

Physical Productivity and Exceptional Exporter Performance: Evidence from a Chinese Production Survey

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Motivation

- ▶ Changing nature of manufacturing and international trade has led to an increased fragmentation of the supply chain
- ▶ A particular form of fragmented production is processing trade
 - ▶ Since 2000, at least 18% of exports from developing countries come from processing trade
 - ▶ By 2006, 130 countries had established 3500 export processing zones
 - ▶ China: 50% of exports are processing trade
- ▶ However little is known about the link between firms' performance and the fragmentation of production
 - ▶ Hard to answer because of new measurement issues introduced by the fragmentation of production

This paper

- ▶ We investigate whether firm's performance (productivity) is affected by participating in a fragmented production network
 - ▶ We study the role of processing trade and its pricing implications on firm-level productivity using a unique combination of datasets from China
 - ▶ We provide evidence of a large bias toward firms engaged into processing trade, mostly explained by prices differences
- ▶ We show that
 - ▶ Exporters have higher physical productivity but not necessarily higher revenue productivity
 - ▶ Exporters charge lower prices
 - ▶ Those effects are mostly driven by processing trade
- ▶ This suggests that it is important to take into account the type of trade transactions firms have with their foreign buyers

Productivity estimation and pricing heterogeneity

- ▶ To estimate productivity, most researchers use revenues as a proxy for the output firms produce
- ▶ While revenues is a function of output, it also depends on output price ($R_{it} = P_{it}Q_{it}$)
- ▶ If firms price differently, estimating TFP using revenues (TFPR) will lead to an "output price bias"
 - ▶ TFPR will be a combination of technical efficiency and demand
- ▶ Solution proposed in the literature is to use quantity for output instead of revenues (TFPQ)
 - ▶ Easy to implement for single products firms (e.g. Foster et al. (2008))
 - ▶ More complicated for multi product firms (e.g. de Loecker et al. (2016), Dhyne et al. (2017))

Productivity estimation and pricing heterogeneity

- ▶ A similar story holds for inputs, especially materials
 - ▶ If firms buy materials at different prices, their measured productivity will also reflect those input prices differences
- ▶ Solution proposed in the literature is to find a proxy for input prices
 - ▶ Augment the usual productivity estimation by adding a function of output prices and market share in the control function (de Loecker et al. (2016))
- ▶ The price bias on both the output and input side has been shown to seriously affect estimates of productivity
- ▶ The problem may be even more severe for firms involved in different modes of trade, especially processing trade
 - ▶ Systematic differences between modes of export, technical efficiency and pricing
 - ▶ E.g. selection into processing, product market competition, provision/purchase of inputs under certain conditions, network externalities

China development policy and institutions

- ▶ Offshoring to China encouraged through processing trade
 - ▶ Specific type of institution where goods are assembled from inputs which are exempted from tariffs (FTZs)
- ▶ Several modes of processing trade
 - ▶ Supplier is freely provided the inputs by the buyer
 - ▶ Supplier acquires the inputs himself
- ▶ Different types of firms cohabit in the same product market
 - ▶ Regular trade
 - ▶ Processing trade
 - ▶ Combination of both (hybrid)
- ▶ Those types of firms may exhibit very different level of efficiency as well as different pricing policy

Empirical strategy

- ▶ Estimate TFPR and TFPQ for Chinese firms engaged in various mode of exports
- ▶ Rely on most recent methods to address potential biases in TFP estimations
 - ▶ Simultaneity bias: Wooldridge LP estimator
 - ▶ Input price bias: de Loecker et al. (2016)
 - ▶ Use translog functional form for flexibility
- ▶ Relate differences between TFPR and TFPQ to output pricing differences

Related literature

- ▶ A few papers have investigated the link between revenue productivity and exporting for Chinese firms
 - ▶ Lu (2010) documents a negative premium for Chinese exporters
 - ▶ Lu et al. (2010) associate the negative export premium to the role of multinationals
 - ▶ Dai et al. (2016) associate the negative export premium to the role of processing trade
- ▶ Previous papers focus only on TFPR
 - ▶ We compare TFPR and TFPQ for exporters and firms involved in processing trade
 - ▶ We show that the previous result reverses while taking into account prices differences

Data

- ▶ Balance sheets
 - ▶ NBSC, 2000-2006
 - ▶ Sales, materials, capital, labor, ownership, location
 - ▶ 186,000 manufacturing firms
- ▶ Production data
 - ▶ NBSC, 2000-2006
 - ▶ Quantity produced
 - ▶ Firm-product survey for 800 most important products
 - ▶ 100,000 manufacturing firms
 - ▶ Match on firm ID with balance sheets
- ▶ Trade
 - ▶ Chinese Customs Transaction Statistics, 2000-2006
 - ▶ Firm-product transactions data at HS8
 - ▶ Transaction mode: processing trade, only ordinary trade or a mix of the two (hybrid trade)
 - ▶ Merge with other datasets based on firm name and contact information (Wang and Yu, 2012)

Sampling strategy

- ▶ Chinese product classification is more aggregated than usual (roughly corresponds to HS6)
 - ▶ Products: "main industrial products" as defined by the Chinese government at the country level
 - ▶ Some products are reported some years, other not
- ▶ Our strategy is to identify products
 - ▶ Reported consistently over the years
 - ▶ Where most firms are single-product
 - ▶ With very little carry along trade
 - ▶ Dominated by Chinese firms
 - ▶ That are export oriented
 - ▶ Where processing trade widely used
- ▶ Focus on leather shoes (shirts, suits)

Getting a proxy for price

- ▶ We know physical quantity by product but not revenue (from production survey)
- ▶ For single product firms, we know firm revenue (from balance sheets)
- ▶ Dividing revenue by quantity is a good proxy for price if little revenue comes from other sources (CAT or services)
- ▶ Good assumption for leather shoes

The Link between TFPR, TFPQ and Exporting

Wooldridge LP, Translog, with price correction					
	TFPR		TFPQ		Price
Exporter	-0.020*** (0.007)	0.001 (0.008)	0.209*** (0.028)	0.087*** (0.023)	-0.085*** (0.023)
Log firm size	0.022*** (0.003)	0.018*** (0.004)	-0.106*** (0.011)	-0.106*** (0.010)	0.123*** (0.011)
Years dummies	x	x	x	x	x
Location and ownership controls		x		x	x
N	3,754	3,731	3,754	3,731	3,731

The Link between TFPR, TFPQ and Exporting

- ▶ Without controls
 - ▶ TFPR lower for exporters (as found in other studies) but TFPQ higher
 - ▶ Very large price differences of 23%
- ▶ Controlling for ownership and location
 - ▶ Exporters are no different than domestic firms in TFPR but exhibit premium in TFPQ
 - ▶ Price differences of 9%
- ▶ $\text{corr}(TFPR_{it}, p_{it}) > 0$ but $\text{corr}(TFPQ_{it}, p_{it}) < 0$
- ▶ Important to control for location and ownership

The Link between TFPR, TFPQ and Modes of Exports

Wooldridge LP, Translog, with price correction					
	TFPR		TFPQ		Price
Ordinary trade	-0.030*** (0.009)	-0.012 (0.010)	0.236*** (0.039)	-0.014 (0.033)	0.001 (0.033)
Processing trade	-0.037*** (0.013)	0.050*** (0.018)	0.333*** (0.053)	0.148*** (0.057)	-0.099* (0.058)
Hybrid trade	0.021* (0.011)	0.038*** (0.014)	0.051 (0.045)	0.043 (0.043)	-0.006 (0.044)
Log firm size	0.022*** (0.003)	0.018*** (0.004)	-0.106*** (0.011)	-0.104*** (0.013)	0.120*** (0.013)
Years fixed effects	x	x	x	x	x
Location and ownership controls		x		x	x
N	2,558	2,548	2,558	2,548	2,548

The Link between TFPR, TFPQ and Modes of Exports

- ▶ Systematic differences between the effect of mode of trade on TFPR vs. TFPQ
 - ▶ TFPR underestimates the effect of various modes of trade
 - ▶ Bias is especially serious for processing trade
- ▶ Using TFPR, processing trade is associated with 5% productivity gains, while using TFPQ, it is associated with 15% productivity gains
- ▶ Pricing differences explain the discrepancy between those two effects
- ▶ While processing trade is marginally more efficient than hybrid trade when using TFPR, differences are large when using TFPQ

Four additional facts: FDI, export prices, imports and ownership

1. Export prices correlate highly with our price proxy
2. Processing trade is associated with lower export prices (9%)
3. The share of imports going to processing trade is 95% in value but 61% in the number of transactions
4. Processing trade firms are more likely to be owned by foreigners (FDI more likely than JVs or domestically private)

Conclusion

- ▶ Firms' performance is affected by participating in a fragmented production network
 - ▶ We provide evidence of a large bias toward firms engaged into processing trade
 - ▶ In the Chinese footwear industry, exporters are not less efficient; they price differently, which is reflected by large differences between TFP_R and TFP_Q
- ▶ This suggests it is important to take into account the type of trade relationships firms have with their foreign buyers
- ▶ Next steps
 - ▶ Generalize to other products
 - ▶ Seriously model fragmented production network in the production function