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**Product Market Regulation  
and Economic Performance  
across Indian States**

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Thomas Chalaux**

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**ECONOMICS DEPARTMENT**

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ACROSS INDIAN STATES**

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**By Paul Conway, Richard Herd and Thomas Chalaux**

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## ABSTRACT/RÉSUMÉ

### **Product Market Regulation and economic performance across Indian States**

This paper uses the OECD's indicators of product market regulation to assess the extent to which the regulatory environment affects economic performance across Indian states. The degree to which product market regulation is supportive of competition is found to vary considerably across states. Furthermore, regression results indicate that these differences in regulation have a significant impact on both labour and total factor productivity. States in which the regulatory environment restricts competition have lower productivity growth in comparison to states in which regulation is more supportive of competition. Relatively liberal states are also found to attract more foreign investment and have a larger share of employment in the organised sector in comparison to states with a more restrictive regulatory environment. State governments that have enacted a relatively liberal regulatory framework have also been more successful at infrastructure provision. Ongoing reform of product market regulation is necessary to improve productivity growth further and ensure that the benefits of reform are distributed more widely across the country.

This working Paper relates to the *2007 Economic Survey of India* ([www.oecd.org/eco/surveys/india](http://www.oecd.org/eco/surveys/india)).

JEL classification: K2, L5, 01, 04.

Keywords: Productivity convergence; institutions and growth.

### **Réglementation des marchés de produits et performances économiques dans les États de l'Union indienne**

Nous utilisons dans ce document les indicateurs de réglementation des marchés de produits (RMP) de l'OCDE pour évaluer les répercussions de l'environnement réglementaire sur les performances économiques des États de l'Union indienne. Nous parvenons à la conclusion que la mesure dans laquelle la réglementation des marchés de produits favorise la concurrence varie considérablement suivant les États. En outre, les résultats obtenus par analyse de régression indiquent que ces différences de réglementation ont un impact sensible tant sur la productivité de la main-d'œuvre que sur la productivité totale des facteurs. Les États où l'environnement réglementaire restreint la concurrence enregistrent des gains de productivité plus faibles que ceux dans lesquels la réglementation est plus propice au libre jeu des forces du marché. Nous montrons également que les États relativement libéraux attirent davantage l'investissement étranger, qu'ils ont de meilleures infrastructures, et que le secteur organisé y représente une proportion plus importante de l'emploi que dans les États ayant un cadre réglementaire plus restrictif. Les États qui ont décrété un système réglementaire relativement libéral sont aussi ceux qui ont connu le plus de réussite dans l'approvisionnement en infrastructure. Les autorités doivent aller plus loin dans la réforme de la réglementation des marchés de produits pour renforcer encore la croissance de la productivité, et veiller à ce que les fruits des réformes soient plus largement distribués dans l'ensemble du pays.

Ce document de travail se rapporte à l'Étude économique de l'Inde 2007 ([www.oecd.org/eco/etudes/inde](http://www.oecd.org/eco/etudes/inde)).

Classifications JEL : K2, L5, 01, 04.

Mots clés : Convergence de la productivité ; institutions et croissance.

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## PRODUCT MARKET REGULATION AND ECONOMIC PERFORMANCE ACROSS INDIAN STATES

Paul Conway, Richard Herd, and Thomas Chalaux<sup>1</sup>

### 1. Introduction and conclusions

1. Since the mid-1980s, successive waves of reform have progressively moved India away from its former *dirigiste* economic model towards a market-based system. The reform of regulations that shape the business environment in markets for goods and services – henceforth referred to as product market regulation – has been an integral part of this transformation. As in a number of developed and developing countries, this reform process has been closely intertwined with increasing the extent of competition in product markets. State intervention and control over economic activity has been significantly reduced and the role of private-sector entrepreneurship increased.

2. Although India has clearly made significant progress in liberalising product markets, the extent to which the regulatory environment is conducive to competition is still an important concern and a number of studies have highlighted weaknesses in India's business environment. In a companion paper, Conway and Herd (2008) find that although liberalisation has improved India's regulatory environment to international best practices in a few areas, the overall stance of product market regulation is still more restrictive of competition than in all OECD and a number of other comparator countries. In other work on the business environment, notwithstanding recent improvements, the World Bank ranks India 120<sup>th</sup> out of 178 countries in the overall ease of doing business (World Bank, 2007). In another major study, business people in India are found to spend more time dealing with government bureaucracy in comparison to OECD and other Asian countries, including China (World Bank-CII, 2002).

3. As well as being an issue at the national level, the degree to which the regulatory environment is supportive of competition is also an important concern at the state level. India's constitution mandates direct responsibility for a number of areas of economic policy to the state governments as well as shared responsibility with central government in a number of other areas.<sup>2</sup> Accordingly, state governments may implement their own laws in certain areas, or amend central legislation prior to implementation. Moreover, the state governments usually formulate and administer the rules and procedures through which all laws are enforced. As a result, differing views across state governments on the role of the public sector and the efficiency with which laws and regulations are administered can lead to considerable differences in the business environment across states. For example, in a large-scale survey of the investment climate in ten Indian States, the World Bank finds that investors' perceptions of the business environment do differ considerably across states (World Bank-CII 2002).

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1. OECD Economics department, 2 rue Andre Pascal, 75775 Paris Cedex 16, France. Email [paul.conway@oecd.org](mailto:paul.conway@oecd.org). We would like to thank Willi Leibfritz, Sean Dougherty, Giuseppe Nicoletti, and Stefano Scarpetta for useful comments on an earlier draft of this paper. Thanks also go to Nadine Dufour for secretarial support. We are also most grateful to Dr. Simrit Kaur who was the principle consultant based in Delhi working on the PMR indicators for India.

2. The Union List stipulates areas of regulatory responsibility that are the exclusive preview of the Government of India (for example, exit policy and bankruptcy procedures) whereas items on the State List come under the jurisdiction of the state governments (for example, inspections and compliance with regulation). A third list – the Concurrent List – covers areas where the centre and state governments have joint responsibility (for example, entry and labour regulation).

4. Previous studies have found that these differences in the business environment have a significant effect on various aspects of economic performance at the state level. For example, the World Bank-CII study finds that states with a better investment climate attract more investment and are more productive relative to states with a poor investment climate. Purfield (2006) finds that characteristics of the state business environment – such as the GDP share of government expenditure and transmission and distribution losses of electricity – have a significant negative effect on state per capita income. Veeramani and Goldar (2004) find that poor governance is associated with low productivity growth across states.<sup>3</sup>

5. Against this background this paper uses the OECD's indicators of Product Market Regulation (PMR) to assess the effect of the regulatory environment on economic performance at the state level.<sup>4</sup> The PMR indicators summarise data covering most of the important aspects of general regulatory practice as well as some aspects of industry-specific regulatory policy. They record only 'objective' data about rules and regulations, as opposed to 'subjective' assessments of market participants as in indicators based on opinion surveys. This isolates the indicators from context-specific assessments and makes them comparable across countries or states in the case of India. These indicators have been estimated for 21 states, which collectively encompass around 98% of both India's GDP and population. The indicator results confirm that cross-state differences in the regulatory environment are significant.

6. A productivity model estimated across 22 manufacturing sectors at the state level is then used to assess the impact of regulation on both labour and total factor productivity. The productivity performance of India states has varied markedly since the onset of economic reform and is a key driver of cross-state differences in GDP per capita, which were diverging in the final decades of last century. Since the beginning of the 2000s, however, there is evidence of a degree of productivity convergence driven primarily by rapid productivity growth in a group of states in the middle of the cross-state distribution of productivity levels in 2000. Although the short sample period necessitates that this result be interpreted with some caution, it does suggest a degree of economic convergence across states.

7. The regression results indicate that cross-state differences in the regulatory environment, as measured by the PMR indicators, have a significant impact on both labour and total factor productivity in the state economies. States in which the regulatory environment hinders the operation of competitive market forces have lower productivity growth in comparison to states in which regulation is more supportive of competition. This implies that inappropriate regulatory settings impinge on the ability of the state economies to reap the full benefits of economic reforms undertaken at the national level. Consistent with a number of studies of the impact of policy on performance, it would seem that poor product market regulation in Indian states reduces firms' incentives to invest and enhance efficiency. The paper goes on to consider a number of channels through which regulation might influence productivity and finds that states with relatively liberal regulatory environments attract more foreign investment, have better infrastructure, and a larger share of employment in the organised sector.

8. Experience in developed and developing countries suggests that liberalising markets and increasing competition enhances productivity growth by improving resource allocation and stimulating innovation and technological diffusion from more to less productive economies (for example, Aghion *et al.*, 2001 and Conway *et al.*, 2006). These are potentially crucial sources of productivity growth in India and the extent to which regulations are conducive to competition will be a central determinant of India's future growth rate. As discussed in detail in Conway and Herd (2008), there is considerable scope for improving product market regulation at the centre and state levels in India. The empirical results reported

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3. Veeramani and Goldar (2005) also provide a review of other work in this area.

4. In a companion paper – Conway and Herd (2008) – the OECD PMR indicators are used to internationally benchmark India's regulatory environment and outline a number of areas in which regulation could be improved to be more supportive of competition in product markets.

below imply that ongoing reform of anti-competitive regulations in the less productive states would help reduce gaps in economic performance and ensure that the benefits of India's economic transformation spread throughout the national economy, which is an important key to reducing poverty (OECD, 2007). In the relatively more liberal states and at the centre, the challenge is to further improve business framework conditions towards those in the OECD area so as to hasten the international diffusion of more productive production techniques.

9. The remainder of the paper is structured as follows. Section 2 outlines the PMR indicator methodology and describes the way in which these indicators have been adapted to suit the Indian environment. Section 3 outlines the empirical model that is used to test the effect of product market regulation on productivity at the sectoral level. Section 4 outlines the data used in estimating the productivity model including the process of collecting the regulatory data used to estimate the PMR indicators in India. Finally, the results of estimating the model are outlined in Section 5.

## 2. Measuring product market regulation: The OECD's PMR indicator system<sup>5</sup>

10. The PMR indicator system is based on 16 low-level indicators that each captures a specific feature of the regulatory regime and collectively span most of the important aspects of general regulatory practice (Table 1). To calculate these low-level indicators, qualitative data on product

**Table 1. The PMR Indicators: Description and State/Centre Split**

	L2 Indicator	Description	State-level PMR
State control	Scope of public enterprise sector	the pervasiveness of state ownership across business sectors	yes
	Size of public enterprise sector	overall size of PSEs relative to the size of the economy	yes
	Direct control over business enterprise	extent of government control over business over and above ownership (eg, special voting rights)	yes
	Use of command and control regulation	use of coercive, as opposed to incentive-based, regulation	no
	Price controls	extent of price controls in specific sectors	no
Barriers to entrepreneurship	License and permits system	use of 'one-stop shops' and silent is consent rules	yes
	Communication and simplification of rules and procedures	communication and efforts to reduce administrative burden of interacting with government	yes
	Administrative burdens for corporation	admin burden for setting up corporation	yes
	Administrative burdens for sole proprietor firms	admin burden for setting up sole trader	yes
	Sector specific administrative burdens	admin burden in retail and road transport sectors	yes
	Legal barriers	explicit legal entry barriers across a range of business sectors	no
	Antitrust exemptions	exemptions of public enterprises to competition law	no
Barriers to foreign trade and investment	Foreign ownership barriers	legal restrictions on foreign acquisition	no
	Discriminatory procedures	procedural discrimination against foreign firms	no
	Regulatory barriers	other barriers to international trade	no
	Tariffs	simple average of MFN tariffs	no

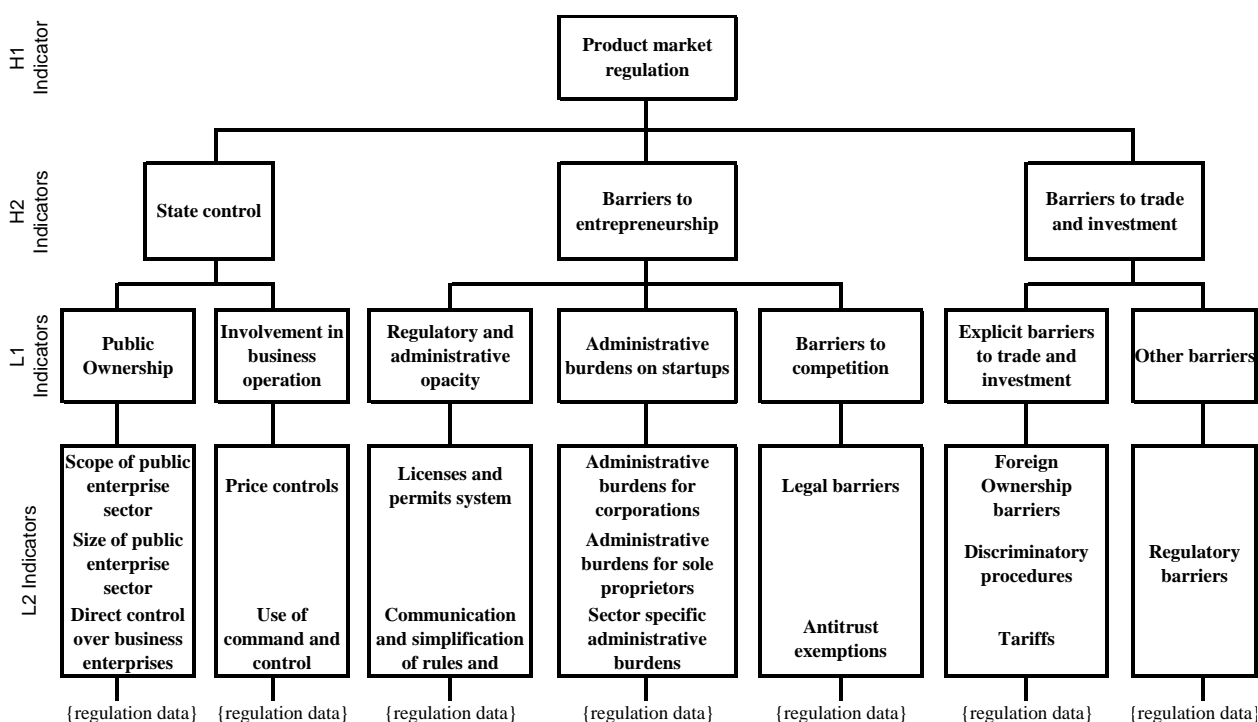
5. This section provides only a very brief summary of the PMR indicator methodology. For a detailed description of the PMR indicators and the results for OECD countries see Nicoletti *et al.* (1999) and Conway *et al.* (2005).



market policy settings – such as YES/NO answers – are coded by assigning a numerical value to each of the possible responses to a given question. Quantitative information is subdivided into classes using a system of thresholds. This coded information is normalised over a scale of zero to six, reflecting increasing restrictiveness of regulatory provisions to competition. These data are then aggregated into the 16 low-level indicators by assigning subjective weights to the various regulatory provisions.

11. The 16 low-level L2 indicators are then aggregated in the form of a pyramid to create an overall indicator (Figure 1). There are four levels to the PMR indicator system.<sup>6</sup> At each step up the pyramid the regulatory domain summarised by the indicators becomes broader. The L1 indicators, which are calculated as weighted averages of the L2 indicators, reflect policy settings in seven regulatory domains. At the next step up the pyramid the high-level H2 indicators summarise the stance of regulation in three broad areas: *state control*, *barriers to entrepreneurship*, and *barriers to international trade and investment*. Finally, the overall H1 indicator at the top of the structure summarises the main features of the regulatory framework in product markets. Higher-level indicators are calculated as weighted averages of their constituent lower-level indicators. The attribution of lower-level indicators to each higher-level indicator and the weights used in the averaging are derived using principal component analysis.<sup>7</sup> In all cases the aggregation weights sum to one, which, in conjunction with the normalisation of the basic data, ensures that all the indicators have a scale of zero to six increasing in the restrictiveness of regulation.

Figure 1. The PMR Indicator System



6. Note that previous work using the PMR indicators (Nicoletti *et al.*, 1999 and Conway *et al.*, 2005) also included another level of indicators – inward-oriented and outward-oriented policies – that are not used in this paper.

7. To ensure comparability, the PMR indicators for India are calculated using the same set of weights as the indicators for OECD countries. More information on principle component analysis in the context of the PMR indicators can be found in Nicoletti *et al.* (1999).

12. As mentioned in the introduction, responsibility for different aspects of product market regulation is split between the central and state governments in India. Table 1 illustrates the way in which this demarcation of policy maps into the 16 L2 indicators. Eight of these indicators are estimated for the states – three of the indicators under the H2 domain of *state control* and five indicators under the H2 domain of *barriers to entrepreneurship*. The other eight L2 indicators reflect product market regulation that is set at the central level and the same across states. This includes all four of the L2 indicators that make up the H2 indicator of *barriers to international trade and investment*. Under the domain of *barriers to entrepreneurship*, the L2 indicators of *legal barriers to entry* – which in the Indian context primarily reflects reservations for small-scale industry – and *antitrust exemptions* also reflect the policies of central government. In terms of *state control*, the L2 indicators of *price controls* and *use of command and control regulation* are also primarily driven by central government.

13. The construction of two of the eight L2 indicators estimated at the state level has been altered somewhat in comparison to the standard construction for OECD countries. Reflecting data availability, the indicator of the *size of the public enterprise sector* is based on the amount of government capital invested in public enterprises as a share of state GDP. At the national level and in OECD countries this indicator is calculated using data on the value added share of state-owned enterprises and privatisation proceeds. The indicator of *communication and simplification of rules and procedures* has also been modified at the state level to suit the Indian context. Four questions, out of a total of eight, on administrative reform have been changed to more accurately assess reform efforts at the state level. In particular, these new questions assess whether: state governments have an administrative reform committee (or similar) to oversee the reengineering of government administrative processes; there is a system of self-certification in place to reduce inspector visits; the state government has a visible policy on implementing e-governance to improve coordination between government department and reduce administrative burden; composite application forms are used.

14. To calculate higher level PMR indicators for the state governments, the eight L2 indicators that reflect central government policies are excluded from the system. Accordingly, there is no estimate of the H2 indicator of *barriers to international trade and investment* in the state-level PMR indicators and the indicators of *state control* and *barriers to entrepreneurship* are calculated using three and five L2 indicators respectively. To ensure that the weights used in the averaging still sum to one, the weights on the indicators excluded from the system are proportionally redistributed to the remaining L2 state-level indicators. This, in conjunction with modifications to two of the L2 indicators, means that the higher-level state PMR indicators are not directly comparable with the national indicators. They do, however, provide a consistent assessment of the extent to which policies promote or inhibit competition in the regulatory areas under the control of the state governments.

15. At the national level the PMR indicators are calculated in exactly the same way as for OECD and other countries.<sup>8</sup> National level estimates of the eight H2 indicators applied at the state level are either calculated based on the regulatory policies of the central government if there is overlapping jurisdiction or as averages of the state-level indicators.

### 3 The productivity model

16. To test the effect of product market regulation on productivity, a model based on the work of Scarpetta and Tressel (2002) and Aghion and Howitt (2005) has been used. It is estimated at the sectoral

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8. As well as India, the OECD Secretariat has estimated the PMR indicators for the following non-member countries: Brazil, Chile, and Romania (OECD 2005a, OECD 2003a and OECD 2002 respectively). The World Bank has also recently estimated the PMR indicators for Bulgaria and updated the Romanian indicator values (see De Rosa *et al.*, 2007a and De Rosa *et al.*, 2007b).

level across states. Here, productivity is driven by a catch-up process whereby improved technology and organisational techniques diffuse from the most productive state to other states. Productivity for a given sector  $j$  of state  $i$  at date  $t$  ( $Prod_{ijt}$ ) is modelled as an auto-regressive distributed lag process in which the level of productivity is co-integrated with the level of productivity of the technological frontier state (*leader*). That is,

$$\ln Prod_{ijt} = \beta_1 \ln Prod_{ijt-1} + \beta_2 \ln Prod_{jt}^{leader} + \beta_3 \ln Prod_{jt-1}^{leader} + \omega_{ijt} \quad (1)$$

where  $\omega$  stands for all observable and non-observable factors influencing the productivity level. Rearranging equation (1) under the assumption long-run homogeneity ( $1-\beta_1=\beta_2+\beta_3$ ) yields the convergence equation:

$$\Delta \ln Prod_{ijt} = \beta_2 \Delta \ln Prod_{jt}^{leader} - (1-\beta_1)(\ln Prod_{ijt} - \ln Prod_{jt}^{leader}) + \omega_{ijt} \quad (2)$$

17. The residual term in equation (2) is modelled as:

$$\omega_{ijt} = \sum_k \alpha_k X'_{kijt} + g_j + d_t + \varepsilon_{ijt} \quad (3)$$

where  $X_{ijt}$  is a vector containing the PMR indicators for Indian states and control variables that affect productivity and  $g_j$ , and  $d_t$  are sector, and year fixed effects respectively and  $\varepsilon$  is white noise. Separating out the PMR indicators for Indian states and renaming the vector of remaining control variables  $Y_{ijt}$ , the estimated equation becomes:

$$\Delta \ln Prod_{ijt} = \delta(\Delta \ln Prod_{jt}^{leader}) + \sigma((\ln Prod_{ijt-1} - \ln Prod_{jt-1}^{leader}) + \gamma PMR_i + \mu(PMR_i)^* (\ln Prod_{ijt-1} - \ln Prod_{jt-1}^{leader})) + \sum_k \alpha_k Y'_{kijt} + g_j + d_t + \varepsilon_{ijt} \quad (4)$$

with  $\varepsilon \sim N(0, \Sigma)$

18. In this model, productivity in a given sector in a given state depends on its ability to catch up with productivity in the state with the highest level of productivity in that sector (the productivity leader) by either innovating or taking advantage of technological transfers. The direct effect of productivity shocks in the leading (most productive state) in a given sector on productivity growth in follower states is measured by the coefficient  $\delta$ . In addition, this equation also allows for the possibility that, in a given sector, differences in productivity levels between each state and the productivity leader may influence productivity growth. If the coefficient  $\sigma$  is negative and significant, then the further a given state is from the technological frontier in a given sector, the greater the scope for productivity improvements arising from technological catch up. The higher is  $\sigma$  (in absolute value) the faster is the process of catch-up to the productivity level of the leading state.

19. The model posits that there are a number of factors that may influence this process and prevent eventual catch-up. In particular, this possibility is affected by the policy environment in follower states. Aghion and Griffith (2005) stress the role played by institutions that promote or hinder firm rivalry and/or entry of new firms in raising or curbing incentives to enhance productivity. In the model presented here, these institutions are proxied by the PMR indicators of anti-competitive regulation at the state level. Product market regulation can influence productivity growth directly, the strength of which is measured by the coefficient  $\gamma$ . In addition, product market regulation can also have an indirect affect by influencing the speed with which states catch up to the productivity leader. This indirect channel is included in the model

by allowing regulation to interact with the productivity gap term. This allows for the possibility that, by creating barriers to entry or hindering competition among incumbents, anti-competitive regulation may reduce incentives to invest and adopt leading production techniques, thereby lowering the speed with which states/sectors catch up to the productivity leader. A positive and significant value of the coefficient on this term,  $\mu$ , implies that more restrictive product market regulation hinders the diffusion of productivity shocks from the productivity leader.

## 4 The data

### 4.1 Product market regulation

#### 4.1.1 Collecting data on product market regulation in India

20. The regulatory database used to construct the PMR indicators for India covers regulations that affect the economy at large, as well as some aspects of industry-specific regulatory policies that are representative of economy-wide regulatory approaches (in particular, in retail distribution, air and rail passenger transport, rail and road freight, telecommunications). In total, the PMR indicators summarise information on 139 economy-wide or industry-specific regulatory provisions that have a bearing on competition. These data were primarily collected using a detailed questionnaire – the *OECD Regulatory Indicators Questionnaire* – that was answered by civil servants that have knowledge and/or responsibility related to the relevant policy area.

21. In the case of India, the questionnaire was split into two parts covering product market regulations under the jurisdiction of the central and state governments respectively. For the central government, the Ministry of Finance acted as a contact point and coordinated the responses of the various central Ministries that answered different sections of the questionnaire. At the state level, data collection was more challenging. Of the 21 states for which the PMR indicators were calculated the state capitals of the following nine states were visited in person: Assam, Bihar, Haryana, Jharkhand, National Capital Territories (Delhi), Punjab, Rajasthan, Uttar Pradesh, and West Bengal. The purpose of these visits was to meet with government officials, usually at the Principal or Deputy Secretary level, in various Departments of the state governments to collect data on state-level regulation.<sup>9</sup> In total, meetings were held with over 50 state government officials over the course of these visits. For the remaining 12 states – Andhra Pradesh, Chhattisgarh, Goa, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Tamil Nadu, and Uttaranchal – meetings were held with the Resident Commissioners, who are the state's representatives in New Delhi and acted as contact points for the completion of the *OECD Regulatory Indicators Questionnaire* for their state. As well as collecting data from the state governments, a law firm was also used to collect data on the requirements for setting up two different types of business in each of the 21 states.<sup>10</sup> All of the questionnaire answers were then vetted by an independent consultant before being submitted to the OECD.

22. The quality of the regulatory data used to calculate the PMR indicators is clearly an extremely important consideration and a great deal of effort was put into ensuring the accuracy of the questionnaire responses. Namely:

- 
9. Principal or Deputy Secretary is the third highest Indian Administrative Service grade. Discussions were typically held with administrators in the following departments: Public-Sector Undertakings (or Disinvestment), Industries, Power, Transport, Food and Civil Supplies, and Planning. In some states meeting were also held with people in the Finance and Development Departments.
  10. This firm, Singhania & Partners, has its head office in Delhi and assess to a network of law practices throughout India. They have experience in collecting this type of data having worked with the World Bank on their Doing Business surveys in India on a number of occasions.

- As well as meeting with state governments, a number of meetings were also held with business people in some of the state capitals that were visited. The purpose of these meetings was to identify perceived areas of policy weakness and corroborate the regulatory data collected from government. These meetings were usually organised by one of the Indian business associations (the Confederation of Indian Industry or the Federation of Indian Chambers of Commerce and Industry).
- To the extent possible, secondary data sources were used to corroborate regulatory data provided by government. For example, the Comptroller and Auditor General of India has a great deal of information on public sector enterprises, both at the central and state levels, and this was used to confirm data collected on the extent of state ownership in various sectors of the Indian economy. Data collected on the procedures for setting up different types of businesses across states were compared with the World Bank's Doing Business data in the 12 states in which it has been collected (World Bank 2006).
- The websites of the state governments were also consulted extensively to confirm answers to the questionnaire and fill any holes in the database. The industrial policies of almost all of the states included in the study are available on the government websites.
- Once all of the regulatory data had been compiled for the 21 states it was sent back to the State Secretaries in the states that were visited in person and the Resident Commissioners of the other states so that they could vet the data and ensure its accuracy.

23. Most of the data used to calculate the national and state-level PMR indicators for India were collected over the period June to October 2006.

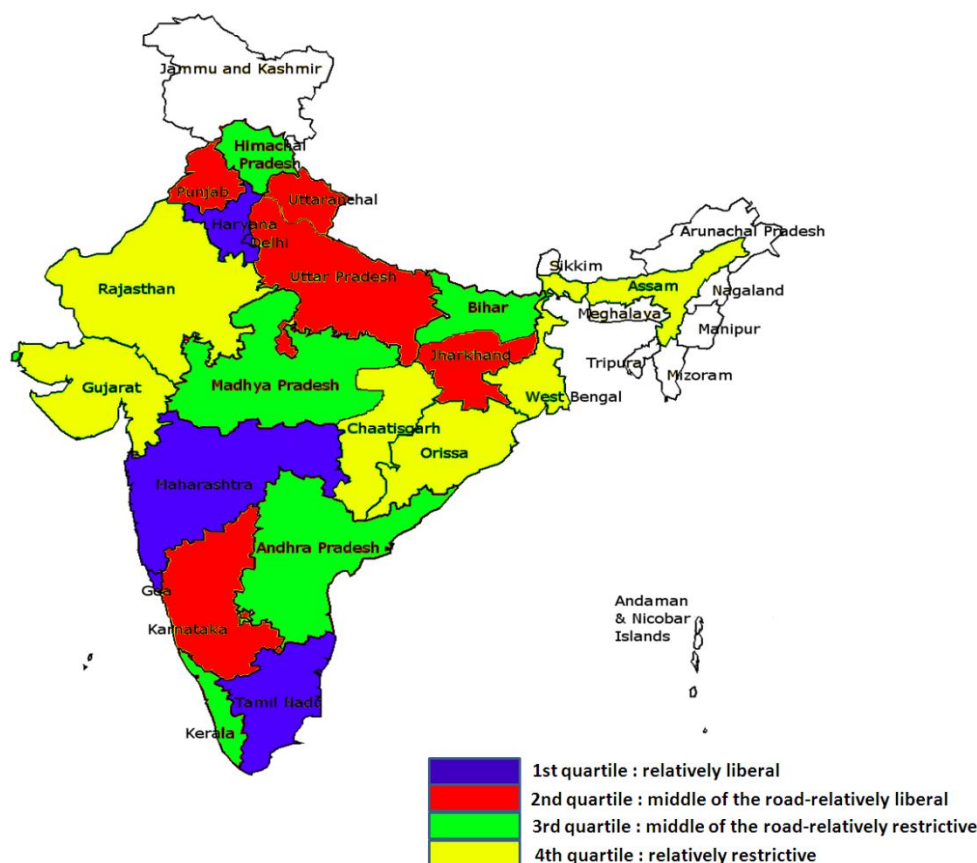
#### 4.1.2 The high-level PMR indicators values for Indian states

24. At the state level the PMR indicators highlight notable differences in the extent to which state government policies are supportive of competition (Table 2). This cross-state variation reflects differences in the extent of both *state control* and *barriers to entrepreneurship*. In broad terms, according to the PMR indicators, the regulatory environment in some of the southern and north-eastern states is relatively more supportive of competition, whereas states in the east and west of the country have regulatory frameworks that are relatively restrictive of competition (Figure 2).

**Table 2. High-level PMR indicators, State**

	Andhra Pradesh	Assam	Bihar	Chhattisgarh	Delhi	Goa	Gujarat
<b>Overall indicator</b>	2.14	2.23	2.22	2.31	1.95	1.71	2.40
<b>State control</b>	2.43	1.96	1.94	1.46	1.90	1.64	2.50
<b>Barriers to entrepreneurship</b>	1.37	2.10	2.12	2.84	1.28	0.81	2.11
	Haryana	Himachal Pradesh	Jharkhand	Karnataka	Kerala	Madhya Pradesh	Maharashtra
<b>Overall indicator</b>	1.89	2.19	2.08	2.03	2.22	2.11	1.95
<b>State control</b>	2.05	2.34	1.34	2.56	2.46	1.76	2.04
<b>Barriers to entrepreneurship</b>	0.96	1.60	2.25	0.89	1.58	1.94	1.14
	Orissa	Punjab	Rajasthan	Tamil Nadu	Uttar Pradesh	Uttaranchal	West Bengal
<b>Overall indicator</b>	2.31	2.00	2.29	1.97	2.11	2.01	2.58
<b>State control</b>	2.57	2.33	1.97	2.03	1.89	1.96	2.58
<b>Barriers to entrepreneurship</b>	1.74	1.01	2.30	1.23	1.79	1.42	2.58

Figure 2. Overall PMR Indicator by State



#### 4.1.3 A comparison with perceptions-based measures of the business environment

25. Overall, these objective measures of product market regulation are generally consistent with indicators of entrepreneur's perceptions of the investment climate across Indian states where both indicators are available.<sup>11</sup> In a few states, however, the overall PMR indicator values do not match preconceptions of the relative competitiveness of the business environment. In particular, Gujarat has an overall PMR indicator score in the 'relatively restrictive' fourth quartile. This largely reflects a very large public enterprise sector and, despite a comprehensive simplification programme, relatively high administrative burdens on firms in this state. However, Gujarat is often considered to be one of India's more progressive states. On the other hand, Jharkhand ranks in the second quartile of "middle of the road-relatively liberal" states but is often considered to have a restrictive regulatory environment comparable to that in neighbouring Bihar, of which it once was a part.<sup>12</sup>

11. The World Bank indicators of entrepreneurs' rankings of investment climate have been estimated for the following states: Andhra Pradesh, Delhi, Gujarat, Karnataka, Kerala, Maharashtra, Punjab, Tamil Nadu, Uttar Pradesh, and West Bengal. Excluding Gujarat, the correlation between the overall PMR indicator and the World Bank's indicator is -0.67, which is significant at the 95% level of confidence.

12. In 2000 three new states were created. Jharkhand was created out of the southern districts of Bihar, Chhattisgarh was created out of eastern Madhya Pradesh and Uttaranchal was created out of north-western Uttar Pradesh.

26. One potential reason why the state rankings implied by the PMR indicators may differ to some extent from perceptions of the investment climate is that efforts aimed at reforming the regulatory regime can influence investor perceptions but take some time to translate into significant changes in actual policy settings. For example, although West Bengal is in the midst of a comprehensive reform and privatisation programme that will make markets more competitive, it still has a relatively poor overall PMR indicator score.

27. The way in which product market policies are enforced is another potentially important reason why the state rankings implied by the PMR indicators may differ from those based on surveys of investor perceptions for a few states. As mentioned in the introduction, the PMR indicators reflect actual policy settings and do not attempt to capture differences in enforcement. So a state with restrictive product market policies that are laxly enforced, for example, may rank more highly in perception surveys than with the PMR indicators. As discussed in Section 2.2, the PMR indicators estimated at the state level cover eight of the sixteen low-level indicators. However, the regulatory policies of central government are also enforced by the state governments, implying a greater possibility for significant enforcement affects across states. In addition, regulatory structures in India are generally less developed than in OECD countries implying that policy enforcement, which essentially reflects the administrative capacity of the state government and their attitude to competition, is likely to play a more important role in shaping the business environment.

28. This suggests that the extent to which the business environment is supportive of competition is a function of both regulation and the way in which regulations are enforced. Measuring enforcement effects in isolation is conceptually difficult. However, indicators of the extent of corruption at the state level may provide a proxy for state governments' approach to policy enforcement. These indicators exist for 20 of the major states and have been estimated on the basis of peoples' perceptions of the extent of corruption and experiences of actually paying bribes in 11 public services (Transparency International, 2005) According to this measure, the state of Gujarat ranks as the third least corrupt state whereas Jharkhand ranks fourteenth suggesting that enforcement, as proxied by the corruption measure, may explain differences between regulations *per se* and investor perceptions of the business environment. To test this, a regression of the World Bank's rankings of the investment climate on the PMR and corruption indicators is estimated across states (Table 3). Although the number of observations is very small, both indicators are significant at the 10% level and the  $R^2$  indicates a good fit that is higher than in an equation with only the PMR indicators on the right-hand side. This suggests that both the regulatory environment and the way in which regulations are enforced are important determinants of the investment climate.

**Table 3. Impact of regulation and enforcement on perceptions of the business environment**

<b>Dependent Variable: Entrepreneurs' perceptions of the business environment</b>		
Product market regulation	1.038***	0.667*
Enforcement		0.435*
Observations	10	10
R-squared	0.55	0.71

Note: \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

#### **4.2 Labour and total factor productivity data**

29. The productivity model depicted in equation (4) above is estimating using data on both labour and total-factor productivity (TFP) across Indian states. Labour productivity is a 'single-factor productivity measure' that relates output to a single measure of labour input. As such, differences in labour productivity across countries or states reflect differences in technology in its broadest possible sense including differences in capital intensity, capital quality, human capital, economies of scale, and intangibles such as management techniques. TFP estimates account for one of these additional factors by relating output to

labour and capital and is potentially a more precise estimate of productive efficiency. However, because of difficulties measuring the capital stock, estimates of TFP tend to be less robust than those of labour productivity, particularly at the industry level.

30. The Annual Survey of Industry (ASI) is the source of both productivity data sets used in the regression. This is an annual survey of the manufacturing sector that covers all factories registered under the Factories Act (1948) – that is, factories employing 10 or more workers and using power or employing 20 or more workers without power. The sample frame of this survey has changed from time to time but currently factories with more than 100 workers are surveyed in a census whereas other factories are surveyed on a sample bases. The sectoral classification of industries is based on National Industry Classification 2004.

31. For a given sector in a given state, labour productivity is measured as the log difference between real value added ( $VA_{ijt}$ ) and total employment ( $L_{ijt}$ ). Real value added is calculated using the wholesale price index (WPI) at the sector level. Ideally, value added would be double deflated using deflators for gross output and intermediate inputs, but this data is not available.

32. TFP is calculated as:

$$TFP_{ijt} = \ln\left(\frac{VA_{ijt}}{L_{ijt}}\right) - \alpha \ln\left(\frac{K_{ijt}}{L_{ijt}}\right) \quad (5)$$

where  $K_{ijt}$  is a measure of the capital stock from the ASI database.<sup>13</sup> The coefficient  $\alpha$  is estimated from a regression on value added per worker on capital per worker that accounts for state and firm-size fixed effects. Labour and total factor productivity are both estimated for 22 manufacturing sectors in 21 states. The sample period for the sectoral data is 1999 to 2004 and the panel is unbalanced.

## 5 The Results

### 5.1 Product market regulation and productivity at the level of the state economy

33. One of the striking features of economic performance across Indian states is that GDP per capita has been diverging over recent decades. A number of studies – for example Purfield (2006) and OECD (2007) – find a positive relationship between the initial level of GDP per capita and subsequent growth across states. In other words, states that were initially relatively better off have been growing more quickly than states that were initially poorer, increasing cross-states income differentials.

34. Since the mid 1990s labour productivity growth has been the primary driver of growth in GDP per capita in the majority of Indian states, with demographic and employment trends playing a relatively minor role (Figure 3). In Bihar, Madhya Pradesh, and to a lesser extent, Rajasthan, however, falls in the share of the population in work were a negative and significant drag on GDP per capita growth. In contrast, an increase in the share of the working population offset a fall in trend labour productivity in Assam over this period. In general, however, it follows that a lack of convergence in labour productivity has been

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13. The measure of TFP used in the regression results reported below is calculated using a measure of the capital stock that is deflated using the WPI. However, given that the capital stock reflects investment flows over a number of years, it is unclear whether this is the most appropriate deflator. In any case, sensitivity analysis of the regression using TFP measures calculated using the nominal capital stock and the capital stock deflated using a ten year moving average of the WPI indicate that the qualitative results are robust to the choice of capital deflator.

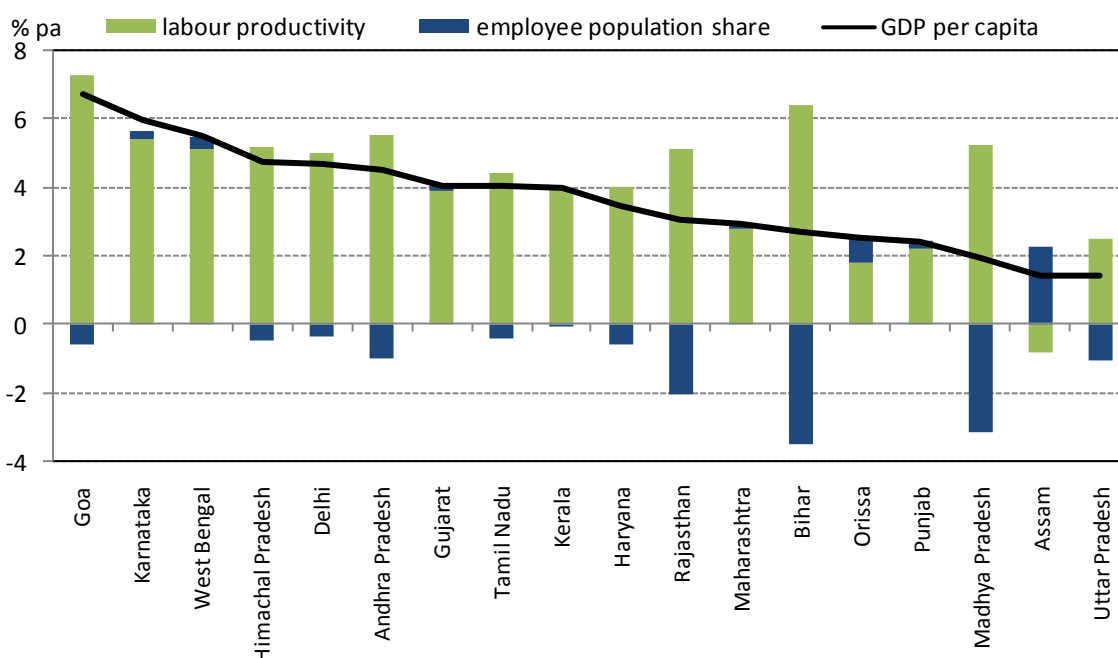


driving divergence in GDP per capita. And indeed, across all states, the correlation between the level of labour productivity in 1994 and its average growth rate over subsequent years is statistically insignificant (Figure ).<sup>14</sup>

35. Over more recent years, however, there is tentative evidence that cross-state differences in labour productivity are beginning to narrow. For the bulk of the country, outside the National Capital Territory, the standard deviation of the level of labour productivity across states stopped increasing in the late 1990s and then began to fall in the early part of the current decade (Figure 5). Adding the National Capital Territory (which accounts for only around 3.5% of Indian GDP) to the sample obscures this falling trend. To a large extent, this recent evidence of convergence is driven by relatively fast labour productivity growth in states that were in the middle of the distribution of labour productivity in the year 2000 (Figure 6).

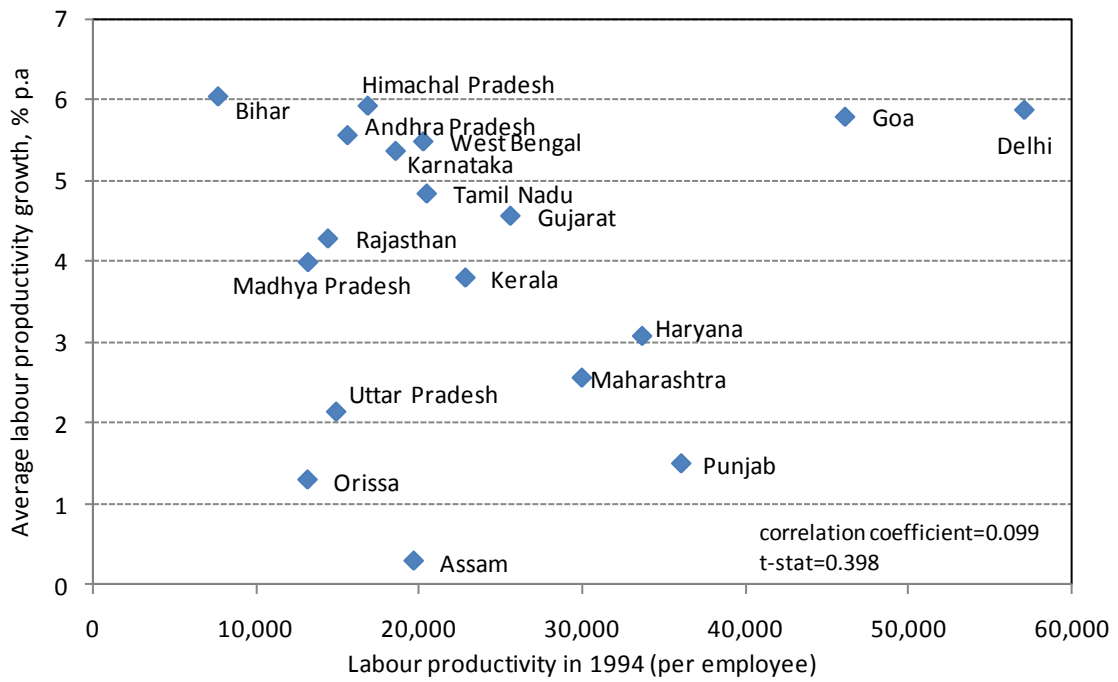
**Figure 3. The driving forces of GDP per capita growth**

Trend growth, average annual percentage change, 1994-2004

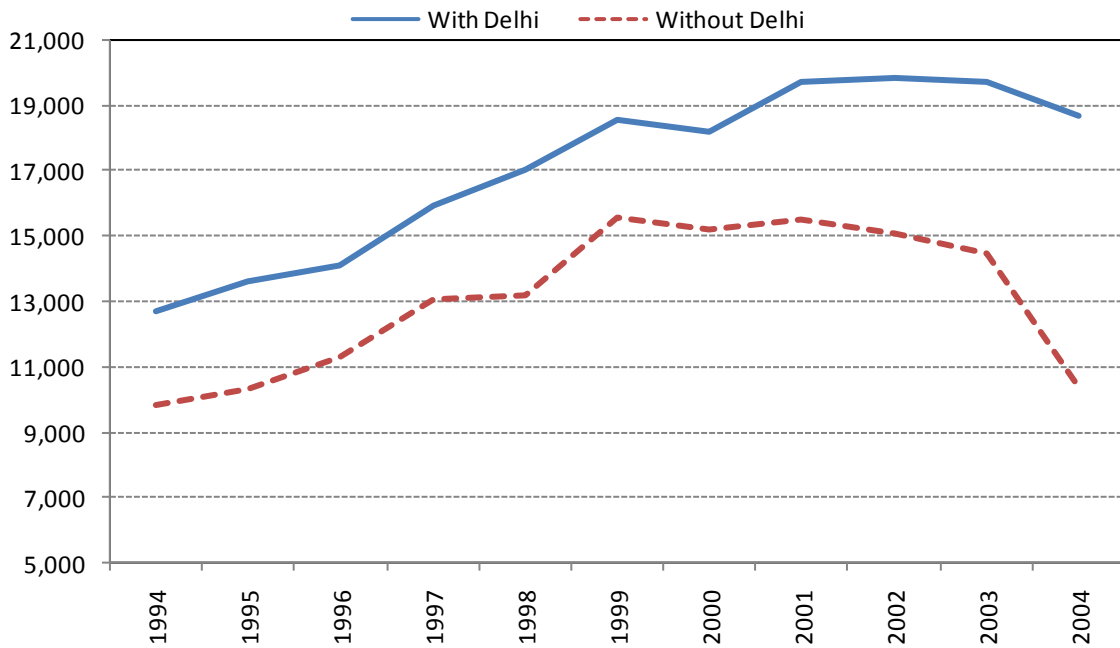


14. The labour productivity data used in Figures 4 to 6 is calculated using state real GDP and employment data from the national accounts. The regression results given in Table 4 below are calculated using ASI data as described in Section 4.2.

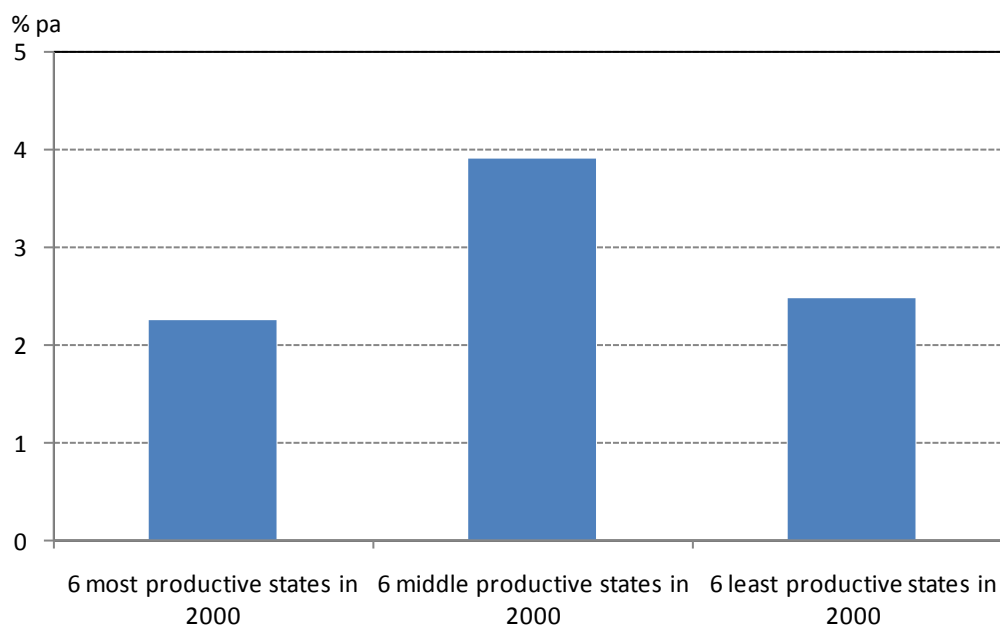
**Figure 4. Labour productivity: level (1994) and average growth rate (1994-2004)**



**Figure 5. Standard Deviation of Labour productivity across states**



**Figure 6. Average Labour productivity growth (2000-2004) of most, middle, and least productive states in 2000<sup>1</sup>**



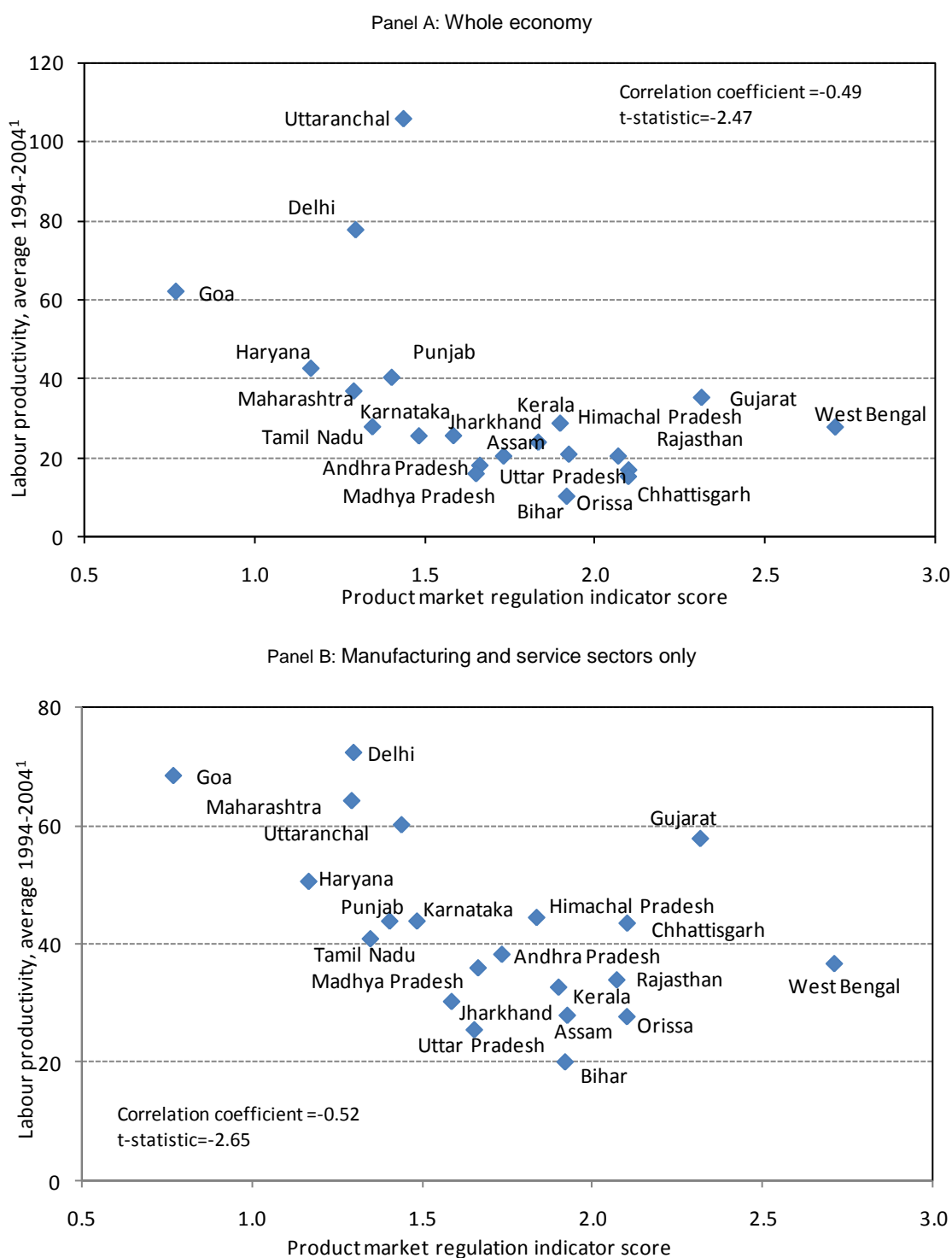
1. The 6 most productive states in 2000 are: Delhi, Goa, Gujarat, Haryana, Maharashtra, and Punjab. The 6 middle productive states in 2000 are: Himachal Pradesh, Karnataka, Kerala, Rajasthan, Tamil Nadu, and West Bengal. The 6 least productive states in 2000 are: Andhra Pradesh, Assam, Bihar, Madhya Pradesh, Orissa, and Uttar Pradesh.

36. Differences in product market regulation, as captured by the OECD's PMR indicators, do appear to have a significant impact on productivity performance at the level of the aggregate state economies. Over the period 1994 to 2004, there is a clear negative relationship between the restrictiveness of product market regulation and average labour productivity (Figure 7a). In the four Indian states with the most relatively liberal regulatory environments, the average level of labour productivity is almost 60% higher than in the four states with the most restrictive product market regulation.

37. Notwithstanding this significant negative relationship, there are a number of factors that weaken the relationship between PMR and labour productivity at the aggregate state level. In particular, the PMR indicators do not account for restrictions on competition in the agricultural sector, the importance of which varies considerably across states. Because agricultural is generally much less productive than other sectors of the economy, overall productivity tends to be lower in states in which agricultural contributes a large share of state GDP. When the PMR indicators are contrasted with labour productivity in the manufacturing and service sectors only, the number of outlying observations is reduced and the correlation coefficient becomes more negative and more significant (Figure 7b). It is noteworthy, however, that labour productivity in Gujarat in the manufacturing and service sectors is higher than would be expected given the value of the PMR indicator perhaps reflecting the effect of policy enforcement.

**Figure 7. Product Market Regulation and Labour productivity**

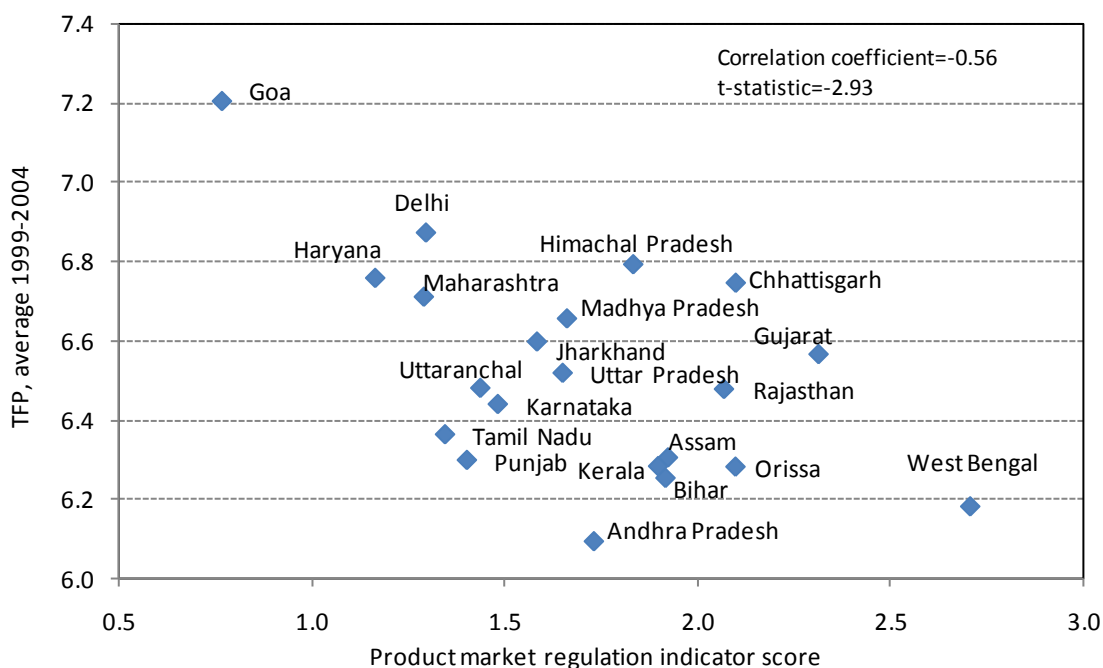
The indicator score runs from 0-6, representing the least to most restrictive



1. Reflecting data constraints, labour productivity in Chhattisgarh, Jharkhand, and Uttaranchal is measured as the average over the period 2002 to 2003.

38. The negative relationship between product market regulation and productivity is even clearer when the inputs used to measure productivity are broadened to include capital. This should be the case if the underlying production function of the economy is of a Cobb-Douglas nature, as differences in labour productivity across states will be partly explained by differences in capital intensity.<sup>15</sup> The relationship between product market regulations and total factor productivity does indeed appear to be closer than the relationship with labour productivity (Figure 8). Moreover, another source of bias is introduced once the analysis is restricted to the private sector. When firms that are predominantly or totally owned by the centre or state governments are removed from the data set, there is a strong negative relationship across states between PMR and investment by private firms, though Gujarat is an outlier (Figure 9a). However, for the public sector there is little correlation (Figure 9b). This may suggest that the investment decisions of public sector enterprises are primarily motivated by regional or political concerns rather than commercial ones. In any case, the negative correlation between private-sector investment and regulation will ensure that over time, capital intensity in private firms will tend to rise in the least regulated states.

**Figure 8. PMR and average total factor productivity**

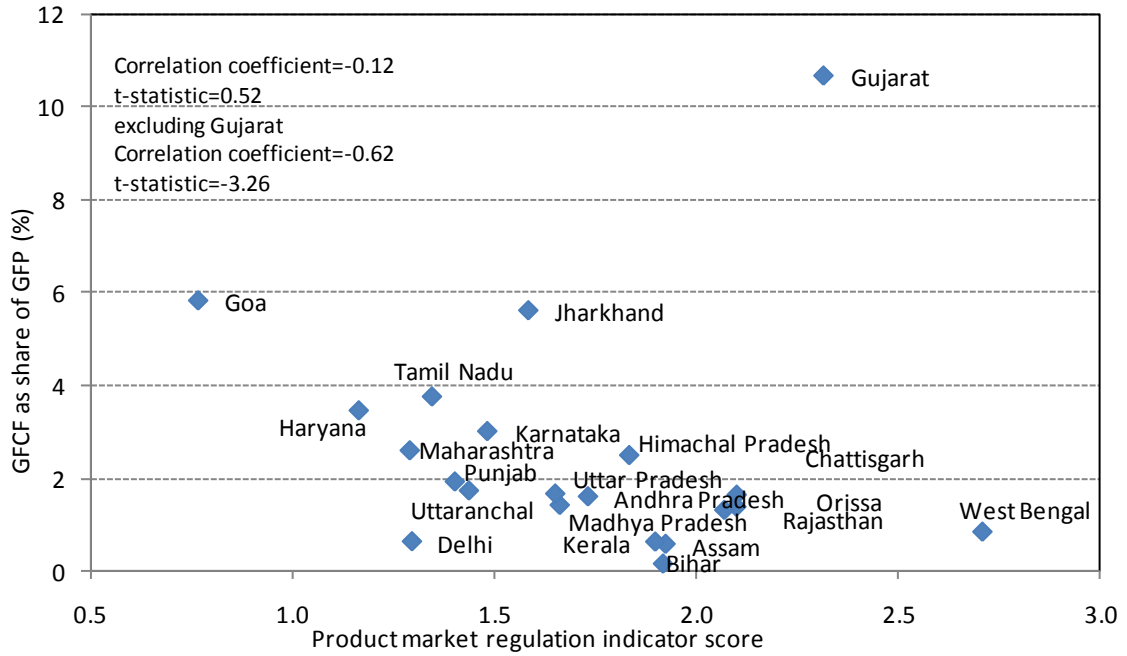


Source: OECD and Indian National Account Statistics.

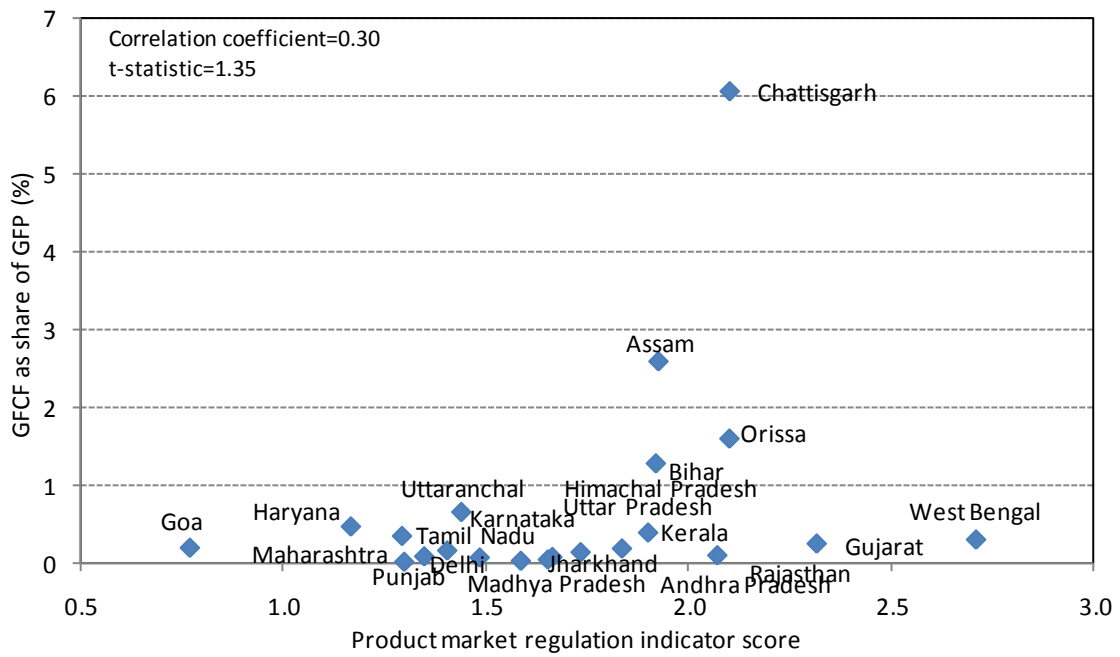
15. To calculate TFP at the state level the analysis must be restricted to firms in the manufacturing sector and the data aggregated from the two digit level of the Indian industrial classification.

**Figure 9. PMR and investment**

Panel A: Private-sector enterprise investment



Panel B: Public sector investment



## 5.2 *Product market regulation and productivity in manufacturing sectors at the state level*

39. There is also evidence of productivity convergence over recent years at the level of the manufacturing sectors across all states and territories. This is tested using a conventional convergence equation, which is a simplified version of equation (4) above in which the productivity gap is replaced by the initial level of productivity and all other explanatory variables are taken out of the equation. This equation is estimated as a panel regression across all sectors at the state level and separately for each of the 23 manufacturing sectors in the dataset. In a number of sectors there is a significant negative relationship between the initial productivity level in 1999 and average productivity growth over subsequent years to 2004 for both labour and total factor productivity (Table 4). Moreover, when estimated as a panel, the results indicate that both labour and total factor productivity have been converging at the sector level since the late 1990s. Notwithstanding the group of unproductive and slow-growing states at the end of the productivity distribution, this may indicate that the productivity dividend from India's economic reforms is to some extent beginning to spread out across the country. This result needs to be interpreted cautiously, however, given the small number of years during which these dynamics can be seen in the data. This is especially so given that productivity growth in the less productive states can be highly volatile from year to year.

**Table 4. Convergence regression results for the period 1999 to 2004**

NIC code and sector	Coefficient on initial productivity level	
	labour productivity	TFP
15: Food products and beverages	-0.04	-0.06**
16: Tobacco products	-0.03	-0.07*
17: Textiles	-0.14**	-0.17
18: Wearing apparel; dressing and dyeing of fur	-0.18*	-0.14
19: Tanning and dressing of leather	-0.17***	-0.17**
20: Wood and wood products	-0.17**	-0.24***
21: Paper and paper products	-0.04	-0.07
22: Publishing and printing	-0.29***	-0.31***
23: Coke, refined petroleum products and nuclear fuel	-0.03	-0.07**
24: Chemicals and chemical products	-0.17***	-0.21***
25: Rubber and plastic products	-0.10***	-0.15***
26: Other non-metallic mineral products	-0.01	-0.09***
27: Basic metals	-0.08	-0.18***
28: Fabricated metal products except machinery and equipment	-0.10***	-0.13***
29: Machinery and equipment NEC	-0.11***	-0.16***
30: Office, accounting and computing machinery	-0.13***	-0.13***
31: Electrical machinery and apparatus NEC	-0.11***	-0.11***
32: Radio, television and communication equipment	-0.08*	-0.10*
33: Medical, precision and optical instruments	-0.18***	-0.26***
34: Motor vehicles, trailers and semi-trailers	0	0.01
35: other transport equipment	-0.13*	-0.14
36: Furniture, Manufacturing NEC	-0.21***	-0.21***
37: Recycling	0.09	0.18
AGGREGATE	-0.09***	-0.13***

Note: \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

1. The reported coefficient for each sector is from a regression across 21 states of average productivity growth over the period 1999 to 2004 on the initial level of productivity in 1999.

40. The finding of conditional convergence in the economic performance of states is maintained when a dynamic version of a convergence model (as in equation 4) is estimated with a panel of data at the sectoral level across states with the addition of an indicator for product market regulation. The coefficient on the 'productivity gap' is always negative and significant confirming more efficient production techniques do diffuse across state borders and are more important as a source of productivity growth the further a state is behind India's productivity frontier. In addition, in all of the different versions of the estimated equation, productivity growth in the leading state in each sector has a positive and significant influence on productivity growth in less productive states in that sector. For labour productivity, as indicated by the coefficient on productivity growth in the leading state, about 25% of the long-run diffusion of a labour productivity shock is diffused to following states in one year. For total factor productivity, the corresponding figure is almost 15%.

**Table 5. Results of estimating the dynamic productivity levels model**

	Dependent Variable: Growth in labour productivity per employee					Dependent Variable: Growth in multi-factor productivity				
Change in productivity in the technology leader	0.235***	0.234***	0.240***	0.240***	0.240***	0.142***	0.147***	0.147***	0.147***	0.147***
Gap in productivity levels (lagged 1 year) <sup>1</sup>	-0.349***	-0.266***	-0.422***	-0.422***	-0.422***	-0.212***	-0.209***	-0.211***	-0.211***	-0.211***
Product market regulation <sup>2</sup>	-0.092**	-0.095***	-0.222***			-0.164***	-0.155***	-0.168**		
Interaction of PMR and prod. gap (lagged 1 year)		-0.048					0.000			
State control				-0.211***					-0.160**	
Barriers to entrepreneurship					-0.233***					-0.176**
Transmission and distribution losses			0.002	0.002	0.002		0.001	0.001	0.001	
Interaction of T&D losses and prod. gap (lagged 1 year)			0.002*	0.002*	0.002*		0	0	0	
Industry fixed effects (jointly significant: F)	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Time dummies (jointly significant: F)	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	2211	2211	2068	2068	2068	2223	2083	2083	2083	2083
R-squared	0.228	0.21	0.235	0.235	0.235	0.334	0.32	0.337	0.337	0.337

Note: \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

1. Measured as the difference in the (log) level of productivity in each state relative to the productivity leader. The productivity leader is allowed to change over time.

2. Regulation is measured as the high-level (H1) indicator in the OECD's PMR indicators estimated for 21 India states.

41. In addition, the extent of product market regulation in a state is found to be negatively related to the productivity of enterprises in that state. In all versions of the labour and total factor productivity model, the indicator of product market conditions enters with a significant negative coefficient.<sup>16</sup> Consistent with a growing number of studies of the impact of policy on economic performance, this implies that anti-

16. Because the PMR indicator are point estimates, the implicit assumption in this regression is that the regulatory environment changes only slowly so that end-of-period values are representative of the cross-state patterns of regulation over the sample period.



competitive product market regulation reduces firms' incentives to invest, enhance efficiency, and innovate.<sup>17</sup> In both the labour and total factor productivity regressions the coefficient on the interaction of PMR and the productivity gap is insignificant, perhaps indicating that the lack of a time dimension in the PMR indicators limits the scope for estimating the indirect effect of regulation on productivity.

42. In all cases the  $R^2$  for the TFP regressions is higher than in the labour productivity regressions, reflecting the omission of capital intensity in the latter. Moreover, if the model is estimated using productivity data for private firms only, the  $R^2$  for the TFP regressions increases slightly in part reflecting the lack of correlation between the PMR indicators and investment by public sector companies. In the case of the labour productivity regressions, the  $R^2$  decreases slightly when estimated using labour productivity data for private sector firms reflecting a higher correlation between PMR and the omitted investment measure.

### 5.3 *Sensitivity of regression results to alternative measures of PMR*

43. When the overall indicator of PMR is replaced in the regression by either the sub-indicator of *state control* or that for *barriers to entrepreneurship*, both are also correctly signed and significant with the coefficient on *barriers to entrepreneurship* slightly larger in both cases. These barriers could also be indicative of more widespread inefficiencies in government administration. As with the overall indicator, the coefficients on the interaction of both of these variables and the productivity gap (not reported) are both insignificant.

44. Inadequate infrastructure is often considered to be a barrier to catch up in low-productivity states (for example, Purfield, 2006). In particular, poor availability of electricity is often seen as a barrier to development. Although direct measurement of the shortfall of supply from demand is not possible, there are a number of performance indicators of state electricity industries that can serve as proxies. Here, transmission and distribution (T&D) losses of electricity, which is power that is generated but not paid for, is included in the regressions as a control variable and interacted with the productivity gap term.<sup>18</sup> Kochhar *et al.* (2006) argue that T&D losses are a proxy for instructional structure in that they ultimately reflect the extent of corruption in state electricity boards and the willingness of politicians to tolerate power theft and non-payment of bills.

45. In all versions of the model the direct effect of T&D losses on productivity is insignificant. In the model of labour productivity, however, there is some evidence that a poorly administered electricity system is a significant factor in preventing catch-up across states and reducing the speed of adjustment. In all cases, the direct impact of the overall PMR indicator on productivity remains negative and significant providing support for the idea that restrictive regulations in product markets have a strong and negative effect on productivity growth across Indian states.

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17. See Crafts (2006) for a recent survey of this literature.

18. An alternative indicator would be a measure of the number and length of power outages. A more general measure would be revenue losses of the state electricity companies. These losses result from poor administration that results in electricity theft, non-payment of bills, and meter tampering. As a result of these losses, investment by the distribution companies is inadequate, resulting in power shortages. The extent of cross-subsidisation from industry to agriculture and household electricity consumers would be another possible proxy variable. A high relative price of electricity might be expected to result in lower usage of electrical machinery and productivity.

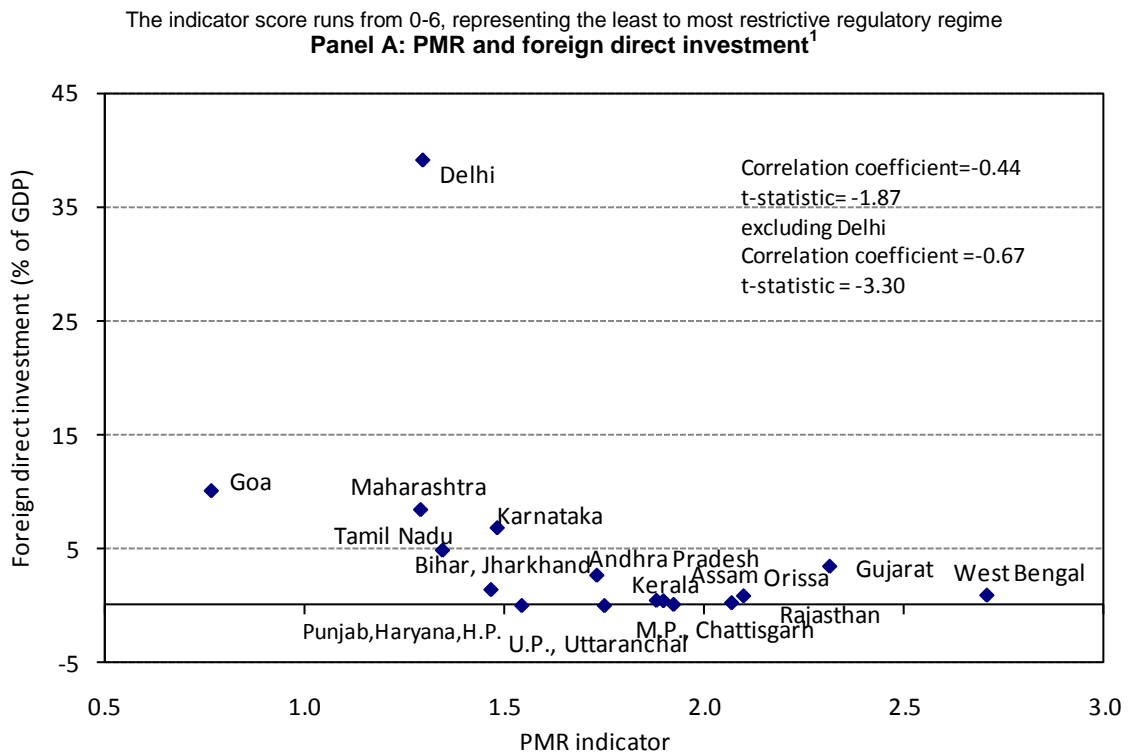
#### 5.4 *Potential transmission channels*

46. Casual empiricism suggests a number of reasons why states with a relatively more liberal regulatory environment have higher productivity growth in comparison to states with more restrictive environments. First, the location of foreign direct investment is negatively related to product market restrictions, with the relatively more liberal states receiving virtually all of India's FDI inflows (Figure 7a). This result is consistent with a growing body of recent research that finds the regulatory environment to be a key determinant of FDI. As shown in Nicoletti *et al.*, (2003), regulatory policies that restrict market access in one way or another negatively influence the share of foreign direct investment in OECD countries. Conway *et al.*, (2006) also find that the employment share of foreign affiliates in manufacturing sectors is higher in countries with relatively more liberal product market environments. Given that foreign affiliates in a host country have been found to be more capital and skill intensive and invest more in research and development than domestic firms in the same industry, they generally have a beneficial effect on productivity growth (Keller, 2004; Keller and Yeaple, 2003). In the case of India, because these firms are attracted to the relatively more liberal states, the beneficial impact on productivity performance is concentrated in these states.

47. States in which product market regulation is more conducive to competition have also been more successful at infrastructure provision than the relatively more restrictive states (Figure 7b). Because infrastructure has, to a large extent, been provided by the public sector in India, this is indicative of complementarities in state government competences; well-functioning state governments that have been able to enact a policy environment that is supportive of competition in product markets have also been more successful at infrastructure provision. In a number of studies, infrastructure has been found to be an important determinant of economic performance across states (eg, Purfield, 2006).

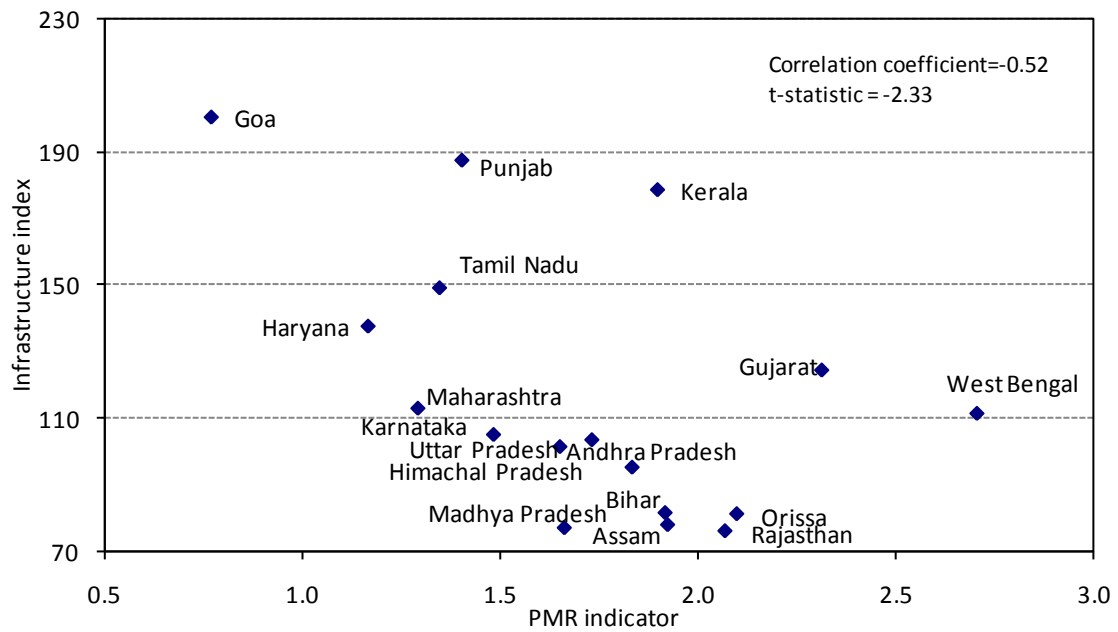
48. Finally, higher administrative burdens, as measured by the indicator of *barriers to entrepreneurship*, are associated with a lower share of private sector employment in the formal sector (Figure 7c). This suggests that firms in relatively restrictive states prefer to remain small and informal so as to stay under the radar of having to interact with government and thereby avoid overly onerous administrative requirements. However, firms in the informal sector have lower capital intensity and are generally much less productive than formal sector enterprises (OECD, 2007). As a result, states with excessive administrative burdens suffer from relatively low fixed capital formation and small average firm size which negatively impacts on productivity performance.

**Figure 10. Channels through which product market regulation might impact on performance**

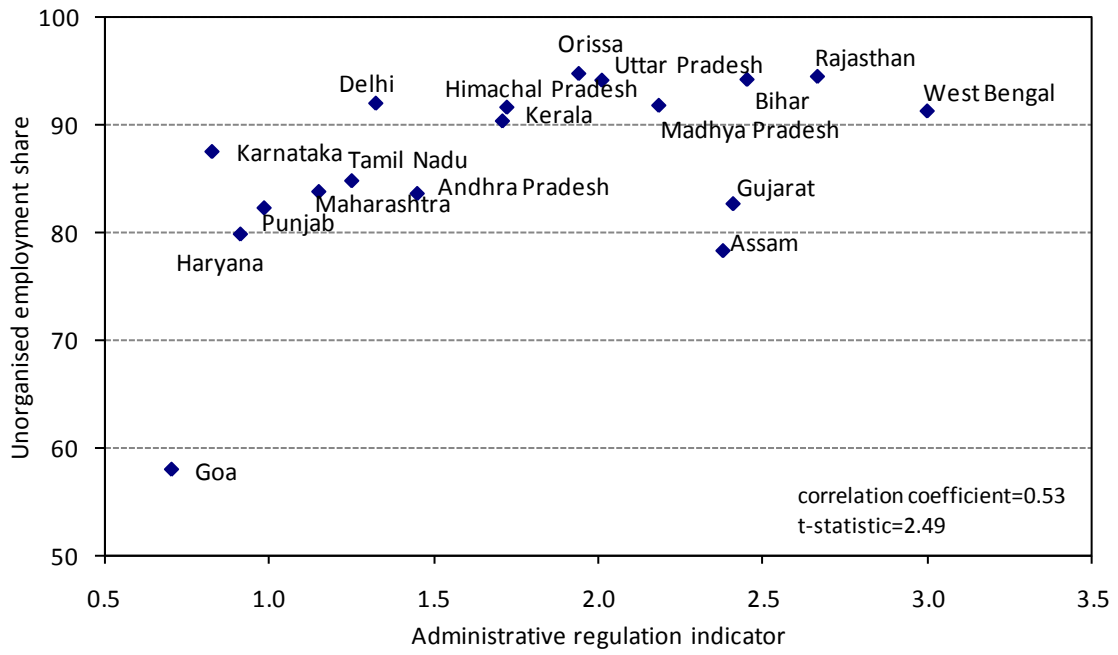


1. Foreign direct investment is measured as cumulative inflows over the period 2000 to 2006 as a share of annual average state GDP.

**Panel B Provision of infrastructure**



**Panel C: Administrative barriers and the share of organised employment**



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