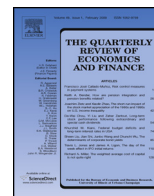




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# Exporting, access of foreign technology, and firms' performance: Searching the link in Indian manufacturing

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### ABSTRACT

This study tests the impact of export and foreign technology on the indicators of firm's performance for a sample of Indian manufacturing firms. To provide new insights into the debate over the linkage among export, technology, and performance, we employ several important performance indicators of firms, such as labor productivity, total factor productivity, product and process innovation, wage, size, and capacity utilization. For this study, we utilize a sample of firms from a recent Enterprise Surveys data of the World Bank on Indian manufacturing. The results of the analysis indicate that exporters are more productive and innovative. They are also large and utilize the capacity in a better way. The results further indicate that export leads to substantial performance gain for Indian firms. Similar results are also estimated for the effects of the use of foreign technology in the production process. Our findings also suggest that exporting products to the developed world have a significant effect on performance and further indicate that single product firms are more benefited from export and technology transfer than multi-product firms. It is also found that firms with more productivity decide to export their products; however, technology transfer is not a significant factor in making decisions about export or enhancing export-intensity. Overall, our analysis supports the argument that research and development (R&D) in the developed countries is an important source of technology for developing countries, and this takes place through export as well as direct technology transfer.

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### 1. Introduction

Unlike the firms operating in a closed or highly protected market environment, firms in open and liberalized international trade environment garner benefit from the export and flow of technological knowledge from their developed counterpart. Firms that export become more productive over time owing to the learning effect associated with export and the spillover effect of advance technology invented and utilized by their developed counterparts. The recent empirical literature on trade and firm performance, especially after the works of Bernard and Jensen (see Bernard & Jensen, 1995, 1999, 2004), offers enough favorable evidence to validate this proposition. The role of export and foreign technology in improving firms' performance, especially the productivity of firms, has now become very crucial for a developing country like India, which is moving steadily towards a liberalized trading system by gradually unshackling the chains of protectionist policies.

Endogenous growth models assert the effect of export on productivity and innovation (e.g. Grossman & Helpman, 1991). There

could be some important channels of this effect. For instance, it is necessary for the highly competitive export markets to invest in technology and innovation in order to remain competitive. Further, firms involved in exports are exposed to superior foreign knowledge and technology, which helps them to learn and improve, i.e., 'learning by exporting', to boost the productivity (Ganotakis & Love, 2011; Kobrin, 1991). The 'scale effect' may also be vital because through export it is possible to extend the boundaries of market, and since R&D costs are largely fixed, such investments may be recouped over a larger sales volume. This augments productivity, and provides greater incentives to invest in R&D and innovation. The empirical evidence on export, R&D, and foreign technology transfer has a mixed result. On one side, Bernard and Jensen (1997), Hallward-Driemeier, Iarossi, and Sokoloff (2002), Baldwin and Gu (2003), Aw, Roberts, and Winston (2007), Aw, Roberts, and Xu (2008), Damijan, Polanec, and Prasnikar (2004), Ferguson (2010), Lileeva and Trefler (2010), Bustos (2011), Long, Raff and St€ahler (2011), and Iacovone and Javorcik (2012) provide evidence in support of export, technology adoption, and firm's R&D activities that could also have a positive and sizable impact on productivity. On the other side, Greenaway, Gullstrand, and Kneller (2005), Damijan and Kostevc (2006), Bigsten and Gebreeyesus (2009), and Sharma and

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Mishra (2011, 2012, 2015) find no favorable results for this relationship. Apart from export, some researchers have specifically focused on the relationship between firm level productivity and import of technology or disembodied technology and various other sources of technology including in-house R&D. In the Indian case, for example, Ferrantino (1992) concludes that expenditure on technology significantly affects the performance, yet there is variation in spending across the industries. Basant and Fikkert, (1996) and Sharma (2016) estimate that the access to foreign technology have much larger effect on productivity than firms' own R&D, while Hasan (2002) finds a statistically significant impact of imported technologies on productivity, especially on imports of disembodied technology.

Therefore, in the present paper, we attempt to investigate the economic link among export, foreign technology, and firm's performance for a sample of firms in Indian manufacturing industry. The issue is interesting and important for Indian firms because the degree of openness of the Indian economy has increased considerably since 1991. Indian policy makers have taken many cautious attempts through economic reform process to liberalize the economy, and this has resulted in the increased interaction of less competitive domestic firms with highly competitive foreign firms in the recent past. The performance of Indian manufacturing industry has improved continuously with the consistent increase in the average output growth rate from 4% in the 1970s and 6.5% in the 1980s to 8% in the last decade (Mitra, Sharma, & Veganzones, 2014). The process of industrial de-licensing and gradual removal of restrictions on foreign investment have considerably enhanced the contour of this sector in the recent past (Aghion, Dewatripont, Kolev, Murray, & Stern, 2010). As a result of the reduction in tariff rates and quantitative restrictions on imports, the overall scenario of export and import of goods, especially that of the intermediate and capital goods, has also improved favorably (see Topalova and Khandelwal, 2011). Further, the government has taken a series of fiscal incentive measures to encourage firms to carry out innovation and R&D activities for achieving higher levels of efficiency and competitiveness in international trade (Mitra et al., 2014; Sharma, 2012; UNIDO, 2005).

Against this background, in the present study, we attempt to provide new insights into the debate over the linkage among export, technology, and productivity using firm-level data from the Indian manufacturing industry. Specifically, the purpose of this study is fourfold. First purpose is to investigate whether firms involved in export are more productive than non-exporting firms. Second is to examine whether firms involved in export are more innovative than non-exporting firms. Third is to test whether exporters utilize production capacity better than non-exports. Fourth is to test the effects of transferring foreign technology on the firms' performance indicators. And last is to examine the factors determining the decision of export and export intensity.

To answer these questions, we utilize a sample of firms from very recent Enterprise Surveys data (2014) of the World Bank on the Indian manufacturing. While doing this, our contributions to the related literature are manifold. First, the data used for the study is large (more than 7000 firms), comprehensive and covers almost all manufacturing industries and geographical regions of India, while the previous studies have mainly used a corporate firms' database.<sup>1</sup> Second, the previous studies especially on Indian firms have mainly focused on a single source of technology in the related analysis, while we attempt to know the role of three important sources of the technologies used in firms—export, foreign technology pur-

chase, and in-house R&D development on firm performance. Third, most of the previous studies have tested the effects on one or two performance indicators; whereas we test the effect of several important indicators, which include TFP, labor productivity, sales, wage, capacity utilization, and product and process innovation. It is noteworthy that in the literature direct testing of the effect on innovation is not common. Fourth, despite the burgeoning literature on export and firm performance, the issue of destination is quite less explored. Therefore, current study contributes to the literature on the export and firms' performance nexus by examining whether the destination of export matters for the Indian firms. Fifth, some recent studies have shown that the multi-product firms are benefitted more from export because of better capability of resource allocation. However, to the best of our knowledge, no such attempt is made to test this issue for the Indian firms. Hence, we further attempt to empirically explore the effects for the Indian firms. Sixth, it is often argued that a considerable level of heterogeneity exists among firms of the different industries; therefore, we also analyze the effect of exporting and accessing the foreign technology on firm performance for different industries. Furthermore, we utilize a range important control variables that may potentially influence firms' performance such as firm size, type of competition, location, age, quality certification, and foreign ownership. Final, our aim is to explain systematic patterns of variation in the export intensity of firms. The observable export intensity is truncated by the fact that many firms are not exporters in the year of the survey. This may lead to the selection biasness because in export intensity data, several observations are clustered at the lower limit, i.e., zero. To estimate and correct the biasness, the Heckman selection model (Heckman, 1976) is applied that estimates selection and response equation in a single framework.

The rest of the paper is organized as follows: Section 2 provides a review of related literature. Section 3 discusses the data and total factor productivity (TFP) estimation-related issues. Section 4 provides descriptive analysis on Exports and Foreign Technology Premia. Section 5 provides models and their analysis results. This section also provides the analysis results related to destination and firm's performance. The final section concludes the study and provides some policy suggestion on the basis of the findings.

## 2. Review of related literature

Theoretically, export and productivity connection is well established in the standard literature, and there is a common opinion among economists that export enhances productivity of firms through technology advancement (e.g., Krugman, 1979; Jovanovic & Lach, 1991). The endogenous growth theories further support the linkage on the ground that participation in export market helps firms in improving their productivity through innovation (Grossman & Helpman, 1991; Rivera-Batiz & Romer, 1991) and technology transfer (Barro & Sala-i-Martin, 1995; Parente & Prescott, 1994). There could be at least three channels of this effect. First, stiff competition in export markets is required to invest in technology and innovation in order to remain competitive. This may also include the need for a firm to undertake R&D as well as acquire technology from foreign sources. Second, firms involved in export are exposed to superior foreign knowledge and technology, which helps them to learn and improve, i.e., 'learning by exporting', to boost the productivity (Ganotakis & Love, 2011; Kobrin, 1991). Finally, scale effect may be vital because through export it is possible to extend the boundaries of market, and since R&D costs are largely fixed, such investments may be recouped over a larger sales volume. This aids productivity and provides greater incentives to invest in R&D and innovation.

<sup>1</sup> Previous studies on India have used prowess database that is a corporate firms' database covers mostly listed firms. These listed firms are mostly large in size, while small firms are somewhat excluded in the database. Prowess database also does not provide information on workers, wage, skill-level and innovation.

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