Real Exchange Rate Movements and Export Quality Upgrading of China's Manufacturing Industries

Risheng Mao
Institute of World Economics and Politics,
Chinese Academy of Social Sciences.
Dec. 18, 2019

Background

- The real effective exchange rate of Renminbi (RMB) fluctuates substantially over the past two decades.
- The substantial volatility and movements of real exchange rate provides a very good experiment to check its associated impacts on performance of Chinese exporting firms.
- To deeply understand trade balance, we should firstly explore how the exchange rate movements can have impacts on the performance of exporting firms in the long term.
- Exchange rate shocks could not only have impacts on export and import growth,but could also cause substantial reallocation both within and across firms as emphasized by existing studies(Klein, et al,2003;

Literature

- **An appreciation of real exchange rate will significantly drive up firm's product quality , productivity and allocation efficiency.**

(Mouradian, 2014; Ekholm, et al.2011; Tomlin, 2014; Jeanneney and Hua, 2011; Hu, et al.,2017)

A depreciation of real exchange rate is more likely to promote the product quality and performance of export firms.

Alfaro,et al.,2018 ; Blaum, 2017; Missio and Gabriel, 2016 Verhoogen, 2008; Alvarez and Lopez,2008; Cimoli,et al.,2013;

Main Contribution

- This study stresses the export quality upgrading attributed to reallocation of products within industries caused by real exchange rate movements.
- Real exchange rate movements impacts on export quality upgrading from export and import channels are simultaneously investigated.
- Export quality upgrading at product level is measured using both KSW and BF methods. (KSW; BF; FR)
- Using a highly disaggregated product level panel data over the period of 2000 to 2015 to measure export quality upgrading.
- Construct industry specific REER at HS4 digit level.

Methodology: KSW

- **KSW Export Quality Index and Decomposition.**

By referring to Khandelwal, et al. (2013), the CES utility function is,

$$U = \left(\int_{\xi \in \Omega} \left(\lambda_c(\xi) q_c(\xi) \right)^{\frac{(1-\sigma)}{\sigma}} d\xi \right)^{\frac{\sigma}{(1-\sigma)}} \quad (1)$$

the parameter λ_c is the quality index that nested in the consumer's preference, q_c is the quantity consumed, the demand function derived under the assumption of maximum utility function is,

$$q_c(\varphi) = \lambda_c^{\sigma-1}(\varphi) p_c^{-\sigma}(\varphi) P_c^{\sigma-1} Y_c \quad (2)$$

Considering a highly disaggregated product level data (HS 8 digit classification) with several dimension, the product h is exported from city c to the destination d in the year t, export quality index at product level can be estimated by taking logs on both sides of equation (2) ,

$$\ln q_{hcdt} + \sigma_h \ln p_{hcdt} = \alpha_c + (1 - \sigma_h) P_{dt} + Y_{dt} + (1 - \sigma_h) \lambda_{hcdt} \quad (3)$$

Methodology :KSW

- Where p is the unit price of product, α_c is the fixed effect representing the export source city, $\left(1-\sigma_p\right)P_{dt}+Y_{dt}$ is the fixed effect.
- σ_h is the elasticity of substitution across products. Following the previous related studies (Khandelwal,et al.2013; Martin and Mejean,2014; Hu, et al.2017), the parameter σ_h can be directly acquired from the estimation results by Broda, et al. (2017), therefore,

$$\hat{\lambda}_{hcdt}=\frac{\hat{\varepsilon}}{(1-\sigma_h)} \qquad (4)$$

- Based on the export quality KSW index at product level, the export quality KSW index at industry level (HS 4 digit classification) can be constructed using weighted average method, that is,

$$\hat{\lambda}_{it}=\sum\nolimits_{h\in i} s^{i}_{hcdt}\hat{\lambda}_{hcdt} \qquad s^{i}_{hcdt}=\frac{p_{hcdt}q_{hcdt}}{\sum_{h\in i} p_{hcdt}q_{hcdt}}$$

- The KSW export quality index can be decomposed into several components following the FHK and BHC methods (Baily, Hulten and Campbell, 1992; Foster, Haltiwanger, and Krizan,2008), that is,

Methodology :FHK & GR Decomposition

$$\Delta\lambda_{it} = \sum_{h\in C_i} s_{ht-1}\Delta\,\lambda_{ht} + \sum_{h\in C_i}(\lambda_{ht-1} - \lambda_{it-1})\,\Delta s_{ht} + \sum_{h\in C_i}\Delta\lambda_{ht}\,\Delta s_{ht} + \sum_{h\in N_i} s_{ht}(\lambda_{ht} - \lambda_{it-1}) - \sum_{h\in X_i} s_{ht-1}(\lambda_{ht-1} - \lambda_{it-1}) \quad (5)$$

Where C_i, N_i, X_i represent the incumbent products, entry products, exit products respectively, s_h is the export share of product h in the whole industry.

Similar to the above decomposition method, the KSW export quality index at industry can also be decomposed by GR method (Griliches and Regev,1995), that is,

$$\Delta\lambda_{it} = \sum_{h\in C_i}\overline{s_h}\Delta\,\lambda_{ht} + \sum_{h\in C_i}\left(\bar{\lambda}_h - \bar{\lambda}_i\right)\Delta s_{ht} + \sum_{h\in N_i} s_{ht}\left(\lambda_{ht} - \bar{\lambda}_i\right) - \sum_{h\in X_i} s_{ht-1}\left(\lambda_{ht-1} - \bar{\lambda}_i\right) \quad (6)$$

Methodology :BF

- Following the previous studies (Boorstein and Feenstra,1987; Harrigan and Barrows, 2009; Martin and Mejean,2014), this study also measure and decompose the export quality index using BF framework. The key assumption of BF framework is that the value of unit consumption(Val_{ht}) should be equal to the product of ideal price index and utility of unit consumption, that is,

$$Val_{ht} = P_{ht} C_{ht}(q_{hcdt}, \Lambda_{hcdt}, \ I_{ht}) \qquad (7)$$

- In equation(7) , P_{ht} is the ideal price index, and the C_{ht} depends on the quantity of different varieties, q_{hcdt} , the quality of different varieties, Λ_{hcdt} , and the set of firms that can produce the product I_{ht} , and the ideal price index denotes the minimum expenditure for unit utility, therefore,

$$P_{ht} = \min \left\{ Val_{ht} = \sum_{h \in I_{ht}} p_{hcdt} q_{hcdt} | C_{hcd}(q_{hcdt}, \Lambda_{hcdt}, I_{ht}) = 1, q_{hcdt} \geq 0 \right\} \qquad (8)$$

- By referring to Boorstein and Feenstra (1999), the quality upgrading from consumer's choice can be calculated as the difference between unit value index and ideal price index, that is,

$$\Delta \ln Q_{ht} = \Delta \ln UV_{ht} - \Delta Ln P_{ht} \qquad (9)$$

Methodology :BF

- The unit value is calculated as total consumption value divided by total quantity consumed, that is,

$$UV_{ht} = Val_{ht}/Qty_{ht} = \sum_{h \in I_{ht}} w_{hcdt}^{R}\, p_{hcdt} \qquad (10)$$

$$w_{hcdt}^{R} = q_{hcdt}/Qty_{ht}$$

- Clearly, the quality upgrading measured by equation (9) is also based on the demand side, the intuition is that consumers are more willing to buy more expensive varieties within product if the unit value is larger than the ideal price index, which also implies that the overall quality is upgraded for product h.
- Therefore, the key here is how to calculate the ideal price index for product h ,the expenditure CES function is assumed as,

$$e(P, I_{ht}, b) = \left[\sum_{h \in I_{ht}} b_h p_{ht}^{1-\sigma}\right]^{\frac{1}{1-\sigma}} \qquad (11)$$

Methodology :BF

- σ is elasticity of substitution. Define the set of product h at time t is I_{ht} and the set of product h at time t-1 is I_{ht-1} and the set of overlap products at time t and t-1 is $I_{ht,t-1}$, if there is no entry and exit of product both at time t and t-1 , then $I_{ht} = I_{ht-1} = I_{ht,t-1}$,

  and the following expression can be defined as,

$$\eta_{ht} = \frac{\sum_{h \in I_{ht,t-1}} V_{hcdt}}{\sum_{h \in I_{ht}} V_{hcdt}} \leq 1 \qquad \eta_{ht-1} = \frac{\sum_{h \in I_{ht,t-1}} V_{hcdt-1}}{\sum_{h \in I_{ht}} V_{hcdt-1}} \leq 1$$

- Based on above definition and expenditure function, then the movements of ideal price index can be expressed as,

$$\ln F(p_{hcdt}, p_{hcdt-1}, q_{hcdt}, q_{hcdt-1}) = \ln P_{ht}/P_{ht-1} = \sum_{h \in I_h} w_{hcdt} \ln \frac{p_{hcdt}}{p_{hcdt-1}} + \frac{1}{\sigma_h - 1} \ln \frac{\eta_{ht}}{\eta_{ht-1}} \qquad (12)$$

Methodology :BF

$$w_{hcdt} = \frac{(s_{hcdt} - s_{hcdt-1})\ln\left(s_{hcdt-1}/s_{hcdt}\right)}{\sum_{h\in I}(s_{hcdt} - s_{hcdt-1})\ln\left(s_{hcdt-1}/s_{hcdt}\right)} \cong \frac{s_{hcdt} + s_{hcdt-1}}{2}$$

If the market share between time t and t-1 change little, then the weight is approximately equal to market share, i.e.,

$$w_{hcdt} = s_{hcdt} \qquad s_{hcdt} = \frac{p_{hcdt}q_{hcdt}}{\sum_{h\in I_h} p_{hcdt}q_{hcdt}} = \frac{V_{hcdt}}{V_{ht}}$$

Combining the equation (9) and (12), the export quality upgrading index can be written as,

$$\ln(Q_{ht}/Q_{ht-1}) = \ln(UV_{ht}/UV_{ht-1}) - \ln F(p_{hcdt}, p_{hcdt-1}, q_{hcdt}, q_{hcdt-1}) \qquad (13)$$

Methodology :BF Decomposition

- Following Martin and Mejean (2014), the BF export quality index can be decomposed into extensive and intensive margin, the intensive margin denotes the export quality upgrading of incumbent products,

$$\Delta \ln Q_{it}^{\text{int}} = \Delta \ln UV_{it}^{\text{int}} - \Delta \ln P_{it}^{\text{int}} \qquad (14)$$

- Using Taylor expansion, the intensive margin of export quality upgrading is approximately equal to,

$$\Delta \ln Q_{it}^{\text{int}} = \sum_{h \in I_i} \left(w_{hcdt-1}^{N} - w_{hcdt-1}^{R} \right) \ln \frac{q_{hcdt}}{q_{hcdt-1}} + \sum_{h \in I_i} w_{hcdt-1}^{N} \ln \frac{\Lambda_{hcdt}}{\Lambda_{hcdt-1}} \qquad (15)$$

- The first part of equation (15) in the right side represents the export quality upgrading by the market share reallocation of incumbent products within industries, the second part is the export quality upgrading within products. w_{hcdt-1}^{N} is the nominal market share of each product (measured by export value share). w_{hcdt-1}^{R} is the real market share of each product (measured by export quantity share).

Methodology :BF Decomposition

- The extensive margin of export quality upgrading base on BF framework is defined as,

$$\Delta \ln Q_{it}^{ext} = \Delta \ln UV_{it}^{ext} - \Delta \ln P_{it}^{ext} \quad (16)$$

$$\begin{aligned}\Delta \ln UV_{it}^{ext} &= \left(\ln \frac{\sum_{h \in I_{it}} p_{hcdt} q_{hcdt}}{\sum_{h \in I_i} p_{hcdt} q_{hcdt}} - \ln \frac{\sum_{h \in I_{it-1}} p_{hcdt-1} q_{hcdt-1}}{\sum_{g \in I_i} p_{hcdt-1} q_{hcdt-1}} \right) \\ &- \left(\ln \frac{\sum_{h \in I_{it}} q_{hpct}}{\sum_{h \in I_i} q_{hpct}} - \ln \frac{\sum_{h \in I_{it-1}} q_{hcdt-1}}{\sum_{h \in I_i} q_{hcdt-1}} \right) \\ &= \ln \frac{\hat{\eta}_{it}}{\hat{\eta}_{it-1}} - \ln \frac{\eta_{it}}{\eta_{it-1}}\end{aligned} \quad (17)$$

$$\Delta \ln P_{it}^{ext} = \frac{1}{\sigma - 1} \ln \frac{\eta_{it}}{\eta_{it-1}} \quad (18)$$

$$\Delta \ln Q_{it}^{ext} == \ln \frac{\hat{\eta}_{it}}{\hat{\eta}_{it-1}} - \frac{\sigma}{\sigma - 1} \ln \frac{\eta_{it}}{\eta_{it-1}} \quad (19)$$

Methodology :REER

- Following Goldberg (2004), the export weighted and import weighted real effective exchange rate at industry level over the period of 1999 to 2016 is defined as,

$$REER_{it} = \sum_{j=1}^{k} \omega_{jt}^{i} RER_{jt}$$

$$\omega_{jt}^{i} = \frac{X_i}{X_i + M_i} * \frac{\sum_{t-3}^{t-1} ex_{jt}^{i}}{\sum_{j=1}^{k} \sum_{t-3}^{t-1} ex_{jt}^{i}} + \frac{M_i}{X_i + M_i} * \frac{\sum_{t-3}^{t-1} im_{jt}^{i}}{\sum_{j=1}^{k} \sum_{t-3}^{t-1} im_{jt}^{i}} \qquad (20)$$

$$XREER_{it} = \sum_{j=1}^{k} \omega_{jt}^{xi} RER_{jt}\, ; \omega_{jt}^{xi} = \frac{\sum_{t-3}^{t-1} ex_{jt}^{i}}{\sum_{j=1}^{k} \sum_{t-3}^{t-1} ex_{jt}^{i}}$$

$$MREER_{it} = \sum_{j=1}^{k} \omega_{jt}^{mi} RER_{jt}\, ; \omega_{jt}^{mi} = \frac{\sum_{t-3}^{t-1} im_{jt}^{i}}{\sum_{j=1}^{k} \sum_{t-3}^{t-1} im_{jt}^{i}}$$

Empirical Equations, Identification

- The same empirical equation as the previous studies((Klein,et al.,2003; Campa & Goldberg, 2001, 2005, ; Moser,et al.,2010; Ekholm,et al.,2012； Berman,et al,2012; Li, et al 2015), to investigate real exchange rate movements impacts on export quality upgrading at industry level, that is,

$$lnQ_{it} = \alpha_0 + \alpha_1 \ln XREER_{it} + \alpha_2 EXPRO_{it-1} * \ln XREER_{it} + \alpha_3 \ln MREER_{it} + \alpha_4 IMS_{it-1} * \ln MREER_{it} + \alpha_5 IMCP_{it-1} * \ln MREER_{it} + \sum_{i=1}^{k} \beta_i X_{it} + \mu_i + \gamma_t + \varepsilon_{it} \quad (21)$$

$$X_{it} = [EXPRO_{it-1}, IMS_{it-1}, IMCP_{it-1}, EXSOE_{it}, EXFOR_{it}, EXHHI_{it}]$$

- Considering that export quality upgrading is time-consuming process, and the long-term exchange rate movement at narrowly defined industry level is more likely to be exogenous to export quality upgrading, the robustness of empirical results estimated using equation(22) are also checked using long term differenced variables following the previous related studies (Amit and Khandewal ,2011； Ekholm, et al., 2012; Bloom, et al., 2015), that is,

Empirical Equations, Identification

$$\Delta \ln Q_{it} = \beta_0 + \beta_1 \Delta \ln XREER_{it} + \beta_2 EXPRO_{it-5} * \Delta \ln XREER_{it} + \beta_3 \Delta \ln MREER_{it}$$
$$+\beta_4 IMS_{it-5} * \Delta \ln MREER_{it} + \beta_5 IMCP_{it-5} * \Delta \ln MREER_{it}$$
$$+\sum_{i=1}^{k} \beta_i \, \Delta X_{it} + \nu_t + \varpi_{it} \qquad (22)$$

For any variable in equation (22),

$$\Delta \ln Z_{it} = \ln Z_{it} - \ln Z_{it-5}$$

Industrial level movements in exchange rates are more likely to be independent from firm specific characteristics. They are mainly yield from national movements in exchange rate and industrial-specific trading patterns. Thus, they are likely to be exogenous to firm behavior (Caballero and Cobo,1989). More importantly, trade weighted REER at industry level is a form of Bartik instrument for exchange rate shocks at macroeconomic level as stressed by recent studies (Goldsmith-Pinkham, Sorkin and Swift, 2019; Adao, Kolesar and Morales, 2018; Borusyak, Hull and Jaravel,2018).

Descriptive Statistics

Table 1 Export Quality Upgrading Index Decomposed by Different Methods in Manufacturing Industries

Method	Period	Within	Between	Cross	Entry	Exit	Between All
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(4) +(5)+(6)-(7)
KSW_FHK	2001-2005	-22.53%	-27.84%	42.87%	27.78%	19.89%	22.93%
	2006-2010	-35.02%	-25.80%	44.02%	30.23%	22.26%	26.18%
	2011-2015	-30.34%	-25.03%	40.83%	29.30%	21.46%	23.64%
KSW_GR	2001-2005	-1.10%	-6.37%		27.80%	19.97%	1.46%
	2006-2010	-12.91%	-3.73%		30.55%	22.45%	4.37%
	2011-2015	-9.89%	-4.67%		29.77%	21.63%	3.47%
		Intensive Margin			Extensive Margin		
BF	2001-2005	0.03%			4.86%		
	2006-2010	0.74%			5.64%		
	2011-2015	0.43%			5.23%		

Note: The statistics is calculated as the average values of export quality decomposition results at HS4 digit industry level.

Figure1 Industry Specific Real Effective Exchange Rate□1999-2016, yr2005==100□

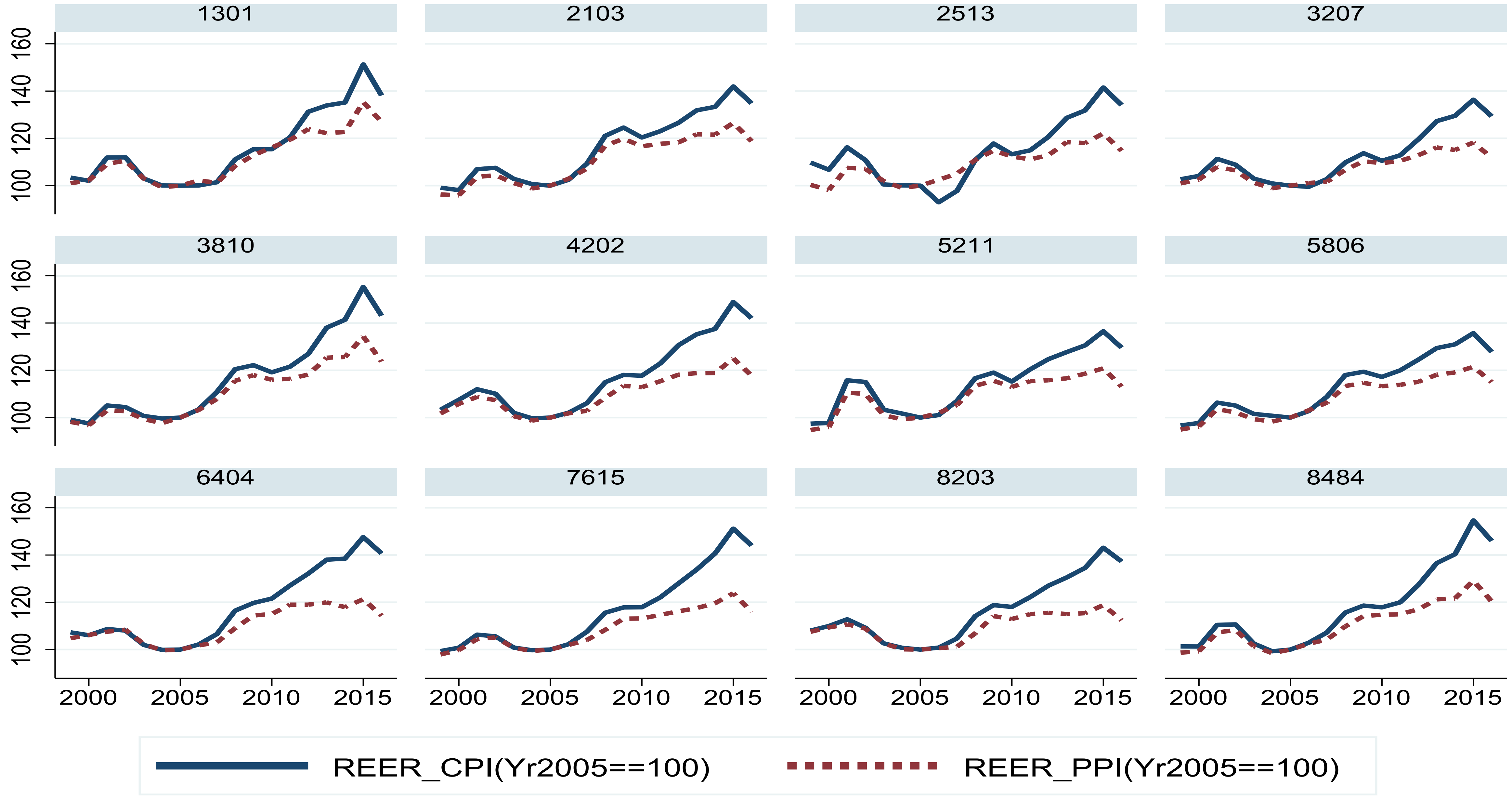

Figure 2 Export & Improt Industry Specific Real Exchange Rate□1999-2016□2005==100□

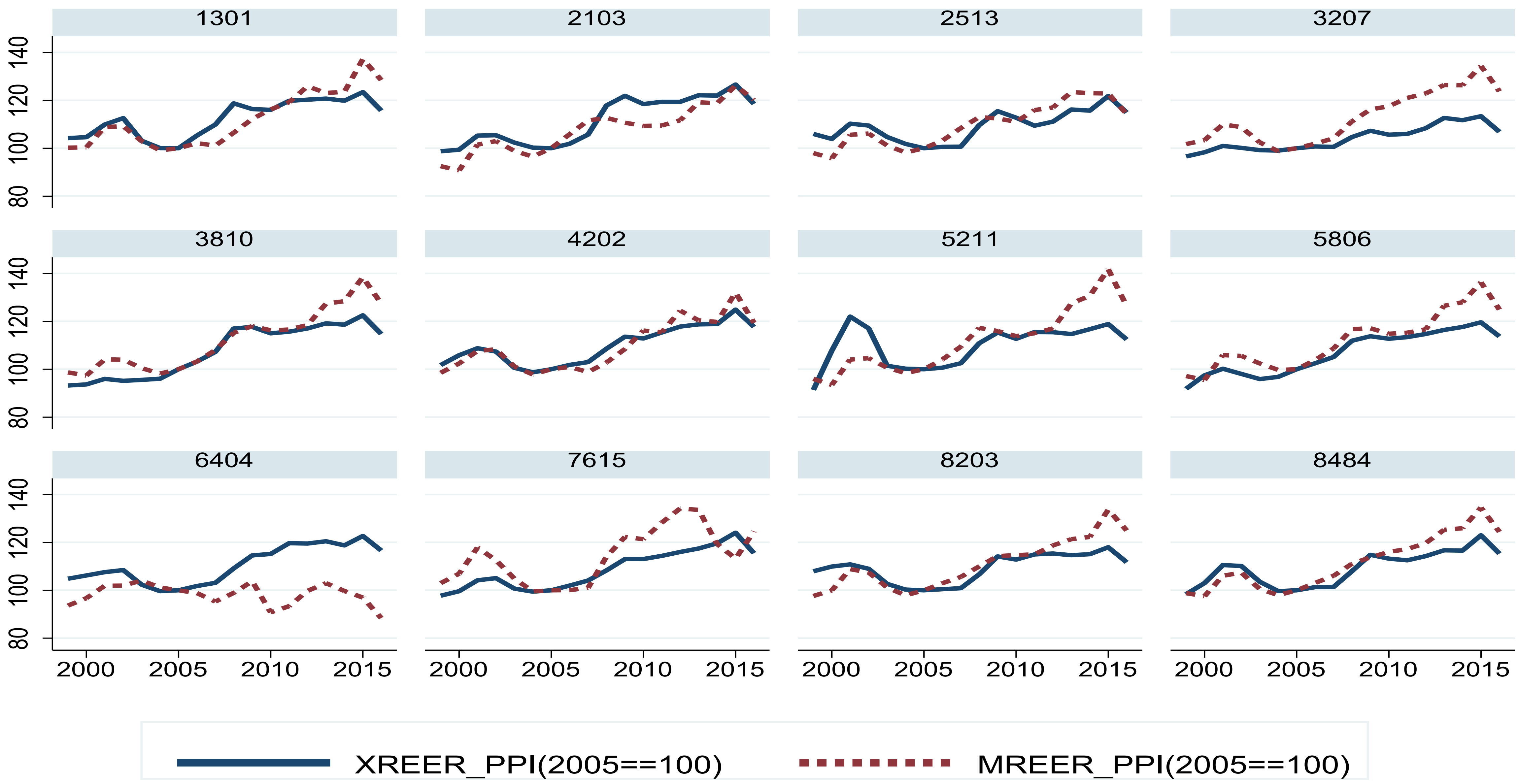

Table 2 Benchmark Estimation of Real Exchange Rate Movements Impact on KSW Export Quality Index

Dependent. Var.	lnQ1	lnQ2	lnQ3	lnQ3	lnQ3	lnQ3
	$\sigma = 5$	$\sigma = 10$	$\sigma(Broda)$	$\sigma(Broda)$	$\sigma(Broda)$	$\sigma(Broda)$
	(1)	(2)	(3)	(4)	(5)	(6)
$\ln(XREER)$	-0.106	-0.103	0.931***	0.984**		
	(0.086)	(0.081)	(0.348)	(0.392)		
$\ln(MREER)$	-0.151*	-0.140*	-0.420**	-0.397*		
	(0.080)	(0.076)	(0.205)	(0.230)		
$\ln(REER)$					0.614*	0.742*
					(0.364)	(0.407)
$\ln(IMP\_COM)$				0.120***		0.121***
				(0.037)		(0.034)
$\ln(EX\_SOE)$				-0.073***		-0.067***
				(0.027)		(0.026)
$\ln(EX\_PRO)$				-0.032**		-0.033**
				(0.014)		(0.013)
$\ln(IM\_Share)$				0.012		0.013
				(0.019)		(0.018)
$\ln(EX\_FOR)$				0.015		0.019
				(0.021)		(0.020)
$\ln(EX\_HHI)$				-0.035		-0.027
				(0.031)		(0.031)
Industry FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Obs.	11,052	11,052	11,052	9,929	11,045	10,108
R-squared	0.004	0.004	0.204	0.219	0.201	0.217
No.of Industries	770	770	770	734	770	739

Notes: Robust Standard Errors Clustered at HS 4 Digit Industry level are in Parenthesis, ***p<0.01, **p<0.05, *p<0.1

Table 3 Robustness Check of Real Exchange Rate Movements Impact on Export Quality Index

Dependent Var.	ΔlnQ	ΔlnQ	ΔlnQ	ΔlnQ
	$\sigma(Broda)$	$\sigma(Broda)$	$\sigma(Broda)$	$\sigma(Broda)$
	(1)	(2)	(3)	(4)
$\Delta\ln(XREER)$	0.750***		0.956***	
	(0.270)		(0.299)	
$\Delta\ln(MREER)$	-0.430***		-0.489***	
	(0.157)		(0.167)	
$\Delta\ln(REER)$		0.450*		0.539*
		(0.264)		(0.301)
$\Delta\ln(IMP\_COM)$			0.100***	0.100***
			(0.029)	(0.029)
$\Delta\ln(EX\_SOE)$			-0.058**	-0.056**
			(0.023)	(0.024)
$\Delta\ln(EX\_PRO)$			-0.026**	-0.027**
			(0.011)	(0.011)
$\Delta\ln(IM\_Share)$			0.011	0.008
			(0.012)	(0.012)
$\Delta\ln(EX\_FOR)$			-0.031	-0.028
			(0.023)	(0.023)
$\Delta\ln(EX\_HHI)$			-0.027	-0.027
			(0.018)	(0.018)
Industry FE	Y	Y	Y	Y
Time FE	Y	Y	Y	Y
Obs.	7,279	7,269	6,457	6,455
R-squared	0.029	0.025	0.048	0.042
No. of Industries	726	726	685	685

Notes: Robust Standard Errors Clustered at HS 4 Digit Industry level are in Parenthesis, ***p<0.01, **p<0.05, *p<0.1

Table 4 REER Movements Impacts on Export Quality and Trade Dependence (Dependent Var. LnQ)

	(1)	(2)	(3)	(4)	(5)	(6)
$\ln(XREER)$	0.955**	1.227***	1.007**	1.124***	1.669***	1.659***
	(0.396)	(0.450)	(0.401)	(0.429)	(0.528)	(0.506)
$\ln(MREER)$	-0.517**	-0.557**	-0.829***	-0.947***	-0.497**	-0.431*
	(0.213)	(0.243)	(0.285)	(0.311)	(0.232)	(0.232)
$L1\_IMP\_COM$	-0.010	-0.017				
	(0.037)	(0.041)				
$\ln(MREER) * L1\_IMP\_COM$	0.003	0.004				
	(0.008)	(0.009)				
$L1\_IM\_Share$			-0.033	-0.060**		
			(0.024)	(0.024)		
$\ln(MREER) * L1\_IM\_Share$			0.007	0.012**		
			(0.005)	(0.005)		
$L1\_EXP\_PRO$					0.075*	0.071
					(0.044)	(0.045)
$\ln(XREER) * L1\_EXP\_PRO$					-0.016*	-0.016
					(0.009)	(0.010)
Covariates	N	Y	N	Y	N	Y
Industry FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
Obs.	10,362	9,393	9,986	9,356	9,675	9,359
R-squared	0.207	0.212	0.209	0.227	0.208	0.221
Industries	770	740	761	735	749	732

Notes：Robust Standard Errors Clustered at HS 4 Digit Industry Level are in Parenthesis, ***p<0.01, **p<0.05, *p<0.1

Table 5 Robustness Check of REER Impacts On Export Quality and Trade Dependence (Dependent Var.Δ lnQ)

	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta\ln(XREER)$	0.747***	0.980***	0.788***	0.882***	1.350***	1.255***
	(0.270)	(0.304)	(0.279)	(0.295)	(0.425)	(0.411)
$\Delta\ln(MREER)$	-0.420***	-0.498***	-0.697***	-0.875***	-0.472***	-0.455***
	(0.163)	(0.178)	(0.223)	(0.231)	(0.179)	(0.168)
IMP_COM_{t-5}	0.001	0.001				
	(0.001)	(0.001)				
$\Delta\ln(MREER) * IMP\_COM_{t-5}$	-0.001	0.000				
	(0.005)	(0.005)				
IM_Share_{t-5}			0.001	0.001*		
			(0.001)	(0.001)		
$\Delta\ln(MREER) * IM\_Share_{t-5}$			0.004	0.006**		
			(0.003)	(0.003)		
EXP_PRO_{t-5}					-0.001	-0.000
					(0.001)	(0.001)
$\Delta\ln(XREER) * EXP\_PRO_{t-5}$					-0.009	-0.007
					(0.007)	(0.007)
Covariates	N	Y	N	Y	N	Y
Industry FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
Obs.	7,279	6,457	6,855	6,403	6,580	6,479
R-squared	0.030	0.039	0.033	0.053	0.035	0.051
Industries.	726	685	699	679	688	679

Notes: Robust Standard Errors Clustered at HS 4 Digit Industry Level are in Parenthesis, ***p<0.01, **p<0.05, *p<0.1

Table 6 REER Movements Impact on Decomposed Export Quality Index

Dependent Var.	WIN	WIN	WIN	BTW	BTW	BTW	Entry	Entry	Exit	Exit
Decom. Method	FHK	GR	GR	FHK	GR	GR	GR	GR	GR	GR
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$\ln(XREER)$	-0.006	-0.046		0.716***	0.606***		0.763***		0.003	
	(0.048)	(0.032)		(0.243)	(0.214)		(0.237)		(0.214)	
$\ln(MREER)$	-0.055*	-0.056**		0.351***	0.262**		0.248*		-0.069	
	(0.033)	(0.026)		(0.131)	(0.114)		(0.141)		(0.074)	
$\ln(REER)$			-0.070**			0.454**		0.686***		0.007
			(0.034)			(0.178)		(0.210)		(0.253)
Covariates	N	N	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Obs.	9,605	9,586	8,651	8,865	8,847	8,843	8,652	8,651	8,652	8,651
R-squared	0.027	0.048	0.074	0.018	0.017	0.016	0.020	0.018	0.014	0.013
No. of Industries	770	766	727	737	734	734	727	727	727	727

Notes：Robust Standard Errors Clustered at HS 4 Digit Industry Level are in Parenthesis, ***p<0.01, **p<0.05, *p<0.1, ***p<0.01,**p<0.05,*p<0.1; WIN is Within Effect of quality upgrading；BTW is Between Effect of quality upgrading ；Entry, Exit represent quality upgrading caused by entry and exit of products within industries.。

Table 7 Robustness Check of REER Movements Impact on Decomposed Export Quality Index

Dependent Var.	ΔWIN	ΔWIN	ΔWIN	ΔBTW	ΔBTW	ΔBTW	ΔEntry	ΔEntry	ΔExit	ΔExit
Decom. Method	FHK	GR	GR	FHK	GR	GR	GR	GR	GR	GR
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$\Delta\ln(XREER)$	-0.146**	-0.142***		0.676**	0.675***		0.870***		-0.092	
	(0.068)	(0.048)		(0.279)	(0.260)		(0.317)		(0.172)	
$\Delta\ln(MREER)$	-0.030	-0.058**		0.386**	0.268*		0.228		-0.013	
	(0.051)	(0.029)		(0.159)	(0.137)		(0.159)		(0.088)	
$\Delta\ln(REER)$			-0.103**			0.676***		0.823***		-0.020
			(0.044)			(0.249)		(0.290)		(0.204)
Covariates	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Obs.	5,158	5,147	5,147	5,160	5,149	5,147	5,149	5,147	5,149	5,147
R-squared	0.043	0.064	0.062	0.023	0.022	0.021	0.025	0.024	0.013	0.013
No. of Industries	665	654	654	665	654	654	654	654	654	654

Notes：Robust Standard Errors Clustered at HS 4 Digit Industry Level are in Parenthesis, ***p<0.01, **p<0.05, *p<0.1; WIN is Within Effect of quality upgrading；BTW is Between Effect of quality upgrading ； Entry, Exit represent quality upgrading caused by entry and exit of products within industries. Δ denotes the long-term differenced operator.

Table 8 REER Movements Impact on BF Export Quality Upgrading Index

Dependent Var.	lnQBF	lnQBF	INTBF	INTBF	EXTBF	EXTBF
	(1)	(2)	(3)	(4)	(5)	(6)
ln $(XREER)$	0.495***		-0.103		0.342*	
	(0.178)		(0.129)		(0.185)	
ln $(MREER)$	-0.121		-0.093**		0.184	
	(0.098)		(0.045)		(0.176)	
ln $(REER)$		0.251		-0.282**		0.611**
		(0.172)		(0.123)		(0.293)
Covariates	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
Obs.	9,253	9,252	8,024	8,692	8,056	8,209
R-squared	0.012	0.011	0.225	0.149	0.011	0.011
No. of Industries	732	732	712	737	715	720

Notes：Robust Standard Errors Clustered at HS 4 Digit Industry Level are in Parenthesis, ***p<0.01, **p<0.05, *p<0.1。QBF is BF export quality upgrading index，INTBF is logged of intensive margin of export quality upgrading index；EXTBF is logged of extensive margin of export quality upgrading index.

Table 9 Robustness Check of REER Movements Impact on BF Export Quality Upgrading Index

Dependent Var.	ΔlnQBF	ΔlnQBF	ΔINTBF	ΔINTBF	ΔEXTBF	ΔEXTBF
	(1)	(2)	(3)	(4)	(5)	(6)
Δln $(XREER)$	0.566**		-0.132		0.394*	
	(0.270)		(0.156)		(0.231)	
Δln $(MREER)$	-0.119		-0.246**		0.348*	
	(0.152)		(0.124)		(0.194)	
Δln $(REER)$		0.233		-0.429**		0.823***
		(0.349)		(0.220)		(0.291)
Covariates	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
Obs.	5,743	5,741	4,675	4,674	4,571	4,571
R-squared	0.010	0.009	0.015	0.016	0.017	0.019
No. of Industries	671	671	647	647	639	639

Notes：Robust Standard Errors Clustered at HS 4 Digit Industry Level are in Parenthesis, ***p<0.01, **p<0.05, *p<0.1。QBF is BF export quality upgrading index，INTBF is logged of intensive margin of export quality upgrading index；EXTBF is logged of extensive margin of export quality upgrading index. Δ is long-term differenced operator.

Table 10 REER Movements Impact on BF Export Quality Upgrading Index and Trade Dependence

Dependent Var.	lnQBF	lnQBF	lnQBF	lnQBF	lnQBF	lnQBF
	(1)	(2)	(3)	(4)	(5)	(6)
$\ln(XREER)$	0.261	0.496***	0.417**	0.483***	0.346*	0.417**
	(0.169)	(0.179)	(0.182)	(0.177)	(0.204)	(0.193)
$\ln(MREER)$	-0.105	-0.124	-0.187	-0.203*	-0.089	-0.142
	(0.097)	(0.100)	(0.118)	(0.111)	(0.095)	(0.098)
IMP_COM_{t-1}	0.009	0.003				
	(0.012)	(0.011)				
$\ln(MREER) * IMP\_COM_{t-1}$	-0.002	-0.001				
	(0.003)	(0.003)				
IM_Share_{t-1}			-0.011*	-0.011*		
			(0.006)	(0.006)		
$\ln(MREER) * IM\_Share_{t-1}$			0.002*	0.002**		
			(0.001)	(0.001)		
EXP_PRO_{t-1}					0.005	-0.007
					(0.016)	(0.015)
$\ln(XREER) * EXP\_PRO_{t-1}$					-0.001	0.001
					(0.003)	(0.003)
Covariates	N	Y	N	Y	N	Y
Industry FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
Obs.	10,285	9,253	9,884	9,253	9,594	9,253
R-squared	0.008	0.012	0.009	0.012	0.007	0.012
No. of Industries	769	732	760	732	747	732

Notes：Robust Standard Errors Clustered at HS 4 Digit Industry Level are in Parenthesis, ***p<0.01, **p<0.05, *p<0.1; QBF is the BF export quality upgrading index.

Conclusion

- An appreciation of export weighted real exchange rate will drive up export quality ; an appreciation of import weighted real exchange rate will depress export quality upgrading.
- The marginal impact of export weighted real exchange rate movements is larger than the marginal impact of import weighted real exchange rate movements.
- The real exchange rate movements impact on export quality upgrading is systematic associated with the import input ratio of manufacturing industries.
- Real exchange rate movements impact on export quality of incumbent products is negative and opposite to those impact on export quality at extensive margin.
- An appreciation will drive export quality upgrading mainly by accelerating the entry and exit of products within industries.