



Output and labor productivity in organized manufacturing: A panel cointegration analysis for India [☆]



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ABSTRACT

One of the policy puzzles faced in India during the last two and half decades has been the weak association between output and labor markets, particularly in the manufacturing sector. In this research, we investigate the long-run relationship between output, labor productivity and real wages in the case of organized manufacturing. We adjust the measure of labor productivity incorporating bottlenecks, such as lack of infrastructure, access to external finance, and labor regulations, which all may influence labor market outcomes. Using panel data from seventeen manufacturing industries, we establish long-run dynamics for the output-labor productivity-real wages series over a period of nearly three decades. We employ recently developed panel unit root and cointegration tests for cross-sectional dependence to incorporate heterogeneity across industries. Long-run elasticities are generally found to be low for labor productivity compared to real wages due to the changes in manufacturing output. There are variations across industries within the manufacturing sector for the effects of the labor market on manufacturing output. In some industries, lower wages are associated with higher output, and the reason for the positive relationship in other industries could be due to workers' bargaining power.

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1. Introduction

Starting from a low growth rate of 3.5% per annum between 1950 and 1980, the Indian economy grew at a remarkable rate of over 9% per annum since 1991 until recent time. Most industries were highly regulated, subject to licensing and rigid capacity controls. The transition to higher growth rates coincided with 'pro-market' economic reforms initiated in the 1980s. This has gained momentum in the early 1990s since the economic reform programs started. [Rodrik and Subramanian \(2004\)](#) identify the 'attitudinal shift' by government towards pro-business and private sector in 1980s.

Within the manufacturing sector, the 1991 liberalization had a strong unequal effect on productivity growth across industries and states as emphasized by [Aghion et al. \(2003\)](#). [Ahluwalia \(2002\)](#) and [Unel \(2003\)](#) report a manufacturing productivity surge in the 1980s. Research by [Topalova \(2004\)](#) and [Pattnayak and Thangavelu \(2010,2014\)](#) note an increase in manufacturing productivity particularly after the economic reforms.

On the other hand, [Balakrishnan and Pushpangadan \(1994\)](#), [Rao \(1996\)](#) and [Hulten and Srinivasan \(1999\)](#) establish little evidence of total factor productivity improvement in manufacturing after the reform period. [Goldar \(1986, 2004\)](#) identifies a decline in manufacturing growth in India during the post-reform period. [Kathuria and Sen \(2013\)](#) review the recent literature on total factor productivity in case of India and highlight the differences between the formal and informal sectors in total factor productivity growth.

While the reforms have been primarily focused on increasing manufacturing growth and productivity, growth has so far been service-led as identified in recent studies (e.g. [Kochhar et al., 2006](#); [Mitra and Ural, 2008](#)). Findings from the studies are mixed and varied due to the econometric techniques, time period and data considered in the studies.

Like China, India has potential to be a global manufacturing hub. Rigid labor regulations can be a major barrier to the decision-making process for global sourcing as suggested by [Holweg et al. \(2011\)](#). 'Make in India' is a major initiative by the current government, promoting the role of manufacturing sector for development. We explore here the major reasons behind the rather lackluster performance of the manufacturing sector in India.

The labor market is one of the key channels by which the effects of globalization can influence the productivity differences amongst various industries within organized manufacturing. The organized manufacturing sector, despite its impressive growth in

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the 1980s and 1990s, failed to expand employment opportunities (see Nagaraj, 2000; Kochhar et al., 2006; Panagariya, 2008). This has been referred to as 'jobless growth' in literature (Nagaraj, 1994; Balhota, 1998). To quote from a survey on India by the Organization of Economic Cooperation and Development (OECD) (2007):

"India has a much smaller proportion of employment in enterprises with ten or more employees than any OECD country. The number of workers has also fallen in the manufacturing sector where the share of labor income in value added is low compared to other countries and the capital intensity is relatively high. Such developments indicate that India is not fully exploiting its comparative advantage as a labor-abundant economy."

In spite of its importance in understanding the links between labor and product markets, there has been scant empirical research on the impact of labor market changes on output, productivity, and labor income particularly for developing economies. In the case of India, most of the literature covers only the initial periods of liberalization in the 1980s and early 1990s (see Nagaraj, 2000 for a review).

Besley and Burgess (2004) investigate the effects of labor regulations on manufacturing performance for various Indian states over the period 1958–1992. Their findings show that the states with pro-worker labor laws experienced lower growth in manufacturing output, employment, investment, and productivity during the pre-reform period. In a recent study, Ahsan, and Pagés (2009) identify job security and the cost of labor disputes being the two major elements in reducing registered output and employment.¹ Das and Kalita (2009) analyze the decline in labor-intensity in Indian manufacturing using survey data from twenty-two export-oriented manufacturing firms. Weak infrastructure, lack of trained skilled workers and rigid labor regulations are identified as constraints on generating employment. Kathuria et al. (2010) indicate that labor productivity has increased for the organized sector over time, but has declined in the unorganized sector during 2000–2001. Bollard et al. (2013) report significant improvement in labor productivity in manufacturing, while employment remains more or less stagnant between 1983 and 2007. Plant efficiency is identified as a determinant in productivity improvement instead of factor movement across the sector due to economic reform.

Our overview identifies quite a few studies focusing on manufacturing productivity and assessing the impact of different aspects of labor regulations on economic and social outcomes. However, there is no study integrating labor and product markets together in an industry panel framework.

Over the past two decades, the heterogeneous panels have attracted a great deal of attention in applied econometrics literature. To our knowledge, Bhattacharya et al. (2011) is the only study analyzing the effects of wages and employment on labor productivity using industry panel data. Our contribution here is to extend this research and relate this with the product market in a panel of all manufacturing industries in India. In this context, we explore the panels of manufacturing as heterogeneous and cross-sectionally dependent. The linking of product with labor market is important to analyze the indirect effects of labor market outcomes on manufacturing output for a heterogeneous panel of manufacturing industries.² The panel-based econometric techniques

analyze both time-series and cross-sectional dynamics between labor and product markets, allowing for more reliable statistical inferences for heterogeneous industries.

Our contribution in this research is three fold. First, we estimate adjusted labor productivity netting out the role of labor regulation, infrastructure, and access to external finance, which can hinder labor productivity for each industry panel and use this measure in our final model for estimation purposes. Second, we establish the long-run dynamics between output, adjusted labor productivity and realwage. The labor market might have differential effects across industries, and their effects might be more beneficial among sectors with a higher dispersion of within-industry shocks. For this purpose, we use panel tests with cross-sectional dependence. Third, given the heterogeneity across the panel of industries, we find elasticity values are less than one for the adjusted labor productivity measure with respect to output, while elasticity values for real wages are greater than one for some industries. Both estimates are inelastic for the overall panel.

The remainder of the paper is organized as follows. Section 2 presents a brief overview of manufacturing output growth while identifying the constraints. Section 3 describes our empirical model and data sources. Section 4 explains the econometrics steps we follow and the empirical findings. The final section summarizes the major findings with indicative policy implications.

2. Constraints on Indian manufacturing output growth: a brief overview

2.1. Labor regulations, labor productivity and real wages

The Indian labor market is complex and characterized by an array of institutional arrangements, incentives, and disincentives both from employer and employees' side. Labor regulations created a stringent environment for business, productivity and output of manufacturing. Labor regulations may increase the cost of hiring, for example via minimum wage legislation and compulsory benefits to the workers. Workers in organized manufacturing enjoy bargaining power. The Industrial Disputes Act (1947) is the major piece of framework regulating industrial relations in the organized manufacturing sector. Labor laws were very rigid and labor market institutions have gradually evolved particularly since the mid-1980s. There is large heterogeneity across the states in labor regulations particularly after the reform period.

2.2. Infrastructure, access to external finance and labor productivity

Nadiri and Mamuneas (1994) examine the effects of infrastructure on the cost structure and productivity for U.S. manufacturing industries. The productive effects of infrastructure vary across industries and have a positive effect on labor productivity growth. Poor infrastructure with weak transport, telecommunications, roads and power shortages have created barriers to business investment in case of India. This has been emphasized by Gupta et al. (2008).

Firms with high labor productivity are less likely to face credit constraints. Financial development can be associated with 'jobless growth'. Easing financial constraints may allow industries to invest in more capital-intensive technologies. This helps in increasing output but not employment in manufacturing. In addition, the effects of financial development may be different across industries. With access to external finance, job relocation may happen from weak to profitable industries. With inelastic labor supply due to labor regulations, the effect will be more on wages and the labor productivity.

¹ An excellent survey by Djankov and Ramalho (2009) discusses employment laws and their effects on economic and social outcome for various developing countries including India.

² Most of the reform programs are related to organized (formal) manufacturing. In India, 80% of employment occurs in unorganized (informal) sector, while only 17% of manufacturing output is from this sector (National Commission for Enterprises in the Unorganized Sector (NCEUS), 2007).

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