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Export Upgrading and Growth: The Prerequisite of Domestic Embeddedness

SANDRA PONCET
Paris School of Economics - Université Paris 1 Panthéon-Sorbonne and CEPII, 106 Boulevard de l'Hôpital, 75013 Paris, France

and

FELIPE STAROSTA DE WALDEMAR *
Université Paris 1 Panthéon-Sorbonne, 106 Boulevard de l'Hôpital, 75013 Paris, France

Summary. — Our work contributes to the literature relating output structure and economic development by showing that growth gains from upgrading are not unconditional. Relying on data from a panel of Chinese cities, we show that the level of capabilities available to domestic firms operating in ordinary trade is an important driver of economic growth. However, no direct gains emanate from the complexity of goods produced by either processing-trade activities or foreign firms. This suggests that the sources of product upgrading matter, and that domestic embeddedness is key in order for capacity building and technology adoption to be growth enhancing.

Key words — economic complexity, export upgrading, FDI, processing trade, growth, China

1. INTRODUCTION

Recent empirical work has put structural transformation back to the forefront of the understanding of economic growth (Hausmann & Hidalgo, 2011). Differences in countries' ability to upgrade their production and diversify into complex goods appear to explain why they take off or remain poor (McMillan & Rodrik, 2011). According to Hidalgo and Hausmann's theory of capabilities, a country's capacity to grow resides in the diversity of its available capabilities. Numerous and exclusive capabilities are required to move toward new activities associated with higher productivity levels.[1] A by now well-established empirical result is that countries specializing in more sophisticated goods subsequently grow faster (Hausmann, Hwang, & Rodrik, 2007; Hidalgo & Hausmann, 2009; Rodrik, 2006). This result has logically revived the question of which policy measures can help countries to produce these higher productivity goods.

The attraction of FDI inflows has often been contemplated as one powerful tool to promote quality upgrades to the country product structure. The first channel is direct since the quality of goods produced by foreign-invested firms is typically higher than those previously exported by domestic firms in the host country (Iacovone & Javorcik, 2010; Wang & Wei, 2010).[2] Second, the presence of multinationals may facilitate the product upgrading of domestic firms through various spillovers. Similar theoretical arguments apply to the promotion of processing trade, which involves the assembly of imported inputs into a final good for export. Apart from the direct effect of producing more sophisticated goods, processing trade may generate knowledge spillovers within firms[3] and between firms. However there are a number of factors which may undermine these potential technological spillovers in practice, especially in the context of developing countries (Crespo & Fontoura, 2007). Technology diffusion and adoption may fail to come about due to limited domestic absorption capacity or in the absence of substantial and well-directed technological efforts by foreign and domestic firms (Lall, 1992, 2001). An additional related impediment is that foreign technologies may not be appropriate to the economic and social conditions of developing countries (Basu & Weil, 1998). The available empirical literature on spillovers from FDI reflects this theoretical ambiguity and finds mixed results (Blomström, Kokko, & Globerman, 2001; Görg & Strobl, 2001). The absence of the expected spillovers has important repercussions on the sophistication–growth nexus: the apparent upgrading of a country's exports could be a statistical mirage. This could only reflect the advances of foreign firms or processed inputs and not signal any enhanced capacity to produce (and export) more complex products by domestic firms. In this case the growth benefits could be zero.

This paper argues that the sources of product upgrading matter and that domestic embeddedness is key for capacity building and technology adoption to be growth enhancing. Our empirical results suggest that China's approach to internationalization based on the confinement of foreign investment in tax-favored special economic zones and in processing trade activities has prevented the capabilities of foreign firms from being growth-enhancing. Our work contributes to the literature relating output structure and economic development by showing that the growth gains from upgrading are not unconditional. Relying on data from a panel of

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Chinese cities, we show that there are no direct gains from the complexity of goods produced by either processing-trade activities or foreign firms. Our results are in line with Jarreau and Poncet (2012) who find that the growth enhancement from export sophistication is limited to the ordinary export activities undertaken by domestic firms. Our approach is different in two respects: first, we depart from the cross-section analysis of city performance and rely on panel data estimates which have the advantage of mitigating the omitted-variables problem via fixed effects. We also rely on a series of robustness checks to ensure that our results are not driven by measurement or endogeneity biases, including long difference in cross-section, first difference and GMM-system estimators. Second, upgrading is measured using the newest Hidalgo and Hausmann (2009) indicator of economic complexity instead of Hausmann *et al.*'s (2007) measure of the income level of an export basket. The economic complexity variable aims to capture the number and exclusivity of locally-available capabilities. It is calculated using the method of reflections developed by Hidalgo and Hausmann (2009) so as to answer the criticism addressed to the circularity of the Hausmann *et al.* (2007) measure of export sophistication (Felipe, Kumar, Abdon, & Bacate, 2012). The problem with export sophistication is that it is measured by comparison to the income level of countries with similar export structures, mechanically leading to the circular conclusion that "rich countries export rich-country products." By contrast, Hidalgo and Hausmann's (2009) economic complexity measure separates information on income from that on the network structure of countries and the products they export.

We compute economic complexity for a panel of over 200 Chinese cities and show that it is a much more robust determinant of economic growth than is export sophistication. When jointly included in a growth regression, export sophistication becomes insignificant while economic complexity is positively and significantly associated with faster subsequent GDP per capita growth. Our results hence confirm, in the context of a panel of cities within one single country (China), Hidalgo and Hausmann's (2009) prediction that deviations from the correlation between economic complexity and income are good predictors of future growth. We find that locations with productive structures geared toward complex products enjoy higher subsequent economic growth, controlling for the level of income. We do however show that the result pertains exclusively to the capabilities of firms which are well-embedded in the local economy. As our data differentiate between processing and ordinary trade separately for domestic and foreign-owned firms, we are able to compute the growth benefits for those four respective categories of export upgrading. The research here hence further contributes to the literature in two different ways.

We first add insights into the potential role of processing trade and FDI in development strategies. These confirm existing results on the effectiveness of China's FDI-reliant industrial and trade strategy. For instance, Wang and Wei (2010) find that neither processing trade nor foreign-invested firms can explain the increased overlap in the export structure between China and high-income countries. [4] Our result that economic complexity only boosts growth if it is locally embedded is in line with the suggestion in Wang and Wei (2010) that the key to China's evolving export structure is human-capital accumulation and favorable government policies such as tax-favored high-tech zones. This casts doubt on the capacity of China (as well as developing countries in general) to successfully build up their own growth-enhancing capabilities through technology acquisition via assembling activities and foreign investment. Our message is thus consistent with the observation made by Fu, Pietrobelli, and Soete (2011) regarding developing countries, that international technology diffusion does not unconditionally follow from globalization and liberal trade regimes. As shown by Lall (2003), the expected gains via technological transfers from FDI-based strategies do not materialize systematically. They instead require a complex mix of indigenous innovation efforts and the presence of appropriate institutions and innovation systems. In the case of China, we interpret our results as evidence that structural and geographical disconnections between ordinary activities and those based on imported technology and foreign affiliates can impede technological diffusion. Similar arguments are brought up in the literature (Blonigen & Ma, 2007; Hale & Long, 2011; Lemoine & Unal-Kesenci, 2004) to explain the limited impact of assembly trade on local production and the absence of FDI spillovers on the productivity of Chinese domestic firms. Chinese authorities have adopted an "enclave" approach to internationalization, confining foreign investment and processing activities to special economic zones dedicated to export development. Our findings suggest that this deliberate choice, by limiting local embeddedness, has reduced potential spillovers and hampered the emergence of growth gains from processing and foreign activities.

Our results further contribute to the literature highlighting the specificity of processing trade. Recent empirical evidence has emphasized, most often in the context of China, that processing trade is a different activity from nonprocessing trade (Dai, Maitra, & Yu, 2011; Manova & Yu, 2012). [5] Our finding of a relationship between export upgrading and economic growth which depends on whether capabilities are embedded in processing activities further confirms that distinguishing between processing and ordinary exporters is crucial for our understanding of trade performance and growth potential. This would also seem to confirm the claims that processing trade systematically upwardly distorts the "true" level of Chinese export sophistication (Amiti & Freund, 2010; Van Assche & Gangnes, 2010; Yao, 2009). Our results here suggest that the upgrading of ordinary export activities by domestic firms is the key indicator of the genuine adoption of technology at the local level and to predict benefits in terms of economic growth.

The remainder of the paper is structured as follows. In the next section we set out our measure of complexity and the datasets used. Section 3 then presents our empirical approach, results and robustness checks. Last, Section 4 concludes.

2. DATA AND MAIN VARIABLES

(a) *Product complexity*

Following the literature on economic complexity (or sophistication), we calculate a location's complexity as a weighted average of the complexity of the products it exports. The weighting reflects the relative importance of each product in the local export basket. The capacity of a locality to export many complex products is considered to be indirect evidence of the available local capabilities. The direct determination of intrinsic product features (the technology embedded in it, the specialized skills required to produce it, R&D investments, and so on) is difficult, especially at a very detailed level. [6] Most indicators (Hausmann *et al.*, 2007; Hidalgo & Hausmann, 2009) instead infer the complexity of the products from observed worldwide trade patterns.

Hausmann *et al.* (2007) identify sophisticated goods as those requiring greater levels of development to be exported. [7] They capture the sophistication level (they call it "productivity") of a good k by reference to the income level of the countries