〈論　文〉

The Impact of Trade Liberalization on Productivity in the Indian Manufacturing Sector

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Abstract: This study analyzes the impact of trade liberalization on incumbent exporters benefited from the trade policy change in Indian manufacturing during the period from 1998 to 2007. Our results indicate that the total factor productivity of them increases when export barrier decreases. Their average productivity increases 8 to 12 percentage points for 1 percentage point decrease in export barrier. Another finding is that importers of inputs improve their productivity along with a reduction in input tariff.

Keywords: Data matching, Export, India, Total factor productivity, Trade liberalization

1. Introduction

The 1995 establishment of the World Trade Organization (WTO) is the capstone of a gradual process of global liberalization of trade that started after the Second World War, and the last few decades have seen an increase in the volume of international trade. As trade volume increases, the role of firms involved in trade increases in importance. A government would support their activity by a change in trade policy and encourage the growth of these firms. Does the change in trade policy, however, make a significant contribution to the economic performance of these firms?

Many theoretical works study the within-plant productivity growth after trade reform (Atkeson and Burstein, 2011; Burstein and Melitz, 2012; Bustos, 2011; Costantini and Melitz, 2008; Yeaple, 2005). Recent research empirically provides evidence that exporters improve their productivity or upgrade their technology. Bustos (2011) shows that Argentinian exporters increased investments

in technology with tariff reduction under the Mercado Comun del Sur (MERCOSUR) trade agreement. Lileeva and Trefler (2010) and Aw et al. (2011) also show that exporters engaged in more productive innovation and increased their productivity in Canada and Taiwan, respectively.

How do incumbent exporters improve their productivity? Bustos (2011) proposes that the within-plant productivity growth is caused by adoption of more advanced technologies. Trade liberalization[1)] reduces trade costs and exporters then upgrade their technologies using the profit from reduced trade costs. That particular model allows the most efficient exporters to invest in additional fixed costs to adopt more advanced technology to reduce their marginal cost. There are other possible channels through which trade reforms increase within-firm productivity: intensifying competition may force firms to improve their efficiency by reducing average costs (Helpman & Krugman, 1985), force firms to focus on their core competency products or product innovation (Bernard, Redding & Schott, 2006), reduce managerial slack and generate x-efficiency gains (Hicks, 1935), or raise innovation incentives among domestic firms due to the threat of foreign entrants (Aghion et al., 2005).

Many empirical studies also show that reduction in import tariffs improves on firm-level productivity in developing countries (Pavcnik, 2002; Muendler, 2004; Amiti and Konings, 2007; Fernandes, 2007). Any reduction in output tariffs (i.e., import tariffs on final goods) will generate competitive pressures from abroad for the domestic producers of final goods as imported final goods become cheaper than before. Moreover, a reduction of input tariffs (i.e., import tariffs on intermediate goods) makes the relatively high quality imported inputs cheaper.

India was well known as one of the lowest trade-to-GDP ratio countries, and that ratio was less than 20% until the mid-1990s. The ratio, however, increased to 54% in 2008 owing to the export-oriented trade policy in 1997. We analyze the impact of reduction in export barrier on productivity of incumbent exporters, who are benefited from the export-oriented trade policy, during the period 1998 to 2007. Exporters had relatively easy access to imported inputs and machinery due to reduction in tariffs on those goods imported to produce export goods under the trade policy. Moreover, exporters who export entire products are promoted by the tax holiday. The exporters benefited from the policy could improve their economic performance when export barrier is reduced. This is the first work analyzing the growth of incumbent exporters' productivity using plant-level data in India. Export revenue data became available from surveys only in 1997. We uniquely match the cross-sectional data in 1997, which includes the information about export, with panel data for 1998 to 2007. Plant level panel data provides the advantage of making it possible to control plant characteristics such as size, age, and type of ownership, as well as time-invariant plant fixed effect.

Since India reduces the import tariffs in final goods and intermediate goods in the same period,

we also analyze the impact of reduction in those tariffs on the productivity of plants. Many studies focus on this economic reform, though early studies of the relationship between liberalization and productivity reach mixed conclusions. Krishna and Mitra (1998) use firm-level data in the manufacturing sector from 1986 to 1993 and find some evidence of an increase in the growth rate of productivity in the years following the 1991 reform, while Balakrishnan et al. (2000) using similar data sets, do not. Recent studies show the consistent findings with Krishna and Mitra (1998). Sivadasan (2009) finds the reduction in final goods tariffs and FDI liberalization increased productivity using a pooled cross-sectional dataset for the early years of the reforms (1986 – 1994). Topalova and Khandelwal (2011) find that reduction in final good and input tariffs increased productivity among large manufacturing firms during the period 1987 to 2001.

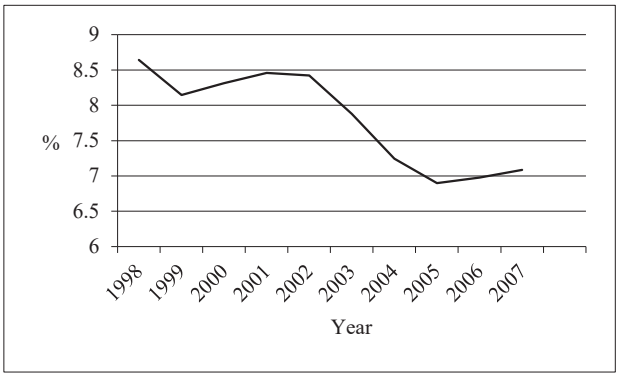
The paper proceeds as follows. Section 2 overviews the process of trade liberalization in India. Section 3 discusses the empirical methodology and Section 4 describes the data. Section 5 presents the results and Section 6 concludes the paper.

2. Indian export-oriented trade policy and trade liberalization

Worldwide economic globalization has developed rapidly since the creation of the WTO. The world average Most Favored Nation (MFN) tariff drops from 13% in 1995 to 9% in 2010. The value of global trade in goods and services increases from US$5 trillion in 1995 to US$16 trillion in 2010[2].

India's top 10 export partners[3] in 2007 with export shares of 50% from India are members of the WTO. Moreover, India has trade agreements with many trading partners[4]. These factors have decreased Indian exporters' export barriers. Figure 1 shows the decreasing trend during the

Figure 1
Average Export barriers



Source: Calculations based on WITs data.

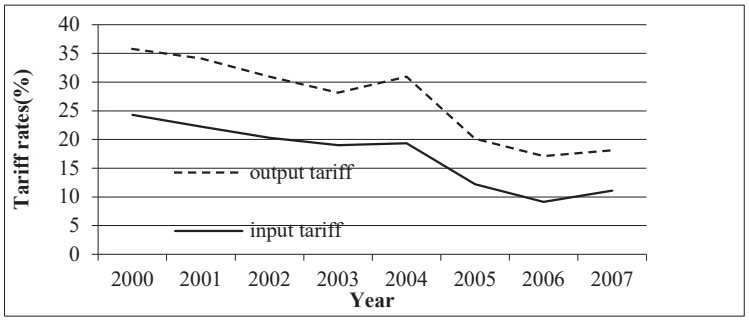
period from 1998 to 2007. It is worth noting that the export barrier is exogenously determined because the barrier depends on the trade partners. We take the weighted average of per-country tariffs, in which the weight is the share of export volume from India to a specific country.

Before 1991, trade policy was characterized by high tariffs and pervasive import restrictions. However, India launched a dramatic economic reform as a part of an IMF adjustment program in 1991. The first generation of trade liberalization from 1991 to 1996 reduced import tariffs, and eliminated quantitative restrictions.

The new 5-year trade policy announced in 1997 was export-oriented. Exporter has relatively easy access to imported inputs and machinery due to reduction in tariffs on imports of capital goods such as machinery and machinery parts, and raw materials and intermediate goods under the trade policy[5)]. The trade policy also simplified procedures for export. In addition, Export Oriented Unions (EOUs), which are organizations aiming to export their entire products, have more benefits and facilitates, such as an extended tax holiday. A scheme to establish Special Economic Zones (SEZs) in the country to promote exports is announced in 2000. The SEZs aim to provide an internationally competitive and hassle-free environment for exports and are expected to boost the country's exports. The tariff reduction on imports does not carry forward in the period, although quantitative restrictions on imports of manufactured consumer goods and agricultural products were finally removed in 2001.

The subsequent foreign trade policy from 2002 to 2007 continued to incentivize exporters. For example, quantitative restrictions on exports were withdrawn, except for some items related to national security. In addition, the government reduced the average output tariffs in Indian manufacturing from 35% in 2000 to 18% in 2007 and the average input tariffs from 24% in 2000 to 11% in 2007 (See Figure 2).

Figure 2
Average Output and Input Tariff in Manufacturing



Note: Based on author's calculation using ASI and WITS data.
Output and input tariffs are simple average of 2-digit industry level tariff rate.

3. Methodology

3.1 Measuring TFP

We first measure plant-level total factor productivity (TFP) following Levinsohn and Petrin (2003). As detailed below, they use plant's raw material inputs as a proxy for the unobservable productivity shocks to correct for the simultaneity problem in estimation of the firm's production function. Including a proxy that controls for the part of the error correlated with inputs eliminates the variation in inputs related to the productivity term.

Following Petrin et al. (2004) and assuming a Cobb-Douglas production function, the estimation equation is

$$y_{it} = \beta_0 + \beta_l l_{it} + \beta_k k_{it} + \omega_{it} + \eta_{it} \quad (1),$$

where y_{it} is the log of plant i's output at time t; k_{it} is the log of plant i's capital assets; and l_{it} is the log of labor. While η_{it} is an error term that is uncorrelated with input choice, the simultaneity problem arises from the ω_{it} term, an unobservable plant-specific time-varying productivity shock that may be correlated with the plant's choice of variable inputs. Assuming that intermediate inputs m_{it} depend on the variables k_{it} and ω_{it}, and monotonic increases in ω_{it}, ω_{it} can be written as a function of k_{it} and m_{it}: $\omega_{it}(m_{it}, k_{it})$. Thus, equation (1) can be rewritten as

$$y_{it} = \beta_l l_{it} + \phi_{it}(m_{it}, k_{it}) + \eta_{it} \quad (2),$$

where $\phi_{it}(m_{it}, k_{it}) = \beta_0 + \beta_k k_{it} + \omega_{it}(m_{it}, k_{it})$. Substituting a third-order polynomial approximation in k_{it} and m_{it} in place of ϕ_{it}, we estimate $\widehat{\beta_l}$, $\hat{\phi}_{it}$ and $\widehat{\beta_0}$ using OLS. In the second stage, for any candidate value β_k^*, we compute a prediction for ω_{it}: $\widehat{\omega}_{it} = \hat{\phi}_{it} - \beta_k^* k_{it} - \widehat{\beta_0}$. Using these values, a consistent approximation to $E[\omega_{it}|\omega_{it-1}]$ is given by the predicted values from the regression

$$\widehat{\omega}_{it} = \gamma_0 + \gamma_1 \omega_{it-1} + \gamma_2 \omega_{it-1}^2 + \gamma_3 \omega_{it-1}^3 + \epsilon_{it}, \quad (3)$$

assuming that productivity follows a Markov process. The estimate of $\widehat{\beta_k}$ is the solution to following process

$$min_{\beta_k^*} \sum_t (y_{it} - \beta_l l_{it} - \beta_k^* k_{it} - E\left[\omega_{it}|\widehat{\omega_{it-1}}\right])^2 \quad (4).$$

The bootstrap approach is used to construct standard errors for the estimates $\widehat{\beta_l}$ and $\widehat{\beta_k}$. Plant-level TFP is measured by substituting the estimated output elasticity of capital, $\widehat{\beta_k}$ and of labor, $\widehat{\beta_l}$ into the Cobb-Douglas production function as follows.

$$TFP_{it} = \frac{y_{it}}{k_{it}^{\widehat{\beta_k}} l_{it}^{\widehat{\beta_l}}}.$$

3.2 Empirical Strategy

The following equation is used to identify the impact of tariff liberalization on within-plant productivity:

$$\begin{aligned}\ln tfp_{ijt} &= \alpha + \alpha_i + \beta(Export\ barrier_t \times ExporterD_{ij,1997}) + \gamma Output\ tariff_{jt} + \delta ImporterD_{ijt} \\ &\quad + \eta Input\ tariff_{jt} + \lambda(Input\ tariff_{jt} \times ImporterD_{ijt}) + X_{ijt}\theta + \varepsilon_{ijt} \end{aligned} \quad (5),$$

where $\ln tfp_{ijt}$ is log of total factor productivity of factory i in industry j at time t; $ExporterD_{ij1997}$ is the exporter dummy, which takes the value of 1 if a factory is an exporter in 1997; and $ImporterD_{ijt}$ is importer dummy, which takes the value of 1 if a factory is an importer of inputs. $Export\ barrier_t$ is the export barrier for exporters, $Output\ tariff_{jt}$ is tariff for final goods at 4-digit industry level[6], and $Input\ tariff_{jt}$ is tariff for intermediate goods at 3-digit industry level at year *t*. These tariffs are at valorem tariff and measured as percentage based on World Integrated Trade Solution (WITS) database. The detailed construction process for $Export\ tariff_t$ and $Input\ tariff_{jt}$ is discussed in subsection 4.1. X_{ijt} is a vector of factory characteristics including type of ownership, and size[7]. All specifications also include plant fixed effect, α_i, to control time-invariant characteristics of the plant.

According to Bustos (2011), we predict that incumbent exporters increase their productivity along with the reduction in export barrier and thus expects $\beta > 0$. According to Amiti and Knonigs (2007), input and output tariffs increase firms' productivity. In the Indian context, Topalova and Khandelwal (2011) and Harrison et al. (2011) find that reduced input tariffs rather than reduced output tariffs increase productivity. The interaction term between input tariff and the importer dummy reflects the direct effect of the decline in input tariff on importers' productivity. A negative and significant coefficient on the interaction term λ would imply that importers benefit more from lower input tariffs than non-importers. Thus, this study hypothesizes that δ is positive, indicating that imported inputs embody advanced technology. Note that we do not include the exporter dummy, as detailed next, due to a data limitation in which exporters' status does not change during the period.

4. Data

4.1 Data

Plant Information

This present paper uses plant-level panel data for Indian manufacturing firms during 1998 to 2007. The unit-level information comes from the Annual Survey of Industries (ASI) undertaken by the Central Statistical Organization (CSO). This is an annual survey of all formal manufacturing factories across all the states. The ASI data covers two sets of surveys: a census and a sample. The former includes enterprises with more than 200 workers and the latter includes enterprises with less than 200 workers[8]. The balanced panel data is constructed using data from the census sector. The data set contains information about 665 individual manufacturing enterprises for each year.

Unfortunately, the panel data from ASI during 1998 to 2007 does not contain the information about exports. Therefore, the cross section ASI data for 1997, which contains information about factories' exporting revenue, are matched with the panel data. However, since there are no factory IDs in the 1997 data, the same factory for 1997 and 1998 is identified by matching the following variables: state, type of ownership, type of organization, rural or urban, and net fixed asset. In accounting, the net fixed asset at the end of last financial year must coincide with the net fixed asset at the beginning of the current financial year. There is, however, a within-plant deviation of around 30% on average, even in the panel data. Therefore, the factories are presumed to be the same if the deviation between the 1997 and 1998 data is less than 30% and the other time-invariant variables are same. Fortunately, there is a deviation of about 2% on average in the matched balanced panel set. The matched data set contains information about 170 individual manufacturing enterprises with information about exports.

Export barrier

We construct a database of annual export barrier data from 1998 to 2007 using World Integrated Trade Solution (WITS) data and Import and Export data from the Ministry of Commerce and Industry. The export barrier for year t is constructed as

$$export\ barrier_t = \sum_k \gamma_{kt} \cdot Average\ import\ tariff_{kt},$$

where γ_{kt} is country k's share of the amount of export value from India and $Average\ import\ tariff_{kt}$ is country k's average Most Favored Nation (MFN) import tariff in year t except for the countries whose bilateral or multilateral trade agreements with India are in force in the sample period[9]. Preferential tariffs are applied for these countries. Number of trade partner is 142. The average export barrier falls from more than 8.6% in 1998 to 7.1% in 2007 (See Figure 1).

Output and Input tariff

We construct a data of annual input tariff data for 1998 to 2007 as follows. Tariff data for India are drawn at the four-digit of the Harmonized System (HS) classification, which are converted to International Standard Industrial Classification of All Economic Activities (ISIC) Revision 3 by using the appropriate concordance table available from WITS. National Industrial Classification (NIC) 98, Indian own industrial classification at 1998, at four-digit level has the one to one correspondence with ISIC Revsion 3. Therefore, the output tariff is at four-digit industry level. The input tariff for industry j is constructed as

$$input\ tariff_{jt} = \sum_s \alpha_{st} \cdot output\ tariff_{st},$$

where α_{st} is the share of input j in the value of output . The share of input of each industry is calculated from the 1998 Input Output (IO) table. The industrial classification of the IO table is at the three-digit NIC level. Therefore, input tariff for the industry is at three-digit industry level.

4.2. Descriptive Statistics

Table 1 reports the descriptive statistics for the main variables, including real value added as output, real fixed asset as capital, and total person-days as labor. This table shows that a plant's average value added and fixed assets are INR443 million and INR869 million, respectively. Plants employ an average of 260,000 person-days. Export barriers range from 6.9% to 8.6%. Output tariffs

Table 1
Descriptive statistics for the main variables

Variables		NOB	Mean	SD	Minimum	Maximum
Real Value Added	(milion Rs.)	1675	443	1,420	11,507	23,500
Real Fixed Asset	(milion Rs.)	1697	869	4,430	583	90,500
Man-days employed	(mandays)	1695	262,634	762,718	26	11,800,000
Real Computer Investment	(milion Rs.)	1640	492	3,987	0	83,772
Export barrier	(%)	1700	7.81	0.65	6.90	8.64
Output tariff	(%)	1640	28.20	18.74	0.00	260.00
Input tariff	(%)	1696	16.91	5.34	6.21	30.15
ExportD	(Indicater)	1700	0.46	0.50	0	1
ImportD	(Indicater)	1700	0.54	0.50	0	1
Private Alone	(Indicater)	1700	0.97	0.17	0	1
Private joint	(Indicater)	1700	0.01	0.11	0	1
Government owned	(Indicater)	1700	0.02	0.13	0	1
Medium	(Indicater)	1700	0.48	0.50	0	1
Small	(Indicater)	1700	0.51	0.50	0	1
Large	(Indicater)	1700	0.02	0.13	0	1
Age	(Year)	1700	29	17	2	112
Age sq	(Year sq)	1700	1,118	1,425	4	12,544

Source: Calculations using ASI data.

range from 0% to 260% with an average of 28.2%, which is much larger than that of input tariffs, which range from 6.2% to 30.2% with an average of 16.9%. . Most plants are privately owned, and 46% of enterprises are exporters. Plants operated for an average of 29 years.

5. Results

Table 2 shows the estimated output elasticity of capital or labor. The production function is constant return to scale since the estimation fails to reject $\beta_l + \beta_k = 1$ statistically.

Table 2
Output elasticity

l	0.562***
	(0.066)
k	0.353***
	(0.114)
Observations	1672

Standard errors in parentheses
***p<0.01, **p<0.05, ***p<0.1
Source: Author's Calculation

Before analyzing the relationship between a tariff reduction and productivity growth, we confirm Bernard and Jensen's (1999) finding that exporters are more efficient, larger in terms of employment, and pay higher wages. For confirmation, we estimate following equation for 1998:

$$v_{ij,1998} = \alpha + \gamma Export_{ij,1997} + \varepsilon_{ij,1998} \qquad (5),$$

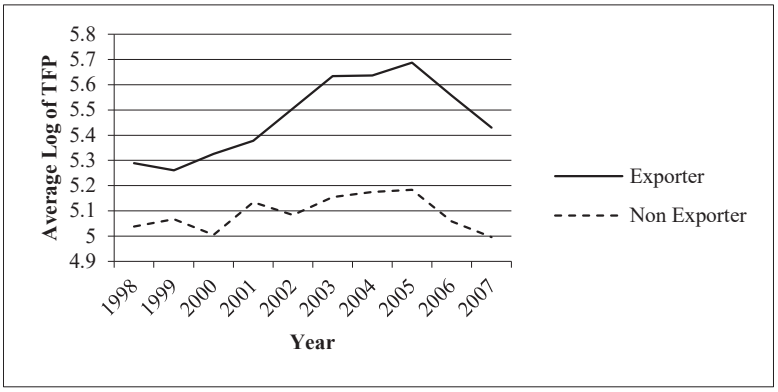
where v_{ijt} is log of TFP, log of employment, or log of labor cost of factory i in industry j at time t; $Export_{ij,1997}$ is the export dummy, which takes a value of 1 if a factory is an exporter in 1997. Table 3 shows the result of these estimations, which indicate that exporters are more efficient, larger in terms of employment, and pay higher wages initially.

Table 3
Exporters' characteristics

Dependent	Log of TFP	Log of Employment	Log of Wage
Export-dummy	0.252**	0.856***	1.445***
	(0.120)	(0.209)	(0.267)
Constant	5.038***	11.346***	16.941***
	(0.082)	(0.140)	(0.183)
Observations	164	169	169
R-squared	0.020	0.089	0.144

Standard errors in parentheses
***p<0.01, **p<0.05, ***p<0.1
Source: Author's Calculation

Figure 3
Comparison of exporters' and non-exporters' log of TFP



Source: Calculations using ASI data.

Comparing the average TFP growth between exporters and non-exporters for 1998 to 2007, Figure 3 shows that Average TFP of exporters dominate that of non-exporters in every year. Moreover, the average TFP growth of incumbent exporters are higher than that of non-exporters from 2000 until 2005. In this period, the export barrier and the import tariffs decreased drastically, suggesting that the reductions in both might have different impacts on the average TFP growth of exporters and non-exporters.

Table 4 reports the results from equation (5) for 1998 to 2007. Column (1) indicates that exporters react to export barrier reductions: their average TFP increases by 11 percentage points for each 1 percentage point decrease in export barriers. The regression in column (2) includes the output tariff and shows results quantitatively similar to those in column (1). Column (3) adds the input tariff and importer dummy and column (4) adds the interaction term of input tariff and importer dummy. These results suggest that, in addition to the exporter's productivity growth with a reduced export barrier, importers improved their productivity with a reduction in the input tariff. Topalova and Khandelwal (2011) also shows that reduced input tariffs rather than reduced output tariffs increase productivity, but output tariff has moderate but significant effect on productivity. Sivadasan (2009) also shows the similar result. The difference from those literatures might be due to the exclusion of exit and entry effects of plant. The results in column (5) include the control variables of ownership, size, state, and industry dummies and indicate that productivity for exporters and importers increase with reduced export and input tariffs, respectively. In addition, larger factories are more productive than smaller factories.

The results indicate that incumbent exporters improve their productivity, consistent with findings from previous studies (Bustos, 2011; Lileeva & Trefler, 2010; Aw et al., 2011). Although the TFP growth may not directly reflect technology upgrades (See Foster et al., 2008; Hsieh and

Klenow, 2009; and Bernard et al., 2010), the process that exporters increase investments in technology using the profit from reduced trade costs may occur in Indian manufacturing. The increase in IT investment may reflect technology upgrades, especially in the late 1990s and early 2000s. Therefore, we estimate equation (4) using computer investment as a dependent variable. Table 5 indicates that a reduction in export barrier leads to an increase in exporters' computer investments in any specification. Thus, exporters might upgrade their technology along with export barrier reduction.

Table 4
Impact of trade liberalization on productivity

	(1)	(2)	(3)	(4)	(5)
Export barrier × ExportD	-0.115***	-0.125***	-0.122***	-0.0795***	-0.0801***
	(0.034)	(0.036)	(0.036)	(0.038)	(0.037)
Output tariff		-0.0006	-0.00001	-0.0002	0.0001
		(0.00181)	(0.00184)	(0.00184)	(0.00155)
Input tariff			-0.011	-0.004	0.011
			(0.009)	(0.010)	(0.011)
ImportD			0.0895*	0.372***	0.234**
			(0.047)	(0.098)	(0.095)
Input tariff × ImportD				-0.0173***	-0.0112**
				(0.005)	(0.005)
Private joint					0.621
					(0.434)
Government owned					-0.084
					(0.389)
Medium					-0.842***
					(0.125)
Small					-1.374***
					(0.135)
Age					0.003
					(0.006)
Age sq					-0.0001
					(0.0001)
Factory FE	YES	YES	YES	YES	
Year FE	YES	YES	YES	YES	YES
State FE					YES
Industry FE					YES
Constant	5.588***	5.653***	5.776***	5.367***	6.210***
	(0.144)	(0.153)	(0.213)	(0.245)	(0.652)
Observations	1,672	1,612	1,608	1,608	1,608
R-squared	0.068	0.068	0.069	0.076	0.153
Number of panelid	170	164	164	164	164

Source: Calculations using ASI data

Table 5
Impact of trade liberalization on computer investment

	(1)	(2)	(3)	(4)	(5)
Export barrier × ExportD	-771.9***	-791.6***	-806.4***	-630.2***	-658.4***
	(211.4)	(220.7)	(222.8)	(236.4)	(237.6)
Output tariff		-8.284	-8.922	-9.672	-3.029
		(11.26)	(11.54)	(11.53)	(7.11)
Input tariff			10.39	72.02	65.95
			(58.38)	(64.69)	(64.98)
ImportD			108.60	1,281**	901.10
			(291.30)	(607.40)	(581.00)
Input tariff × ImportD				-71.89**	-41.73
				(32.69)	(31.75)
Private joint					15,729***
					(1281.00)
Government owned					476.30
					(1128.00)
Medium					-7,290***
					(742.40)
Small					-7,320***
					(782.70)
Age					5.00
					(23.54)
Age sq					-0.114
					(0.28)
Factory FE	YES	YES	YES	YES	
Year FE	YES	YES	YES	YES	YES
State FE					YES
Industry FE					YES
Constant	3,108***	3,423***	3,229**	1,528	6,473***
	(876.4)	(941.9)	(1318.0)	(1526.0)	(2366.0)
Observations	1,697	1,637	1,633	1,633	1,633
R-squared	0.026	0.028	0.028	0.031	0.045
Number of panelid	170	164	164	164	164

Source: Calculations using ASI data.

6. Conclusion

We construct unique, balanced plant-level panel data for Indian manufacturing firms by matching cross sectional data in 1997, including information about exports, for 1998 to 2007. Based on the data, we estimate TFP and examine the differing trends in TFP growth between exporters and non-exporters and the impact of export barrier reductions on incumbent exporter's productivity. The results show that trade liberalization improves incumbent exporters' productivity and computer investment: their productivity increases by 8 to 12 percentage points for each 1 percentage decrease in export barriers. This may suggest that incumbent exporters increase investments to upgrade technology using the profit from reduced tariffs, as Bustos (2011) suggests. Another possibility is that "learning by exporting" increases exporters' productivity

after entering the export market (Van Biesebroeck, 2005; De Loecker, 2007), though our data could not identify when a firm enters the export market. Another finding is that importers improved their productivity as input tariffs declined. This result is consistent with that of Topalova and Khandelwal (2011).

In the wave of globalization after the creation of the World Trade Organization (WTO), the Indian government adopted an export-oriented trade policy with subsidies to exporters. The results from chapter suggest that this policy change benefited incumbent exporters during the period in which the trade partner reduced the export barrier. The improved economic performance among exporters led the government's targeted growth in the Indian economy.

One limitation in the data is that exporter status does not change during the sample period because the data only contains initially this information. Moreover, the method of identifying factories from the 1997 data in the post-1998 data suffers from sample selection bias because this favor plants with good accounting systems and drop some samples with insufficient systems. Therefore, future research could use other methods for matching, such as propensity score matching. Future studies could also construct the export barrier at the industry level.

Annotation

1) Bustos (2011) assumes the bilateral trade liberalization with an identical partner.
2) Source data is World Integrated Trade Solution data.
3) The U.S.A, United Arab Emirates, China, Singapore, the U.K., Hong Kong, Netherland, Germany, Belgium, and Italy in 2007.
4) In the 2000's, India concluded bilateral trade agreements with Sri Lanka, Afghanistan, Chile, Singapore, Nepal, Korea, Bhutan, and Bangladesh. India concluded the CEPA with Malaysia and Japan in 2011, and a multilateral trade agreement with Association of South-East Asian Nations (ASEAN), Mercado Comun del Sur (MERCOSUR), South Asian Free Trade Area (SAFTA), Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC), and American Public Transportation Association (APTA). Other bilateral or multilateral trade agreements are still under negotiation.
5) The Duty Entitlement Pass Book (DEPB) scheme began in1997, and under the DEPB scheme, the credit of amount as a specified percentage of FOB value of exports is given to the exporter after the export of goods. Firms can then use this credit to import raw materials and intermediate goods for export purpose. The Export Promotion of Capital Goods (EPCG) scheme benefits exporters by reducing tariffs on imports of capital goods such as machinery and machinery parts.
6) Tariff data for India are drawn at the four-digit level of the Harmonized System classification, which are converted to International Standard Industrial Classification of All Economic Activities (ISIC) Revision 3 using the concordance table available from WITS. National Industrial Classification (NIC) in 1998 at the four-digit level has a one to one correspondence with ISIC Rev 3 at the four-digit level.
7) Topalova and Khandelwal (2011) categorize firms as small if the average sales during the sample period are below the median, medium if sales are above the median but less than the 99th percentile, and large if sales exceed the 99th percentile.
8) The threshold changed from 200 workers to 100 workers in 2000. However, chapter uses the previous threshold in order to create balanced panel data.

9) FTA with Sri Lanka, Singapore, Bhutan, and Chile are in force in 2000, 2005, 2006 and 2007, respectively. MFA in South Asian Free Area (including Bangladesh, Pakistan, Nepal, and Maldives) is in force in 2006.

Reference

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