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REGIONAL OPENNESS, INCOME GROWTH AND DISPARITY ACROSS MAJOR INDIAN STATES DURING 1980-2004

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Abstract

As a country progressively engages in international trade, its factors of production will enter increasingly into the export sector, where their return is higher, compared to the import competing sector. At the regional level too those states, which can attune their production structure to international demands, earn higher than other states and grow at a faster rate. Further if the newly-industrial states concentrate more on those sectors, a trend of regional convergence will be discernible.

Then, the regional openness index, developed by Marjit, Kar and Maiti (2007), has been reconstructed by using two alternative weighting techniques to combine the export and import intensities, ranks of correlation of state production shares, respectively with national export and import shares of the states. The per capita net state domestic products have grown in all major states in India during 1980-2004 but at different rates resulting to the rise of regional disparity and the regional openness have been detrimental for this. The state, which moved away from importable production to exportable production, grew faster than the rate of others at least by 1-1.5% per annum. Definitely, a few newly-industrial states showed an increasing dependence on exportable production, but not all. Moreover, some of the industrially developed states (in terms of exportable share) it has been observed yet continue with importable production to a large extent.

Key Words: Regional Openness Index, Trade, Growth, Disparity, Indian States

JEL Code: C33, F43, O18

1. Introduction

An ongoing debate is whether the removal of trade restrictions has a positive impact on regional growth of a large country like India. Traditional trade theories argue that this has a positive impact on the industrial dynamics of a country depending on the factor intensities of these industries. But as such there is no available well known framework which explicitly relates trade to the regional growth of a country. Classical economists such as Adam Smith and David Ricardo did talk about trade and growth. But non-classical trade theory does not have a universally accepted model of trade and growth. As a country progressively engages in international trade, its factors of production will enter increasingly into the export sector, where their return is higher, compared to the import competing sector. At the regional level too, the states, which can attune their production structure to international demands, should earn higher returns than other states and grew at a faster rate. Hence the relative income of a region depends on how open the region is. It can be a catalyst of regional convergence if the newly-industrial states go for more exportable production. The purpose of this work is to reconstruct the regional openness index, developed by Marjit, Kar and Maiti (2007), putting two alternative weights to the export and import intensity indices derived at the regional or state level, and to examine its effect on their growth performances. As a derivative of this exercise, we can confer the effect on regional growth and disparities in India during 1980-2004. It seems worthwhile to undertake this exercise at the regional level in a country in which the institutional and organizational factors do not widely vary as is the case in cross country analysis.

It is essential for geographically and politically large developing countries with varied regions to understand whether trade has an equalizing impact or not. Available work on the European Union, where countries are treated as regions, is not as problematic, since then trade data is readily available for each nation. The paper related closest to our work dealing with the EU (Egger, Huber and Pfaffermayr, 2005), extends the empirical literature on the effects of trade liberalization on regional growth and disparities within a country. Studies on the Central and Eastern European countries show a significant convergence of real wages in Poland and Bulgaria, only. Furthermore, countries with faster growing export openness in the period 1991–1998 experienced

larger increases in their regional disparities. In a recent work, Topalova (2005) constructed a trade exposure index of an Indian district which is a weighted average of tariff rates of importable commodities where the share of employment for each commodity stands as weight. Further, Hasan et al. (2007) extended this index considering Non-Tariff Barriers (NBTs), for state level, in addition to tariff rate. Interesting, while Topalova (2005) found a negative impact of trade reform on poverty, Hasan (2007) made a diametrically opposite observation at the state level analysis. Whatever have been the results, the justification for putting employment shares as weights to the tariff or non-tariffs rates suffer from an endogeniety problem, because employment must be an end product of trade policies. Moreover, while concentrating on tariff and non-tariff barriers these exercises must have ignored the exportable sector in the indexation. Hence Marjit, Kar and Maiti (2007) provide an alternative framework for the same and further extend a bit of this methodology. It should be noted that this paper *does not* use intra-national trade data, which consequently allows substantial differences in both idea and approach as we develop here.

The contribution of the paper has been specifically in the construction of openness indices and application of the same in the analysis of the effect of trade openness on regional growth and disparity. In the absence of regional trade data in a large federal democratic country, we further reconstruct the regional openness index, developed by Marjit et al. (2007), putting alternative weights to the export and import intensities for the derivation of overall openness indices at the state level. The attempt was to investigate how 'open' Indian states are with respect to international trade and then try to characterize regional growth and disparities in the light of this 'openness'. This is a typical problem for countries that are large in size and have diverse heterogeneous regions in terms of geography, culture and politics. Usually, the shares of export and import to GDP are used to measure the trade intensities of a country and those trade informations do not exist at the sub-national level. In a large federal framework, a particular state enjoys a bit of autonomy over its planning and execution, depending on forms and functions of the institutions at the levels of the region, and must show a different growth path owing to external shocks similar to all the states. The methodology is not only applicable to the Indian case but is also useful for many such countries where

the state-level trade data are not available. Marjit et al. (2007) try to devise a proxy, which allows us to rank states over time in terms of their exposure to trade for major Indian states. We refine our earlier related work in 2007 in two ways. The work derived the export and import intensities of each state running a correlation between the state production share with country trade shares of each item, using a concordance table, and then combined the indices of export and import intensities, arbitrarily putting equal weights to those, for final calculation of openness index of a particular state. The present work attempts to modify this weighting technique and employs two different alternatives. One modification has been the use of the country-level trade shares as weights on export and import intensity indices of each state. The production shares of exportable and importable items to total production for each state have been used as alternative weights. So, the former is fixed for each state in a year while the latter may vary for the same. Second, these indices along with other control variables have been regressed on per capita net state domestic products (PCNSDP), using panel regression techniques, to see its effect on income growth and disparities. This has been a more controlled experiment than that amongst a group of countries. The results consistently suggest that the regional openness, particularly in terms of exportability, has been detrimental to explain the differential growth and disparity of major Indian states during 1980-2004. The states, which are relatively open, have grown at 1 to 1.5% higher than others. In addition, the newly-growing states have focused more on exportable commodities while the industrially-developed states in terms of exportable productions continue to produce importable goods to a large extent. They had developed this trend during the early periods of planning under the policy of import substitution. Third, while we notice a continuous dispersion of absolute regional incomes amongst the major 15 states of India during 1980-2004, the conditional convergence trend has been statistically significant after controlling state-specific factors including regional openness. In this context, we proceed as follows. Section 2 provides a literature survey. Section 3 provides empirical method and Section 4 concludes.

2. Literature

2.1 Trade and Growth

The debate on whether trade is essential for growth both theoretically and empirically is never resolved. Scitovsky (1954), Keesing (1967), Bhagwati (1978), Krueger (1978), Liu et al. (2001) etc., broadly argue that openness exposes countries to the most advanced new ideas and methods of production dictated by international competitive behaviour, and thus it enhances efficiency. Also, a number of contributions are of the view that the trade openness can have positive impact on economic growth of a country, such as, Romer (1986, 1992), Lucas (1988), Barro and Sala-I-Martin (1995), Grossman and Helpman (1991). Buffie (1992) contends that whether an export boom acts as an engine of growth depends on the structural characteristics of the economy. Levine and Renelt (1992) argue that an increasing openness raises long-run growth only when the openness provides greater access to investment goods. However, Batra (1992), Batra and Slottje (1993), and Leamer (1995) go further by suggesting that free trade can be a primary source of economic downturn as trade liberalization and the openness may make imports more attractive than domestic production, and hence the domestic economy may suffer a loss.

While Dollar (1992), Sachs and Warner (1995) and Edwards (1998), using different measures of openness, show the positive effects of trade on growth, Rodriguez and Rodrik (2001) strongly criticize these papers for the problems with measures of trade openness and the econometric techniques used as well as for the difficulty in establishing the direction of causality. According to them, Sachs and Warner (1995) capture many aspects of the macroeconomic environment in addition to trade policy. Baldwin et al. (2003) has defined the same approach on the grounds that the other policy reforms directly and indirectly accompany most of the trade-reform related factors. Updating the Sachs-Warner dataset, again show the positive effect of such reforms in driving growth. According to Dodzin and Vambakidis (2004), the estimates from a panel of 92 developing countries in the period 1960–2000 suggest that an increase in openness to trade leads to an increase in the industrial value added share of production, at the expense of the agricultural share. Therefore, such trade leads developing countries to industrialization, in contrast to what the infant industry argument would imply.

Frankel and Romer (1999) look at the effect of trade share in GDP on income levels across countries for the year 1985 constructing an instrument by summing up the gravity-model driven, geography-based predicted values of bilateral trade flows across all trading partners. The variables which predict bilateral trade flows include distance and country size variables. They find that their instrumental variables approach produces positive effects of trade on income levels that are greater than the estimates produced by ordinary least squares. Irwin and Tervio (2002) apply the Frankel-Romer approach to cross-country data from various periods in the twentieth century to show that this trade-income relationship is indeed highly robust. Noguer and Siscart (2005) use a richer data set that allows estimating the impact of trade on income with much greater precision. They also show that the geographical controls must enter the income equation to avoid bias and find that countries that trade more reach at higher levels of income. This result is remarkably robust to a wide array of geographical and institutional controls.

Rodrik et al. (2002) look at the simultaneous effects of institutions, geography and trade on per capita income levels and have used a measure of property rights and the rule of law to see their impact on the trade-GDP ratio. Using the same instruments as used by Acemoglu et al. (2001) and Frankel and Romer (1999), they argue that the quality of institutions matter for the growth.

Most of these works are silent on the impact of trade on regional growth. A pioneering work trying to link economic geography with international trade is by Krugman (1991) in which he builds up an economic geography model. Franco Peracchi (1992) later uses this model to demonstrate that the protectionary economic policies adopted by Mexico have led to the growth of large metropolises in the country. A consequence of their argument is that liberal trade policies should disperse economic activities, across locations and thus reduce the regional disparity within a country. Thus, liberal trade policies break the influence of the 'home market' and activities should disperse. For example, the North American Free Trade Agreement (NAFTA) involving the US, Mexico and Canada have resulted in the shifting of economic activities from Mexico City towards border towns near the U.S. Krugman (1995) and Fujita, Krugman and Venables (1999) discuss this issue at length.

Greater equality across Europe in productivity and income has been one of the central goals of the European Community since the early days of European economic integration. And for a long time this was achieved. If one looks at the country level, it appears to be a tendency towards long-run convergence in productivity and income levels in the European Union. However, this tendency cloaks important differences across regions of the same country. In fact, for most countries, there is either little change in regional dispersion, or a tendency towards divergence (Cappelen-Fagerberg-Verspagen, 1999). Walz (1995) argues that trade liberalization promotes regional economic growth and does the reduction of barriers to labour migration. Reduction of labour migration barriers allows unskilled workers to migrate.

Alcala and Ciccone (2004) find that international trade has an economically significant and statistically robust positive effect on productivity. Their trade measure is imports plus exports relative to purchasing power parity GDP (i.e., *real openness*) and it raises the total factor productivity through specialization and scale affect. They also find a significantly positive aggregate scale effect where the estimates control for proxies of institutional quality as well as geography and take into account the endogeneity of trade and institutional quality.

On the other hand, one could also argue that if trade becomes really important, the activities will get concentrated around 'ports', in case shipping is a significant means of commodity transportation. In that case, the regional disparity may increase and will hamper overall regional development. Again, an increase in trade should improve real income of the regions producing exportables and reduce the real income of the regions producing import competing goods. Gains from trade make sure that the overall welfare effect is positive. But nonetheless, the income is redistributed from the import competing to the exporting regions (Marjit and Beladi, 2009). If initially, exporting regions were low income regions, a greater openness should reduce the degree of regional inequality.

2.2 Indian experiences

A rich number of studies dealt with the issues on regional convergence or divergence in the Indian sub-continent, using the existing measurement, albeit these studies do not clearly bring in the connection between trade openness and regional

growth. Nevertheless, a brief account of these studies may be useful to reflect on the larger issue of regional convergence/divergence and to further emphasize unavailability of any study that investigates a connection between trade openness and regional disparity at the country level. This has left a void which the present study intends to fill.

A study of 20 Indian states over the period 1960-90 by Dholakia (1994) finds a tendency of convergence in long-term state domestic product (SDP) growth rates. A revised study (Dholakia, 2003) concludes that regional disparity in terms of human development has been decreasing but that regional disparity of income has been almost constant over the past two decades during the 1970s and 1980s. Marjit and Mitra (1996) study the issue of regional convergence in 24 Indian states (1961-62 to 1989-90). On the basis of real per capita net state domestic product (PCNSDP), they find no evidence of convergence of PCNSDP among Indian states. Subsequently, Ghosh et al. (1998) and Kurian (2000) find the same indications towards regional divergence across states over time. Dasgupta et al. (2000) also report a clear tendency of divergence in terms of per capita SDP for Indian states, although they find convergence of sectoral shares of SDP. Cashin and Sahay (1996) also examine four sub-periods between 1961 and 1991, for a sample of 20 Indian states. Although they find evidence of unconditional and conditional convergence in all four sub-periods, their results are not statistically significant. Analyzing a sample of 19 Indian states for the period 1961-1993 (divided into three sub-periods), Bajpai and Sachs (1996) do not find statistically significant results of convergence for the period as a whole. It is only for the sub-period 1961-71 that they find evidence of convergence. Rao and Singh (2001) examine a sample of 14 major states over the period 1965-1994, divided into various sub-periods. Strikingly, they find an evidence of absolute and conditional divergence in every sub-period they consider. In another study, for a sample of 14 major Indian states for the period from 1990-91 to 1998-99.

Shand and Bhide (2000) examine variations in the size, income and structural characteristics of Indian states analyzing total and per capita net state domestic product for the period 1970-71 to 1995-96. A sectoral analysis shows that reform in agriculture yields the most benefit as growth in this sector is positively and significantly related to overall growth, followed by reform in infrastructure and human development.

In support of the improved growth performance during the 1980s in all the states relative to the previous two decades, Krishna (2004) points to unevenness of growth performances in the 1990s. Provinces that could take advantage of the reforms in the 1990s, that allowed much scope in policy making at the state level, seem to have performed better. This is in sharp contrast to the results of the earlier studies.

Bhattacharya and Sakthivel (2004) reveal a marginally improved growth rate of gross domestic product in the post-reform decade in India along with a drastic rise of regional disparity in state domestic product (SDP). Industrial states have grown much faster than backward states in recent years, but there is no strong evidence of convergence of growth rates among the states. Disturbingly, an inverse relationship between population growth and SDP growth is observed. This has serious implications for employment and for the political economy of India.

In the evolution of spatial economies, Saban (2006) argued that the regions may converge at one 'spatial scale' but can diverge at another scale, or there may be marked presence of 'convergence clubs'. In this line of argument, he analyses sectoral and aggregate per capita incomes in Maharashtra over the period 1993-94 to 2002-03 and observes the regional convergence in Maharashtra, in spite of significant differences in the rates of convergence across various sectors and regions. The study also highlights the impact of 'spatial spillovers' on regional patterns of economic development in the state and its policy implications.

In a recent paper, Lall and Chakravarty (2006) observe a spatial inequality of industrialization in India due to cost saving for individual firms where private industry seeks promising locations whereas state industries traditionally attach much less importance to the ideal location factor. As a result, the spatial pattern of industrialization that emerged lately is predominantly led by private sector investments mainly. .

In a more recent study, Nayyer (2008) found that the states are not converging to identical levels of per capita income in the steady-state of a panel data study for 16 Indian states for the period from 1978-79 to 2002-03. Once the factors that affect steady-state levels of income are controlled for, the poor states grow faster on average than the rich ones, and there is an increase in the dispersion of per capita incomes across states over

time due to increasing inter-state disparities in levels of private and public investment and an insignificant equalizing impact of centre-state government transfers. However, this study has not considered trade openness as an explanatory variable.

3 Empirical Analysis

3.1 Regional Growth and Disparity

Before going to the factor analysis, one has to look at the growth of regional income and its variations across states over the years. The per capital net state domestic products (PCNSDP) at 1999-2000 prices have been taken from the annual reports of RBI (Table 1). This increased sharply from Rs. 8911 in 1980-81 to Rs. 11985 in 1990-91 further to Rs.18247 in 2003-04. In total, the absolute increase of the income in the 1990s is approximately three times higher than that in the 1980s. It reveals that the growth of absolute income has accelerated in the later period. All the major states have registered a similar trend, but not at the same pace. West Bengal, Andhra Pradesh and Karnataka follow exactly the same level and pattern. Haryana, Punjab, Maharstatra, Gujarat and Kerala were the better performing states in 1980-18 and also have maintained a higher level of per capita income upto the year 2003-04. On the other hand, Bihar, Orissa, Rajasthan, Madhya Pradesh and Uttar Pradesh showed a level well-below than the average. It suggests a greater degree of regional disparity in the income across the major states. For example, the PCNSDP of Haryana in 2003-04 is almost four times that of Bihar (Fig 1). Moreover, the figures on co-efficient of variation sharply reveal an increasing trend of regional disparity. It was 0.28 in 1980-81 and increased to 0.35 in 2003-04. This is more visible in Fig. 2 where the trend line of CV is positively sloped during 1980-2004. All these factors reveal the divergence of absolute income across regions and there must be some factors responsible for that. These are examined by the study.

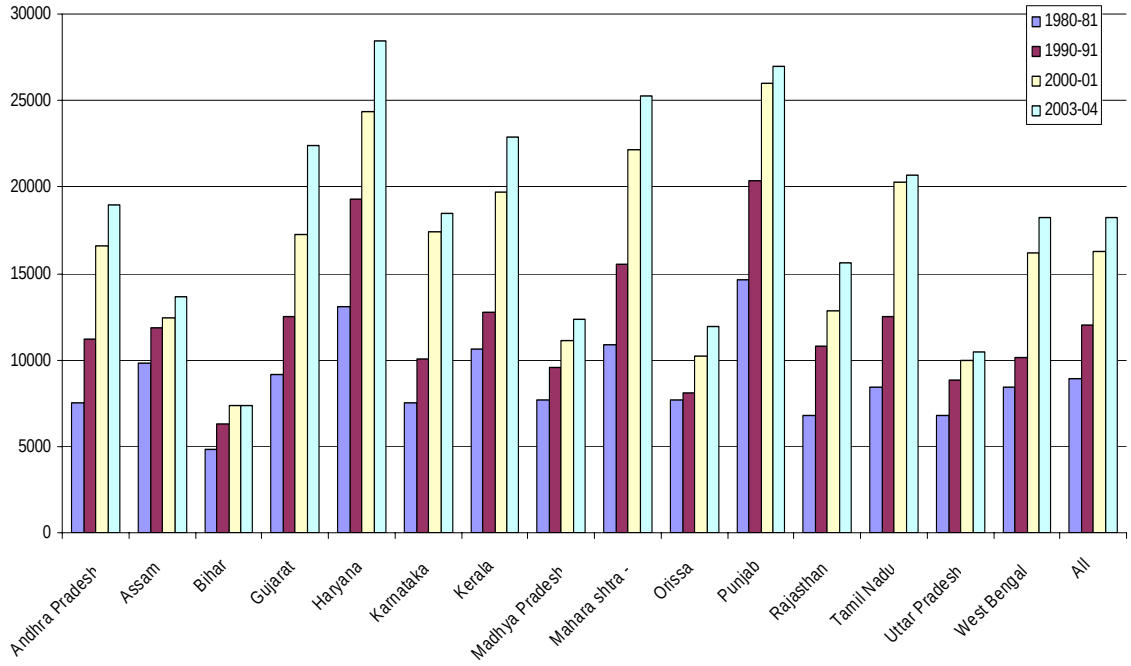
Table 1: PCNSDP (Rs., at 1999-2000 prices) of Major Indian states

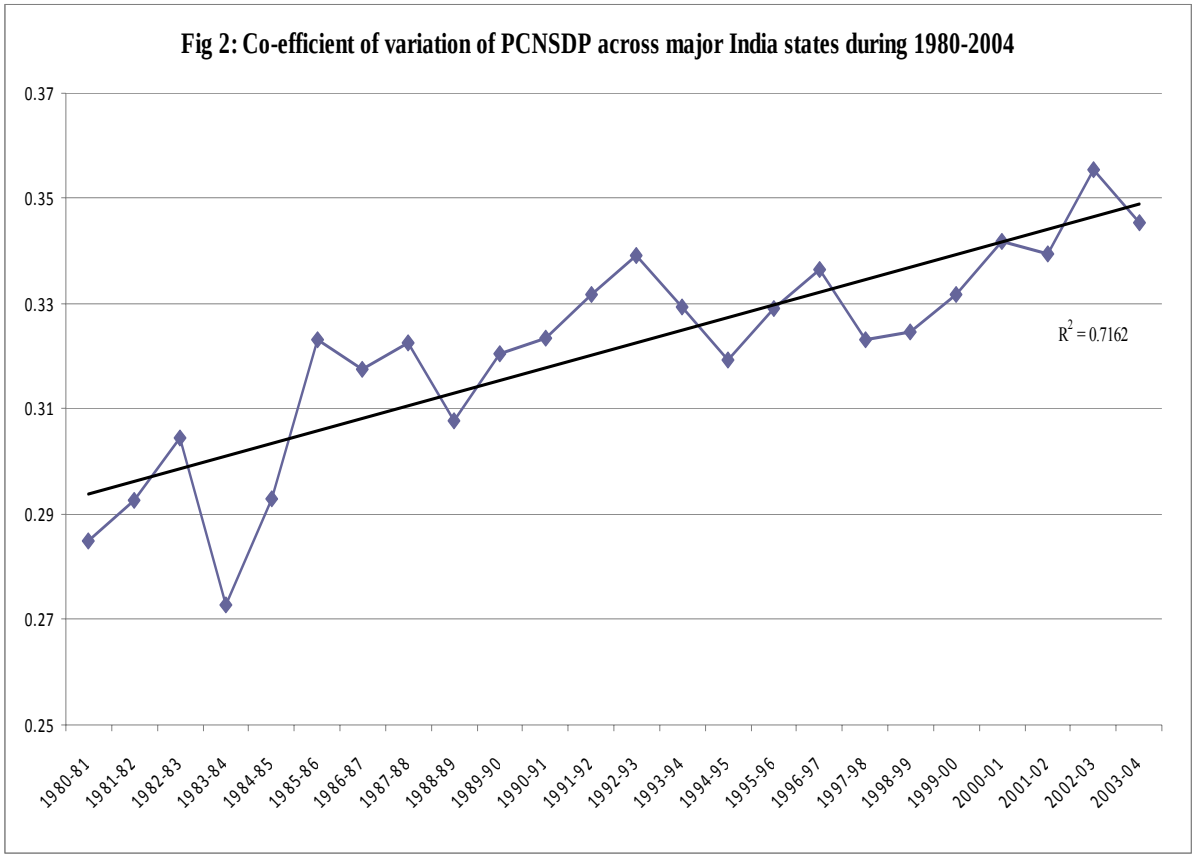
State	1980-81	1990-91	2000-01	2003-04
Andhra Pradesh	7528	11237	16622	18961
Assam	9842	11834	12447	13675
Bihar	4801	6268	7371	7374
Gujarat	9157	12466	17227	22387
Haryana	13041	19309	24328	28484
Karnataka	7522	10090	17405	18505
Kerala	10589	12745	19724	22848
Madhya Pradesh	7654	9559	11121	12365
Maharashtra	10865	15541	22151	25265
Orissa	7673	8076	10211	11951
Punjab	14599	20365	25990	26955
Rajasthan	6771	10761	12840	15579
Tamil Nadu	8398	12541	20249	20672
Uttar Pradesh	6819	8815	9963	10447
West Bengal	8408	10173	16184	18231
All	8911	11985	16256	18247
SD	2540	3877	5559	6302
CV	0.28	0.32	0.34	0.35

Source: Handbook on Indian Economy, RBI

Note: Bihar includes Jharkhand, Madhya Pradesh includes Chattrisgarh and Uttar Pradesh includes Uttarkhand.

Fig 1: PCNSDP (Rs., at 1999-2000 prices) of Major Indian states





3.2 Regional Openness Index

Let us discuss the methodology of the regional openness index, the most important explanatory variable of our interest. While existing studies largely deal with the issue of regional disparities without considering the impact of trade exposure of regions on this growth, does not seem to be a comprehensive approach to explain the regional growth patterns in a federal framework under a liberal regime. To overcome this lacuna, we first measure 'regional openness'. Although the term openness is widely used in the related literature on international economics and economic growth, no consensus has emerged on how to measure it. The existing empirical studies attempt in various ways. These include the following: trade dependency ratios and the rate of export growth (Balassa, 1982), trade orientation indices which are defined as the distance between actual trade and the trade predicted by the 'true' model in the absence of distortion (Leamer, 1988; Wolf, 1993), World Bank's outward orientation index which classifies countries into four categories according to their perceived degree of openness (World Bank, 1987), the

composite openness index which is based on such trade-related indicators as tariffs, quotas coverage, black market premia, social organization and the existence of export marketing boards (Sachs and Warner, 1995), and the Heritage Foundation index of trade policy which classifies countries into five categories according to the level of tariffs and other perceived distortions (Johnson and Sheehy, 1996) (*cited* in Liu-Liu-Wei, 2001). All these indices are applicable to the national level analysis. We have already discussed the district and state-level trade exposure indices, developed by Topalova (2005) and Hasan et al. (2007), but those are not well-accepted on many grounds. As a result, an urgent need has been set forth to construct such indices at the sub-national level.

We use the index, developed by Marjit et al. (2007), in slightly modified ways. At first, the study constructs the export intensity index and import intensity index matching the production share of a state with the country share of trades, both export and import separately, putting ranks on the correlation coefficients between them. Then the export and import intensity index are combined by assigning equal weights arbitrarily to each for a final calculation of the overall openness index. The present study modifies only the weighting techniques providing two alternative methods.

The level of output (including industrial and agricultural) of a specific state has been linked to the all-India trade figures to get an approximate indicator of how 'open' it is. This is on the assumption that the higher the correlation the higher would be the probability of being exported by the state. If most of the production is concentrated on items, which at the all-India level, contribute largely to exports, then it is reasonable to conclude that a particular state is attuned to exports. Correspondingly, if a state has a high production value of import substitutes then it must be relying less on imports and hence is not so 'open'. Thus, in our analysis for a state to be 'open' requires consistency of its production structure with the trade pattern of the country, i.e. more important commodities in the state's production basket would be the exportable, and/or less important contributors would be the major import-competing goods.

Due to frequent changes of industrial classification, the first step involves finding the share of Gross Value Added (GVA) of each industry (at the 2-digit level of National Industrial Classification) for 15 major Indian states from 1980 to 2004. The Classification ignores small states, because 15 states can sufficiently explain a more than 90%

production share for each of the goods. They take only the agricultural and manufacturing goods based on NIC reclassification of industries in 1998. Since Indian states depend to a large extent on agriculture, it is also added to the agriculture- related industry (i.e. NIC 15-16). The share of value added contributed by each industrial group for all the states for all these years are calculated from the Annual Survey of Industries (ASI), (various issues).

$$s_{it}^{k} = \frac{y_{it}^{k}}{\sum_{i}^{n} y_{it}^{k}}, i = 15,...37, t = 1980,..,2004 \qquad (1)$$

where, s_{it}^{k} = production share of i^{th} industry in k^{th} state at time period t, y^{k}_{it} = gross value added of ith industry in k^{th} state at time period t.

The second step is to find out how these goods fared with the trade profile of India for each year under consideration. Since the trade data classification (i.e., HS classification) is different from NIC, they develop a concordance table between HS and NIC classification to make it comparable to the way trade data is classified in Directorate General of Commercial Intelligence and Statistics (DGCI&S) publications (Marjit, Kar and Maiti, 2007). The export share of i-th commodity at t-th period with respect to total exports of India is $x_{it} = \frac{X_{it}}{X_t}$, where, x_{it} is the share of i^{th} industry in total exports in the t^{th} period, X_{it} is the export value of the i^{th} industry in the t^{th} period and X_t is the total export value of India in the t^{th} period. Similar to the export share, the import share is derived in the following manner: $m_{it} = \frac{M_{it}}{M_t}$, m_{it} = import share of i-th industry to total import in India at t-th period, M_{it} = import of i-th industry at t-th period and M_t =Total import in India at t-th period.

The third step is to correlate x_{it} with s_{it}^{k} and m_{it} with s_{it}^{k}. These correlation coefficients will clarify how the production structures of the states are in tune with the export and import structures of India. These correlation coefficients are now ranked such that R_{mt}^{k}, $R_{xt}^{k} \in (1,2,...15)$, where R_{mt}^{k} and R_{xt}^{k} provides rank of the correlation between import and

export shares respectively with production shares of state *k* at the t^{th} period. They assign the rank of 1 to the state with highest correlation and the rank of 15 to the state with the lowest correlation.

The fourth stage of the analysis involves finding a trade openness index. This combined index is constructed using R^{k}_{xt} (the export performance rank) and the inverse of R^{k}_{mt} (the import competing performance rank) which is denoted by $\widetilde{R}^{k}_{mt}$ (i.e., the inverse of R^{k}_{mt}). Thus, in the case of imports those states are ranked higher which import higher or contribute less to import substituting production. These ranks are denoted respectively, as export and import intensity indices of each state.

Then, we adopt two different weighting techniques in order to derive two alternative composite indices. In the first case, the production share of exportables and importables of a state are used as weights respectively to export and import intensity indices. In other words, we assign s^{k}_{xt} and s^{k}_{mt} as weights respectively, to export and import competing indices of a state where s^{k}_{xt} is the share of exportable production of k-th state at *t-th* period and s^{k}_{mt} is share of importable production of *k*-th state at *t*-th period.

$$ROI1^{k}_{t} = s^{k}_{xt} R^{k}_{xt} + s^{k}_{mt} \widetilde{R}^{k}_{mt} \qquad (2)$$

If the export performance rank of a state is high and the inverse import competing performance rank of that is low (the way we have assigned ranks), it suggests production that is more exportable and less of import substitute and it is ranked 1.

We also construct another combined index where country-level q_{xt} and q_{mt} are used as weights to respective export and import competing indices of each state. Here, q_{xt} is the share of country-level export to the total trade volume (i.e., sum of export and import) and q_{mt} is the share of country-level import to total trade volume.

$$ROI2^{k}_{t} = q_{xt} R^{k}_{xt} + q_{mt} \widetilde{R}^{k}_{mt} \qquad (3)$$

These alternative indices will help us to check the robustness of the variables. We incorporate the state-level export intensity index, import intensity index and two openness indices for the regression analysis. Table 1 provides the figures of the indices

for the states on 1980-81, 1990-91 and 2002-03 and a lower the value of the index represents a higher degree of openness. It appears that Gujarat and Tamil Nadu have been two major exporting states in India throughout the time period. Surprisingly, industry in both the states, Gujarat and Tamil Nadu, had been engaged in importable production to a large extent and the resultant openness indices were not among the highest in the states during the early 1980s when the import substitution was the prime national policy. According to the theory, as a country engaged more and more in free trade, it is expected to produce more and have more exportable production by reducing importable production within the state. But in practice, while Gujarat has kept the same pace of importable production, Tamil Nadu has gradually moved away from it. Hence, the openness value (ROI1) accounts for a rise from 7.75 on 1980-81 to 8 on 2002-03 for the former and a drop from 7.25 on 1980-81 to 2.5 on 2002-03 for the latter. The states with the highest importable production were Maharastra, Gujarat and Tamil Nadu during 1980-81 and eventually these states were the most industrially developed states. After more than two decades, the three states with the most importable production have been respectively, Gujarat, Maharastra and Assam during 2002-03. It seems that some of the industrially developed states produce both exportable and importable production. In terms of exportability, Gujarat, Tamil Nadu and West Bengal registered the highest ranks in 1980-81 and after more than two decades, states that registered highest ranks on the same have been Gujarat, Tamil Nadu and Maharashtra. At the same time, it should be noticed that some of the relatively less-developed states in terms of per capita income in 1980s, like Bihar, Orissa and Assam have not changed much on their exportability ranks, rather have shown deterioration in this front. On the whole, the most open states are Tamil Nadu, Punjab and Rajasthan and the most restrictive states are Assam, Bihar and Kerala during 2002-03. A similar trend will be apparent if we look at the figures of ROI2.

Table 2: Regional Openness Indices of Major states of India, 1980-81, 1990-91 and 2002-03

State	1980-81				1990-91				2002-03			
	XII	MII	ROI1	ROI2	XII	MII	ROI1	ROI2	XII	MII	ROI1	ROI2
Andhra Pradesh	7.5	9	8.25	12.5	10	4	7	8.5	10	10	10	11
Assam	11.5	1	6.25	8	13	12	12.5	8.5	12	13	12.5	10
Bihar	15	3	9	9.25	15	14	14.5	12.5	15	8	11.5	7.5
Gujarat	1.5	14	7.75	9	2	13	7.5	7	1	15	8	8.5
Haryana	7.5	7	7.25	7.5	12	5	8.5	11	14	5	9.5	8
Karnataka	5	10.5	7.75	7.5	8.5	6.5	7.5	6.5	4	11	7.5	7.5
Kerala	10	12	11	10.5	7	11	9	10.75	9	12	10.5	13
Madhya Pradesh	11.5	8	9.75	6	11	3	7	8	6	9	7.5	4
Maharastra	13	15	14	12.5	3	15	9	7.25	3	14	8.5	10
Orissa	14	4	9	8.5	14	6.5	10.25	7.5	13	1	7	8
Punjab	7.5	10.5	9	7.5	4.5	1	2.75	4	8	2	5	7
Rajasthan	4	2	3	1.5	4.5	2	3.25	5.5	5	6	5.5	4.5
Tamil Nadu	1.5	13	7.25	6.25	1	10	5.5	5	2	3	2.5	7
Uttar Pradesh	7.5	5.5	6.5	9	8.5	9	8.75	9.5	11	7	9	8.5
West Bengal	3	5.5	4.25	4.5	6	8	7	8.5	7	4	5.5	5.5

-: *Note: The state with **lowest** openness index value is assigned **rank 1** and vice-versa, XII: Export intensity index and MII: Import Intensity Index.*

3.3 Econometric Analysis

The stylized facts of regional growth have led to two major themes in the development of formal econometric analyses of growth. The first theme concerns the identification of growth determinants: which factors explain observed differences in growth? The second theme revolves around the question of convergence: are contemporary differences in aggregate economies transient over sufficiently long time horizons? Parallel to the investigation of growth factors, the empirical method for the same has been evolved, changed and complicated over time. What we do here is to run pooled regression at the level controlling year effects in order to see the marginal of the effect of one variable on the growth of income (i.e, logarithmic value of PCNSDP) and then we run panel (GMM type) at the first difference, a relatively richer model, to see the effect of shock of a variable or rate of change of one particular variable on the changes in growth (i.e., regional disparity). It should be noted that the variables that affect the growth rate may not be significant to explain the rate of changes in growth.

In a seminal work of the augmented Solow model, Mankiw et al. (1992) use cross section data and provide an idea of how region-specific factors effect the growth. The following is the most general form of pooled regression:

$$\ln Y_{it} = \alpha + \beta \ln Y_{it-1} + \Psi X_{it} + \theta Z_{it} + \mu_i + \eta_t + \varepsilon_{it} \qquad (4)$$

Suppose X and Z are two sets of exogenous variables, and μ and η are respectively, region-specific and time-specific variables. Interestingly, one can easily derive the rate of divergence from the estimated figure of the equation which is $(\beta - 1)\%$. While we simply regress the lag dependent variable on logPCNSDP, it shows significant divergence of growth at 0.08%. This reveals the diverging trend of absolute per capita incomes. Now if we control respectively state and time factors in separate regressions, the converging trends are at 2.4% and 0.16%. Similarly, the trend of convergence is 20.4% when we control both state and time-specific factors (Table 3). In other words, there must be some dominant state-specific factors which might form the more motivating factor for the promotion of growth in some states at a faster rate than that of others. Time alone plays a very insignificant role in the process. Therefore, one can read a trend of divergence of absolute income coupled with conditional convergence of it across regions during 1980-2004.

Table 3: Absolute Divergence and Conditional Convergence of PCNSDP for major Indian states during 1980-2004

Independent Variables	(1)	(2)	(3)	(4)
$\log PCNSDP_{it-1}$	1.008^{***}	0.976^{***}	0.9984^{***}	0.796^{***}
Cons	0.0246	0.263^{*}	0.0869^{*}	2.025^{***}
Model	Pooled, robust	Pooled, robust	Pooled, robust	Pooled, robust
State effect	No	Yes	No	Yes
Year effect	No	No	Yes	Yes
Dep. Variable	$\log PCNSDP_{it}$	$\log PCNSDP_{it}$	$\log PCNSDP_{it}$	$\log PCNSDP_{it}$
N	360	345	345	345
R^2	0.97	0.973	0.97	0.98
Rate of convergence/divergence (%)	0.08	-2.4	-0.16	-20.4

Note: 15 major states for 1980-2004, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

We shall now consider a few region-specific variables to explain the growth which are X_{it} and Z_{it} in equation (1). X_{it} is the regional openness index and Z_{it} is a set of control variables. These are namely, per capita government expenditure (PC_GE), literacy- rate (LIT), per capita electricity consumption (ELEC), and Besley Burgess codes[1] of state labour legislation (BBcode). The per capital government expenditure is a sum of per capita revenue and capital expenditures. The former expenditure is the recurring cost for regular maintenance of public goods and services while the latter is the expense on assets like infrastructure, public amenities, etc. These two expenditures have been spited in some regressions to see which has more explanatory power. Because of susceptive collinearly between per capita gross capital formation in the private sector and per capita government expenditure, we do not include the former. Literacy rate is the variable that captures the effect of human capital formation (education) on growth. There has been a huge problem in getting continuous observations of the literacy rate. The Census of India is the only major source for getting the variable every 10 years and hence it is more of a state-specific factor. The per capita electricity consumption has been considered to see the effect of electricity supply on regional growth. BBcode represents the cumulative scores of labour legislation amendments in a particular state. If the

[1] This is a proxy of the rigidity of labour market institutions in the respective states. But this has attracted a lot of criticism. Strike rates or union density could have better proxies for that, but such information is not available for all the states during the study period.

amendment is in favour of employers it gets one and if it is in favour of employee, the value will be minus one, otherwise zero. Besley and Burgess (2004) provide the cumulative scores of each of the states upto 1997. Then we update the score upto 2004 looking at Mallik (2006) and there is no substantial change during this period. All these factors have been established as significant explanatory variables in the growth regression. But, what has been missing in the existing literature is the regional openness. We consider both forms of alternative variables of regional openness in separate regressions. The export intensity index and import intensity index have been also used in another set of regressions to see the effect of export orientation and import penetration on regional growth (see Table 4)..

Table 4: Determinants of regional growth of PCNSDP for major Indian states during 1980-2004

Independent Variables	(1)	(2)	(3)	(4)	(5)
LIT_{it}	0.009***	0.009*	0.01**	0.009*	0.01***
$ELEC_{it}$	0.0001	0.0001*	0.0001	0.0002*	0.0001
$ROI1_{it}$	-0.014***		-0.015***		
$ROI2_{it}$		-0.01***		-0.01**	
XII_{it}					-0.0084***
MII_{it}					-0.0066***
BB $code_{it}$	0.01**	0.013**	0.011**	0.012**	0.13**
PC_GE_{it}	4.19***	4.18***			4.205***
PC_CE_{it}			3.492***	3.51***	
PC_RE_{it}			6.705***	6.58***	
Cons	8.34^{***}	8.31^{***}	8.275***	8.241^{***}	8.354***
Model	Pooled, robust	Pooled, robust	Pooled, robust	Pooled, robust	Pooled, robust
Year effect	Yes	Yes	Yes	Yes	Yes
Dep. Variable	$\log PCNSDP_{it}$	$\log PCNSDP_{it}$	$\log PCNSDP_{it}$	$\log PCNSDP_{it}$	$\log PCNSDP_{it}$
N	360	360	360	360	360
R^2	0.83	0.83	0.83	0.83	0.83

Note: $^{*}\ p < 0.10$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$

XII = Export intensity index, MCI = Import intensity Index, ROI1 = Regional openness index 1, ROI2 = regional openness index 2, PC_GE = per capita government expenditure, PC_RE = per capita revenue expenditure, PC_CE = per capita capital expenditure, ELEC = per capita electricity consumption, LIT = Literacy rate, BBCode = Besley-Burgess measure of cumulative score of state labour legislations.

While running this set of regressions, the year effects[2] have been controlled. All the regression results suggest that both forms of openness indices have been highly significant and reveal that the higher the value of index the lower would be the growth rate. In other words, a more open state shows a higher rate of growth by 1 to 1.5%. While we separate out the export and import indices and run a regression, the coefficients of both variables are negative and highly significant. Therefore, one must argue that both export orientation and import penetration of state have a positive impact on the growth of the region and lead a growth rate respectively, 0.8% and 0.6% higher than that of others.

The regression coefficients of all other control variables except BBcode have shown the usual signs. Literacy rate and per capita government expenditure (both revenue and capital) of a region have been significant to explain its growth. The regression coefficients of ELEC have been positive but not statistically significant in all the cases. More importantly, the pro-workers legislation amendment pushes up the growth rate (unlike Besley Burgess results). The reason could be that pro-workers legislation might reduce the growth of formal manufacturing but definitely cannot reduce the large unorganized sector of 90% workforce engaged in agriculture, manufacturing and tertiary sector. In fact, the growth of the informal sector has been well documented in the post-reform period (Marjit and Maiti, 2006).

Over the years, there has been a substantial development of the growth equation. Although the results, depicted in the Table 2, sound good, this form of models often encounter several criticisms. One is that the model has not captured the initial conditions of the states. If we include lagged dependent variable into the right hand side of the equation, it gives a different problem of collinearity between lagged dependent and disturbance term and one cannot solve it by using same technique. Moreover, since equation (1) includes unobserved state-specific factors, it recommended adopting a device to eliminate those rather than incorporating them into the model. Because, the differences in technology and preferences in regions may be variables that are not readily measurable or even observable in such framework. Only a dynamic panel data approach of first difference can overcome this problem. Once the regression is used at difference

[2] Aghion et al. (2008) have used the same methodology to see the effect of delicensing on manufacturing growth and employment.

form, one also would expect a change in interpretation (Durlauf et al., 2004). Islam, 1995 and Caselli et al. 1996 write an equation for growth (essentially, the first difference of log PCNSDP) containing lagged output in following form.

$$\ln Y_{it} - \ln Y_{it-1} = \beta \ln Y_{it-1} + \Psi X_{it} + \theta Z_{it} + \mu_i + \eta_t + \varepsilon_{it} \qquad (5)$$

β represents here the rate of convergence. This equation also incorporates state specific time invariant factors. Using the framework of Islam (1995), equation 2 can be rewritten as a dynamic panel data model in which the difference of log PCNSDP is regressed on difference of exogenous variable and the difference of lagged dependent variable as follows.

$$\Delta \ln Y_{it} = (1+\beta)\Delta \ln Y_{it-\tau} + \Psi \Delta X_{it} + \theta \Delta Z_{it} + \Delta \eta_t + \varepsilon_{it} - \varepsilon_{it-\tau} \qquad (6)$$

In statistical terms, this is the same model with the only difference of interpretation being that the coefficient on initial output (originally β) is now 1+ β. Arellano and Bond (1991), building on the work by Holtz-Eakin, Newey, and Rosen (1988), developed this method using the GMM approach and it also suits the unbalanced panels and specification tests. Now, the equation (6) is free from the effect of state-specific factor μ_i. In order to avoid the serial correlation between the difference of lag dependent and difference in disturbance term, further lag differences are used as the instrument variable for usual lag difference of the dependent variable. This is essentially useful to see the robustness of the results derived in equation (5) as well as to look at the significant impact of the change in one independent variable on the changes in growth rate. The same set of variables has been considered for this regression and the results have been reported in Table 5. It reveals that the change in openness of one state leads to the 0.3-0.4% changes in the growth rate and this is statistically significant. The change in import competing index has not been a significant variable for the explanation of growth difference. The other most significant variables are the change in per capita government expenditure (particularly per capita revenue expenditure) and labour legislation amendment. These are all significant variables to explain the regional disparity in the growth difference. Controlling these factors, the result reveals a significant converging trend of growth across region approximately at 20% per annum.

It was expected that the export sector will flourish, along with trade liberalization, and that the import sector would shrink. The states that developed import substitution production during the 1970s and 1980s, successfully shifted from importable to exportable production grew faster than the others. In practice, some of the states have been able to do this and continue in importable production along with the focus towards exportable production. It must be mentioned that all the states did not purse liberalized policies in the same fashion, on several grounds, and this had a detrimental effect on their growth performance.

Table 5: Determinants of regional disparity of PCNSDP for major Indian states during 1980-2004

Independent Variables	(1)	(2)	(3)	(4)	(5)
$\Delta \log PCNSDP_{it-1}$	0.794***	0.7966***	0.765***	0.767***	0.794***
ΔLIT_{it}	0.001	0.001	0.008	0.001	0.001
$\Delta ELEC_{it}$	0.0001*	0.0001*	0.0001*	0.0001*	0.0001**
$\Delta ROI1_{it}$	0.003*		0.004*		
$\Delta ROI2_{it}$		0.004*		0.004**	
ΔXII_{it}					0.0038*
ΔMII_{it}					0.0006
$\Delta BB\ code_{it}$	0.059**	0.059***	0.0562**	0.056***	0.061***
ΔPC_GE_{it}	0.47**	0.463**			0.467***
ΔPC_CE_{it}			-0.442	-0.467	
ΔPC_RE_{it}			0.687***	0.680***	
Cons	1.78***	1.76***	2.058***	2.03**	1.77***
Model	GMM, robust	GMM, robust	GMM, robust	GMM, robust	GMM, robust
Dep. Variable	$\log PCNSDP_{it}$	$\log PCNSDP_{it}$	$\log PCNSDP_{it}$	$\log PCNSDP_{it}$	
Instruments	$\Delta \log PCNSDP_{i(t-2)}$ and further lags	$\Delta \log PCNSDP_{i(t-2)}$ and further lags	$\Delta \log PCNSDP_{i(t-2)}$ and further lags	$\Delta \log PCNSDP_{i(t-2)}$ and further lags	$\Delta \log PCNSDP_{i(t-2)}$ and further lags
N	330	330	330	330	330
Wald	2420	2650	2170	2371	2735
Rate of convergence/ divergence	-20.6	-20.6	-23.5	-23.3	-20.6

$^{*}\ p < 0.05,\ ^{**}\ p < 0.01,\ ^{***}\ p < 0.001$

Note: 15 major states for 1980-2004

XII = Export intensity index, MCI = Import intensity Index, ROI1 = Regional openness index 1, ROI2 = regional openness index 2, PC_GE = per capita government expenditure, RD = road density (per capita availability of road), ELC = per capita electricity consumption, LIT = Literacy rate, D_i = dummy for labour legislation of the state.

4 Conclusion

India has gradually moved away from trade restrictions during the last two decades beginning mid-1980s and the present paper attempts to see the impact of such reform on regional growth and disparity. In methodological issues, we reconstruct the regional openness indices, using two alternative weighting techniques for aggregation of export and import intensities, ranks of correlation of state production patterns with national trade pattern, of each state and then use these indices to estimate the impact on regional growth and disparity across 15 major states of India during 1980-2004. This is a more controlled experiment than that amongst a group of countries where the institutional parameters widely vary across countries. The evidence suggests that the PCNSDP has sharply increased in all the states during the period where the rate of rise has been faster in later period. At the same time, the variation of PCNSDP across the region has also shot up from 0.28 in 1980-81 to 0.35 in 2004-05. The regression results suggest that the states, which are more open, have grown faster that others by 1-1.5% per annum. Moreover, the change in export orientation has a much stronger effect on the change in growth rate of the state. A few newly-developed states have shown their dependence on exportable production, while some other backward states have not changed their status of exportability, rather they registered a deterioration. At the same, some of the industrially developed states in terms of exportability are still engaged in importable production along with exportable and that may be the reason for a weak impact of import penetration on regional growth. Therefore, we argue that the impact of trade reform has been detrimental for the state income. The state, which has not been able to switch resources from importable to exportable production due to so many constraints and rigidities at the level of state, has suffered a loss the growth. This partially supports the Marjit-Beladi hypotheses. We also observe the conditional convergence approximately at 20% per annum if we control state-specific factors like government expenditure, infrastructure, education and regional openness. The study has a few limitations. We used a concordance table between industrial and trade statistics respectively, at the two digit level of NIC and HS classification and this seems to be a gross matching. A more disaggregate level of matching is required in order to avoid cross tabulation. Second, we should consider a more suitable variable to represent the exact level of education, which

would be continuous. Third, a better proxy is also required to capture the form and functioning of labour market institutions across states as the Besley and Burgess codes have been severely criticized in recent literature (Bhattacharya, 2006). Finally, one agenda of future study would be what specific regional rigidities are responsible for a differential level openness of the states. These are the areas of concern for further improvement of the work.

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