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The connection between imported intermediate inputs and exports: Evidence from Chinese firms☆

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ABSTRACT

We use Chinese manufacturing firm data to estimate the causal effect of increased imported intermediate input use on firm export outcomes. To account for the endogeneity of import decisions, we pursue an IV strategy that utilizes instruments for import costs connected to intermediate input import tariffs, exchange rates, and firm differences in fixed trade costs. We find that firms that expanded their intermediate input imports expanded the volume and scope of their exports. Further, we find that the benefit of imported inputs differed along a number of dimensions including initial trade status, import source country, export destination, firm ownership, and industry R&D intensity. Although increased imports of intermediates boosted exports by all firms, we find that the effects were largest when they were purchased by private firms or firms that started out as non-traders. In addition, intermediate inputs from the higher-income G7 countries were especially helpful in facilitating firm exports to the presumably more-demanding G7 export markets. Taken together, these results suggest that product upgrading facilitated by technology or quality embedded in imported inputs helped Chinese firms to increase the scale and breadth of their participation in export markets.

1. Introduction

It is widely believed that China's WTO entry, with its promised market opportunities and guarantees, spurred the exceptional growth in China's exports. However, much less noted is the fact that China's imports grew almost as rapidly as China's exports. Indeed, in 2002 — China's first full year as a WTO member — China's imports of intermediate inputs by manufacturing firms grew at a rate (58.3%) that exceeded its rate of manufacturing export growth (47.7%). Thus, while the rapid growth of China's imports and exports might be uncorrelated, the coincidence of these trends raises an important question. How has increased use of imported intermediate inputs contributed to Chinese firms' improved export participation and performance?

In general, the benefit of utilizing a variety of inputs is well-known. The seminal work by Ethier (1982) rigorously but simply demonstrated the benefits of input variety arising from the finer division of labor. The empirical relevance of this theoretical insight has been supported by Amiti and Konings (2007), Goldberg et al. (2010), Lileeva and Trefler (2010), Yu (2013), and Gopinath and Neiman (2013), who have demonstrated how imported inputs enhance firm productivity. Further, aggregate level evidence from Acharya and Keller (2009) and micro level evidence from Halpern et al. (2015), Kugler and Verhoogen (2009), Bas and Strauss-Kahn (2014) and Fan et al. (2015) recognizes the role of imported intermediates in facilitating firm improvements as firms avail themselves of new technologies embodied in the inputs.

Nonetheless, the literature to date has paid more limited attention to the effect of imported inputs on firm export decisions. For example, while research on firm productivity has noted that importing and exporting firms are more productive than non-trading firms, study is needed to determine whether the connection between imports and

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exports is causal, rather than a joint byproduct of firm productivity in a heterogeneous firm setting.[3] To advance this literature, our paper studies the causal effect of firm-level intermediate input imports on firm-level export outcomes. To do this, we track the activities of Chinese manufacturing firms between 2002 and 2006. We rely on exogenous changes in the relative costs of foreign inputs, including intermediate input import tariff changes, exchange rate movements, and firm-specific differences in fixed trade costs, to instrument for firm changes in the use of imported inputs, thus identifying the causal effect of increased use of imported intermediate inputs on firm export performance.

Our analysis reveals a number of robust links between firm-level imports and exports. First, we find that Chinese firms that increased their use of imported intermediates increased their exports, an effect we observe whether firm import activity is measured by firm transition to import, increased expenditure on imported inputs, or an expanded range of imported inputs. Further, the effects are economically significant. For example, our full sample IV estimates demonstrate that a 1% increase in the value of imported inputs boosted a firm's export value by 1.6%.

Second, even when firms face equal costs of import, the use of imported inputs may yield heterogeneous benefits. In particular, if the technology and quality embedded in imported inputs are primary drivers of the trade connection, imported inputs may have provided the largest benefits to firms whose capabilities were more distant from the technological or quality frontier. Thus, firms' responses to new import opportunities may depend on their previous trade decisions, current level of trade engagement or their organizational form.[4] For this reason, we first delineate the responses for two key firm subgroups based on the firms' trade involvement at the start of the sample: non-traders who were uninvolved in export or import, and traders who were involved in both import and export from the beginning. We find that increased import has a positive and significant effect on export by both firm groups, though the strongest effects involve firms that started as non-traders. We then study how the strength of the firm-level import–export connections was related to ownership, finding that private firms experienced stronger benefits from importing than did state-owned enterprises, or firms controlled by foreign owners. This difference is economically meaningful, as the benefit experienced by private firms is always 20% or greater in magnitude than the benefit experienced by foreign-owned firms.

Finally, to gain further insights into the mechanisms linking firm import expansion to firm export growth, we compare the benefits of imported inputs by source country as they relate to the export destinations and industry-level R&D intensity. In particular, if improved access to imported inputs enables firms to upgrade their products for export and to increase their range of exported products, we expect that imported inputs from technologically developed countries will provide the strongest benefits to exports to more-demanding high-income destinations, and that the benefits will be largest for firms operating in sectors which are most technologically dependent. In support of the technological conjecture, we document that imported inputs from high-income countries had the greatest effect in boosting firm exports to customers in high-income destinations, and the strongest effects were for firms which were active in the most R&D-intensive sectors.

Our paper contributes to a number of literatures. First, our work advances the literature on trade liberalization and firm outcomes by establishing a more direct connection between imported input use and firm exports. The possibility of such a connection is suggested by previous work such as Amiti and Konings (2007), Kasahara and Lapham (2013), Goldberg et al. (2010), Bas (2012) and Bas and Strauss-Kahn (2014), which note a connection between industry-level tariff liberalization, imported inputs and firm productivity, though their projects do not include firm-level information on imported intermediates. A connection is also suggested by Damijan et al. (2014) who uncover an association between Slovenian firms' imports and firm export scope, and by Damijan and Kostev (2010) who note a relation between Spanish firms' imports and their entry into export. We are able to evaluate this question more directly since we identify causal effects through the application of an instrumental variables approach to detailed Chinese firm-level import data. While there are a number of similarities between our project and the work of Fan et al. (2015), who demonstrate the importance of imported intermediates for firms that were already importers, our work provides an extended perspective by investigating the effects for a broader range of firms, the majority of whom did not begin as importers.

Our work also contributes to the recent literature on quality heterogeneity and trade. For example, observation of firm-level data from a number of countries has revealed marked variation in product unit values across export destinations. Consistent with a quality explanation, many of these projects, including Manova and Zhang (2012a, 2012b), Bastos and Silva (2010), Görg et al. (2010) and Martin (2012), who present firm product export prices for Chinese, Portuguese, Hungarian and French firms, respectively, demonstrate that export product prices are increasing in destination country GDP per capita. More important, in addition to the cross-sectional correlation between export prices and destination country income, other projects have shown how demand shocks have led firms to change their product quality. Among these projects, Verhoogen (2008) shows how competition introduced by currency shocks caused Mexican firms to improve product quality, while Amiti and Khandelwal (2013) provide evidence from US import data which suggests that firms upgraded their product quality when tariff reductions in their home markets increased the competition in their domestic market. Moreover, import-led quality upgrading by Chinese firms is particularly plausible given Manova and Zhang's (2012a, 2012b) observation that Chinese firm export prices were higher for firms that procured higher priced inputs, and Bastos et al.'s (2014) work with Portuguese firm data, which shows that an exogenous increase in the average destination market income caused firms to export higher priced goods, and to use higher-cost inputs. Since our analysis finds that the export expansion benefits of intermediate input imports from high-income developed countries were particularly strong in the case of high-income destined export markets, particularly for Chinese firms in R&D-intensive sectors, our results suggest that intermediate input imports supported quality upgrading.[5]

Our results also provide insights into the nature of technological diffusion. In particular, while the literature has long shown that international R&D spillovers are related to imports, the presence of firm identifiers in our data set allows us to verify that the benefits of imported inputs accrued disproportionately to private Chinese firms, who were at a technological disadvantage, rather than being captured by multinational firms that were active in China.[6] Further, since the benefits accruing to private firms were particularly large when the inputs were purchased from richer and more technologically advanced countries, and were especially valuable in providing support in export to richer destinations, our estimates provide further evidence in support of the idea that imported inputs, as carriers of technology and quality, boost the export capability of importing firms.

[3] A few papers have started to investigate the link between imported inputs and exports, for example, see Bas and Strauss-Kahn (2014), Bas (2012), and Kasahara and Lapham (2013). However, in the absence of detailed measures of imported inputs, the results from this literature are based on correlations with industry tariff changes, rather than observed changes in firm-level usage of imported intermediates.

[4] For example, Lileeva and Trefler (2010) suggest a complementarity between firm innovation and export due to the fact that the fruits of innovation can be more broadly applied when firms sell in both domestic and export markets.

[5] Our finding is also related to Bustos (2011) evidence of input-driven quality upgrading, which is based on connection between import tariff liberalization and Argentine firm innovation.

[6] The Chinese technological gap by firm ownership is documented by Brambilla's (2009) work that reveals that private Chinese firms developed only 50% as many new products as were developed by multinational firms. See Keller (2010) for a comprehensive discussion of international trade and spillovers.