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Global value chains and trade elasticities

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HIGHLIGHTS

- We investigate whether global value chains have increased the elasticity of trade to foreign income shocks.
- This may occur through a composition and a supply chain effect.
- We use Chinese trade data across industries and customs regimes.
- We find evidence of a composition effect.
- We find no evidence of a supply chain effect.

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ABSTRACT

We investigate whether global value chains have increased the sensitivity of Chinese trade to foreign income shocks. This may occur through either composition or supply chain effects. We find evidence for the former, but not the latter.

1. Introduction

Can the emergence of global value chains (GVCs) explain the documented rise in the income elasticity of global trade (Cheung and Guichard, 2009; Freund, 2009)? Recent studies have highlighted two possible channels through which this may have occurred. Bems et al. (2010) and Eaton et al. (2011) suggest that GVCs have primarily emerged in durable goods sectors, therefore altering the composition of trade. Since durables have higher income elasticities, this has made aggregate trade more sensitive to foreign income shocks (a *composition effect*).

By contrast, Alessandria et al. (2010) argue that characteristics inherent to the structure of global supply chains may cause income elasticities in GVC trade to be higher than for regular trade (a *supply chain effect*). GVCs, for example, require firms to hold disproportionately large inventories of imported inputs. During economic downturns, firms draw down these inventories to maintain production while suspending new purchases of imported inputs. The disproportionate falloff in upstream imports within GVCs can lead to a heightened sensitivity of trade to foreign income shocks.

The relative importance of these two channels remains an unsettled matter (Altomonte and Ottaviano, 2009). Decomposing these effects requires data that distinguish between GVC trade and regular trade, which are difficult to come by. In this paper, we address the issue by exploiting a dataset covering China's trade by customs regime. Using a variant of the workhorse export-demand model, we evaluate the existence of a composition effect and supply chain effect in Chinese exports.

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Table 1
China's exports, by sector, various years.

	HS Codes	Share of total exports		Annualized growth rate	Processing exports share	
		1995	2009	1995–2009	1995	2009
Durables						
Machinery, electrical	84–85	10.1	43.2	32.2	70.2	77.3
Misc. Manufacturing	90–97	6.5	10.8	23.5	50.2	44.0
Metals	72–83	10.4	6.4	15.1	44.5	19.6
Transportation	86–89	2.1	4.2	25.0	77.8	60.9
Stone and glass	68–71	2.3	2.0	18.0	13.1	20.0
Total durables	**68–97**	**31.4**	**66.6**	**25.7**	**53.9**	**63.6**
Non-durables						
Textiles	50–63	28.8	14.6	13.5	41.8	20.8
Non-manufacturing	01–27	20.5	4.6	7.2	11.4	22.8
Chemical and allied industries	28–38	8.1	4.4	14.1	12.1	17.6
Plastics and rubbers	39–40	1.8	3.2	24.3	58.9	59.9
Footwear and headgear	64–67	3.2	3.1	18.9	56.2	39.1
Wood and wood products	44–49	2.6	1.9	16.7	11.8	31.6
Raw hides, skins, leathers & furs	41–43	3.6	1.6	12.4	62.2	25.5
Total non-durables	**01–67**	**68.6**	**33.4**	**13.2**	**30.3**	**26.9**
Total		**100.00**	**100.00**	**19.2**	**37.7**	**51.3**

Notes: Authors' calculations using China Customs Statistics data.

2. Processing versus ordinary trade

Our focus on Chinese trade is pertinent for two reasons. First, similar to aggregate trade, the income elasticity of Chinese exports has risen significantly in the past decades (Aziz and Li, 2008). Second, trade data from China's Customs Statistics allow us to distinguish between trade under the processing trade (PT) regime and ordinary trade (OT) regime. Under PT, firms enjoy duty-free importation of inputs that are used in production, but face restrictions on selling to the domestic market. As a result, firms use it almost exclusively if they rely heavily on imported inputs and export their products, i.e. if they are part of GVCs. Under OT, firms face duties on imported inputs but can sell their output locally. Firms that export under the OT regime, therefore, have more extensive domestic value chains. Two stylized facts back this up. First, processing exports embody less than half as much domestic value-added as ordinary exports (Koopman et al., 2012). Second, in 2009, foreign-invested enterprises dominated PT with an exports share of 84%, while Chinese firms dominated OT with an exports share over 70%.

GVC trade has gained importance in China's exports. As shown in Table 1, the share of processing exports has increased from 38% in 1995 to 51% in 2009. These processing exports are concentrated in rapidly growing durable goods sectors. In 2009, PT accounted for 64% of durable goods exports, but only 27% of non-durable goods exports. As a consequence, the composition of Chinese exports has shifted both to durable goods and GVC trade. Disentangling these two phenomena may help us understand the evolution of China's trade elasticities.

Our paper is related to recent studies that investigate the role of PT in the stability of China's trade elasticities. Cheung et al. (2012) and Thorbecke and Smith (2010) find that aggregate processing exports have a higher income elasticity than aggregate ordinary exports. Both studies acknowledge that this result may be because processing exports contain more capital-intensive goods, which may have higher income elasticities. Our contribution is to specifically assess this possibility by investigating whether PT has a higher income elasticity than OT once we control for composition effects.

3. Data and methods

To estimate China's trade elasticities, we build on the workhorse export-demand model, which relates the demand for exports to foreign income and relative prices (Goldstein and Khan, 1985). We modify the model by adding a supply-side variable to take into account the effect of rapid productivity improvements in China (Chinn, 2010):

$$\Delta \ln x_{rkt} = \alpha + fe_{rk} + \beta \Delta \ln rgdp_{rkt} + \gamma \Delta \ln rer_t + \delta \Delta \ln sup_t + \varepsilon_{rkt}. \quad (1)$$

Here x_{rkt} is real exports under regime r in industry k and at time t; fe_{rk} are industry-regime fixed effects; $rgdp_{rkt}$ is real foreign income under regime r in industry k and at time t; rer_t is the Chinese real exchange rate; and sup_t is a supply-side variable. To avoid spurious results due to non-stationary regressors, we estimate the equation in differenced logarithms (approximately growth rates).[1]

For the dependent variable, we use Chinese annual exports to OECD countries, disaggregated by the twelve sectors identified in Table 1 and by customs regime. We deflate exports using industry-level Hong Kong re-export unit value indexes.

For our foreign income measure, we use the export-weighted real GDP of the OECD countries, where weights equal the share of Chinese exports in industry k and regime r destined for each country. We obtained the real GDP data from the IMF's *International Financial Statistics*.

Due to the poor coverage of export prices for China, we use the IMF's CPI deflated trade-weighted index of the RMB against a broad basket of currencies as a measure of rer_t.

Finally, for our supply-side variable, we use China's total factor productivity (TFP) growth, obtained from the Conference Board's Total Economy Database.

To investigate variations in trade elasticities across sectors and regimes, we estimate the following encompassing export-demand equation:

$$\begin{aligned}\Delta \ln x_{rkt} = {} & \alpha + fe_{rk} + \beta_1 \Delta \ln rgdp_{rkt} + \beta_2 \Delta \ln rgdp_{rkt} * dur_k \\ & + \beta_3 \Delta \ln rgdp_{rkt} * proc_r \\ & + \beta_4 \Delta \ln rgdp_{kt} * dur_k * proc_r + \gamma_1 \Delta \ln rer_t \\ & + \gamma_2 \Delta \ln rer_t * dur + \gamma_3 \Delta \ln rer_t * proc_r \\ & + \gamma_4 \Delta \ln rer_t * dur_k * proc_r + \delta \Delta \ln sup_t + \varepsilon_{rkt} \end{aligned} \quad (2)$$

[1] An alternative approach is to estimate the model in a cointegration framework. In a panel setting, however, estimation of cointegrating relationships is complicated by heteroskedasticity and potential cross-sectional dependence (Bai et al., 2009). In our case, the very short available time series makes evaluation and treatment of these issues difficult.