Global Value Chains and the Exchange Rate Elasticity of Exports

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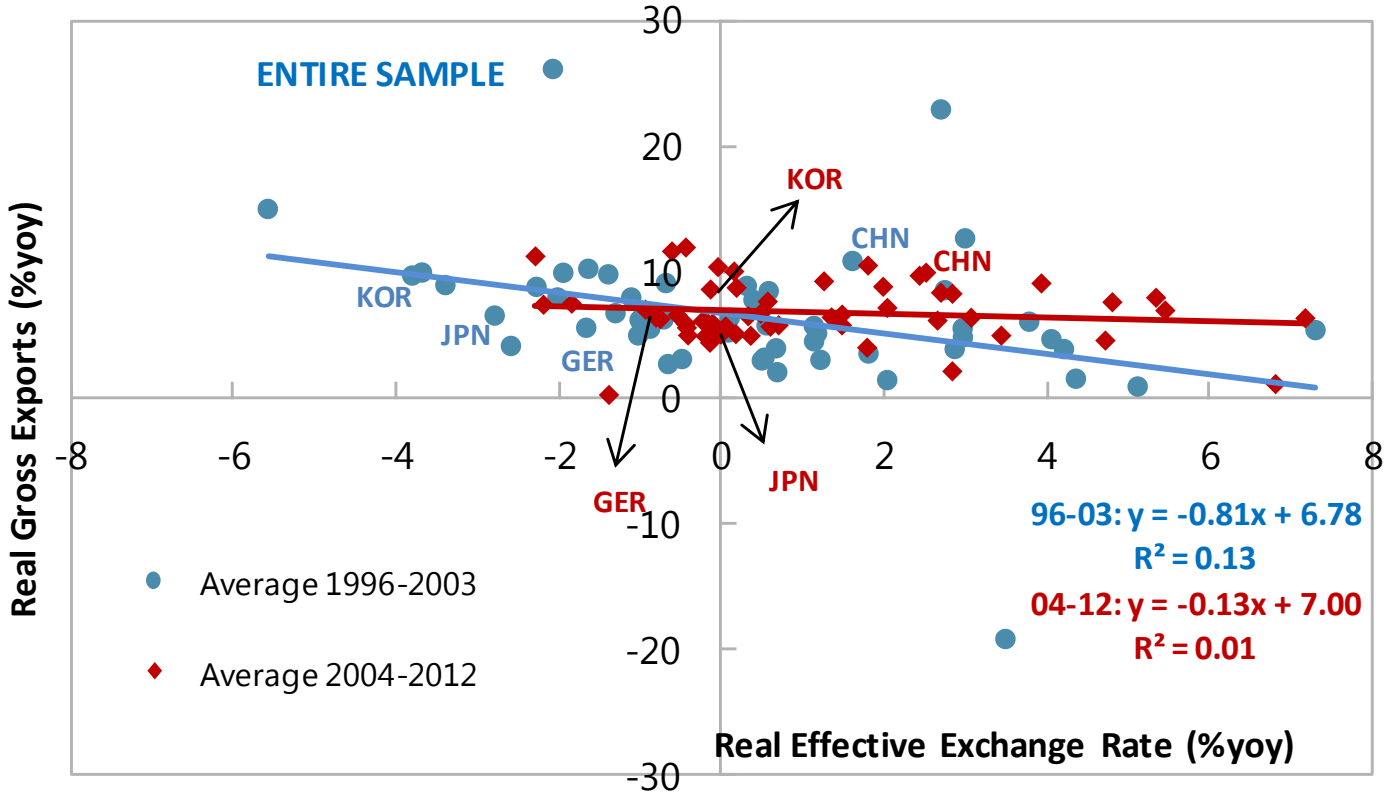
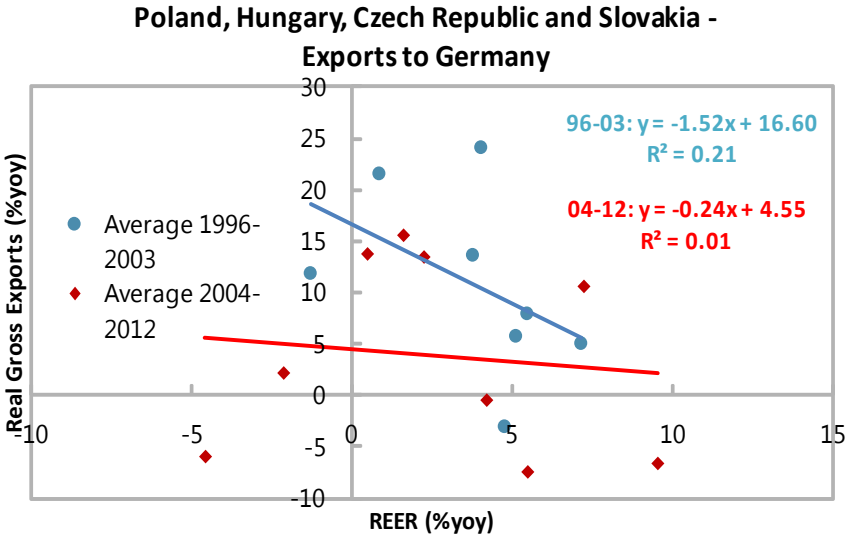
Question and motivation

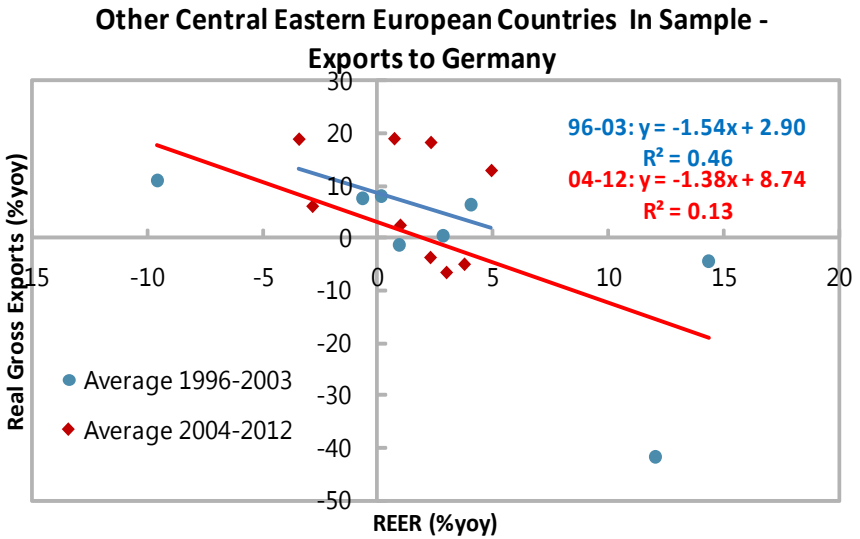


The sensitivity of exports to currency movements appears to have decreased over time

Can the increasing importance of Global Value Chains (GVCs) in production explain the lower REER elasticity?

An illustrative example: German value chains





Following the enlargement of the EU in 2004, German value chains expanded to Poland, Hungary, Czech Republic and Slovakia (IMF, 2014)

Since then, the exchange rate elasticity of these countries' exports appears to have declined, differently from other Central and Eastern European countries

Our answers

- **Reduction of REER Elasticity**
  - Empirical strategy
  - REER elasticity over time

- **Role of GVCs in reducing REER Elasticity**
  - Basic concepts and theoretical hypotheses
  - Regression results using different GVC measures
    - Manufacturing exports
    - Industry level data
    - Regression results using domestic value-added exports and value-added REER (Bayoumi *et al.* 2013, Bems and Johnson, 2013)

Empirical Strategy: Estimating the REER Elasticity of Exports

- Related literature:
  - Rodrik (1986, 2009)
  - Freund and Pierola (2008) & Di Nino, Eichengreen, and Sbracia (2011)
  - Eichengreen and Gupta (2012)

- We use a panel framework to document:
  - The change over time in the REER elasticity of total and of manufacturing exports
  - The extent to which integration in GVCs can explain this change in REER elasticity

- Period of analysis, country coverage and data sources:
  - Data on GVCs are from Duval *et al.* (2014) based on OECD-WTO TiVA database. Coverage: 46 countries, 1995 - 2012

Empirical Strategy: Estimating the REER Elasticity of Exports

- Panel framework using both cross section fixed effects and period fixed effects

$$\Delta Exports_{it} = \alpha + \beta * \Delta REER_{it} + \boldsymbol{\gamma} * controls_{it} + \text{time } FE + \text{country } FE + \varepsilon_{it}$$

  - $\Delta Exports_{it}$ = annual real gross exports growth
  - $\Delta REER_{it}$ = annual real effective exchange rate growth
  - Controls
    - $lnGDP_{it}(-1)$ = lagged GDP expressed in constant US dollar terms
    - $\Delta ForeignGDP_{it}$ = real GDP growth of foreign countries, weighted by export share

REER Elasticity: Manufacturing versus Total Exports

Table 1

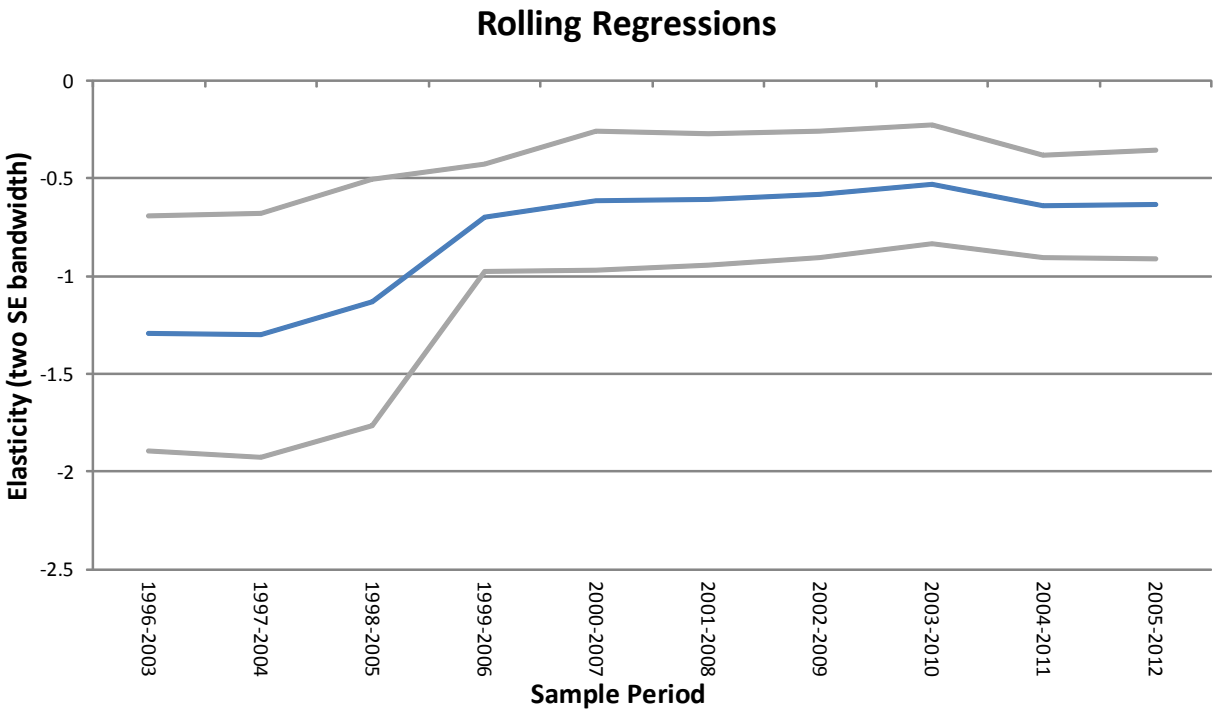
Dependent variable:	Growth of Total Exports from COMTRADE			Growth of Manufacturing Exports from COMTRADE		
	1996-2012	1996-2003	2004-2012	1996-2012	1996-2003	2004-2012
Real Exchange Rate Change	**-1.173** ***	**-1.383** ***	**-0.626** ***	**-1.099** ***	**-1.294** ***	**-0.615** ***
	0.223	0.261	0.094	0.246	0.300	0.120
Lag real GDP	**-1.808**	**-8.155**	**-19.562** ***	**-4.387**	**-15.084**	**-18.643** **
	3.213	19.558	3.460	3.901	21.896	7.579
Foreign real GDP	**1.523**	**1.310**	**1.541** **	**1.374** *	**1.710**	**1.230** ***
	0.969	1.820	0.630	0.797	1.696	0.408
Time Fixed Effects	Y	Y	Y	Y	Y	Y
Country Fixed Effects	Y	Y	Y	Y	Y	Y

Note: *** indicates statistically significant 1%, ** indicates statistically significant at 5%, and * indicates statistically significant at 10%.

Countries included Australia, Austria, Belgium, Brazil, Bulgaria, Canada, Chile, China, Czech Republic, Denmark, Finland, France, Germany, Greece, Hong Kong, Hungary, India, Indonesia, Ireland, Israel, Italy, Japan, Korea, Republic of, Latvia, Luxembourg, Malaysia, Mexico, Netherlands, New Zealand, Norway, Philippines, Poland, Portugal, Romania, Russian Federation, Singapore, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, United Kingdom, United States.

The sensitivity of exports to currency movements decreased over time

REER Elasticity of Manufacturing Exports over Time



Note: These are the slopes on Real Exchange Rate Change estimated for the different samples in the horizontal axis using the regression framework discussed in empirical strategy.

The decline in REER elasticity of manufacturing exports pre-dates the global financial crisis

Possible reasons for lower REER Elasticity

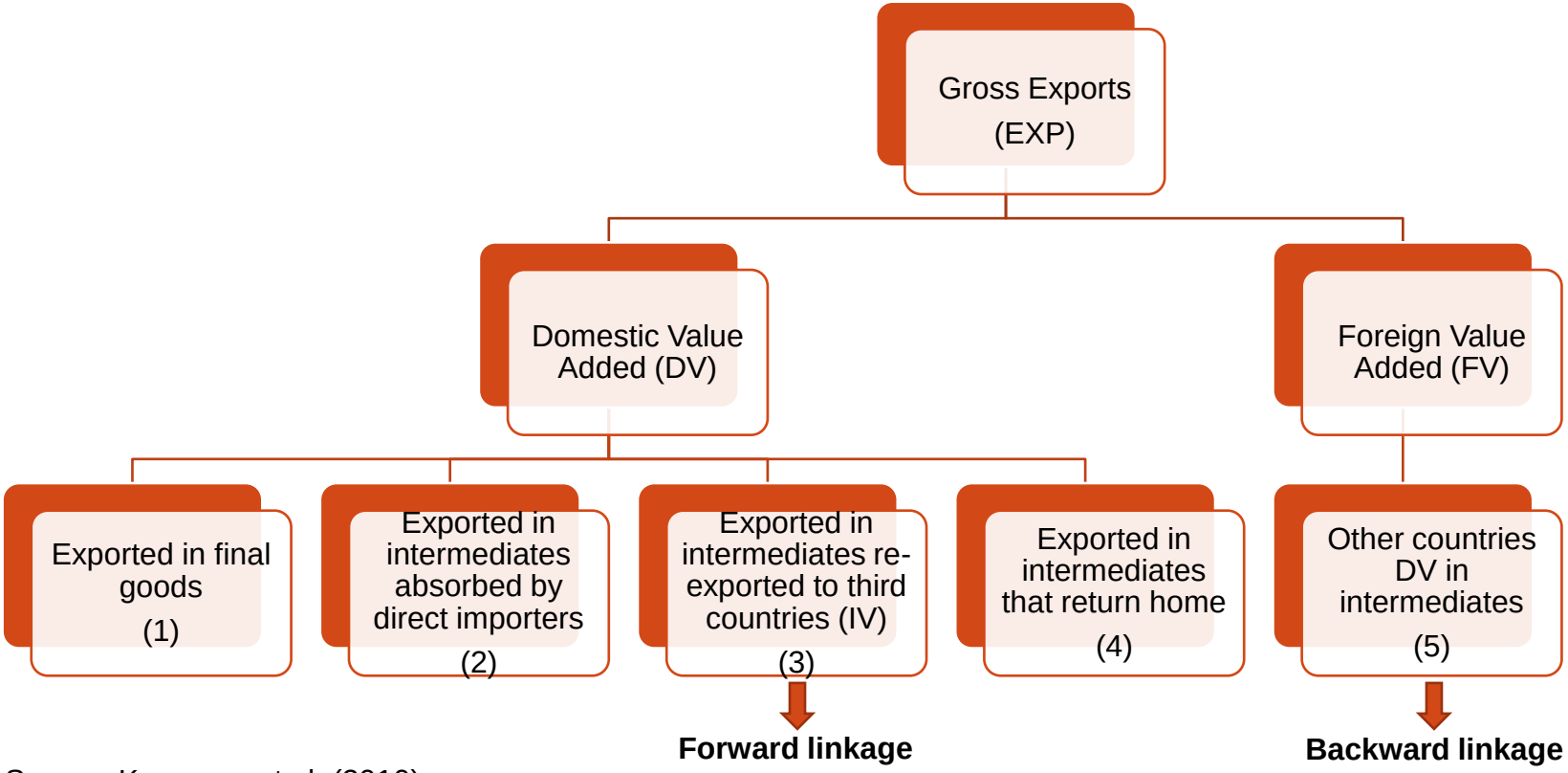
1. **Weak external demand.** Increased uncertainty and changing composition of demand (e.g. investment decline) affect disproportionally complex manufacturing sectors

2. **Slowing down of world trade.** Constantinescu, Mattoo and Ruta (2015) find that the trade income elasticity has declined in part due to structural factors such as slower pace of GVC growth

3. **Behavior of firms.** Berman, Martin and Mayer (2011) find that firms may react to depreciation by increasing significantly more their mark-up and by increasing less their export volume

4. **Protectionism.** If trade partners adopt policies (border and behind-the-border) in response to REER devaluations (e.g. Bown and Crawley, 2012), REER elasticity for input exporters declines

Decomposition of Gross Exports



Source: Koopman et al. (2010)

Key measures of GVC integration:

- GVC_Participation = IV/EXP + FV/EXP
  - GVC_Backward linkages = FV/EXP
  - GVC_Forward linkages = IV/EXP
- GVC_Position = ln (1 + IV/EXP) – ln (1 + FV/EXP)

GVCs and REER Elasticity

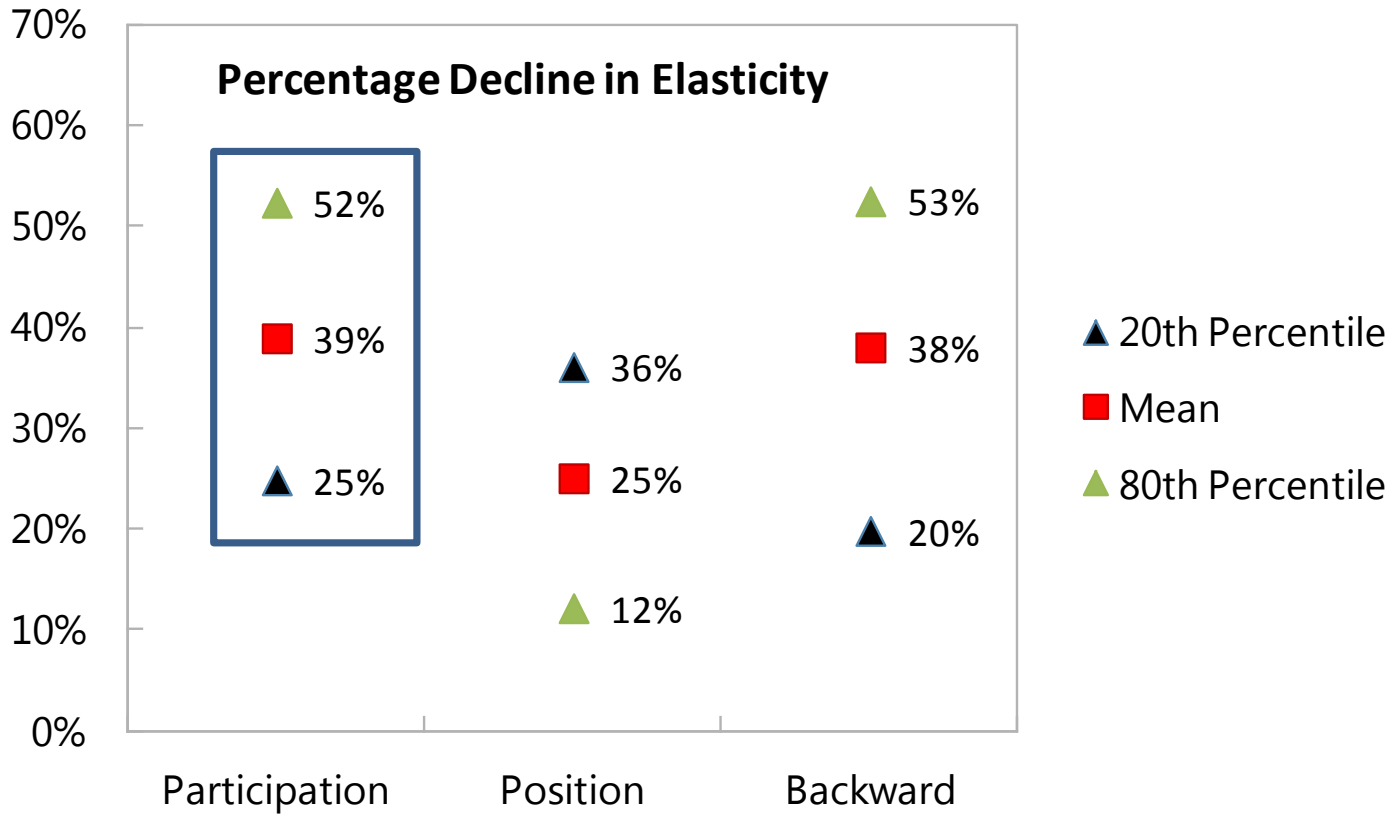
Table 2

Dependent variable:	Growth of Manufacturing Exports from COMTRADE			
	(1)	(2)	(3)	(4)
	Annual data			
Real Exchange Rate Change	**-1.099** ***	**-1.429** ***	**-1.056** ***	**-1.718** ***
	0.246	0.411	0.216	0.609
Real Exchange Rate Change interacted with Participation in GVCs		**0.010** *		
		0.006		
Real Exchange Rate Change interacted with Position in GVCs			**0.177**	
			0.370	
Real Exchange Rate Change interacted with Backward Participation in GVCs				**0.007**
				0.006
Real Exchange Rate Change interacted with Forward Participation in GVCs				**0.041**
				0.032
	5 year average			
Real Exchange Rate Change	**-1.097** ***	**-1.750** ***	**-1.395** ***	**-1.432** ***
	0.238	0.342	0.251	0.222
Real Exchange Rate Change interacted with Participation in GVCs		**0.019** ***		
		0.006		
Real Exchange Rate Change interacted with Position in GVCs			**-1.119** ***	
			0.087	
Real Exchange Rate Change interacted with Backward Participation in GVCs				**0.026** ***
				0.006
Real Exchange Rate Change interacted with Forward Participation in GVCs				**-0.024**
				0.018
All Regressions:				
Lag real GDP and Foreign real GDP	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y
Country Fixed Effects	Y	Y	Y	Y

Note: *** indicates statistically significant 1%, ** indicates statistically significant at 5%, and * indicates statistically significant at 10%.

The grey shaded areas are jointly significant using Wald tests.

Possible Ranges of Elasticity



- Mean GVC participation = 36.1
- Multiply by the corresponding interactive coefficient (0.02)
- Divide by the corresponding REER coefficient (-1.75)
- Estimated elasticity decrease = -(36.1*0.02)/(-1.75) ≈ 40 percent

GVCs and REER Elasticity: Sectoral Analysis

Table 3

Dependent variable:	Growth of Manufacturing Exports from COMTRADE by Industry			
	1996-2011	1996-2003	2004-2011	1996-2011
Real Exchange Rate Change	**-1.356** ***	**-1.593** ***	**-0.699** ***	**-1.515** ***
	0.261	0.303	0.084	0.317
Real Exchange Rate Change interacted with Participation of Industriesin GVCs				**0.041** **
				0.016
Participation				**-1.087** *
				0.586
Lag real GDP	**0.174**	**-10.774**	**-24.578** ***	**0.608**
	5.367	23.771	5.441	5.261
Foreign real GDP	**1.478** **	**1.842** **	**1.228** ***	**1.541** **
	0.721	1.464	0.411	0.748
Time Fixed Effects	Y	Y	Y	Y
Country-Industry Fixed Effects	Y	Y	Y	Y

Note: *** indicates statistically significant 1%, ** indicates statistically significant at 5%, and * indicates statistically significant at 10%.

Countries included Australia, Austria, Belgium, Brazil, Bulgaria, Canada, Chile, China, Czech Republic, Denmark, Finland, France, Germany, Greece, Hong Kong, Hungary, India, Indonesia, Ireland, Israel, Italy, Japan, Korea, Republic of, Latvia, Luxembourg, Malaysia, Mexico, Netherlands, New Zealand, Norway, Philippines, Poland, Portugal, Romania, Russian Federation, Singapore, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, United Kingdom, United States.

Industries included basic metals, chemicals, electrical equipment, food, machinery, textiles, transport equipment and wood products.

Gross versus Value Added Exports

Table 4

Exports of Goods and Services

Independent variable/Dependent Variable	1996-2011	1996-2003	2004-2011
Total Exports/REER	-1.05 ***	-1.22 ***	-0.68 ***
Value Added Exports/ REER in Value Added Terms	-0.17 *	-0.13	-0.24 ***

All Regressions include Time FE, Country FE, Lag real GDP and Foreign real GDP.

Note: *** indicates statistically significant 1%, ** indicates statistically significant at 5%, and * indicates statistically significant at 10%.

Countries included Australia, Austria, Belgium, Brazil, Canada, Chile, China, Denmark, Finland, France, Germany, Greece, Hungary, India, Indonesia, Ireland, Israel, Italy, Japan, Korea, Republic of, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Singapore, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, United Kingdom, United States.

Conclusion

- Exchange rate elasticity of exports has declined over time
- The rise of GVC participation could explain 40 percent of the fall in the elasticity (using average GVC participation)
- Our findings suggest that while currency depreciations can boost exports, their effectiveness does appear to have muted
- Future research should explore alternative channels such as lags of depreciations, differences across GVCs, pricing to market effects, weak external demand, world trade slowdown or protectionism