The dynamics of market structure and firm-level adjustment to India's pro-market economic liberalizing reforms, 1988–2006: A Time Varying Panel Smooth Transition Regression (TV-PSTR) approach

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A R T I C L E   I N F O

A B S T R A C T

This paper for the first time employs the Time Varying Panel Smooth Transition Regression (TV-PSTR) approach to model the dynamic adjustments of firms and the evolution of industrial structure in the bigger setting of decades against the backdrop of India's dramatic liberalizing reform starting from 1991. Using Indian manufacturing firm data, it finds that the transition of market structure and productivity after liberalization did follow a smooth transition process. Instead of the previously assumed instantaneous 'big-bang' shift just after reforms, it actually took years for the Indian manufacturing industries start to react to the reforms, and the transitional impact of reforms took approximately four to eight years to complete. There is strong evidence of increased competition after the transition, with shrinked returns to scale (RTS) in most industries except for leather and chemical industries. The results on total factor productivity (TFP) are mixed: most import-competing industries, which suffer most from the shrinking of market size experienced no change or decreasing TFP growth; whereas the export-oriented industry, as the industry which benefits most from economy of scale, enjoyed a huge TFP growth following the reforms.

1. Introduction

During the past several decades, lots of developing countries launched dramatic pro-market economic liberalization in an effort to attain higher growth. These liberalization efforts, broadly defined to include trade and entry liberalization, regulatory reform, ER regime reform and privatization, are believed to transform economies via more competition (domestic and foreign) and the removal of distortions in relative prices. Therefore it may bring the country welfare gains through several possible channels, which have been the questions receiving the extensive interests of country policy makers. First, it has been argued that, in imperfectly competitive markets, pro-market liberalization will bring welfare gains by reducing the dead weight losses created by domestic monopolies and oligopolies by increasing competition, and by reducing price-marginal cost markups.[1] Secondly, there may be scale efficiency gain of trade by moving the firms down their average cost curves, thereby effectively raising firm size and scale efficiency. In addition, trade liberalization, as the major component of Indian pro-market liberalizing efforts, has been argued to have dynamic effects on firms' productivity growth through innovation.

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[1] This argument was first made in context of domestic monopolies in the classic paper by Bhagwati (1965), and was subsequently extended to oligopolies by the more recent work of Helpman and Krugman (1989), inter alia. See Helpman and Krugman (1989) for a detailed discussion.

In contrast to the theoretical predictions on the effect of liberalization on competition and markups, theoretical predictions about firm activity (dynamic effects) from macro models of entry liberalization and deregulation are ambiguous (see endogenous growth theories by Grossman and Helpman, 1990, 1994; Melitz and Costantini, 2008). Trade can potentially be growth generating as well as growth decelerating. Trade can enhance growth permanently by facilitating the international exchange of knowledge and technology. Trade can have growth decelerating effects if it, via market size effects, reduces domestic firms' incentives to innovate or diverts resources away from R&D.[2] As outlined by Melitz and Costantini (2008), these dynamic effects are characterized by a heterogeneous firm-level adjustment process following the reforms. Firm-level productivity evolves stochastically, and innovation involves a trade-off between its cost and a return in terms of a better distribution of future productivity draws. Moreover, their model shows there will be an industrial evolution over its entire transition path to a new steady state. In particular, how the relative timing and magnitude of firm-level productivity improvements and export market entry decisions are also determined by non-technological factors such as the timing of trade liberalization announcements and the speed of liberalization. Although theory has provided us some implications on liberalization-growth nexus, few studies have systematically examined the growth performance of firms, or more specifically model the dynamic adjustments process of micro-economic industrial structure following the liberalizing reforms.[3]

In the context of developing countries, several studies have explored the relationship between firm productivity and trade reforms using firm level data. Tybout et al. (1991) find no evidence of increased productivity following liberalization in Chile. Harrison (1994), Tybout and Westbrook (1995), Pavcnik (2002), Fernandes (2007) and Muendler (2004), on the other hand, do observe productivity increases following liberalization in, respectively, Cote d'Ivoire, Mexico, Chile, Colombia and Brazil. Krishna and Mitra (1998) find mixed results of change in productivity growth in four manufacturing industries with weak significance. However, they, as with almost all previous studies, assumed an instantaneous discrete shift in market efficiency parameters and productivity growth following the reforms, either by imposing a post-reform dummy or using one period lag output tariffs as a measure of trade reforms. However, linear estimation cannot account for nonlinear dynamics by imposing the unrealistic and restricting assumption of coefficient stability. Instead, it is more reasonable to model the transition after liberalization as a sequenced smooth process by a flexible functional form.[4] There are two main reasons behind this argument: first, reforms taking time to gain credibility and market reactions; secondly, micro level restructure after unexpected macro level reforms usually take time due to various rigidities and adjustment cost of investment at micro level. It usually takes years before the dynamic effects of trade on productivity growth start to happen, and continue for years.

This study takes a new approach to the question, Time Varying Panel Smooth Transition Regression (TV-PSTR) model.[5] The starting point of this study is to recognize that the core mechanism that drives economic growth following liberalization is massive microeconomic restructuring and factor reallocation, which must be a slow process. Hence, it starts from the presumption that any changes in economic performance following reforms and liberalization may be more appropriately modeled as a steady transition rather than a discrete change. A standard explicit or implicit assumption underlying linear models is that there is a single structural break in the sample. In this study that assumption is replaced by a more general one stating that the parameters of the model may change continuously and smoothly as a function of time, which is more consistent with the firms' adjustment behaviors and economic evolution process. Moreover, this TV-PSTR model not only allows for discrete changes in parameters, but also allow for any form of nonlinear transition path. With discrete change ('big bang' shift) in parameters as a special case within this more general framework, the model doesn't lose its generality. Instead of using a priori information to fix the date of a transition, the speed and the timing of the transition are endogenously determined by the data. With the above merits, the TV-PSTR model has great advantage over conventional approach and doesn't put any prior estimation restrictions on the process of transition.

Utilizing this TV-PSTR approach and the natural liberalizing experiment of India, I document some stylized facts about the evolution of India's industrial structure against the backdrop of India's unexpected dramatic liberalizing reform starting from 1991. More precisely, I estimate the transition of average industry level price-marginal cost markups, RTS and productivity growth in nine two-digit level manufacturing industries in India using firm level panel data. A full production function with substantial flexibility is employed, which allows for both non-perfect competitive market and non-constant return to scales. By relaxing the perfect

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[2] Theoretically, Krugman (1986) and Lucas (1988) argue that trade encourages learning by doing and innovation, leading to productivity growth. However, Rodrik (1992a,b) has questioned the importance of these supposed productivity gains, and claims that there are no theoretical reasons to believe that the protection of domestic markets discourages productivity growth. This skepticism stems from the view that trade liberalization might retard productivity growth by shrinking domestic firms' sales, which would in turn reduce the incentive for these firms to invest in technological efforts.

[3] The widespread liberalizing reforms of the 1980s and 1990s around the world have provided researchers with good opportunities for estimating productivity gains from enhanced competition, and hence generated large empirical literature. However, before the availability of sufficiently detailed firm level data, most studies that examined this question either employed calibrated industry (examples of simulated industry studies include the works of Dixit, 1988; Rodrik, 1988; Baldwin and Krugman, 1988) or provided econometric estimates using industry-level aggregate data (Oczkowski and Sharma, 2001). One obvious weakness of these studies is that industry level data mask the extensive firm level variations. For better studying the dynamics of changes after regulatory reforms, especially with short time series, one needs to delve into micro panel data, which provides us repeated observations of enough cross-sections.

[4] Greenaway et al. (1997) suggests that the effects of liberalization on GDP growth rates follow a smooth transition S curve process. Veldkamp (2008) shows that sustained reforms do take time to gain credibility and popularity growth.

[5] Aizenman and Geng (2009) for the first time apply a logistic smooth transition regression (LSTR) approach to model the transition associated with the economic reforms in China. As PSTR model, LSTR model is another member of the STR family, but designed for time series data instead of panel data. The paper estimates a homogenous aggregate value added production function of the State Owned (SOE) and Foreign-Funded Enterprises (FFE) in China, 1980s–2007, employing a curvilinear logistic function, where the speed and the timing of the transition are endogenously determined by the data. We find high but gradually declining markups in both SOEs and FFEs during the early stages of the adjustment, with SOEs having a much larger scale and market size than the FFEs. However, over the transition process, returns to scale in industrial SOEs dropped sharply. For both FFEs and SOEs the transition is slow, with a midpoint about 7 and 14 years, respectively. We find significant increase of TFP growth rate for both FFEs and SOEs, by 0.1436 and 0.1971, respectively.