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Trade liberalization, technology transfer, and firms' productive performance: The case of Indian manufacturing



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ABSTRACT

India's economic liberalization in the 1990s provides scope for research on the effects of policy reforms on economic performance. This paper examines some of these policy changes and their impact on firms' productivity and efficiency. We assess, specifically, the role of export and import (total, intermediate, and capital goods) as an outcome of trade liberalization, R&D, technology transfer, and infrastructure endowment over the period 1994–2008. Although our analysis may involve certain biases in capturing the causal relationships, results suggest that infrastructure is a crucial determinant of manufacturing performance in India. This is true for a wide range of variables, such as transport, energy, and information and communication technology (ICT). This finding has important policy implications in the Indian context, as several parts of the country are constrained by severe infrastructure shortages. Other empirical results concern knowledge transfers, which seem to materialize more through exports than imports. Our findings also suggest that R&D is not a productivity-enhancing activity in India and that firms rely more on purchase of foreign technology. This outcome does not come as a surprise because Indian firms are known for low in-house research and limited innovation-oriented activities.

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1. Introduction

A vital element of India's rapid economic growth in the reform period (since 1991) has been the improved performance of its manufacturing sector. Despite the recent surge of the service sector, manufacturing has gained strength in many ways. The average output growth rate went up from 4% in the 1970s and 6.5% in the 1980s to 8% in the last decade. The target was approximately 12% for the eleventh plan period (2007–2012, [Planning Commission, 2006](#)). Manufacturing is also an important sector in terms of foreign exchange earnings, comprising between 70 and 80% of the India's total exports. One of the objectives of the government of India is to enhance these trends so that manufacturing emerges as the engine of growth. This is important, as the Indian growth story in the last two decades has relied heavily on the service sector. However, in order to provide jobs to a large number of unemployed and under-employed workers, manufacturing growth is very much warranted.

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In the reform era (since 1991) in India, the manufacturing sector has witnessed major policy changes. Industrial delicensing and removal of restrictions on foreign investment have modified the profile of this sector considerably (Aghion et al., 2008). Trade policies have stimulated exports and imports, especially of intermediate and capital goods, since tariff rates have been reduced drastically and the quantitative restrictions on imports were by and large abolished (see Topalova & Khandelwal, 2011). To encourage firms to innovate and conduct R&D activities, the government has developed a system of fiscal incentives and financial benefits (Sharma, 2012; UNIDO, 2005). These reforms aimed to make Indian industry more efficient, technologically up-to-date, and competitive. However, despite these policy changes, the total factor productivity (*TFP*) growth of this sector declined from above 5% in the 1980s to less than 2% in the 1990s (see Goldar & Kumari, 2003; Trivedi et al., 2000). Recent estimates also indicate only marginal improvement in *TFP* in the 2000s (Kathuria et al., 2010; Sharma & Sehgal, 2010). This situation constitutes a puzzle that the literature has not adequately addressed until now.

In the literature, the importance of *TFP* is highlighted as broadly explaining growth differences across countries (Howitt, 2000). Improving *TFP* in manufacturing, in particular, is recognized as an effective way of enhancing performance and catching up with other better performers (what is widely known as the convergence hypothesis). Manufacturing is traditionally considered as the sector of most rapid productivity gains through technical progress, innovation, externalities, economies of scale, and knowledge spillovers (Kaldor, 1966; Murphy et al., 1989). These productivity gains can be further realized at the macroeconomic level through structural transformation and changes in resource allocation from less to more productive firms and sectors (Bernard & Jensen, 2004). Models of creative destruction, likewise, explain the dynamics of firms and the process of productivity gains and structural transformation at the microeconomic level (Aghion & Howitt, 1992).

The central role of manufacturing in the context of rapid growth and catching up of the Indian economy has also been debated in relation to the surge of the service sector. Some authors have argued that nontraditional *ICT*-intensive services, which are characterized by a growing tradability, increasing technological sophistication, and low transport costs, are on the forefront of a third industrial revolution (see Ghani, 2010). Others, such as Lin (2012), Aghion (2012), and Stiglitz et al. (2013) still think that manufacturing remains the only realistic path toward sustained growth for low-income, low-skilled, and labor-abundant countries such as India.¹

In the literature, the role of import and export in enhancing long-term growth has been the subject of extensive debate (see Balassa, 1988; Krugman, 1994). International trade is considered a key source of technology transmission and adoption (see Barro, 1997; Coe & Helpman, 1995; Frankel & Romer, 1999). This channel is particularly important for developing economies where new technology is relatively scarce, resources are limited, and firms are dependent on high quality imported inputs. In one sense, imports are generally seen to present increasing competition for domestic firms, inciting them to invest and be more productive. Additionally, imports of intermediate and capital goods are seen as stimulating productivity through technology transfer from advanced countries and providing a better quality of inputs (Goldberg et al., 2010; Topalova & Khandelwal, 2011). As for exporting firms, international competition encourages innovation and investment in more productive technologies and organization as well.

Research and innovation has also been identified as another key channel of firms' productivity and income gains. Endogenous growth models explain that R&D expenditures, in addition to directly enhancing firms' productivity through innovation, contribute to this process through their industry-wide spillover effect (see Grossman & Helpman, 1990b; Romer, 1986). But the success of the manufacturing sector has also been linked to foreign technology transfer through imported inputs and foreign investment (see Chawla, 2007; Goldberg et al., 2010).

Another important factor that has direct implications on manufacturing performance is physical infrastructure impinging on productivity and efficiency enhancement through external economies of scale and complementarity with other factors of production (see Romer, 1986; Lucas, 1988; Barro, 1997). In India, infrastructure inadequacies have been recognized as a major constraining factor for the productivity of firms (see Pinto et al., 2006). In recent years, the Indian government has been putting effort into enhancing infrastructure services and government expenditure on infrastructure has risen from 4.6% of GDP to 7 to 8% in the eleventh plan period (2007–2012) (Planning Commission, 2011). These efforts, however, have had limited success, seen only in some areas of infrastructure provision (i.e. roads and telecommunication), while in other areas (i.e. electricity, water transportation and ports) it has continued to be a nightmare for users (Patel & Bhattacharya, 2010).

Against this background, the present paper revisits the issue of the impact of reforms on manufacturing performance. This question is important for the government of India, particularly given the limited resource base and the compulsion to achieve a rapid growth rate. We test the effect of several factors—imports (total, intermediate, and capital inputs) and exports as an outcome of trade liberalization, in-house R&D, technology transfer, and physical infrastructure—on the productivity and efficiency of Indian industry. While doing so, we introduce several novelties from the empirical standpoint. *First*, in the standard literature, the factors mentioned above have generally been tested separately (see Goldar & Kumari, 2003; Trivedi et al., 2000). We move a step ahead and test them in a single framework in order to limit the omitted-variables bias in the regression analysis, as well as to compare drivers of industrial performance. *Second*, in most of the previous studies on the Indian context, the data was mainly taken from the Annual Survey of Industry (*ASI*). We utilize a new

¹ In this new literature, industrial policy is more selective than in the past and committed to boosting competitive firms in industries with comparative advantages only (see also UNIDO, 2009 for some elements of the literature on the New Industrial Policy).

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