Does trade openness affect manufacturing growth at the Indian state level?

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Abstract

On the whole, manufacturing growth in India failed to accelerate in spite of widespread trade reforms undertaken since the early 1990s. However, the picture is mixed if we look at the sub-national level. This paper attempts to examine the determinants of manufacturing performance at the state-level in a panel model framework for the time period 1988-2007. One aspect, which makes this paper distinct from other empirical exercises in this field, is the consideration of trade openness of the states as one of the determinants of manufacturing performance in addition to the other usual control variables such as infrastructure, access to credit, human capital and labour market environment. Data on trade is not available at the Indian state level. We therefore construct two proxies for trade openness, one relating to exports volume and the other related to tariff barriers, for the Indian states in our sample. In line with the conventional view, trade barriers have a negative impact on manufacturing growth whereas trade volumes have a positive impact. However, openness has no impact on registered manufacturing in India. We argue that it is the flexibility of the unregistered sector (due to lack of rigid labour laws) which helps it take advantage of trade openness.

Keywords: Manufacturing growth, Trade openness, Indian states, Panel data model

JEL Classification: F10, F13, O14, O24

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The usual disclaimer applies.

1. Introduction

After gaining independence in 1947, India started its journey on the economic path guided by the philosophy of self-sufficiency. The country followed a state-led growth model with the public sector as the dominant player in the economy.

India's post-independence industrial strategy adopted during the late 1950s was primarily based on import substitution (Goldberg et al., 2008 and Veeramani, 2012). Import substitution was a strategy of encouraging an expansion of domestic production by restricting imports of manufactured goods from foreign industries. The infant industry argument provided the most popular rationale for protection among policymakers. The crux of the argument was that the industry is unable to compete currently but may be able to do so in the "future". Accordingly, India adopted a restrictive regime during the 1950s which more or less continued till the early 1980s. Several restrictive measures such as quantitative restrictions on imports and foreign exchange controls were undertaken. Industrial policy operated through a complex system of industrial licensing with the state taking all the major investment decisions.

Due to such onerous controls on international trade, Indian industries did not have access to superior technologies from developed countries. Lack of competition and huge government subsidies created an "unchallenged" environment making the overall manufacturing sector largely inefficient. The lack of technology and competition coupled with stringent government regulations left the industries unmotivated for improvement. The policy of import substitution did allow India to build a diversified manufacturing sector but it also led to misallocation of resources and is blamed for the stagnation of the manufacturing sector in the 1960s (Kulkarni and Meister, 2008 and Gupta, et al., 2008). The Total Factor Productivity (TFP) grew at a rate below 1% during 1960s and then the country experienced a negative TFP growth during the period 1970-80.

By contrast, the East Asian economies adopted a policy of export-led industrialisation and experienced rapid growth.Their success cast a doubt on the effectiveness of the policies such as import substitution and developing countries were almost always recommended to follow the East Asian model of growth (Veeramani, 2012). During the late-1970s and early-1980s, a few measures of liberalisation were adopted by India. This included deregulation and delicensing in certain industries, thus according a greater role to the private sector. This process of

liberalization greatly accelerated after 1991 following a severe balance of payments crisis. The crisis compelled India to undertake a series of industrial and trade reforms. According to Ahluwalia (1995), the changes that the reforms after 1991 brought in were “fundamental” in nature compared to the “marginal” changes only in the previous decade.

Under these reforms, the trade regime was drastically modified by introducing reduction in tariffs, a removal of quantitative restrictions on imported inputs and capital goods for export production and elimination of public sector monopoly on imports of all items except petroleum, edible oils, and fertilizer and certain items canalized for health and security reasons. The government’s export-import policy plan (1992–97) reduced the role of the import and export control system considerably. The share of products subject to quantitative restrictions decreased from 87% in 1987-88 to 45% in 1994-95. Restrictions on exports were also relaxed, with the number of restricted items falling from 439 in March 1990 to 210 in March 1994. Furthermore, the average tariffs fell from more than 80% in 1990 to 39% by 1996.

All these reforms were carried out in order to make the Indian industry more efficient, technologically up-to-date and competitive to achieve rapid growth. No doubt, India grew quite fast during the post-1991 period following the reforms. However, it has been a growth led mainly by the fast expansion of the services sector. Some of the sub-sectors of manufacturing, which did well during this period, were mainly capital-intensive industries and not the labour-intensive ones. Overall, the manufacturing sector of India is yet to take off. This is contrary to the evidence from other emerging countries such as China where manufacturing has been the main contributor to the fast economic growth.

As seen from Table 1, the manufacturing sector in India, in spite of the widespread reforms, remained more or less stagnant for the past three decades. As the Indian economy started to adopt a pro-business regime by moving away from a government-led growth model during the 1980s, the GDP composition started to shift towards services with a subsequent decline in the agricultural share.

Table 1: Sectoral shares in GDP of India

Year	Agriculture, value added (% of GDP)	Manufacturing, value added (% of GDP)	Services, etc., value added (% of GDP)
1980	35.4	16.2	40.3
1990	29.0	16.2	44.5
2000	23.1	15.4	50.8
2010	17.7	14.5	55.1

Source: - World Development Indicators (2011)

However, there is significant variation in the share of manufacturing in the State Domestic Product (SDP) across the Indian states. There have been some states, such as Gujarat and Maharashtra, whose manufacturing share in SDP has been consistently higher than the other Indian states. Furthermore, the manufactures share in SDP for the 15 major states has actually fallen over time during the post-reform period. But states such as Orissa, Bihar and Rajasthan have experienced a rise in the share during the same period. On the other hand, there are some states such as Tamil Nadu and Kerala whose performance has been much worse when compared to the overall average decline of 2.1% in the share.

Table 2: Share of Manufacturing to SDP of Indian States

States	1994-95	2004-05	Change
Punjab	16	14.8	-1.3
Haryana	17.4	17.3	0.0
Rajasthan	18.3	18.9	0.5
Uttar Pradesh	18.4	16	-2.3
Bihar	20.4	21.8	1.3
Assam	18.9	16	-3.0
West Bengal	21.9	18.6	-3.2
Orissa	21.6	25.9	4.3
Madhya Pradesh	23.8	23.4	-0.4
Gujarat	30.6	28.1	-2.4
Maharashtra	28.1	22.6	-5.5
Andhra Pradesh	20.2	19.0	-1.2
Karnataka	23.3	20.4	-2.8
Kerala	19.2	15.3	-4.0
Tamil Nadu	29.3	20.9	-8.4
Average of 15 states	**20.5**	**18.4**	**-2.1**

Source: Kathuria and Raj (2010)

In this paper, we ask: can trade openness explain some of the differences in the cross-state manufacturing performance? We try to answer this question on the basis of manufacturing SDP growth performance of 22 states (including the new states-Jharkhand, Chhattisgarh and Uttarakhand) in a panel model framework for the time period 1988-2007. The states of Jharkhand, Chhattisgarh and Uttarakhand have been clubbed with their parent states-Bihar, Madhya Pradesh and Uttar Pradesh respectively in order to maintain consistency in the data for the entire sample period.

The rest of the paper is organised as follows. Section 2 conducts a review of the relevant literature. Section 3 presents a descriptive analysis of the manufacturing performance of major Indian states. The econometric model is presented in Section 4 along with variable description. Section 5 presents and discusses the econometric findings. Finally, Section 6 concludes with some policy implications.

2. Review of the Literature

A vast gamut of empirical papers exist which show that the manufacturing sector in India failed to take off during the post reform period. Researchers have put forward several hypotheses explaining the reasons behind such dismal performance. Gupta et al. (2008) say that India's crumbling infrastructure has been one of the main reasons behind the under-performance of its manufacturing sector. Another major constraint has been the lack of proper infrastructure. Many researchers such as Panagariya (2006) argue that India's crumbling infrastructure is one of the factors which explain the difference in the manufacturing performance of India and China. The financial sector (access to credit) is another area where there has been little progress even in the post reforms period. Problems of credit constraints due to lack of financial sector reforms may have acted as a barrier to small and medium-sized firms from expansion (Nagaraj, 2005).

However, as mentioned previously, the manufacturing sector performance differs drastically across states. Some states have experienced substantial growth in the manufacturing sector during the post-reform period whereas some experienced almost no growth at all in spite of the fact that the macro level reforms were same for all the states. A few papers have studied the pattern of industrial development at the Indian sub-national level. The debate, whether inter-regional disparities have increased or decreased, remain largely inconclusive. Dhar and Sastry (1967) conduct a study on industrial growth for the time period 1951-61 and conclude that inter-state dispersion in industrial output has been declining.[2]Sarodamoni (1969) and Lahiri (1969) observe a similar trend. Awasthi (1991) studies the pattern of industrial growth of 17 major Indian states for the time period 1961-1978 and concludes that inter-state disparities have declined. On the other hand, there are many empirical studies which present exactly the opposite picture. Nadkarni (1970), Jhuraney (1976) and Barathawal (1980) all show that inter-state

[2] They used industrial power consumption as a proxy for industrial output.

disparity in industrial development has increased during the 1960s and 1970s. Some empirical papers relating to the post reform period also find that the inter-state disparities in industrial development are growing (Bhattacharya and Sakthivel, 2004 and Papola et al., 2011).Sarker and Das (2011) study the disparities of state-level manufacturing performance in India and say that the better performing states introduced better economic and administrative reforms during the reform period compared to the laggard states and this is the main reason behind the formers' industrial growth. They point out some of the key areas, such as labour market problems, which may have caused the difference in the performance across states. For instance, West Bengal, one of the worst performers in manufacturing among Indian states, had the highest number of man-days lost due to lockout and strikes among all the states. Number of man-days lost in West Bengal was about 69% of all man days in India in 2005. On the other hand, all the better performing states experienced a substantial decline in the incidence of industrial disputes during the post reform period. In 2005, the combined man-days lost in Andhra Pradesh, Gujarat, Karnataka, Maharashtra, Punjab and Haryana was only 7.75% of all man-days lost in India during that year. States with higher labour market rigidities are also less attractive for industrial investments (Panagariya, 2006). States such as Gujarat, Haryana, Maharashtra, Tamil Nadu and Karnataka have the highest incidence of per capita Foreign Direct Investment (FDI) during the time period 1991-2003. Conversely, West Bengal and Kerala failed to attract FDI compared to the above mentioned states.

The difference in the quality of physical infrastructure between the better performing states and the so-called 'laggard' states has also been cited by past papers as one of the factors why the former outperformed the latter. Assam, Bihar, West Bengal and Uttar Pradesh record the most dismal performance among all states in regard to per capita electricity consumption and telephone lines per hundred people. Chakravorty and Lall (2007) find evidence of "cumulative causation and divergence" i.e. industrial investments tend to go to states where there already exists a substantial industrial base. In other words, they find that the industrially advanced regions attract the new investments.

One major limitation of the past studies is that none of them controlled for any openness measure in their analysis.[3] This study tries to fill that gap in the existing literature. We expect that there should be positive a correlation between trade openness and state-level manufacturing performance. We create two proxies for trade openness to assess the state-level manufacturing and trade link which will be explained later in the paper.

Some previous studies have found that the impact of the trade and industrial reforms have been different on registered and unregistered sectors of manufacturing (Rani and Unni, 2004). This is quite possible because there are some fundamental differences in characteristics of the two sub-sectors. We too therefore disaggregate the manufacturing sector into registered and unregistered sectors and try to assess the impact of trade openness on the two manufacturing sub-sectors separately at the state level

In the next section, we look at the relative industrial performance of the states (in terms of the growth of manufacturing sector) in our sample and try to see whether the states are converging or diverging in terms of their manufacturing performance. Though many studies have done this exercise yet re-doing this is important because, in the past, different papers have reached different conclusions on the convergence of Indian states in terms of manufacturing performance. The ambiguity is probably expected because they all use different time periods and most of them did not have enough years after the 1991 reforms to carry out this analysis.

2. Manufacturing Performance of Indian States-An Overview

In the post reform period, the general notion was that inter-state disparities grew wider and the richer states, on an average, grew faster than the laggard states. The state governments, which implemented a series of reforms within their own states, took advantage of those macro level economic reforms and registered more impressive manufacturing performance than the others. As we see in the Table 3, there is significant variability in manufacturing performance at the state-level.

[3]Mitra and Ural (2008) is probably the only exception. They find that trade liberalisation benefits most the export-oriented industries located in states with flexible labour-market institutions and deregulation does not have a positive impact on industrial productivity in states with bad labour institutions.

Table 3: State-wise aggregate manufacturing GSDP growth (%)

States	1980-89	1990-99	2000-09
Andhra Pradesh	7.65	7.34	6.37
Assam	6.59	1.04	6.86
Bihar	6.93	-0.83	6.67
Delhi	8.67	7.12	7.17
Goa	8.15	10.47	4.18
Gujarat	8.23	11.65	9.41
Haryana	10.81	6.03	7.69
Himachal Pradesh	12.58	10.48	6.05
Karnataka	6.76	6.52	10.94
Kerala	2.87	6.14	4.6
Madhya Pradesh	5.89	7.99	1.2
Maharashtra	5.65	7.12	6.99
Meghalaya	5.78	1.7	17.31
Orissa	6.15	6.4	14.36
Punjab	8.98	8.3	5.15
Rajasthan	6.01	5.6	5.41
Tamil Nadu	3.52	4.22	5.28
Uttar Pradesh	9.95	3.12	6.03
West Bengal	3.11	5.63	3.97
Aggregate Average Growth	**5.95**	**7.03**	**8.5**

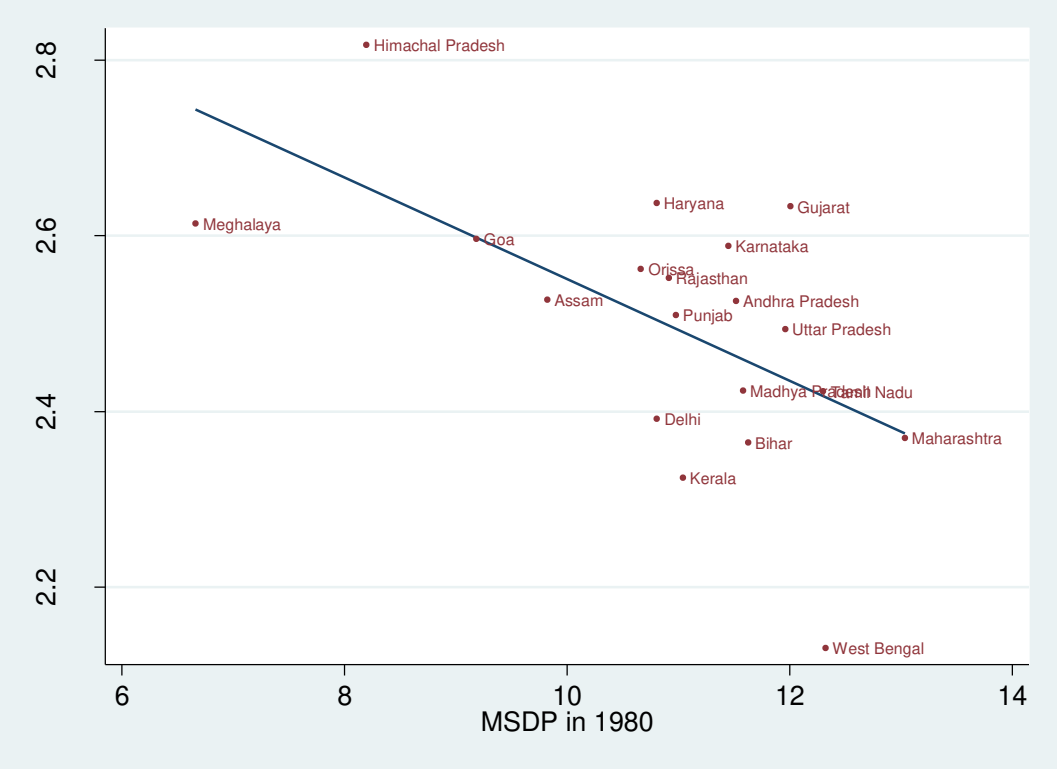
Source: Authors' own calculation using data from EPWRF.
Note: The new states of Jharkhand, Uttarakhand and Chhattisgarh have been clubbed with their parent states.

Among all the states, only Gujarat has performed better than the national average throughout the three decades. States such as Himachal Pradesh, Karnataka, Andhra Pradesh, Delhi and Haryana also maintained an impressive growth rate (a rate that is higher or at par with the national

average) during this time period. States such as Kerala and West Bengal have been the consistent under-performers (growth in these 2 states has always been below the national average). Aggregate manufacturing growth in the previous decade (2000s) went up by around 1.5 percentage points compared to the 1990s. However, it is not the high performers such as Maharashtra, Andhra Pradesh or Gujarat which experienced a rise in growth to explain the acceleration in aggregate average growth in the 2000s. In fact, for most of the fast-growing states like Gujarat, Maharashtra, Goa, Punjab, Himachal Pradesh and Andhra Pradesh, the performance in the context of manufacturing worsened in the 2000s when compared to that during 1990s. Only Karnataka, Haryana and Tamil Nadu are the exceptions. It has been the hitherto "laggard" states such as Assam, Orissa, Bihar, Uttar Pradesh and Meghalaya which showed a sharp rise in their average growth rates during 2000-09.If we disaggregate the manufacturing GSDP and look at the registered and the unregistered manufacturing performance separately, a similar pattern is observed (see Tables 12 and 13 in the Appendix).

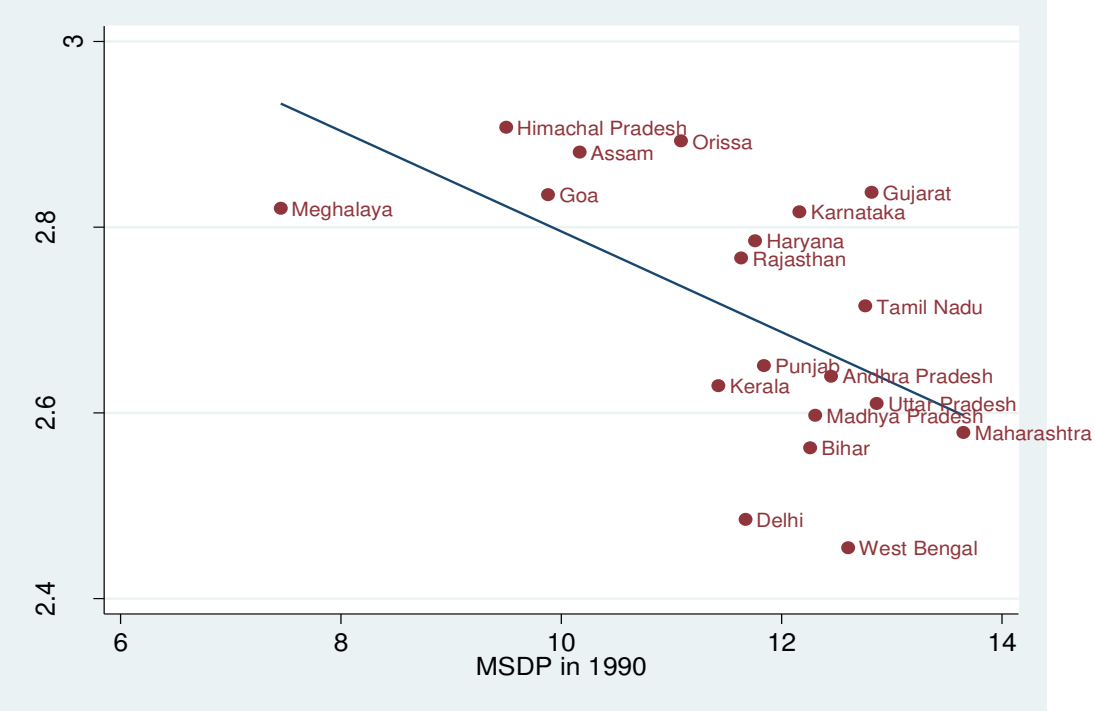
So if it is the case that there has been an acceleration in the manufacturing growth rate of the poorer states during the 2000s then it will be interesting to check whether the Convergence Hypothesis holds for the Indian states. According to the hypothesis, a poor state, other things equal, should grow faster than a rich state. We test the hypothesis for the time periods 1980-2007 and 1990-2007 respectively. We use manufacturing Gross State Domestic Product (GSDP) in 1980 and 1990 as the initial GSDP respectively. As Figures 1 and 2 suggest, we find some support for the fact that manufacturing sector in the poorer states are growing at a faster rate than that in the richer states during the last two decades.

Figure 1: Testing the Convergence Hypothesis for 1980-2007



Source: Authors' own calculations based on data from EPWRFITS.
Note: Both x and y variables are expressed in logs.

Figure 2: Testing the Convergence Hypothesis for 1990-2007



Source: Authors' own calculations based on data from EPWRFITS.

The graphs above plot the average growth rate of the states for the period 1980-07 and 1990-07 against the manufacturing GSDP in 1980 and 1990 respectively. If there is convergence with the income level of the richer states, the relationship should be downward sloping which is the case for Indian states. This evidence of convergence is contrary to the findings by some previous studies such as Chakravorty and Lall (2007). It may probably be due to the fact that those studies covered very few years after the 1991 reforms and did not include the 2000s when "laggard" states such as Bihar, Orissa and Meghalaya experienced a considerable increase in growth as compared to that in the 1990s.

4. Model and Variable Description

There are two surveys- Investment Climate Survey by World Bank and a survey of about 250 manufacturing firms by ICRIER-which examined the views of the managers on what factors they perceive as major obstacles for the operation of firms.[4] Around 40% of respondents cited infrastructure as a major obstacle.[5] The next on the list of problems were access to finance, skills and labour regulations. The ICRIER survey found that managers regard lack of infrastructure, skill and access to finance as the most serious obstacles for growth. We select the explanatory variables for our model on the basis of the findings of these two surveys. The model, in the general form, can be written as

$\Delta Y_{it}=f(\dot{y}_{it}, enrol_{it}, manday_{it}, road_{it}/electricity_{it}, credit_{it}, TOI_{it})$

where at time t, in state i,

'Y'is the manufacturing GSDP growth rate in 1980-81 constant prices,[6] 'ẏ' is the initial manufacturing GSDP, 'enrol' (proxy for human capital) is the enrolment ratio in middle schools, 'manday' (proxy for labour market regulations) is the number of man-days (in 1000s) lost per worker due to lockouts and strikes, 'road' (proxy for infrastructure) is the road density (in km per square km), 'electricity' (another proxy for infrastructure) is electricity generation in million kwh as a proportion of total persons engaged in registered manufacturing sector, 'credit' is industrial

[4] See Gupta et al. (2008) for a detailed discussion on these two surveys.
[5] Tax incentives also came out to be a major factor. However, as Gupta et al. (2008) say, it is not straight forward to interpret this finding as the firms will always prefer to pay as less as possible. So we ignore the tax-related issues.
[6] 'Δ' denotes growth rate.

credit by scheduled commercial banks as percentage of manufacturing SDP and 'TOI' is the trade openness index. Data sources are given in the Appendix (Table 14).

To the best of our knowledge, Marjit et al. (2007) is the only other paper which constructed an openness index for 15 Indian states for the years 1980-2002. We construct proxies for both trade volume and trade barrier for 19 states. The indices introduced in this study also extend to more recent years.

Our analysis period ranges from 1988 till 2007. Years prior to 1988 could not be included in our study because tariff data is available from 1988 onwards. There can be endogeneity problem in our dataset because there can be reverse causality running from growth rate of manufacturing GSDP towards some independent variables such as the trade openness indices. Hence we work with 5 year averages of the data which will eliminate some of the endogeneity between SDP growth rate and trade openness variables. Moreover, our dependent variable is growth rate and it fluctuates greatly across years for all states. Hence, also to smooth the data, we take 5 year averages.

We have worked at the 2-digit industry level following the National Industrial Classification (NIC) 1987. For the years from 1998 onwards, a concordance has been done between NIC 1987 and NIC 1998 in order to maintain consistency in the grouping of a product. Since, the focus of this paper is manufacturing output hence as per NIC 1987, the divisions 20-38 have been considered. The details of the division have been given in the Appendix (Table A3.9).

Construction of the Trade Openness indices

1) Export Openness Index: The first of our indices is known as Export Openness Index (EOI). Let us suppose that there are 2 states A and B in a country at time t which produces products, X and Y. The production share of A and B for producing X is 0.4 and 0.6 respectively. Hence if the total export of X is 100 units then we assume that A exports 40 units out of it and B 60 units. Similarly, if the production share of A and B for producing Y is 0.3 and 0.7 respectively and the country exports 100 units of Y then, in that case, we assume that A exports 30 units of Y and B exports the remaining 70 units. If the state would have produced more products, we would have calculated the potential export share using the production share.

Now if A's State Domestic Product (SDP) is 300 units and there are n products then the general expression for EOI for A will be as follows:-

$$EOI = (\sum_{p=1}^{n} exports) / SDP$$

where, p=product and EOI=export openness index.

Similarly, we calculate the export openness index for the other state, B. The higher the number, the more is the degree of openness of the state concerned. We expect the sign on the coefficient of this variable to be positive. As per the economic theories, a more open state should grow faster than a relatively less open state. In our data, the export openness index for a particular state in a particular period is the average of the export openness for that state over the entire 5 years period.

2) Industry Tariff Index: We call the other trade openness index Industry Tariff index (ITI). Let us once again suppose that there are 2 states, A and B producing 2 products X and Y respectively. Let us assume that the import tariff rate is higher for X than Y. We then argue that B should have a higher manufacturing SDP growth rate than A because the latter is engaged in import-substitution industrialisation. In other words, the state economy for A practicesprotectionism and hence will have comparatively inefficient industries because they are not exposed to foreign competition. On the other hand, B engages in a comparatively more export-oriented industrialization (which makes its domestic industries more efficient) and hence is expected to have a higher growth rate.

The index has been calculated as follows:-

Say there are 5 manufacturing product divisions-I, II, III, IV and V. The tariff rates (T) are 100,104,110,160,200 (in percentages) respectively. There are 2 states, A and B. Production share (PS) of A is 10,20,30,30 and 10 and that of B is 25,35,15,10 and 15 (in percentages) respectively. Then the Industry Tariff Index is calculated, for state i at time t, as

$ITI_{it}=\Sigma(T_{it}*PS_{it})$

The lower the magnitude of the index the more open the state is. We expect the index to have a negative coefficient in our econometric model because protectionism or import-substitution strategy hampers growth. Table 4 below presents the trade openness index for each state in our sample. Column III and IV present the openness index based upon the level of trade barrier and trade volume respectively. The 20 year time period considered for our econometric analysis has been divided into four 5-year time periods and, accordingly, the openness indices are also based on 5 year averages for each of those four periods. For example, export openness index for Andhra Pradesh is 0.147 during the time period 2003-07. This implies that the average export openness of Andhra Pradesh during this 5-year time period is 14.7%.

Table 4: Trade Openness Indices for Indian states

State	Year	Industry Tariff Index (ITI)	Export Openness Index (EOI)
Andhra Pradesh	1988-92	151.8	0.037
Andhra Pradesh	1993-97	65.6	0.056
Andhra Pradesh	1998-02	33.74	0.07
Andhra Pradesh	2003-07	21.45	0.147
Assam	1988-92	142.8	0.092
Assam	1993-97	60.83	0.106
Assam	1998-02	31.66	0.086
Assam	2003-07	19.91	0.231
Bihar	1988-92	121.5	0.126
Bihar	1993-97	51.65	0.049
Bihar	1998-02	33.38	0.058
Bihar	2003-07	20.55	0.110
Gujarat	1988-92	128.28	0.022
Gujarat	1993-97	53.2	0.056
Gujarat	1998-02	31.96	0.108
Gujarat	2003-07	18.8	0.194

Haryana	1988-92	123.49	0.023
Haryana	1993-97	52.98	0.072
Haryana	1998-02	33.85	0.116
Haryana	2003-07	24.86	0.208
Karnataka	1988-92	136.76	0.03
Karnataka	1993-97	57.84	0.071
Karnataka	1998-02	33.73	0.119
Karnataka	2003-07	22.03	0.179
Kerala	1988-92	145.4	0.033
Kerala	1993-97	62.18	0.053
Kerala	1998-02	32.3	0.088
Kerala	2003-07	21.45	0.132
Madhya Pradesh	1988-92	132.51	0.028
Madhya Pradesh	1993-97	53.04	0.048
Madhya Pradesh	1998-02	34	0.064
Madhya Pradesh	2003-07	20.81	0.117
Maharashtra	1988-92	126.4	0.024
Maharashtra	1993-97	53.69	0.067
Maharashtra	1998-02	32.23	0.146
Maharashtra	2003-07	20.33	0.272
Orissa	1988-92	127.55	0.049
Orissa	1993-97	51.12	0.062
Orissa	1998-02	33.72	0.103
Orissa	2003-07	19.12	0.182
Punjab	1988-92	130.44	0.032
Punjab	1993-97	55.51	0.082

Punjab	1998-02	34.38	0.109
Punjab	2003-07	25.92	0.164
Rajasthan	1988-92	128.78	0.031
Rajasthan	1993-97	55.44	0.063
Rajasthan	1998-02	33.84	0.104
Rajasthan	2003-07	20.95	0.172
Tamil Nadu	1988-92	129.39	0.037
Tamil Nadu	1993-97	56.37	0.079
Tamil Nadu	1998-02	33.92	0.127
Tamil Nadu	2003-07	22.58	0.224
Uttar Pradesh	1988-92	135.1	0.032
Uttar Pradesh	1993-97	57.75	0.06
Uttar Pradesh	1998-02	33.74	0.109
Uttar Pradesh	2003-07	22.64	0.173
West Bengal	1988-92	126.53	0.035
West Bengal	1993-97	53.97	0.055
West Bengal	1998-02	32.61	0.053
West Bengal	2003-07	20.17	0.089
Delhi	1988-92	143.62	0.064
Delhi	1993-97	60.34	0.11
Delhi	1998-02	33.72	0.165
Delhi	2003-07	21.5	0.135
Goa	1988-92	131.3	0.043
Goa	1993-97	61.06	0.072
Goa	1998-02	33.43	0.118
Goa	2003-07	20.59	0.361

Himachal Pradesh	1988-92	138.85	0.062
Himachal Pradesh	1993-97	58.62	0.092
Himachal Pradesh	1998-02	33.69	0.132
Himachal Pradesh	2003-07	18.79	0.507
Meghalaya	1988-92	200	0.192
Meghalaya	1993-97	65.11	0.036
Meghalaya	1998-02	33.49	0.012
Meghalaya	2003-07	18.08	0.119

Source:- Authors' own calculations.

According to 2003-07 figures, Himachal Pradesh is the most open state in terms of exports volume (50.7%) followed by Goa (36.1%); whereas West Bengal is the least open state (8.9%). Among the larger states, Maharashtra is the most open of all (27.2%). In terms of tariff openness index, Meghalaya is the most open state (tariff index=18.08) with Himachal Pradesh being marginally behind (18.79). We compare the relative state rankings in terms of export openness index between the starting and the end periods in Table 5 below.

Table 5: Export Openness Index, 1988-92 and 2003-07

State	Export Openness Index_2003-07	Rank	Export Openness Index_1988-92	Rank
Himachal Pradesh	0.507	1	0.062	5
Goa	0.361	2	0.043	7
Maharashtra	0.272	3	0.024	17
Assam	0.231	4	0.092	3
Tamil Nadu	0.224	5	0.037	8
Haryana	0.208	6	0.023	18
Gujarat	0.194	7	0.022	19
Orissa	0.182	8	0.049	6
Karnataka	0.179	9	0.03	15
Uttar Pradesh	0.173	10	0.032	12
Rajasthan	0.172	11	0.031	14
Punjab	0.164	12	0.032	12
Andhra Pradesh	0.147	13	0.037	8
Delhi	0.135	14	0.064	4
Kerala	0.132	15	0.033	11
Meghalaya	0.119	16	0.192	1
Madhya Pradesh	0.117	17	0.028	16
Bihar	0.11	18	0.126	2
West Bengal	0.089	19	0.035	10

Source:- Authors' own calculations. Export Openness Index_2003-07 and Export Openness Index_1988-92 stand for openness index during the time period 2003-07 and 1988-02 respectively.

It can be seen that the rankings have changed considerably over time for many states. The starting point of our sample period, 1988-92, denotes that time when India has just started to adopt widespread trade reforms. The states which improve their ranks drastically over this span of 20 years are all the high performers like Maharashtra, Haryana and Gujarat. For instance, Maharashtra, which was ranked 17th out of the 19 states during 1988-92, came up to the 3rd position during 2003-07. Similarly, Haryana and Gujarat were placed at the last two ranks during the start of the sample period. However, they ended up at the 6th and 7th positions respectively. On the other hand, states such as West Bengal, Kerala and Meghalaya experienced significant deterioration in their ranks. In Tables 6 and 7, we rank the states according to the two openness indices during 2003-07 and the corresponding average manufacturing GSDP growth rate during 2000-09. Column III in both the tables ranks the states according to the corresponding degree of trade openness. Ranks presented in columns V, VII and IX denote ranks assigned to a state on

the basis of aggregate, registered and unregistered manufacturing sectors average GSDP growth rates during 2000-09 respectively.

Table 6: Ranking the states by Export Openness Index and Manufacturing Performance

State	Export Openness Index	Rank	Manufacturing GSDP growth rate(%)	Rank	Registered sector growth rate(%)	Rank	Unregistered sector growth rate(%)	Rank
Top 10 states in terms of trade openness								
Himachal Pradesh	0.507	1	6.05	11	6.93	13	7.21	5
Goa	0.361	2	4.18	17	2.33	18	6.82	6
Maharashtra	0.272	3	6.99	7	12.64	3	7.75	4
Assam	0.231	4	6.86	8	2.86	17	6.31	10
Tamil Nadu	0.224	5	5.28	14	7.4	11	3.47	18
Haryana	0.208	6	7.69	5	8.18	8	6.66	8
Gujarat	0.194	7	9.41	4	10.77	5	8.23	1
Orissa	0.182	8	14.36	2	18.95	2	6.76	7
Karnataka	0.179	9	10.94	3	11.45	4	5.26	14
Uttar Pradesh	0.173	10	6.03	12	9.54	6	6.54	9
Remaining States								
Rajasthan	0.172	11	5.41	13	7.47	10	7.79	3
Punjab	0.164	12	5.15	15	7.39	12	4.65	17
Andhra Pradesh	0.147	13	6.37	10	8.5	7	5.11	16
Delhi	0.135	14	7.17	6	4.64	15	8.2	2
Kerala	0.132	15	4.6	16	5.98	14	5.57	13
Meghalaya	0.119	16	17.31	1	36.18	1	5.2	15
Madhya Pradesh	0.117	17	1.2	19	7.74	9	2.83	19
Bihar	0.11	18	6.67	9	2.25	19	5.87	12
West Bengal	0.089	19	3.97	18	4.32	16	6.2	11

Source:- Authors' own calculations.

Maharashtra, Gujarat, Haryana and Orissa seem to be the most consistent performers. These states register some of the highest growth rates in both the registered and unregistered manufacturing sectors. Regardless of which trade openness index is considered, Maharashtra, Orissa, Gujarat, Himachal Pradesh and Assam are also amongst the most open states in India. Conversely, states such as Punjab, West Bengal and Kerala are some of the least open states and also the worse performers, as far as manufacturing is concerned.

Table 7: Ranking the states by Industry Tariff Index and Manufacturing Performance

State	Industry Tariff Index	Rank	Manufacturing GSDP growth rate(%)	Rank	Registered sector growth rate(%)	Rank	Unregistered sector growth rate(%)	Rank
Top 10 states in terms of trade openness								
Meghalaya	18.08	1	17.31	1	36.18	1	5.2	15
Himachal Pradesh	18.79	2	6.05	11	6.93	13	7.21	5
Gujarat	18.8	3	9.41	4	10.77	5	8.23	1
Orissa	19.12	4	14.36	2	18.95	2	6.76	7
Assam	19.91	5	6.86	8	2.86	17	6.31	10
West Bengal	20.17	6	3.97	18	4.32	16	6.2	11
Maharashtra	20.33	7	6.99	7	12.64	3	7.75	4
Delhi	21.5	8	7.17	6	4.64	15	8.2	2
Bihar	20.55	9	6.67	9	2.25	19	5.87	12
Goa	20.59	10	4.18	17	2.33	18	6.82	6
Remaining States								
Madhya Pradesh	20.81	11	1.2	19	7.74	9	2.83	19
Rajasthan	20.95	12	5.41	13	7.47	10	7.79	3
Andhra Pradesh	21.45	13	6.37	10	8.5	7	5.11	16
Kerala	21.45	14	4.6	16	5.98	14	5.57	13
Karnataka	22.03	15	10.94	3	11.45	4	5.26	14
Tamil Nadu	22.58	16	5.28	14	7.4	11	3.47	18
Uttar Pradesh	22.64	17	6.03	12	9.54	6	6.54	9
Haryana	24.86	18	7.69	5	8.18	8	6.66	8
Punjab	25.92	19	5.15	15	7.39	12	4.65	17

Source:- Authors' own calculations.

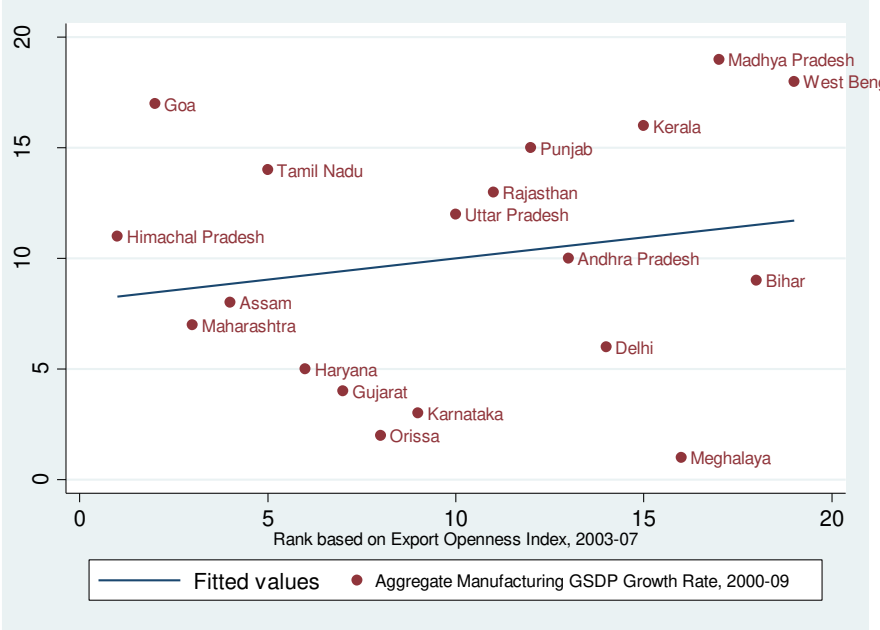
Haryana and West Bengal achieve quite dissimilar ranks across the two measures. For instance, West Bengal is the least open state when trade volumes are considered; whereas it ranks at the 6th position among the 19 states if trade openness is measured using industry tariffs.

Another picture which emerges is that of a mixed performance in the two sub-sectors by a few states. For example, in terms of average growth rates, Meghalaya has experienced the fastest growth in registered manufacturing during the last decade but when it comes to the unregistered sector, it is one of the most unimpressive performers. Similar performance is displayed by Karnataka too. Exactly an opposite picture is projected by Himachal Pradesh and Delhi. For

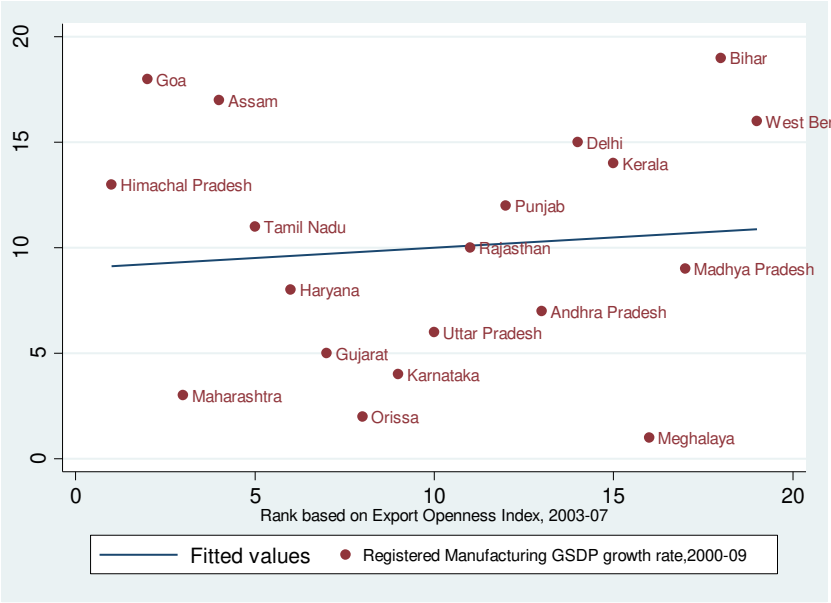
instance, Himachal Pradesh has one of the fastest growing unregistered manufacturing sector in India (ranked 5th) but not so when the registered sector is considered (13th).

A scatterplot analysis reveals that there may exist some correlation between trade openness and manufacturing performance though the degree of correlation seems to differ significantly across different manufacturing sectors. Figures 3(a-c) present the scatter diagram with ranks of the states on the basis of export openness index during 2003-07 as the x-variable and that on basis of aggregate, registered and unregistered manufacturing average growth rate during 2000-09 as the y-variables respectively. In other words, we examine whether a higher degree (or, rank) of trade openness enables the states to achieve a higher rank in terms of manufacturing growth rate in the following scatter diagrams.

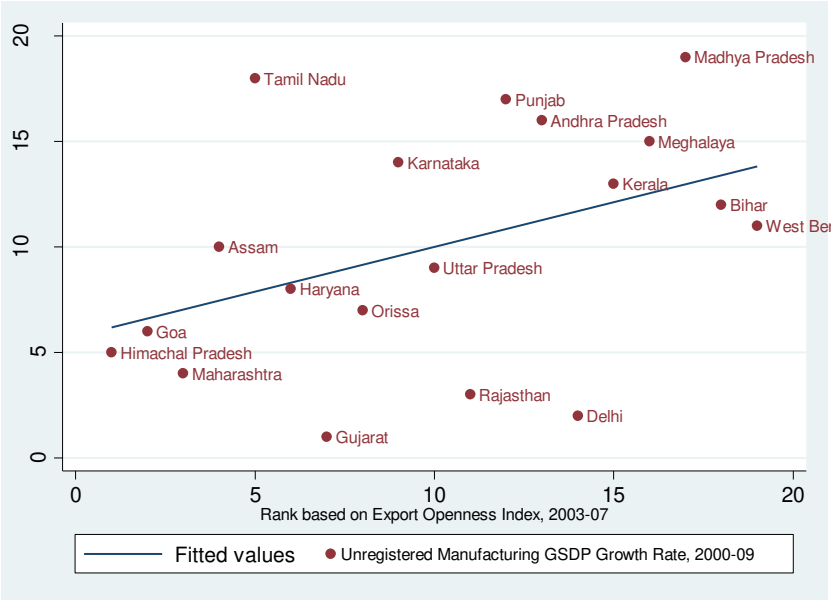
Figure 3: Export Openness Index and Manufacturing Growth Scatterplot



(a)



(b)

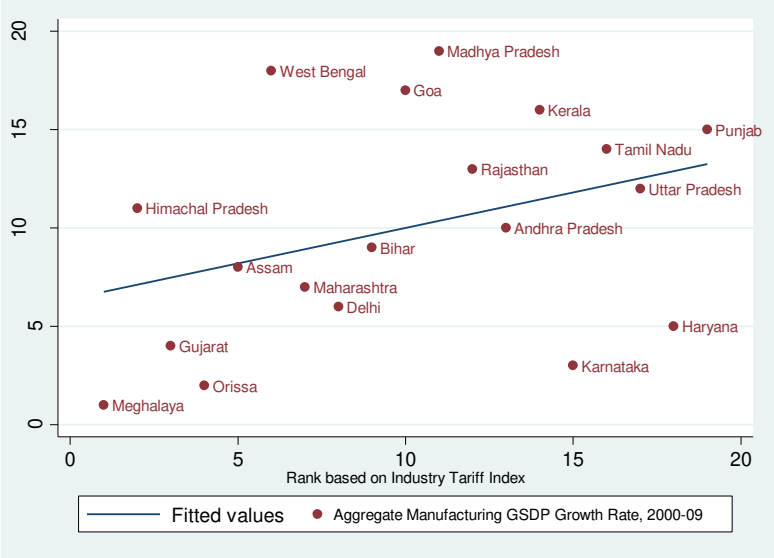


(c)

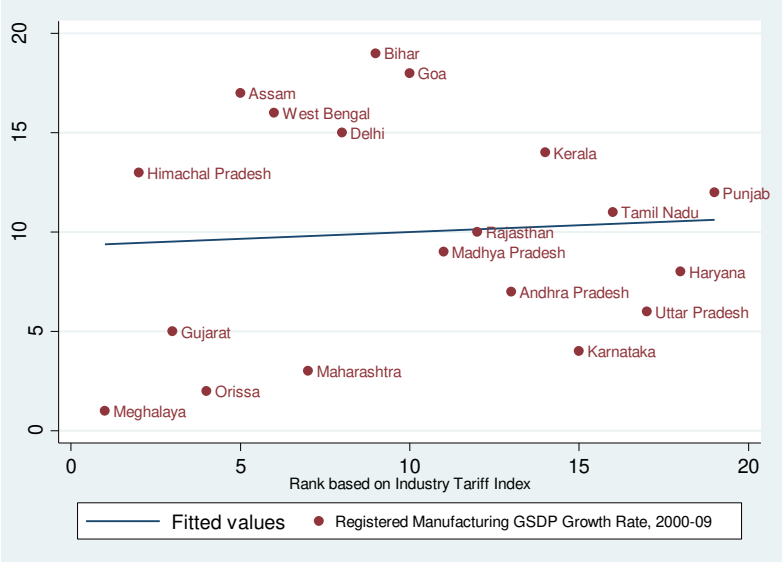
The unregistered manufacturing sector seems to have some correlation with trade openness (Figure 3c). In line with the theoretical expectations, the slope of the line of best fit is positive indicating that a higher level of trade openness is associated with higher growth rate in the unregistered sector. However, this positive relationship seems to be non-existent if we look at the registered sector. At an aggregate level, there is some positive correlation present though it does not seem to be very strong. We examine the correlation between manufacturing growth and

industry tariff index in the Figures 4(a-c). Overall, the picture obtained is very similar to that of the previous scatterplot. The unregistered sector exhibits a strong correlation with trade openness; whereas there seems to be no relationship between registered sector and the tariff index. It looks like that the positive relationship between aggregate manufacturing sector and trade openness is solely driven by the unregistered sector. As seen in the figures below, the slope of the line of best fit is positive since the ranks were assigned in such a way that the least protected state achieves the rank of 1 and the most protected achieves the last-the 19th rank (see Table 7).

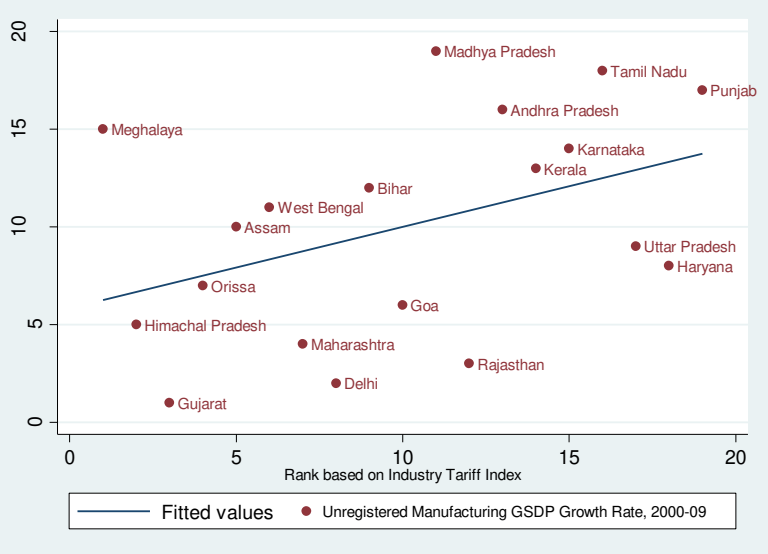
Figure 4: Industry Tariff Index and Manufacturing Growth Scatterplot



(a)



(b)



(c)

However, based on these correlations, we cannot comment on causality. We therefore re-examine the empirical relationship between manufacturing growth and trade openness using panel methods in the following section.

The estimating panel regression equation (with 'road' and 'EOI' as proxies for infrastructure and trade openness respectively) can be written as:-

$$\Delta Y_{it} = \beta_0 + \beta_1 L\dot{y}_{it} + \beta_2 Lenrol_{it} + \beta_3 mandays_{it} + \beta_4 Lcredit_{it} + \beta_5 Lroad_{it} + \beta_6 LEOI_{it} + e_{it} \qquad (2)$$

Similarly, equation with electricity and ITI as alternate proxies for infrastructure and trade openness respectively will be specified. All the variables are expressed in their natural logarithms apart from the dependent variable and 'mandays'. The former could not be taken in logs because there are many negative values in our dataset. For example, Orissa, Kerala and Madhya Pradesh had negative manufacturing growth rates during the period 1998-2002. Hence we take the variable in levels in order to avoid loss of observations. 'mandays' has been taken in levels because for many states it takes the value 0. Hence we take it in levels to avoid loss of observations. Since 'road' and 'electricity' are both proxies for infrastructure so they enter the equations separately. Similarly, the trade openness indices enter the equation one at a time. As mentioned previously, we separately re-estimate the model for registered and unregistered manufacturing sectors as well.

5. Results and Discussion

We initially estimate our model using Fixed Effects Method (FEM). Where we detected presence of autocorrelation, we did not use FE Model results to draw any conclusions and instead have re-estimated the model using Feasible Generalized Least Squares (FGLS) method. FGLS method allows estimation in the presence of first-order autocorrelation within panels, heteroskedasticity or cross-sectional correlation across panels.

The results from the FEM model with aggregate manufacturing GSDP has been presented in Table 8. Models 1 and 2 (see Table 8 below) estimate a gross relationship between manufacturing GSDP and trade barriers and manufacturing GSDP and export share respectively. Models 3 and 4 estimate the fully-specified model with road density as the proxy for infrastructure. Models 5 and 6 re-estimate the full model with electricity as the proxy for infrastructure. There is strong evidence that trade openness affects manufacturing GSDP growth positively with the coefficients on 'LITI' being negative and significant in Models 1 and 5 and that on 'LEOI' being positive and significant in Models 2, 4 and 6. Apart from the trade variables, 'Lenrol', which is a proxy for human capital, appears to have a positive and (almost always) significant coefficient. Access to industrial credit also seems to be important in determining the growth rate of the manufacturing sector. Initial SDP has always come out with a negative and significant coefficient which provides further support for the Convergence Hypothesis.

Table 8: Fixed Effects Model Estimation Results

Independent variables	**Coefficients (FE model) Model 1**	**Coefficients (FE model) Model 2**	**Coefficients (FE model) Model 3**	**Coefficients (FE model) Model 4**	**Coefficients (FE model) Model 5**	**Coefficients (FE model) Model 6**
Lỳ	-7.5***	-3.26*	-9.07***	-8.9***	-6.73***	-7.5***
Lelectricity					2.83	2.6
mandays			-37.03	-59.47	-38.5	-89.07
Lenrol			7.44*	5.6*	6.86*	5.48
Lroad			-3.66	-1.2		
Lcredit			3.24	4.51**	2.5	3.68***
LITI	-4.65***		-3.06		-2.18*	
LEOI		2.8***		1.95**		2.08*
constant	114.05***	52.3**	131.8**	116.98*	85.7***	100.9**
Wooldridge test for autocorrelation H_0:No Autocorrelation			P-value=0.95	P-value=0.47	P-value=0.79	P-value=0.29

Note: Dependent variable= Growth rate of Aggregate Manufacturing SDP. Errors used are heteroskedasticity-robust standard errors. ***, ** and * denote statistical significance at 1%, 5% and 10% respectively.

Next we estimate the models with registered and unregistered manufacturing as the dependent variables. The estimation results of the model with registered manufacturing growth rate as the dependent variable are presented in Tables 9 and 10. The results clearly suggest that trade openness has absolutely no impact on state-level registered manufacturing growth rate.

Table 9: Fixed Effects Model Results for Registered Manufacturing

Independent variables	**Coefficients (FE model)** **Model 1**	**Coefficients (FE model)** **Model 2**	**Coefficients (FE model)** **Model 3**	**Coefficients (FE model)** **Model 4**
Lỳ	-5.96	-6.51	-0.78	-2.03
mandays			-204.3*	-113.07
Lenrol			10.85	12.7
Lroad			4.29	6.98
Lcredit			7.9**	6.24***
LITI	-0.22		-3.49	
LEOI		-0.09		-0.4
constant	-60.5	-67.8	112.4	108.57
Wooldridge test for autocorrelation H_0:No Autocorrelation			P-value=0.01	P-value=0.04

Note: Note: ***, ** and * denote statistical significance at 1%, 5% and 10% respectively. Heteroskedasticity-robust standard errors have been used. Results do not change even when we include electricity as the proxy for infrastructure instead of road density. Hence, we do not report the results.

As can be seen from the table above, there is problem of autocorrelation in our model with registered manufacturing as the dependent variable. So we do not conclude anything from the results and instead re-estimate the model using FGLS method (Table 10). The results do not change apart from only that now initial SDP has turned significant statistically. We see some evidence that states with better financial markets experience a faster growth in the registered manufacturing sector. This is an expected finding since firms located in such states will have easier access to industrial credit thus making the process of expansion of industrial operations faster.

Table 10: FGLS regression results

Independent variables	**Coefficients (FE model)** **Model 3**	**Coefficients (FE model)** **Model 4**
Lỳ	-0.87*	-0.78*
mandays	-182.96	-193.2
Lenrol	6.27*	6.09*
Lroad	3.14	3.24
Lcredit	3.1*	3.89**
LITI	-0.84	
LEOI		-0.33
constant	26.7	26.1

Note: Note: ***, ** and * denote statistical significance at 1%, 5% and 10% respectively. Heteroskedasticity-robust standard errors have been used. Results do not change even when we include electricity as the proxy for infrastructure instead of road density. Hence, we do not report the results.

Table 11 presents the estimation results with unregistered manufacturing SDP growth rate as the dependent variable. Models 1 and 2 estimates the gross relationship with tariff and export share as the trade openness variables respectively. 3 and 4 are the fully-specified models with road as the proxy for infrastructure. We get very similar results when we replace road with electricity. That is why we do not separately report the estimation results from those equations which have electricity as the proxy for infrastructure. Also we drop the ‘mandays’ variable because normal labour laws do not apply in the informal sector.

Table 11: Fixed Effects Model Results for Unregistered Manufacturing

Independent variables	**Coefficients (FE model)** **Model 1**	**Coefficients (FE model)** **Model 2**	**Coefficients (FE model)** **Model 3**	**Coefficients (FE model)** **Model 4**
Lỳ	-9.39***	-6.64***	-9.32***	-9.44***
Lenrol			0.96	-0.47
Lroad			0.15	2.04
Lcredit			1.41	2.42*
LITI	-4.32***		-3.2*	
LEOI		3.46***		2.74**
constant	124.01**	86.3**	120.86**	111.09**
Wooldridge test for autocorrelation H_0:No Autocorrelation			P-value=0.63	P-value=0.98

Note: ***, ** and * denote statistical significance at 1%, 5% and 10% respectively. Heteroskedasticity-robust standard errors have been used.

We find that trade openness has a positive and statistically significant impact on the growth rate of unregistered manufacturing but has no impact on that of registered manufacturing. The reason behind such findings can be that unregistered manufacturing units operate under a more liberal environment. In other words, there is more flexibility in day-to-day operations of a firm in unregistered sector. Flexibility in factor markets is required to take advantage from trade liberalisation. This is because opening up to trade leads to restructuring across the economic sectors. As an economy opens up, sectors where the economy has comparative advantage expand. Conversely, import-substituting sectors shrink because openness brings in foreign competition which compels the previously protected and inefficient firms to close down. Consequently, unemployment rises in the sectors which were previously import-substituting and workers start to move into the expanding sectors where there is comparative advantage.

However, the registered sector in India cannot undergo this restructuring encouraged by comparative advantage due to rigid labour laws (for example, no "hire and fire" policies) and hence the impact of the trade reforms is probably not showing up.

6. Conclusion and Policy Implications

The paper examines the determinants of manufacturing GSDP growth of 19 Indian states for the time period 1988-2007. Overall, it can be asserted that there is a robust association between trade openness and manufacturing sector performance in Indian states. Trade openness seems to have a positive impact on aggregate manufacturing growth. In line with the conventional view, trade barriers have a negative impact on manufacturing growth whereas trade volumes have a positive impact.

Apart from the trade variables, human capital and access to industrial credit seem be important determinants of manufacturing growth. However, the impact is not very robust. We have also found some evidence of convergence among Indian states in terms of growth rate in the manufacturing sector.

One of the most interesting findings from this study is that trade openness does not affect the performance of the registered manufacturing sector at all but has a strong positive impact on the growth of the unregistered sector. This is because, as an economy opens up, the sectors in which it has a comparative advantage expands and where it does not (maybe previously import-substituting sectors), shrinks. As a result, unemployment in the firms in the latter sectors rises and a restructuring takes place in the economy with workers moving into those sectors where the comparative advantage lies. However, this restructuring is probably hindered in the registered manufacturing sector of India due to rigid labour laws (for example, no hire and fire polices). As a result, we do not see any impact of trade openness on the performance of this sector.

Policy Implications: Compared to the other rapidly developing countries such as China, foreign direct investment in manufacturing is really low in India. Rigid labour regulations impose a cost on the entrepreneurs and that is undoubtedly part of the reason why they are reluctant in investing in Indian manufacturing sector. India is endowed with a vast and excess labour force waiting to be mobilized into manufacturing from agriculture. This mobilization is only possible if the states carry out reforms in their labour regulations along with other necessary fiscal and

administrative reforms. That will help them take advantage of the macro-level economic reforms and expand their industrial base.

Reference

AHLUWALIA, M. S. 1995. India's Economic Reforms in Cassen Robert and Vijay Joshi (eds.).

AWASTHI, D. N. 1991. Regional Patterns of Industrial Growth in India, Concept Publishing Company, New Delhi.

BHATTACHARYA, B.B. and SAKTHIVEL, S. 2004. Regional Growth and Disparity in India, Comparison of Pre and Post Reform Decades, *Economic and Political Weekly*, 39(10), 1071-1077.

CHAKRAVORTY, S. and LALL, S. 2007.Made in India: The Economic Geography and Political Economy of Industrialization.Oxford University Press, New Delhi.

CENTRE FOR MONITORING INDIAN ECONOMY. States of India (Various Issues). India

DHAR, P.N., and SASTRY, D.U. 1967. Inter-State Variations in Industry, 1951-61. *Economic and Political Weekly*, 4(12), 535–538.

GOLDBERG, P. K., KHANDELWAL, A., PAVCNIK,N., and TOPALOVA, P. 2008. Imported Intermediate Inputs and Domestic Product Growth: Evidence from India. *NBER Working Paper,* No. 14416, National Bureau of Economic Research.

GUPTA, P., HASAN, R. and KUMAR, U. 2008. What constraints Indian manufacturing? *ERD working paper,* No. 119,Asian Development Bank.

JHURANEY, J. C. 1976. Spatial changes in the distribution of employment in the organised sector. *Indian Journal of Industrial Relations,* 12(1), 61-72.

KATHURIA, V., and SN, Raj R. 2010.Manufacturing an engine of growth in India – Analysis in the post-nineties.Submitted for Conference on *Frontier Issues in Technology, Development and Environment* to be held during March 19-21, 2010 at Madras School of Economics, Chennai.

KULKARNI, K. G., and MEISTER, K. J. 2008. Trouble with import substitution and protectionism: a case of Indian economy, *International Journal of Economic Research,* 5(1)*,* 35-57.

LAHIRI, R.K. 1969. Some Aspects of Inter-State Disparity in Industrial Development in India: 1956-65, *Sankhyā: The Indian Journal of Statistics,* 31(3), 523-532.

MARJIT, S., KAR, S., and MAITI, D. 2007.Regional Trade Openness Index and Income Disparity - A New Methodology and the Indian Experiment, *Economic and Political Weekly*, 24 (9).757-69.

MINISTRY OF HUMAN RESOURCE DEVELOPMENT, Analysis of Budgeted Expenditure on Education, Various Issues, Department of Education, Government of India.

MINISTRY OF LABOUR AND EMPLOYMENT. Labour Statistics, Various Years, Government of India.

MINISTRY OF STATISTICS AND PROGRAMME IMPLEMENTATION.Annual Survey of Industries, Various Issues, Central Statistical Organisation, Government of India.

MITRA, D., and URAL, B. 2008. Indian manufacturing: A slow sector in a rapidly growing economy. *The Journal of International Trade and Economic Development*, 17(4), 525-559.

NADKARNI, N.V. 1970. Regional imbalance in India.Published in *Balanced regional development*: papers read at the Indian Economic Conference, Patna, 1969. Popular Prakashan, Mumbai, 56-73.

NAGARAJ, R. 2005. Industrial Growth in China and India: a Preliminary Comparison. *Economic and Political Weekly*, 40(21), 2163-2171.

PANAGARIYA, A. 2006.Transforming India.*Conference Paper,* presented at the *Conference on India: An Emerging Giant*, October 2006, Columbia University.

PAPOLA, T.S., MARYA, N., and JENA, N. 2011.Inter-regional disparities in Industrial Growth and Structure. A Study Prepared as a Part of a Research Programme STRUCTURAL CHANGES, INDUSTRY AND EMPLOYMENT IN THE INDIAN ECONOMY, Institute for Studies in Industrial Development, New Delhi.

RANI, U., and UNNI, J. 2004. Unorganised and Organised Manufacturing in India: Potential for employment Generating Growth. *Economic and Political Weekly*, 39(41), 4568-4580.

SARDAMONI, K. 1969. Growth of Manufacturing Employment in the States 1950-63. *Economic and Political Weekly*, 4(15), 655-657.

SARKER, D., and DAS, D. 2011. Performance of manufacturing industry in Indian states: who loose and why? *MPRA* Working *Paper*, No. 33645, University Library of Munich, Germany.

VEERAMANI, C. 2012. The 'Miracle' Still Waiting to Happen: Performance of India's Manufactured Exports in Comparison to China. India Development Report 2012, 132-150, Oxford University Press, New Delhi.

WORLD BANK. 2011. World Development Indicators, World Bank.

WORLD BANK (2012), UN COMTRADE. World Integrated Trade Solution (WITS) Database.

Appendix

Table 12: State-wise registered manufacturing GSDP growth (in %)

STATES	1980-89	1990-99	2000-09
ANDHRA PRADESH	10.02	6.26	8.50
Assam	4.13	-0.01	2.86
BIHAR	7.50	3.24	2.25
DELHI	8.84	2.17	4.64
GOA	9.36	6.47	2.33
GUJARAT	8.98	12.99	10.77
HARYANA	8.61	6.78	8.18
HIMACHAL PRADESH	20.36	10.92	6.93
KARNATAKA	9.12	6.82	11.45
KERALA	4.96	10.33	5.98
MADHYA PRADESH	6.80	7.68	7.74
MAHARASHTRA	6.93	20.15	12.64
MEGHALAYA	9.44	-3.22	36.18
ORISSA	13.43	6.40	18.95
PUNJAB	9.42	8.27	7.39
RAJASTHAN	8.64	8.03	7.47
TAMIL NADU	6.78	4.55	7.40
UTTAR PRADESH	13.46	3.01	9.54
WEST BENGAL	2.75	6.06	4.32

Source:- Authors' own calculation using data from EPWRF. The new states, Jharkhand, Uttarakhand and Chhattisgarh have been clubbed with their parent states.

Table 13: State-wise unregistered manufacturing GSDP growth (in %)

STATES	1980-89	1990-99	2000-09
ANDHRA PRADESH	4.63	7.91	5.11
ASSAM	0.50	2.13	6.31
BIHAR	4.14	-5.16	5.87
DELHI	7.12	10.00	8.20
GOA	-11.36	8.22	6.82
GUJARAT	7.28	8.06	8.23
HARYANA	16.98	5.51	6.66
HIMACHAL PRADESH	5.81	8.21	7.21
KARNATAKA	4.33	5.37	5.26
KERALA	-0.29	1.68	5.57
MADHYA PRADESH	3.32	7.49	2.83
MAHARASHTRA	4.90	9.91	7.75
MEGHALAYA	4.15	1.93	5.20
ORISSA	2.90	8.13	6.76
PUNJAB	8.75	8.64	4.65
RAJASTHAN	4.75	3.53	7.79
TAMIL NADU	0.57	2.97	3.47
UTTAR PRADESH	5.66	3.86	6.54
WEST BENGAL	4.01	5.88	6.20

Source:- Authors' own calculation using data from EPWRF. The new states, Jharkhand, Uttarakhand and Chhattisgarh have been clubbed with their parent states.

Table 14: Data source

Variable	Variable Source
Manufacturing GSDP	EPW Research Foundation. Accessed at www.epwrfits.in
Enrolment ratio in middle school	Selected Educational Statistics, Ministry of Human Resouce Development, Government of India
Number of mandays (in 1000s) lost	Ministry of Labour and Employment, Government of India
Road density and Electricity	Centre for Monitoring Indian Economy (CMIE)
Industrial credit	CMIE
Tariff and exports	WITS
State level industrial output, Manufacturing (gross value added)	Annual Survey of Industries (Various Years), Ministry of statistics and programme implementation, Government of India

Table 15: List of states

List of States	
Andhra Pradesh	Punjab
Assam	Rajasthan
Bihar	Tamil Nadu
Gujarat	Uttar Pradesh
Haryana	West Bengal
Karnataka	Delhi
Kerala	Goa
Madhya Pradesh	Himachal Pradesh
Maharashtra	Meghalaya
Orissa	

Note: Jharkhand, Chhattisgarh and Uttaranchal have been clubbed with Bihar, MP and UP for all the years. The remaining states and union territories could not be included because of unavailability of data.

Table 16: NIC 1987 at 2 digit industry level

Sections 2 and 3-Manufacturing	Description
Division 20-21	Manufacture of food products
Division 22	Manufacture of beverages, tobacco and related products
Division 23	Manufacture of cotton textiles
Division 24	Manufacture of wool silk and man-made fibre textiles
Division 25	Manufacture of jute and other vegetable fibre textiles (except cotton)
Division 26	Manufacture of textile products (including wearing apparel)
Division 27	Manufacture of wood and products of wood; furniture and fixtures
Division 28	Manufacture of paper and paper products and printing, publishing and allied industries
Division 29	Manufacture of leather and leather products, fur and substitutes of leather
Division 30	Manufacture of basic chemicals and chemical products (except products of petroleum and coal)
Division 31	Manufacture of rubber, plastic, petroleum and coal products; processing of nuclear fuels
Division 32	Manufacture of non-metallic mineral products
Division 33	Basic metal and alloys industries
Division 34	Manufacture of metal products and parts, except machinery and equipment
Division 35-36	Manufacture of machinery and equipment other than transport equipment (manufacture of scientific equipment, photographic/cinematographic equipment and watches and clocks is classified in div. 38)
Division 37	Manufacture of transport equipment and parts
Division 38	Other manufacturing industries

Source: Central Statistical Organisation, Ministry of Statistics and Programme Implementation, Govt. of India.

Table 17: State-wise registered manufacturing GSDP growth (in %)

STATES	1980-89	1990-99	2000-09
ANDHRA PRADESH	10.02	6.26	8.50
Assam	4.13	-0.01	2.86
BIHAR	7.50	3.24	2.25
DELHI	8.84	2.17	4.64
GOA	9.36	6.47	2.33
GUJARAT	8.98	12.99	10.77
HARYANA	8.61	6.78	8.18
HIMACHAL PRADESH	20.36	10.92	6.93
KARNATAKA	9.12	6.82	11.45
KERALA	4.96	10.33	5.98
MADHYA PRADESH	6.80	7.68	7.74
MAHARASHTRA	6.93	20.15	12.64
MEGHALAYA	9.44	-3.22	36.18
ORISSA	13.43	6.40	18.95
PUNJAB	9.42	8.27	7.39
RAJASTHAN	8.64	8.03	7.47
TAMIL NADU	6.78	4.55	7.40
UTTAR PRADESH	13.46	3.01	9.54
WEST BENGAL	2.75	6.06	4.32

Source:- Authors' own calculation using data from EPWRF. The new states, Jharkhand, Uttarakhand and Chhattisgarh have been clubbed with their parent states.

Table 18: State-wise unregistered manufacturing GSDP growth (in %)

STATES	1980-89	1990-99	2000-09
ANDHRA PRADESH	4.63	7.91	5.11
ASSAM	0.50	2.13	6.31
BIHAR	4.14	-5.16	5.87
DELHI	7.12	10.00	8.20
GOA	-11.36	8.22	6.82
GUJARAT	7.28	8.06	8.23
HARYANA	16.98	5.51	6.66
HIMACHAL PRADESH	5.81	8.21	7.21
KARNATAKA	4.33	5.37	5.26
KERALA	-0.29	1.68	5.57
MADHYA PRADESH	3.32	7.49	2.83
MAHARASHTRA	4.90	9.91	7.75
MEGHALAYA	4.15	1.93	5.20
ORISSA	2.90	8.13	6.76
PUNJAB	8.75	8.64	4.65
RAJASTHAN	4.75	3.53	7.79
TAMIL NADU	0.57	2.97	3.47
UTTAR PRADESH	5.66	3.86	6.54
WEST BENGAL	4.01	5.88	6.20

Source:- Authors' own calculation using data from EPWRF. The new states, Jharkhand, Uttarakhand and Chhattisgarh have been clubbed with their parent states.