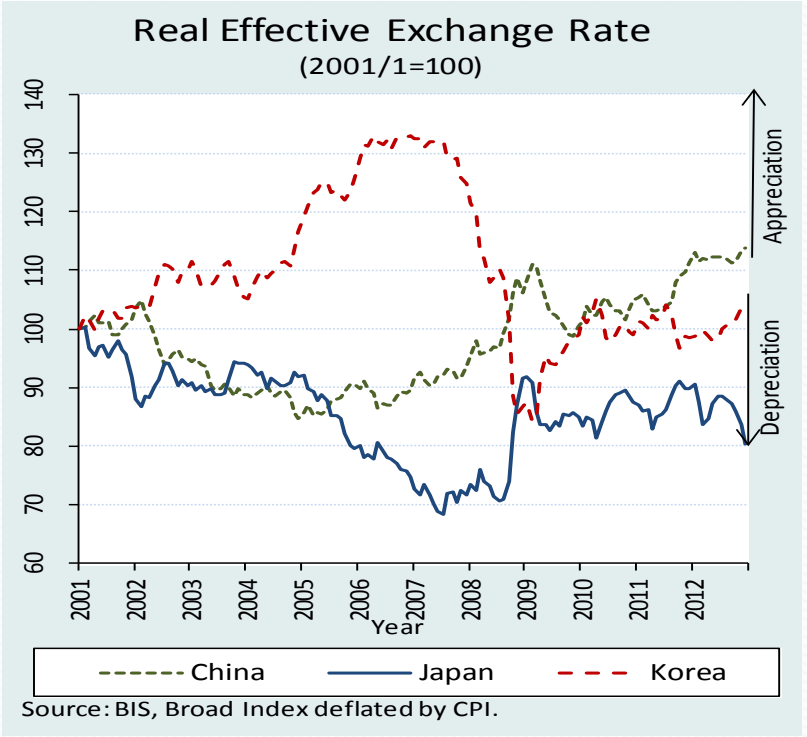
2. An Overview of Factors Explaining Countries' International Competitiveness (2)

--- BIS NEER & REER ---

- The effective exchange rate provides a better measure of exporting firms' price competitiveness in the global market than the bilateral nominal exchange rate.



Source: BIS, Broad Index comprising 61 economies.

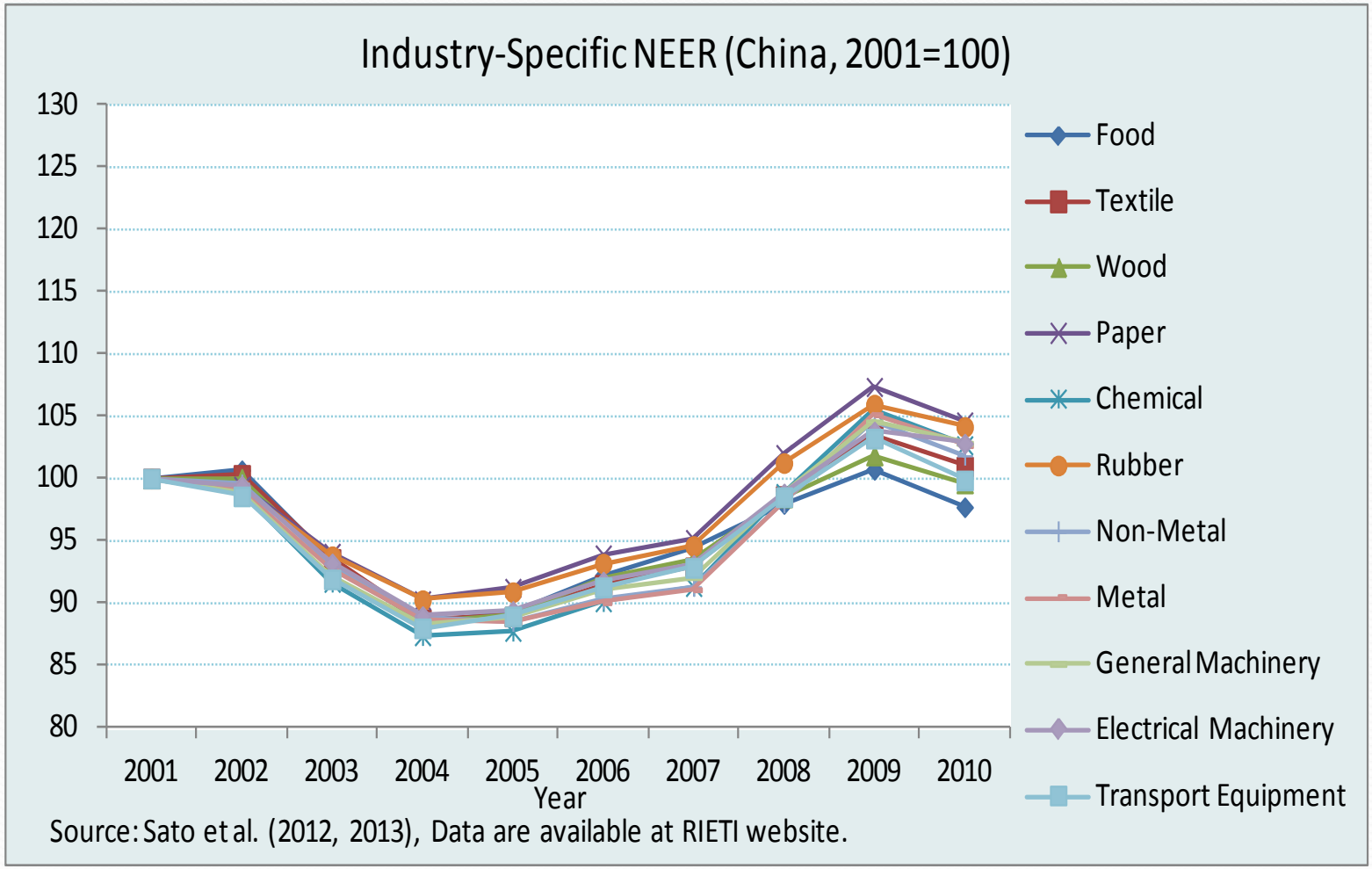


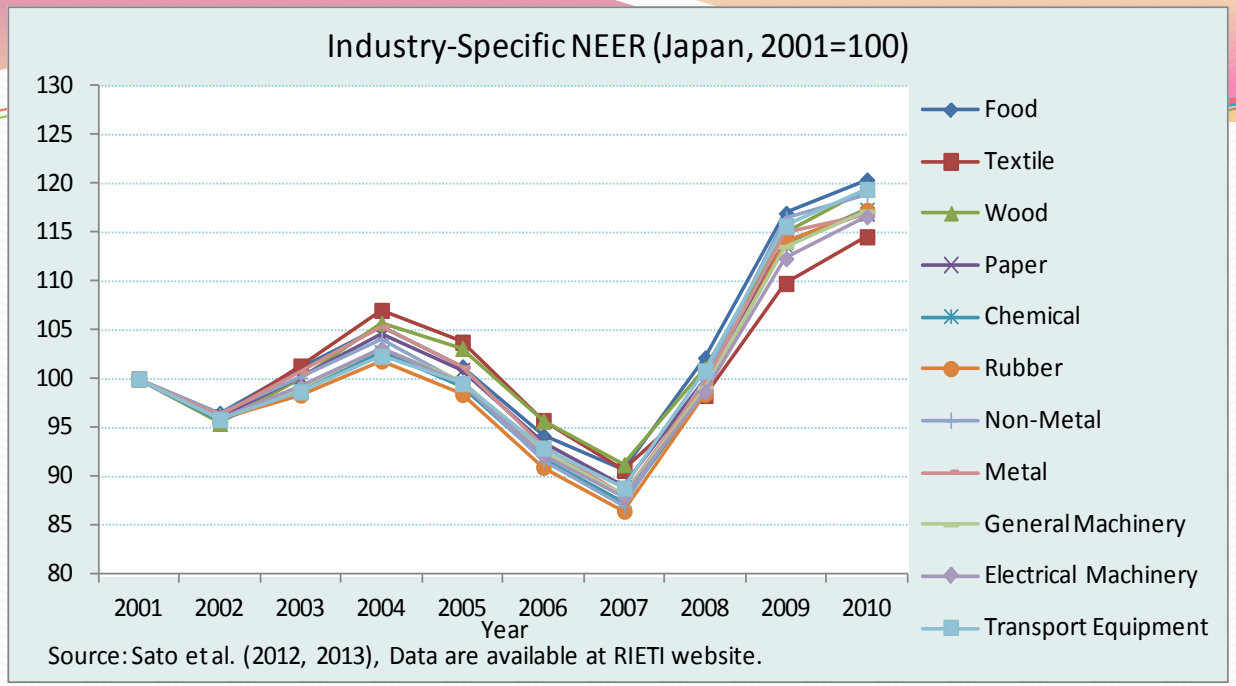
Source: BIS, Broad Index deflated by CPI.

2. An Overview of Factors Explaining Countries' International Competitiveness (3)

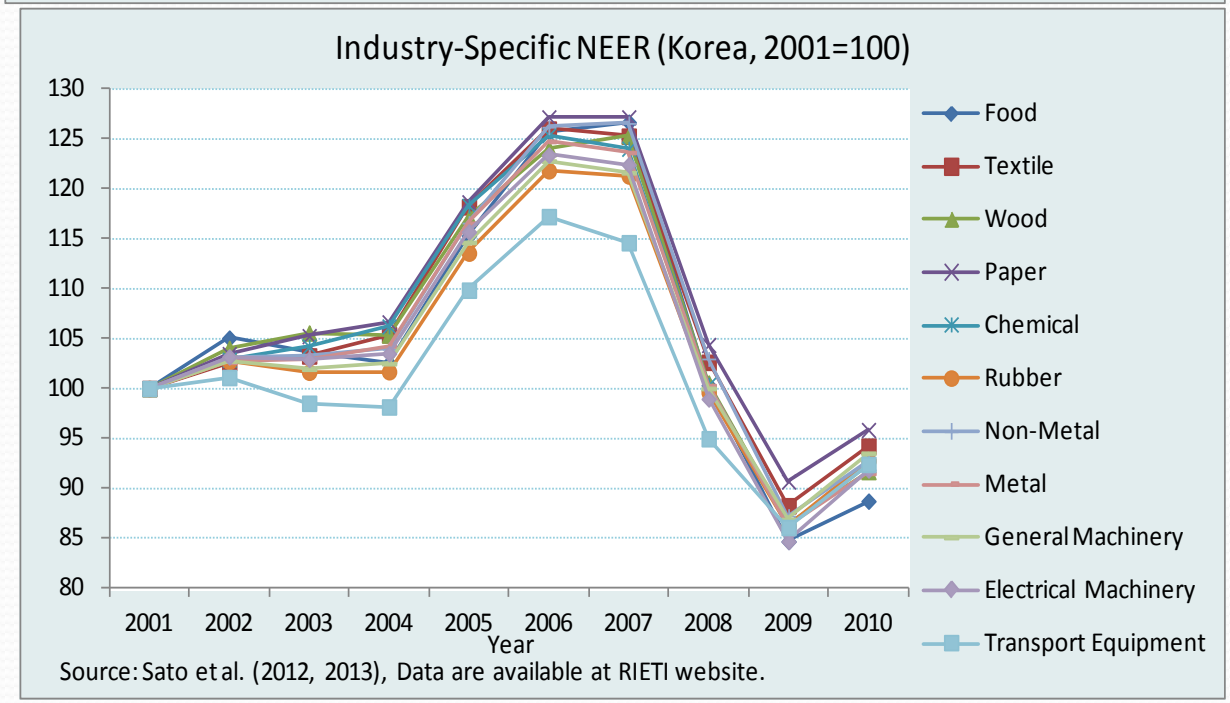
Industry-Level NEERs

- The effective rate can differ across industries.
- Sato et al. (2012a, 2012b, 2013) constructed a new dataset of industry-specific NEERs for Japan, China, and Korea, using the export shares as weights. → We utilize their NEERs.
- Although the overall trend was similar to that indicated by the BIS NEER data, we confirm that there were some differences in the level of NEERs across industries.


Industry-Specific NEER (China, 2001=100)
130
125
120
115
110
105
100
95
90
85
80
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Year
Food
Textile
Wood
Paper
Chemical
Rubber
Non-Metal
Metal
General Machinery
Electrical Machinery
Transport Equipment
Source: Sato et al. (2012, 2013), Data are available at RIETI website.



Source: Sato et al. (2012, 2013), Data are available at RIETI website.



Source: Sato et al. (2012, 2013), Data are available at RIETI website.

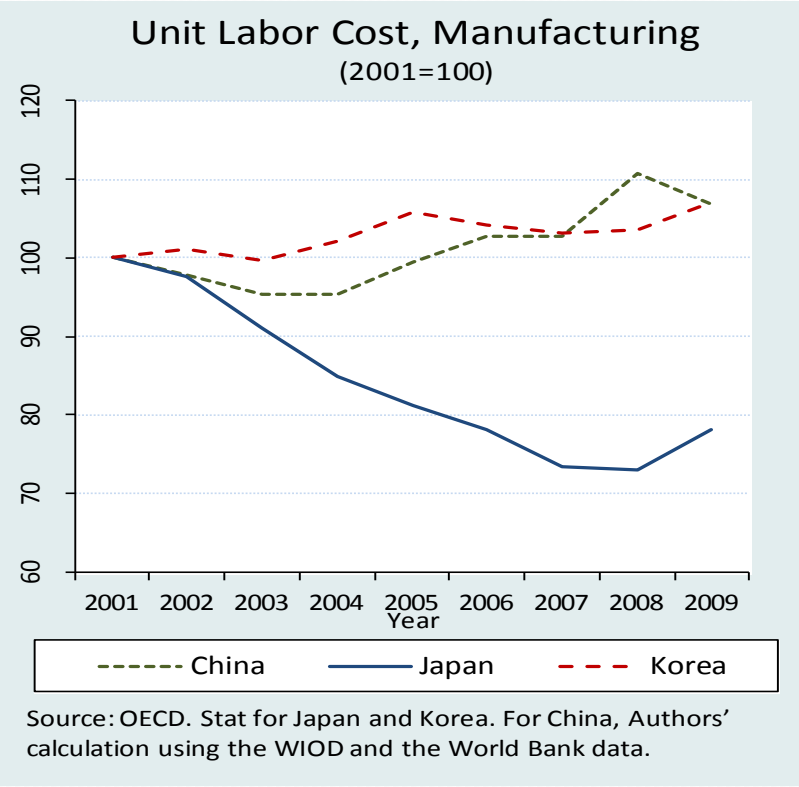
2. An Overview of Factors Explaining Countries' International Competitiveness (4)
--- Unit Labor Costs ---

- A widely used measure of cost competitiveness is ULCs.
- ULCs are calculated as the ratio of total labor compensation in nominal terms to real output. ULCs also equal to the ratio of compensation per worker to labor productivity.

$$ULC = \frac{w_n L}{Y} = \frac{w_n}{\frac{Y}{L}}$$

- Increases (decreases) in ULCs indicate that workers' nominal compensation grew faster (slower) than labor productivity.

2. An Overview of Factors Explaining Countries' International Competitiveness (5)
--- Unit Labor Costs (OECD & WIOD)---



Source: OECD. Stat for Japan and Korea. For China, Authors' calculation using the WIOD and the World Bank data.

CHN & KOR: Cost competitiveness has been deteriorated.

- Japan would have been gaining international competitiveness by reducing production costs if the nominal exchange rate did not change.

2. An Overview of Factors Explaining Countries' International Competitiveness (6)

Industry-Level ULCs

- Developments in ULCs are likely to have been very different across industries, given that the speed of technological development greatly differs across industries.
- Utilizing the industry-level data taken from the WIOD, we construct annual series of ULCs for the 12 manufacturing sectors for the period 2001-2009.

- We calculate industry-level ULCs using the data on labor compensation and real output in local currency.

- **Table 1. Unit Labor Costs by Industry (2001=100, calculated based on local currency)**

Industry Classification	China		Japan		Korea	
	2005	2009	2005	2009	2005	2009
Food, beverages and tobacco	102.2	112.0	107.6	109.4	116.0	133.9
Textiles	79.4	71.1	99.1	114.0	91.3	102.5
Wood and cork	78.9	74.7	96.2	97.7	124.3	149.6
Pulp, paper, printing and publishing	68.1	57.1	88.1	94.8	121.8	154.5
Coke, refined petroleum and nuclear fuel	135.1	146.6	93.5	104.4	161.5	120.6
Chemicals	99.2	90.4	92.2	103.0	110.9	121.3
Rubber and plastics	84.6	74.3	100.5	83.6	119.3	126.4
Other non-metallic minerals	83.3	65.0	89.2	75.3	111.7	144.1
Basic metals and fabricated metal	83.8	67.9	93.4	91.3	120.9	136.8
General machinery	70.1	61.0	79.2	67.6	99.0	107.5
Electrical and optical equipment	66.1	53.9	65.4	47.3	69.7	63.2
Transport equipment	74.8	67.4	87.1	82.7	98.0	126.2

Annual ULC index are shown in Appendix Figure 1 in the paper.

2. An Overview of Factors Explaining Countries' International Competitiveness (7)

Industry-Level ULCs based on local currency

- Evolutions in ULCs greatly differ not only across countries but also across industries.
- Japan's ULCs were relatively stable or declined in most industries while Korea's ULCs tend to show an upward trend in many industries. As for China, ULCs declined in most industries, after which they remained more or less stable.
- Korea's ULCs show the largest increase among the three countries in a majority of industries. A notable exception is electrical and optical equipment industry.

2. An Overview of Factors Explaining Countries' International Competitiveness (8)

Industry-Level ULCs in Foreign Currency Terms

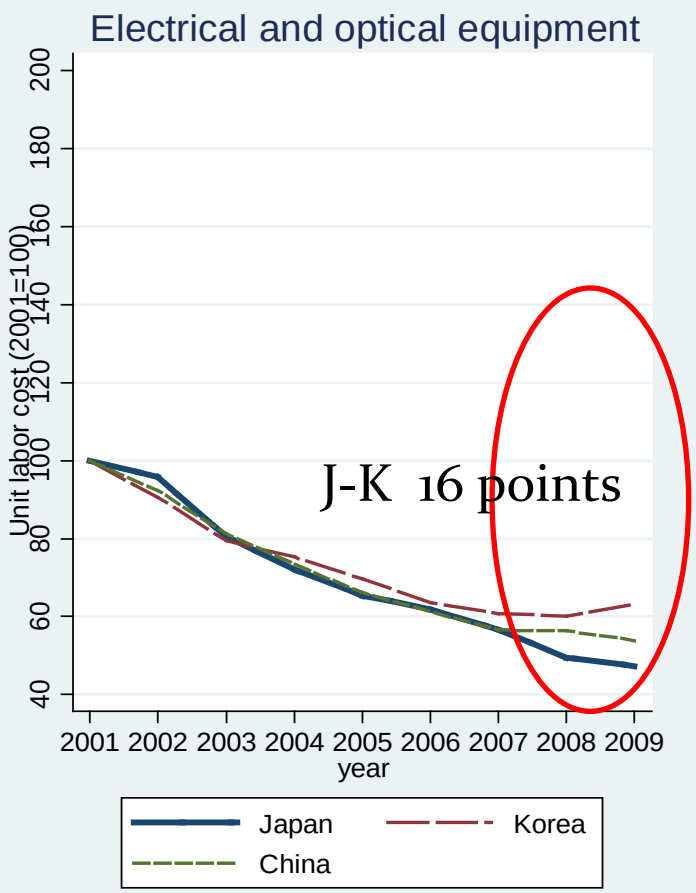
- The NEERs for Japan fluctuated considerably, while that for China remained relatively stable.
- The cost competitiveness of Japan and China increased in many industries through a reduction in ULCs, while Korea's ULCs declined only in the electrical and optical equipment industry.
- These observations suggest that Japan's cost advantage was offset when Japan faced a large appreciation of home currency while Korea's cost disadvantage was offset when Korea faced a large depreciation of home currency.

2. An Overview of Factors Explaining Countries' International Competitiveness (9)

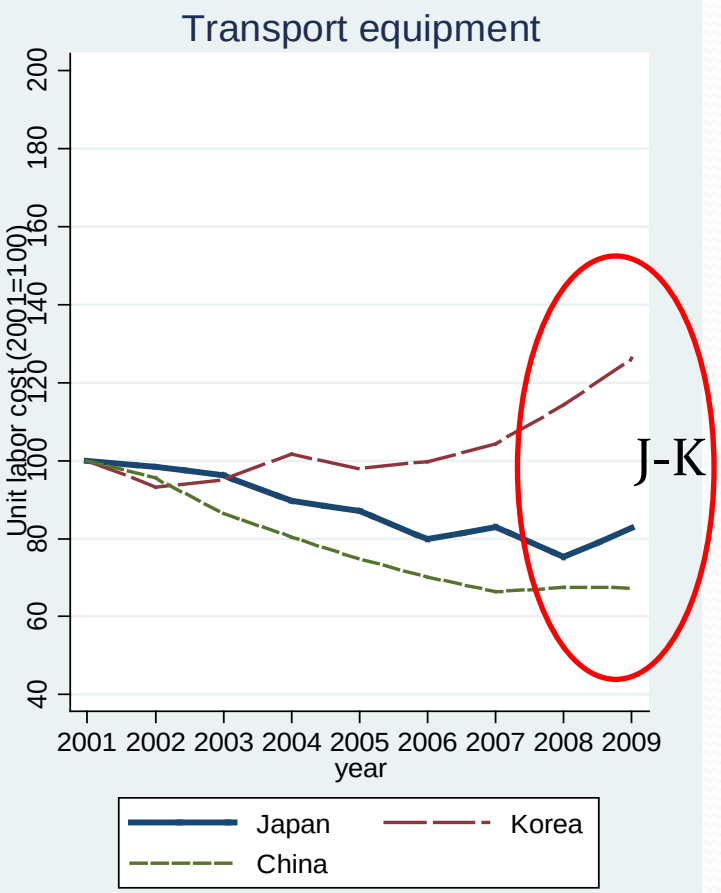
Industry-Level ULCs in Foreign Currency Terms (Figure 6)

- To examine the effect of nominal exchange rates on cost competitiveness, we evaluate the ULCs in foreign currencies using the industry-specific NEER.
- China's ULCs are remained relatively low in most industries in most years.
- Korea's ULCs increased considerably during the period of won appreciation (mid-2000s), but they then declined sharply in 2008 and 2009 thanks to the rapid depreciation of the won.
- Japan's ULCs increased sharply in 2008 and 2009 due to the appreciation of the yen. → Japan's efforts at cost reduction were more than offset by the yen appreciation.

Appendix Figure 1. Unit Labor Costs by Industry (2001=100, calculated based on local currency)

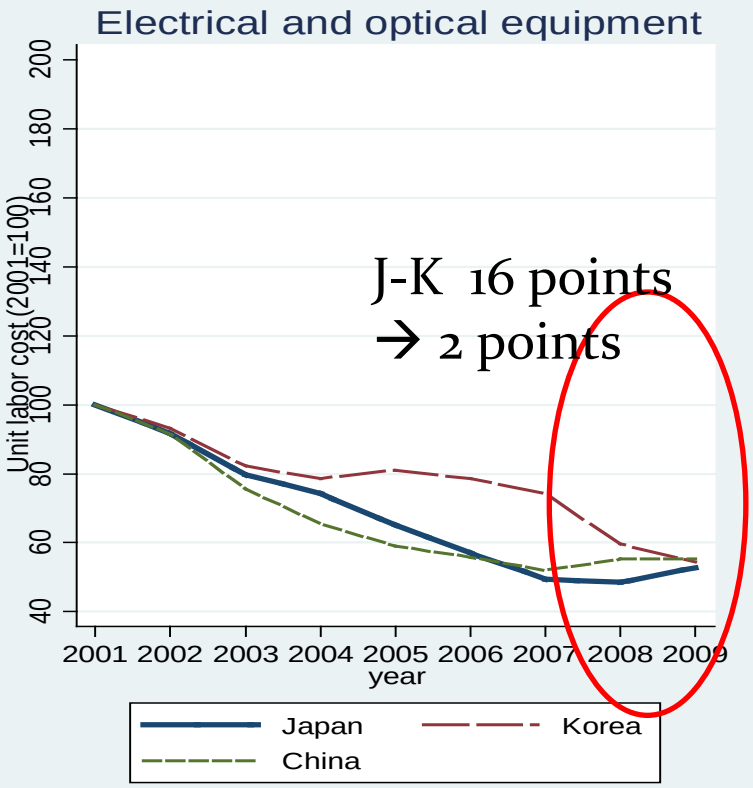


Source: Authors' calculation based on data taken from the WI

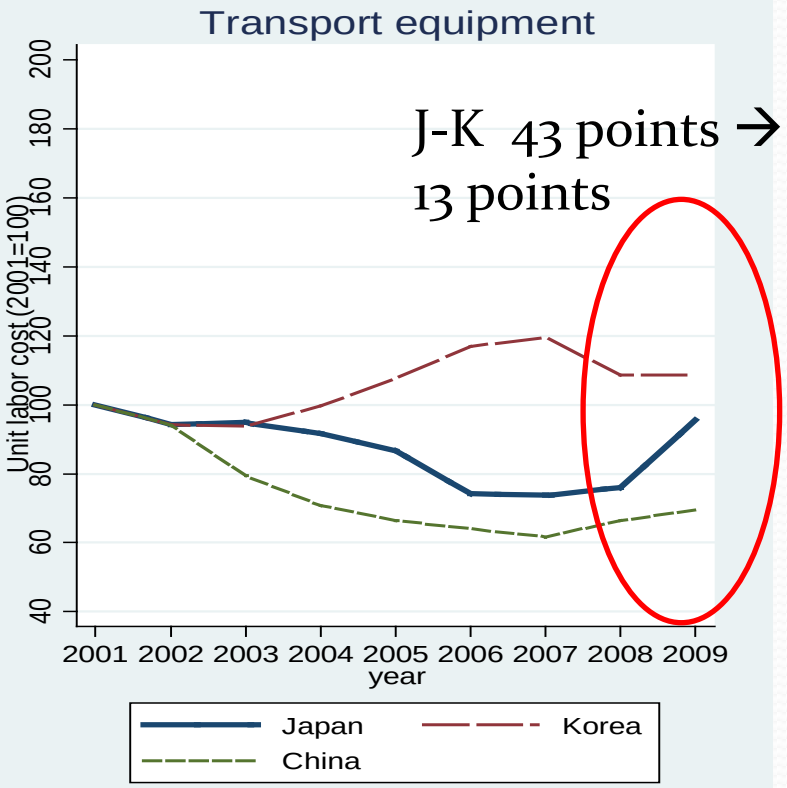


Source: Authors' calculation based on data taken from the WIOD

Figure 6. Unit Labor Costs by Industry (2001=100, calculated based on **foreign currency** using the NEER)



Source: Authors' calculation based on data taken from the WI



Source: Authors' calculation based on data taken from the WIOD

3. Model for Relative Prices and Competitiveness (1)

- The logarithm of the real exchange rate at time t (q_t) is defined as:

$$q_t \equiv s_t - p_t + p_t^*$$

- where s is the log of the nominal exchange rate, p is the log of price levels. * denotes the foreign country.
- If we focus on the export competitiveness, the relative price of tradable goods is important.

$$q_t^2 = q_t^T \equiv (s_t - p_t^T + p_t^{T*})$$

- A related concept is cost competitiveness. Consider the following markup (μ) model of pricing:

$$p_t^T = \log\left[(1+\mu_t)\left(\frac{W_t}{A_t}\right)\right]$$

ULC = Wage rate / Productivity

3. Model for Relative Prices and Competitiveness (2)

- Assuming that markups are constant:

$$q_t^3 = \left[s_t - (w_t - a_t) + (w_t^* - a_t^*)\right] - \ln(1+\mu) + \ln(1+\mu^*)$$

log nominal exchange rate

log ULC home

log ULC foreign

constant

- A country's export volume is:

REER

$$lnEXP_{ijt} = \theta_1 lnEXPROW_{ijt} + \theta_2 lnNEER_{ijt} + \theta_3 lnULC_{ijt} + \theta_4 lnFULC_{ijt} + \mu_{ij} + \tau_t + \epsilon_{ijt}$$

Real export value from country *i* to the world in industry *j* *(WIOD industry output deflators used)*

Nominal export value from Rest of the world in industry *j*

Calculated using the ULCs of the 40 countries included in the WIOD.

3. Model for Relative Prices and Competitiveness (3)

- Taking the first difference for all variables except the year dummies to eliminate country-industry fixed effects, the equation to be estimated is:

$$\Delta lnEXP_{ijt} = \theta_1 \Delta lnEXPRoW_{ijt} + \theta_2 \Delta lnNEER_{ijt} + \theta_3 \Delta lnULC_{ijt} + \theta_4 \Delta lnFULC_{ijt} + \tau_t + \epsilon_{ijt}$$

Positive coefficients expected.

Negative coefficients expected.

Positive coefficients expected.

Negative coefficients expected.

- Interaction terms of industry dummies (GM, EL, TR) or country dummies (JP, KR) and ULC or NEER variables included.

4. Empirical Analysis (1)

Baseline Results (Table 2)

Dependent variable: D.ln(real export value in local currency)

	(1)	(4)
D.lnEXPRoW	0.386***	0.284**
	[0.104]	[0.124]
D.lnNEER	-0.413***	-0.402***
	[0.095]	[0.114]
D.lnULC	-0.512***	-0.647***
	[0.120]	[0.142]
D.lnFULC	-0.121	-0.036
	[0.176]	[0.189]
Observations	312	273
F-statistic	20.549	5.507
R-squared	0.430	0.174

Expected sign

Excluding the 2009 observations

4. Empirical Analysis (2)

Differences across countries (Table 2)

Dependent variable: D.ln(real export value in local currency)

	(2)	(5)
D.lnEXPRoW	0.498***	0.554***
	[0.100]	[0.114]
D.lnNEER	0.013	0.924**
	[0.374]	[0.382]
D.lnULC	-1.235***	-1.883***
	[0.199]	[0.221]
D.lnFULC	0.470*	0.548**
	[0.247]	[0.246]
JP*D.lnNEER	-0.848**	-2.521***
	[0.406]	[0.477]
KR*D.lnNEER	-0.256	-0.844*
	[0.451]	[0.442]
JP*D.lnULC	1.248***	2.096***
	[0.257]	[0.301]
KR*D.lnULC	0.758***	1.095***
	[0.288]	[0.313]
JP*D.lnFULC	-0.842**	-0.868***
	[0.335]	[0.334]
KR*D.lnFULC	-1.140***	-1.131***
	[0.357]	[0.352]
Observations	312	273
F-statistic	18.151	9.915
R-squared	0.512	0.383

NEER: Largest negative impact on Japan

ULC: Largest negative impact on China

FULC: Negative impact on Japan & Korea, but positive for China

4. Empirical Analysis (3)

Differences across industries (Table 2)

Dependent variable: D.ln(real export value in local currency)

	(3)	(6)
D.lnEXPRoW	0.310***	0.244*
	[0.108]	[0.125]
D.lnNEER	-0.343***	-0.401***
	[0.105]	[0.127]
D.lnULC	-0.278**	-0.399**
	[0.137]	[0.167]
D.lnFULC	0.019	0.047
	[0.184]	[0.193]
GM*D.lnNEER	-0.111	0.437
	[0.359]	[0.441]
EL*D.lnNEER	-0.304	-0.028
	[0.372]	[0.441]
TR*D.lnNEER	-0.685*	-0.526
	[0.390]	[0.461]
GM*D.lnULC	-0.798*	-1.396**
	[0.452]	[0.587]
EL*D.lnULC	-0.826**	-0.736*
	[0.383]	[0.423]
TR*D.lnULC	-1.078**	-0.997*
	[0.460]	[0.520]
GM*D.lnFULC	-0.627	1.625
	[0.633]	[1.754]
EL*D.lnFULC	-0.091	-0.076
	[0.749]	[0.880]
TR*D.lnFULC	0.100	-0.624
	[0.655]	[1.191]
Observations	312	273
F-statistic	12.319	3.574
R-squared	0.458	0.212

ULC: Larger negative impact in machinery-related industries.
Cost competitiveness is particularly important.

← Relocation within the production network?

5. Summary

- We examined the industry-level export competitiveness of mfg industries in China, Japan, and Korea, focusing on cost competitiveness (ULCs) and nominal exchange rates.
- Both ULCs and NEERs have a negative impact on exports on average. ← as predicted by theory, but the effects differ across countries and industries
- ULCs have a negative impact on exports and the negative impact is the largest for China while it is much smaller for Korea. ULCs do not appear to matter much for Japanese exports.
- ULCs have a larger negative impact in machinery-related industries, indicating that cost competitiveness is particularly important in these industries. ← production can easily be relocated across East Asian countries

5. Summary

- The NEER has a strong negative impact on exports for Japan whereas the effect is not significant for Korea and China.
- ➔ Labor costs are important determinant of export competitiveness in the case of China, while exchange rates are important in the case of Japan.
- Empirical evidence relevant to the design of policies to enhance industrial competitiveness and coordination in foreign exchange markets.
  - For Japan, policies for cost reduction may not be very effective in enhancing export competitiveness. Instead, policies to achieve greater exchange rate stability may be more effective.

For future research…

- Differences in determinants of export competitiveness may be more pronounced if we take product characteristics into account. (Final goods vs. intermediate goods)
- Relating our research to the effects of the exchange rate pass-through (reflecting non-price competitiveness) could help to disentangle the complex effects of the exchange rate and cost competitiveness on exports.
- Further investigation taking account of product types and intra-firm trade, etc., could offer further insights.

Thank you and comments welcome!