Indian Manufacturing: A Slow Sector In A Rapidly Growing Economy

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Abstract: In this paper, we investigate the determinants of productivity in Indian manufacturing industries during the period 1988-2000. Using two-digit industry level data for the Indian states, we find evidence of imperfect interindustry and interstate labor mobility as well as misallocation of resources across industries and states. We find that trade liberalization increases productivity in all industries across all states. Productivity is also found to be higher in the less protected industries. These effects of protection and trade liberalization are more pronounced in states that have relatively more flexible labor markets. Similar effects are also found in the case of employment, capital stock and investment. Furthermore we find that labor market flexibility, independent of other policies, has a positive effect on productivity. Importantly, per capita state development expenditure seems to be the strongest and the most robust predictor of productivity, employment, capital stock and investment. Industrial delicensing increases both labor productivity and employment but only in the states with flexible labor market institutions. Even after controlling for delicensing, trade liberalization is shown to have a productivity-enhancing effect. Finally, trade liberalization benefits most the export-oriented industries located in states with flexible labor-market institutions.

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1 Introduction

In recent years, economists have understood and have emphasized the role of institutions in growth and development. The Nobel laureate Douglas North (1981) defines institutions as "a set of rules, compliance procedures, and moral and ethical behavioral norms designed to constrain the behavior of individuals in the interests of maximizing wealth or utility of principals." According to him, institutions affect the process of capital accumulation as well as the process of converting this capital into output, both of which are important for economic growth and poverty reduction.

Rodrik (1999) has tried to dig deeper into the issue of which particular institutions countries should try to acquire and under what circumstances. He argues that "a clearly delineated system of property rights, a regulatory apparatus curbing the worst forms of fraud, anti-competitive behavior, and moral hazard, a moderately cohesive society exhibiting trust and social cooperation, social and political institutions that mitigate risk and manage social conflicts, the rule of law and clean government … are social arrangements that usually economists take for granted, but which are conspicuous by their absence in poor countries." These non-market institutions need to exist to support the full and proper functioning of the market mechanism, where private economic agents face the right kind of incentives. The basic Arrow-Debreu model that shows the optimality of the market mechanism assumes a well-defined set of property rights, and the perfect enforceability of contracts, institutions that are absolutely essential for the development of a strong and robust private sector. On the whole, Rodrik argues that it is the "meta-institution" of democracy and participatory politics, which in most cases can bring success in the search for specific economic institutions that are appropriate for local conditions.

Rodrik's "meta-institution" of democracy and participatory politics exists and has had a long tradition in India. Huang and Khanna (2003) have argued that it is the presence of strong institutions in the form of India's "rule of law, its democratic processes and a relatively healthy financial system" that will provide India the competitive edge over China. Huang (2006) in a recent *Financial Times* article has claimed

vindication of their predictions since India's last two years of 8 percent growth per annum (compared to China's 10 percent) have been achieved with just half of China's level of domestic investment in new factories and equipment and only 10 percent of China's foreign direct investment. He also writes, "While China's GDP growth in the last two years remained high in 2003 and 2004, it was investing close to 50 percent of its GDP in domestic plant and equipment – roughly equivalent to India's entire GDP. That is higher than any country, exceeding even China's own exalted levels in the era of central planning." He goes on to write further that while China's growth is based on "massive accumulation", India's growth is driven by "increasing efficiency". He defends his claim by contrasting the recent, stellar performance of the Indian stock market to the dismal performance of the Chinese stock market where half the wealth has been wiped out in the last five years.

It is true that India's overall economic performance in recent years has been outstanding, with the economy growing at roughly 8 percent per annum in the last two years. One might argue, however, that the growth has been service-led and that manufacturing, considered to be ordinarily the engine of growth in a country at that stage of development, has not been so in India's case. Kochhar et al (2005) point out that while India's share of services in overall GDP has increased from 37 to 49 percent in the last two decades, the share of manufacturing has remained more or less constant at 16 percent. They also show that the change in the share of manufacturing during this period in India has been about 2.5 percentage points lower than the average country at the same stage of development, while the change in the services share was about 10 percentage points higher than average (even though its employment performance was below average). Kochhar et al (2005) write "In sum then, Indian manufacturing showed signs over the post-1980s period of not keeping up with the average performance in other, similar countries." Within India, even many of the fastest growing states have seen either no change or a fall in the share of manufacturing. Thus, it is important to understand why in a rapidly growing Indian economy with the right "meta-institution" for growth, the manufacturing sector has been lagging. We therefore investigate

in this paper the determinants of productivity in the Indian manufacturing sector using a three-dimensional panel of two-digit industries across states and over time.

While institutions encompass the formal and informal rules and customs within which individuals and firms operate, policies refer to various strategies and measures a government adopts to achieve its goals and objectives within the country's institutional framework.[1] One policy variable that has received a lot of attention in the growth literature is the degree of openness in trade. As a measure of this policy variable we use the nominal rates of protection across various two-digit industries over the period 1988-2000. Trade generates efficiency at the macro level through gains from specialization and exchange. While the availability of a larger variety of final goods represents gains for consumers and efficiency gains at the aggregate level, the availability of larger varieties of intermediate inputs through trade increases efficiency both at the aggregate as well as micro levels for individual producers. A larger variety of inputs, as is well understood in the trade literature, can increase productivity through greater division of labor and/or through better matching between output and inputs.[2]

In addition, trade can affect research and development (R&D). These effects can go in opposite directions, as argued by Rodrik (1992) and by Devarajan and Rodrik (1991). While a tariff cut reduces the market size of a domestic import-competing producer and therefore reduces the gain from a cost-reducing innovation, it also increases competition from foreign substitutes, thereby flattening the demand curve, reducing the mark up (reducing monopoly power) and thereby increasing output. While the former is the market size effect, the latter is called the pro-competitive effect of trade liberalization. While the former represents a negative impact of trade reforms on R&D and therefore on productivity, the latter represents a positive effect. Which of the effects dominates is an empirical question. However, the second channel, which basically focuses on the need to do R&D to increase efficiency to fight the increase in competition arising from international trade, is quite intuitive. In addition, recent work by Melitz (2003) on firm heterogeneity and international trade clearly shows how trade can get rid of the least productive firms and

transfer labor from the less productive to the more productive of the surviving firms to increase overall productivity of the industry in question.

Another policy variable that is important for our analysis is the size of government expenditure on infrastructure and social services, which we will call development expenditure throughout the rest of the paper. While the productivity of the various inputs in production clearly depends on the quality of public infrastructure, the quality of human capital (skilled workers) clearly depends on the quality of education, health and social services. This quality will not be captured in the simple head count of skilled workers and will also show up in their productivity. We therefore study the effects of the size of development expenditures per capita incurred by the state government on productivity.

A somewhat neglected aspect in the literature on growth and productivity is the effect of labor-market institutions.[3] Rigid labor markets constrain the ability of firms to hire and fire workers in response to shocks to technology, relative prices of output and inputs, and the macroeconomic environment. Thus adjustment is restricted and that can have an adverse impact on the functioning of private firms and therefore on efficiency at all levels. Additionally, the realization of the beneficial effects of trade reforms requires both substantial amounts of intersectoral labor reallocation as well as intrasectoral labor reallocation across firms. Rigid labor laws can constrain such reallocation. Panagariya (2001) has argued that rigid labor laws raise the costs for employers and also constrain the size of firms by discouraging them from employing more than a fairly small number of permanent workers. He also argues that the costs of such rigid labor laws go beyond those incurred by existing entrepreneurs as these laws discourage entry. We explore the effect of labor-market restrictions on efficiency by categorizing Indian states into pro-labor and pro-employer, which we will call rigid and flexible labor institution states respectively. As explained in our data section, the classification is from Hasan, Mitra and Ramaswamy (2007) and is based on the earlier work of Besley and Burgess (2004) and of Dollar (2002).

Another factor that has adversely affected the efficiency of the private sector in India is the panoply of rules restricting entry and exit of firms. Such restrictions limit competition faced by existing firms and thus lower firm efficiency. They also prevent firms that are currently inefficient, from exiting the market. Thus productivity of the industry as a whole gets adversely affected. We capture the policy restrictions on entry and exit of firms using a variable, which we call "delicensed". This variable measures the output share of three digit sectors within any two-digit sector that have been delicensed, i.e., licensing restrictions on them have been lifted. It is expected that a variable of this sort will interact with labor market institutions. For example, removing entry and exit restrictions will not have an effect if labor market restrictions on firing of workers are still in place, since effectively this is an exit barrier. It is also an entry barrier since it discourages entry by discouraging firms from hiring permanent workers who benefit from on-the-job training.

Following the work of Hall and Jones (1999), we will focus on the determinants of productivity levels rather than productivity growth rates. Hall and Jones have argued "levels capture the differences in long-run economic performance that are most directly relevant to welfare as measured by the consumption of goods and services." Also, in this context they point to the recent evidence on the transitional nature of growth rate differences across countries, the empirical questioning by Jones (1995) of the relevance of endogenous growth models, and the theoretical support from the recent models that show the effect of policies on income levels and not on growth rates. They argue that countries in the long run differ in their income levels and not growth rates. Other important, recent papers that have focused on levels rather than growth rates are Frankel and Romer (1999), Irwin and Tervio (2002) and Rodrik, Subramanian and Trebbi (2002).

Using two-digit industry level data for the India states for the period 1988-2000, we are able to obtain some results, that we think are interesting and have important policy implications. We find certain interesting trends in the inequality of per worker and aggregate output and value added across industries

and states that show imperfect interindustry and interstate labor mobility as well as misallocation of resources across industries and states. We find that trade liberalization increases productivity in all industries across all states. Productivity is also found to be higher in the less protected industries. The effects of protection and trade liberalization are more pronounced in states that have relatively more flexible labor markets. Similar effects are also found in the case of employment, capital stock and investment. We also find that labor market flexibility, independent of other policies, has a positive effect on productivity. Importantly, per capita state development expenditure seems to be the strongest and the most robust predictor of productivity, employment, capital stock and investment. Furthermore, industrial delicensing increases labor productivity but only in the states with flexible labor market institutions. Even after controlling for delicensing, trade liberalization is shown to have a productivity-enhancing effect. Finally, trade liberalization benefits most the export-oriented industries located in states with flexible labor-market institutions.

2 Related Literature

Hall and Jones (1999) look at how capital accumulation, productivity and therefore output per worker are affected by social infrastructure. Social infrastructure here refers to institutional and policy variables that determine the economic environment determining capital accumulation, skill formation, invention, innovation and technology transfer. Their measure of social infrastructure is based on measures of corruption, expropriation risk, government repudiation of contracts, law and order, bureaucratic quality and trade barriers. While output is made a function of social infrastructure in their estimation framework, they correct for endogeneity of the latter using instruments such as geographical variables, mainly distance from the equator and the extent to which modern European languages are spoken as first languages today, which captures European influences on institutions. Their study concludes that countries with better social infrastructure have higher levels of output per worker in the long run, have higher investment rates and are more efficient at converting inputs to output.

Recently, a major advance in this literature has been made by Acemoglu, Robinson and Johnson (2001) who have looked at former European colonies to study the impact of institutions on per capita income levels. For these countries, they are able to use European settler mortality rates as instruments for institutions. In countries conquered by Europeans, whether they decided to permanently settle or not were determined by their ability to survive there (by their mortality rates). If they decided to settle in a country themselves, they adopted good institutions while if they decided to rule from their home country, they put in place extractive institutions. Their decision to settle in a region, however, was a function of their mortality there. On the other hand, mortality rates of potential settlers, to begin with, can be viewed as a function of geographical variables. While Acemoglu, Johnson and Robinson find statistically significant effects of institutional variables on per capita income in the expected direction even after instrumenting institutions (with variables capturing expropriation risk that current and potential investors face), this instrumentation completely takes away the effect of geographical variables on income.

From the literature on institutions, we move to trade policy. The effects of trade barriers on growth and income have been studied since the early 1990s. While Dollar (1992), Sachs and Warner (1995) and Edwards (1998), using different measures of openness, in many cases constructed from standard policy measures, showed positive effects of trade on growth, these papers have been strongly criticized by Rodriguez and Rodrik (2001) 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. While Rodriguez and Rodrik (2001) have criticized the measure of openness used by Sachs and Warner (1995) as capturing many aspects of the macroeconomic environment in addition to trade policy, Baldwin (2003) has recently defended that approach on the grounds that the other policy reforms captured in the measure, though not trade reforms per se, accompany most trade reforms sponsored by international institutions. Therefore, using such a measure tells us the value of the entire package of trade and accompanying reforms. Wacziarg and Welch (2003) have updated the Sachs-Warner dataset and have again shown the benefit of such reforms in driving growth.

Just as in the case of the literature on the effect of institutions as explained above, the trade literature has also shifted focus to levels from growth rates. Frankel and Romer (1999) look at the effect of trade share in GDP on income levels across countries for the year 1985. They construct an instrument for the trade share by summing up the gravity-model driven, geography-based predicted values of bilateral trade flows across all trading partners. The variables used to predict bilateral trade flows include distance, country size variables such as land area and population and dummies for whether the countries are landlocked, have a common border etc. 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.

Building on two literatures, namely the one on institutions and incomes and the other on trade and incomes, Rodrik, Subramanian and Trebbi (2002) have looked at the simultaneous effects of institutions, geography and trade on per capita income levels. Using a measure of property rights and the rule of law to capture institutions and the trade-GDP ratio to capture openness in trade, and treating them both as endogenous in their growth regressions, they use the instruments that Acemoglu, Johnson and Robinson (2001) and Frankel and Romer (1999) use to instrument institutions and trade openness respectively (and separately). Rodrik, Subramanian and Trebbi (2002) find that "the quality of institutions trumps everything else". However, trade and institutions have positive effects on each other, so that the former affects incomes through the latter. Similarly, geography also affects institutions.

The most closely related to what we are doing are a few papers on the role of labor-market institutions, deregulation and trade reforms in Indian manufacturing. Besley and Burgess (2004) look at the impact of state-level amendments (made over the period 1958-92) to the Industrial Disputes Act of 1947. They find that states, with net pro-worker amendments, had a relatively lower output, employment, investment and

productivity in overall, organized (formal) manufacturing than other states. The state-level data they used were at the aggregate manufacturing level, and they did not look at trade policy, the role of development spending or industrial deregulation.

Aghion et al (2007) look at the effects of the dismantling of the system of controls including entry deregulation and trade reforms on three-digit industry level output, employment, the number of factories and total capital stock across states. They find the positive effects of these reforms were more pronounced in states with more pro-employer institutions. The difference between this paper by Aghion et al and our paper is that our focus is on labor productivity and total factor productivity, while theirs is on overall output and employment. We also separately look at employment and capital, as do they. Our emphasis on productivity is important in the context of the question we are trying to answer. We are looking at why India's exports in manufacturing are not taking off. Comparative advantage depends on features of the aggregate economy such as endowments, institutions and policies. These economy wide characteristics affect production in different industries differently. Institutions and policies can affect productivity (efficiency) differently in different sectors. Productivity also depends on infrastructure and social services, the role of which also we try to study in this paper, and which is completely missing in the existing literature. It is the relative productivities of different sectors that ultimately have a crucial role to play in the determination of comparative advantage.

In Aghion et al (2005), using the same industry-level, state-level data from India they show that delicensing led to an increase in interstate inequality in industrial output during the same period. This follows from Aghion et al (2007) where they showed that output and employment in each industry increase relatively more in the pro-employer states than in other states. Their focus here is only on delicensing.

3 Indian policy framework

3.1 The Trade Reforms in India

In the 1980's, India experienced moderate economic growth, but accompanied by large macroeconomic imbalances reflected in the rapid rise in the fiscal deficit to GDP ratio, in foreign commercial debt and in the debt service ratio. These problems were further accentuated by a drastic rise in the price of oil as a consequence of the Gulf War. At this time, the general elections of 1991 brought to power a new government that inherited probably the world's most complex and restrictive trade regime. By the time the new government assumed power, India's external payments problem had assumed crisis-like proportions. The government requested the IMF for loans, which were granted but came attached with the strong conditionality of major and deep economic reforms. The reforms were initiated almost immediately. There were many members in the new cabinet who had been cabinet members in past governments that had tried to avoid IMF loans precisely because of these conditionalities. These governments were also strong believers in inward-looking trade policies and the use of tariffs as a primary source of revenues. Thus, the reforms came as a surprise.

The major trade reform objectives announced by the Indian government in July, 1991 included the removal of most licensing and other non-tariff barriers on all imports of intermediate and capital goods, the broadening and simplification of export incentives, the removal of export restrictions, the elimination of the trade monopolies of the state trading agencies, the simplification of the trade regime, the reduction of tariff levels and their dispersion and the full convertibility of the domestic currency for foreign exchange transactions. Subsequently, the maximum tariff was reduced from 400 percent to 150 percent in July 1991, to 110 percent in February 1992, to 85 percent in February 1993, 64 per cent in February 1994 and to roughly 45 percent by 1997-98. The mean tariff went from 128 percent before July 1991 to 94 percent in February 1992, 71 percent by February 1993, 55 percent in February 1994 and to roughly 35 percent by 1997-98. The standard deviation of tariffs during this period went down from 41 percentage points to roughly 15.[4] As far as the non-tariff barriers were concerned, prior to 1991, there were

quantitative restrictions on 90 percent of the value added in the manufacturing sector. In April 1992, all the twenty-six import-licensing lists were eliminated. However a "negative list" (from which most intermediate and capital goods were excluded) of items, whose imports were prohibited, was introduced, thereby eliminating many of the licensing procedures and discretionary decisions of the previous import regime.

As far as the exchange rate is concerned, the Indian Rupee was devalued 20 percent against the US dollar in July 1991 and further devalued in February 1992 when an explicit dual exchange market was introduced. The percentage reduction in tariffs and non-tariff barriers were much greater than the percentage devaluation (and even larger relative to the real exchange rate devaluation on account of fairly high inflation, hitting roughly 14 percent, during the initial years of the reforms).

3.2 Labor Markets: Regulations and Rigidity

In this section, we describe some key, basic features of labor regulations in India and their implications for labor-market rigidity.[5] First, legislative authority over labor issues lies with both the central (federal) government as well as individual state governments. In other words, the state governments have the authority to amend central legislations or to introduce subsidiary legislations. In addition, the state governments are responsible for the enforcement of most labor regulations, irrespective of who enacted them. Thus there may be considerable variation in labor regulations and/or their enforcement across India's states.

Second, it is widely believed that India's labor laws have placed serious impediments in the hiring and firing of workers. The Industrial Disputes Act (IDA) requires firms employing more than 100 workers to obtain the permission of state governments in order to retrench or layoff workers.[6,7] While the IDA does not prohibit retrenchments, it is not easy to carry them out. States have often been unwilling to grant permission to retrench, perhaps for reasons of political expediency (See Datta-Chaudhuri, 1996). There

are additional provisions for job security among in the Industrial Employment (Standing Orders) Act. Under this act, all employers with 100 or more workers (50 in certain states) are required to specify to workers the terms and conditions of their employment. While the purpose of the Act is to make labor contracts complete, fair, and legally binding, one can easily see how it may interfere with quick adjustments to changing conditions. In particular, modification of job descriptions or interplant transfers of workers, in response to changing market conditions, cannot be done without worker consent. The problems further accentuated by India's Trade Union Act (TUA) that makes it difficult to obtain worker consent. While the TUA allows any seven workers in an enterprise to form and register a trade union, it has no provisions for union recognition (for example, via a secret ballot), leading to multiple, rivalrous unions within the same firm, consensus among which becomes a virtual impossibility (See Anant, 2000).

Panagariya (2001) argues very persuasively about the costs of these labor laws. These laws restrict the size of firms below their minimum efficient scale, hurting their competitiveness in export markets. Hiring workers under these conditions, he argues, is a prohibitively costly activity when the number of workers runs into thousands. Finally, these laws prevent entry and reduce competition. This aspect of the cost of labor regulations goes beyond what costs existing entrepreneurs incur.

It is important to note, however, that not all analysts agree that India's labor laws have made for a rigid labor market. In particular, a counter-argument to the views discussed above is that India's labor regulations relating to job-security have been either ignored (see Nagaraj, 2002) or circumvented through the increased usage of temporary or contract labor (see, in particular, Dutta, 2003). Ultimately, whether India's labor laws have created significant rigidities in labor markets or not is an empirical issue. It is hard to imagine that they have not created any rigidities or have not constrained entrepreneurs at all in adjusting to shocks.

Measuring Labor-Market Flexibility

We use the partitioning of states, in terms of whether they have flexible labor markets or not, in Hasan, Mitra and Ramaswamy (2007). They start with Besley and Burgess' (2002) coding of amendments to the Industrial Disputes Act between 1958 and 1992 as pro-employee, anti-employee, or neutral. Hasan, Mitra and Ramaswamy (2007) find the natural partition of states based on Besley and Burgess (2004) (to treat states with anti-employee amendments, in net year terms, to the IDA as those with flexible labor markets) somewhat problematic. They make changes based on the recent survey work by Dollar, Iarossi, and Mengistae (2002) and World Bank (2003) that strongly calls for some modifications. Maharashtra and Gujarat, two of India's most industrialized states that have passed pro-employee amendments to the IDA, are perceived by Indian businesses to be good locations for setting up manufacturing plants, and are states where overmanning of plants is not prevalent. Kerala is just the opposite case, with net pro-employer amendments but with an overall perception of not being very business friendly, and with substantial over-manning. Table 2 provides a list of the states as well as how they are classified. [8]

4 Empirical Analysis

4.1 Data

The variables required are measures of employment, output, and value added, and indicators for protection, labor-market rigidity and industrial deregulation. Our source for production related information is the Annual Survey of Industries (ASI)[9] from 1980 to 2000 which, among other things, reports for each industry-state combination values of gross output produced, intermediate inputs, wage bill, the book value of capital stocks and the number of workers. [10] Since the ASI reports monetary values in current prices, appropriate price deflators are needed to convert the nominal values into real ones. We use industry specific wholesale price index (WPI) series to deflate output to constant 1981 rupees. The WPI for machinery, transport equipment and construction is used to deflate the book value of capital stock. Dividing the total wage bill by the number of workers is used to arrive at wages. Our materials price deflators are those constructed by Trivedi, Prakash and Sinate (2000).[11]

As regards our trade policy variable, we use industry-year specific tariff rates, for the period 1988-2000 (summarized in table 1). These variables are based on the calculations for the 18 two-digit industries made by Hasan, Mitra and Ramaswamy (2003, 2007). [12]

Based on the classification in table 2, whose construction is explained in the subsection on measuring labor market flexibility, we create a dummy variable called "FLEX" which takes a value of 1 for states with flexible labor market institutions (and 0 otherwise).

Our variable on delicensing, which we call "delicensed", is defined as the share of manufacturing output accounted by delicensed industries. First, we determined delicensed industries based on Aghion et al. (2005), who use industrial policy statements, press notes, and notifications issued by the central government to identify when various 3-digit manufacturing industries were delicensed.[13] We then calculated the output share of these industries within each 2-digit industry for each state in each year.

Another policy variable we use is the real per capita development expenditure. Development expenditure here includes expenditure on education, public health, water supply, sanitation, relief from natural calamities and food subsidy.

4.2 Methodology

Our basic measure of productivity in this paper is labor productivity, which is real net value added divided by the number of workers. This measure of productivity is regressed on our policy and institutional variables, and their relevant interactions.

We extend our analysis of productivity to total factor productivity. Our methodology in investigating the determinants of total factor productivity follows the general Cobb-Douglas type production function approach. Consider the following production function:

$$Y = AK^{\alpha}L^{\beta} \tag{1}$$

where *Y* is the real net value added, *A* is the productivity level, *K* is the amount of real capital and *L* is the labor used in the production. Let *s=1,…,S* index states, *i=1,..,I* index industries and *t=1,…,T* index time in years. Our estimating equation can be written as:

$$\ln Y_{ist} = \ln A_{ist} + \alpha \ln K_{ist} + \beta \ln L_{ist} \quad i = 1...I; \quad s = 1,...,S; \quad t = 1,...,T \tag{2}$$

with *i* denoting industries, *s* denoting states and *t* denoting time. The *i* and *s* subscripts denote the cross section dimension and *t* denotes time series dimension of panel data. Productivity A_{ist} depends on the policy variables:

$$\ln A_{ist} = \gamma_0 + \gamma_1 FLEX_s + \gamma_2 NRP_{it} + \gamma_3 (FLEX_s * NRP_{it}) + \gamma_4 DEV_{st} + \gamma_5 (NRP_{it} * DEV_{st}) + \gamma_7 GSDP_{st} + u_{ist} \tag{3}$$

and

$$u_{ist} = \mu_i + \lambda_t + \varepsilon_{ist} \tag{4}$$

where μ_i denotes industry specific and λ_t denotes time specific unobservable characteristics. ε_{ist} is the remainder disturbance with $IID(0, \sigma_{\varepsilon}^2)$. As can be seen, this is a three-dimensional panel data model, and we run a fixed effects regression.[14] *FLEX* is a state-specific dummy variable that takes the value one for states with flexible labor markets and *NRP* is the industry and time varying tariff rate. We also use non-tariff barriers and import penetration as alternatives to *NRP*. *DEV* is defined as the logarithm of real per capita development expenditure and varies by state and time. *GSDP* is the logarithm of real Gross State Domestic Product and is used to control for the possible existence of economies of scale. We run our regressions with and without the *GSDP* control.

The impact of policy variables on employment and capital accumulation is estimated using a specification analogous to the one in equation 3. In these regressions the dependent variable is number of workers and real invested capital, respectively.

We extend our analysis of the determinants of productivity to using delicensing (along with its interaction with labor market flexibility) of industries as an additional industry regulation variable. Another extension was made to analyze the impact of export promotion of industries using the interaction of export dummy, trade protection and labor market flexibility.[15]

4.3 Some Simple Data Analysis

In Figure 1, we plot the overall GDP growth rate, growth rate in manufacturing value added and the growth rate in value added in services (all obtained from WDI) over time for the period 1980-2004. After the 1991 reforms, only in 5 of the 13 years (only in 1993, 1994, 1995, 1996 and 2000) do we find growth rates in manufactures to be higher than in services. There is a clear acceleration in growth in the case of manufactures from 1991 to 1994, which is followed by a sharp deceleration. We see much lower volatility in the growth rate of service value added. In Figure 2, we clearly see that value added in services as a proportion of GDP has clearly been gradually increasing over time for the period 1980-2004 from roughly 37 percent to about 51 percent. In the case of manufactures, the proportion has remained in the narrow range of 15 percent to 18 percent. This clearly shows that the growth is service driven, and that manufacturing has not taken off in a big way. Figure 3 clearly indicates that most of the trade is in goods, though both trade overall and services trade as a proportion of GDP have been rising.

In Figure 4, we plot the simple yearly averages of our policy and institutional variables from our dataset. While trade liberalization clearly starts in 1991, delicensing started in 1985. We see that output share of delicensed industries increased from 0 before 1985 to roughly 40 percent in 1985, which next rose to roughly 85 percent in 1991 and finally to about 92 percent in 2000. It is also interesting to see that starting

from 1981 until about 1991, there was about a fifty percent increase in average state per capita development expenditure.[16] While this itself may have been driven by economic growth in the 1980s, it is also quite plausible that economic growth itself was partly driven by per capita development expenditure growth. This may look like a virtuous circle, especially if we fail to take into account the macroeconomic crisis of the late 1980s and the early 1990s. Our labor market flexibility variable, namely FLEX, remains unchanged in this 1980-2000 period and there we do not plot it. It only varies across states and not over time.

Since India is a large country with many states that are larger than the member countries of the European Union (EU), labor mobility across these states is probably more imperfect than within the EU. Therefore, it makes sense to take a look at the spatial (interstate) distribution of output in addition to looking at the interindustry distribution. So for each year, we calculate the coefficient of variation (a measure of inequality), the ratio of standard deviation to the mean, of output and value added across the different industry-state units. The unit of observation is an industry in a state. With 18 two-digit industries in 15 major states, we have 270 such units. While in Figure 5, output inequality has a mild positive trend, value added inequality has a much stronger positive trend. In other words, the large units are growing larger while the small units are growing smaller. In Figure 6, we see that inequality in per worker output and value added also has an upward trend, showing that labor productivity is also becoming more and more unequally distributed over time. This clearly shows that there are barriers to the movement of resources across states and industries, as factor returns are not getting equalized across state and across industries. In fact, there is a trend towards steady divergence. Thus, there is clear evidence of strong factor market imperfections.

In Figures 7 through 10, we decomposed this inequality into interindustry and interstate by calculating separate coefficients of variation along the two dimensions. These figures are posted on the website http://www.ualberta.ca/~ural/MitraUral_2007/appendix.pdf. We find that, while output and value added

inequalities are increasing across industries (Figure 7), they are decreasing across states (Figure 8). Per worker output and value added inequality are increasing at both the interstate and interindustry levels (Figures 9 and 10). In other words, productivity is becoming more and more heterogeneous across industries and across states. However, we see that total income or output is becoming more and more equal across states, as shown by the falling inequality in Figure 8. This means employment is rising faster in the less productive states. Thus, from these inequality trends it is clear that there is serious interstate and interindustry labor immobility that leads to substantial misallocation of resources. In our regressions presented in Tables 3 though 9, we will see this is a fairly serious problem.

4.4 Regression Results

In Tables 3 through 9, we present the effects of different policy and institutional variables and their interactions on the real value added per worker, the total factor productivity (using a production function approach), on employment, on capital and on investment. The variable "NRP" denotes annual average nominal rate of protection at the two-digit industry level. The variable "FLEX" is a measure of labor market flexibility of a state. As explained in the subsection on measuring labor market flexibility, this is based on the Besley-Burgess measure of labor market flexibility combined with David Dollar's survey. This is a binary variable where a value of 0 represents a state that has a rigid labor market while a value of 1 represents a state that has a flexible labor market. There seems to be no variation in this variable over time for the period we are looking at, i.e., it varies only across states. In order to control for the export oriented industries, we determined 2-digit industries with exports greater than imports in each state in 1991, which is called "Export Dummy" in the regressions.

Our regressions are run on a three-dimensional panel. The data are by two-digit industry across the fifteen major states of India over the period 1989-2000. Table 1 summarizes the key variables in our analysis.

The Effects of Protection, Labor Market Flexibility and Development Expenditure on Labor Productivity

Starting with Table 3, we see that the real net value added per worker is higher in less protected industries, as seen by the statistically significant, negative sign of the coefficient of the NRP variable in column 1 and 2. Since the labor productivity variable is in logarithms, the magnitude of the coefficient indicates that a percentage point reduction in the tariff rate leads to a 0.2 to 0.5 percent increase in labor productivity in a state with a rigid labor market. The strength of this effect is stronger in the case of a flexible labor market, as seen by the statistically significant negative sign on the coefficient of the interaction term between NRP and FLEX. A percentage point reduction in the tariff rate leads, in states with flexible labor markets, to a 0.3 - 0.65 percent increase in labor productivity. In the period 1980-91, the average NRP across all two-digit sectors was 153 percent, while it was 65 percent in the post 1991 period. This reduction, of 88 percentage points, according to our regressions, could have led to a 60 percent increase in average labor productivity in the flexible states and a 45 percent increase in average labor productivity in the rigid states. This estimate of an increase in productivity, attributable to tariff liberalization, could be an overestimate, as this effect could also be picking up the effects of other accompanying policy changes.

Non-tariff barriers (NTBs) also turn out to have a negative effect on labor productivity, especially in states with flexible labor markets (column 3). A percentage point reduction in the NTB coverage ratio leads to a 0.4 percent increase in labor productivity in states with rigid labor markets, and a 0.6 increase in labor productivity in states with flexible labor markets. This result indicates that the reduction in NTBs, by about 29 percentage points (between 1980-91 and the post 1991 period), could have led to a 17 percent increase in labor productivity in the flexible states and a 12 percent increase in labor productivity in the rigid states. These estimates seem more plausible than the ones related to tariffs.

FLEX by itself has a positive sign and is significant when state GDP is not thrown in as a control. So labor market flexibility leads to higher labor productivity. Taking into account in column 1 the sign, significance and magnitudes of the FLEX and its interaction with NRP, a flexible labor market state that is similar in all other respects compared to another rigid labor market state (at an NRP of 50 percent) has roughly about an 11 percent higher productivity. Throwing in state GDP takes away the significance of the own (level) term in FLEX, probably since richer and bigger states are also the ones that have more flexible labor markets. However, the sign still remains positive. The interaction between NRP and per capita development expenditure has a positive sign and is significant but is extremely small in size, i.e., it is statistically significant but economically insignificant.

The Effects of Protection, Labor Market Flexibility and Development Expenditure on Total Factor Productivity

In Table 4, we use a production function approach. The TFP is assumed to be a function of time and industry effects as well as policy and institutional variables and their meaningful interactions. Clearly, from the coefficients of the logs of labor and capital, the production function is close to being CRS (or mildly IRS). Again NRP has the right (negative) sign and is significant. The interaction of NRP and FLEX also has the correct (negative) sign and is very significant without the state GDP control and is somewhat significant with the right sign using state GDP as a control. Again, this means that the positive effect of trade reforms on TFP is stronger in states with more flexible labor markets. While a percentage point reduction in NRP raises TFP by 0.2-0.3 percent in the rigid labor market states, this increase can be about 0.4 percent in the flexible states. FLEX by itself has the right (positive) sign but is not significant. Per capita development expenditure does have a positive effect on TFP. As indicated by the coefficient of the state GDP variable, TFP also is increasing in state size, showing economies of scale. The effect of non-tariff barriers on TFP turned out to be insignificant (columns 3 and 4).

The Effects of Protection, Labor Market Flexibility and Development Expenditure on Employment, Capital Stock and Investment

In Table 5, we look at the effect on employment of the policy and institutional variables considered above. There is mixed evidence from these regressions that protection reduces employment and that this effect is stronger in more flexible labor markets. In other words, trade liberalization can increase employment, especially in states with more flexible labor markets. A percentage point reduction in NRP can raise employment by as much as 0.9 percent in the rigid states and up to 1.1 percent in the more flexible labor markets. Once we control for state GDP, these effects go away, as the effects of protection on industrial expansion and on overall state GDP might be highly correlated. The positive effect of per capita development expenditure on employment, however, is very robust to the inclusion and exclusion of the state GDP control. One percentage point increase in non-tariff barriers reduces employment by 2 percent, and this effect is the same for all states. Once we control for state GDP, we find a positive effect for only flexible states.

In Table 6, we find similar results with invested capital, and in Table 7 with investment as the dependent variable. However, in the case of investment, the positive effects of both FLEX and per capita development expenditure are very robust to the inclusion and exclusion of the state GDP variable. Investment is about 40 to 80 percent higher in a flexible labor market state as compared to a similar state with a rigid labor market. Also, if per capita development expenditure rises by one percent, investment can go up by 0.37 to 0.63 percent. We find negative effect of NRP and non-tariff barriers on investment, and this effect is more pronounced in states with flexible labor markets.

The Effects of Industrial Deregulation

We now present our extension that includes a new independent variable, namely industrial deregulation. We call this variable “delicensed”. As explained in the data section, this variable measures the extent of delicensing that has taken place. We throw in “delicensed” and the interaction of “delicensed” and “FLEX” into our regressions, to pick up any differential effects across states with different labor market

institutions. While the results are sensible and economically meaningful in the case of both labor productivity and employment, we only present the productivity results (Table 8). We find that delicensing of industries had a positive impact on labor productivity in states with flexible labor markets. This effect was reversed for the rigid states. The "delicensed" variable by itself has a negative and significant coefficient, but when it is interacted with labor market flexibility the coefficient is positive and bigger in magnitude. One percentage point increase in the output share of delicensed industries increased labor productivity by 1.3 to 2.1 percent in flexible states, and decreased labor productivity by 1.1 to 1.5 percent in inflexible states. In the period 1980-91, the output share of delicensed industries was 28 percent across all two-digit sectors, while it was 87 percent in the post 1991 period. According to our results, from the pre- to the post-reform period, delicensing of industries could have led to a 77-120 percent increase in average labor productivity in flexible states and 66-90 percent decrease in average labor productivity in rigid states. Again, this could be an overestimate because of the many correlated accompanying policy reforms. However, we believe in the signs of our coefficient estimates.

The effects of NRP, NTB and per capita development expenditure remain robust to the inclusion of these industrial delicensing terms. While per capita development expenditure is positive and significant throughout (in both columns of Tables 8 and 9, i.e., with and without the state GDP control), the NRP/NTB is negative and significant in three of the four columns of Table 8 .

The Effects of Export Orientation

We analyze how protection affects export-oriented industries as compared to other industries. At the same time, we try to investigate whether in this relationship labor-market flexibility matters. We look at all this using the interaction of the export dummy (which takes the value of 1 for export-oriented industries and 0 otherwise), trade protection and labor market flexibility. We experimented with an alternative specification, which also consisted of the export dummy by itself, as well as its interaction with trade protection. However, those variables did not turn out significant and the effect of their exclusion on other

coefficients was very small. For this reason, those regressions are not presented in the paper. As seen in Table 9, the triple interaction terms, *Export Dummy*NRP*FLEX* and *Export Dummy*NTB*FLEX* are negative and significant. This negative sign shows that trade liberalization has a greater positive impact on productivity in export-oriented industries located in states with flexible labor market institutions.

Thus our main results can be summarized as follows:

(1) There has been an increase in the inequality of aggregate and per capita output and value added across industry-state units over time. Inequality of these variables increases across industries over time. While the inequality of the aggregate variables decreases across states, the interstate inequality of the per capita variables has been decreasing over time. This clearly shows imperfect interindustry and interstate labor mobility as well as misallocation of resources across industries and states.

(2) Trade liberalization increases productivity in all industries across all states.

(3) Productivity is higher in the less protected industries.

(4) The effects in (2) and (3) above are more pronounced in states that have relatively more flexible labor markets, i.e., the beneficial effects of trade reforms on productivity are stronger in states with more flexible states. In such states, there is a bigger variation in productivity across sectors based on the protection received.

(5) Labor market flexibility, independent of other policies, has a positive effect on productivity.

(6) Per capita development expenditure by itself seems to be the strongest predictor of productivity.

(7) Furthermore, there is some evidence that the above effects of policies, institutions and their interactions on productivity are both through their effects on factor accumulation as well as independent of them.

(8) Industrial delicensing increases both labor productivity but only in the states with flexible labor market institutions.

(9) The productivity-enhancing effect of trade liberalization is greater in export-oriented industries located in states with flexible labor-market institutions.

4. Concluding Remarks

While India has not really been a part of the global production-sharing network in manufacturing, her manufacturing sector has gained from globalization. This probably has been from tougher competition from imported products or from a larger variety of imported inputs that has led to higher productivity through greater division of labor. That productivity, whether labor productivity or total factor productivity, is negatively related to trade protection, is a result we see in all our regressions and is quite robust to specification of the regressions or the set of control variables used. The "pro-competitive effect" clearly dominates the "market-size effect". However, there seems to be some evidence from our regressions, that a stronger beneficial effect of trade reforms on productivity is felt in the presence of more flexible labor market institutions. Not only is there direct impact of these variables on productivity, there also seems to be an impact of these variables on factor accumulation and employment. Labor market flexibility, by itself, can improve productivity to a large extent and has a positive effect on employment and investment as well. The trend in value added and output inequality (both in aggregate and per worker terms) across states and industries clearly shows resource misallocation and barriers to factor mobility within the country. Thus, the challenge for the Indian government is to get rid of the rigid labor laws, whose operation over several decades has created strong vested interests. We also show in this paper that deregulation can only be useful in the presence of better labor laws. In states with better labor institutions, deregulation has had a positive effect on productivity, but not in other states. Even after controlling for delicensing, trade liberalization is shown to have a productivity-enhancing effect.

We also find that trade liberalization benefits most the export-oriented industries located in states with flexible labor-market institutions. This clearly shows complementarities between policies – between lowering protection, promoting exports and having a smoothly functioning, flexible labor market. Thus, various types of economic reforms should go hand in hand for these reforms to generate maximum benefits.

Finally, it turns out from our econometric analysis that the most important and robust determinant of productivity and factor accumulation in the last two decades has been state development spending (spending on infrastructure, health, education etc). It shows that the public sector has an important role to play here. This is so since in this area, especially in infrastructure provision, private returns are much below social returns and so there could be coordination failure if the private sector alone were to perform this function.

The positive role played by government development spending is particularly remarkable since India is a developing country. Corruption is a serious problem in the developing world. Even though India is better than most developing countries in this regard, it still does not do very well in the world corruption rankings. Thus, for government spending to matter in a positive way in such an environment is quite impressive. It also means that in the absence of corruption, things could have been even better. While trying to reduce or eliminate corruption is important, it cannot always be done directly. Policy reforms are an important way of cleaning the system since they reduce the incentives for corruption. The more rigid are the rules, regulations and restrictions (associated with doing business) that require government monitoring, the greater is the scope for corruption.

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FIGURE 1

Growth Rates of GDP, Manufacturing and Services Value Added

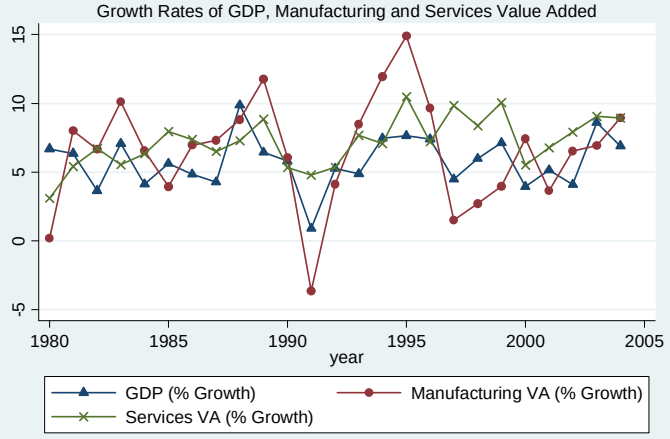

FIGURE 2

Sectoral Value Added as a Proportion of GDP

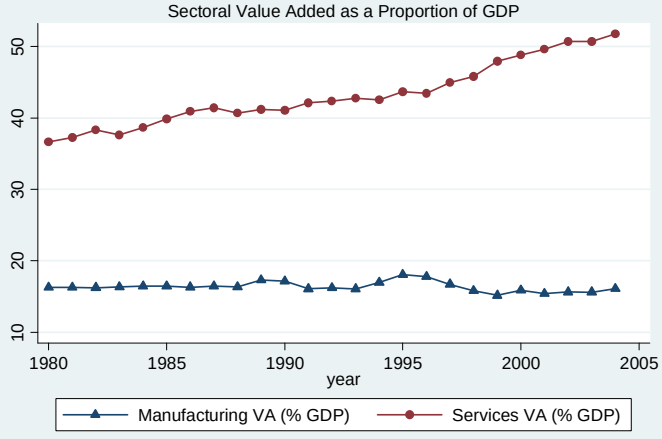

FIGURE 3

Trade as a percetage of GDP

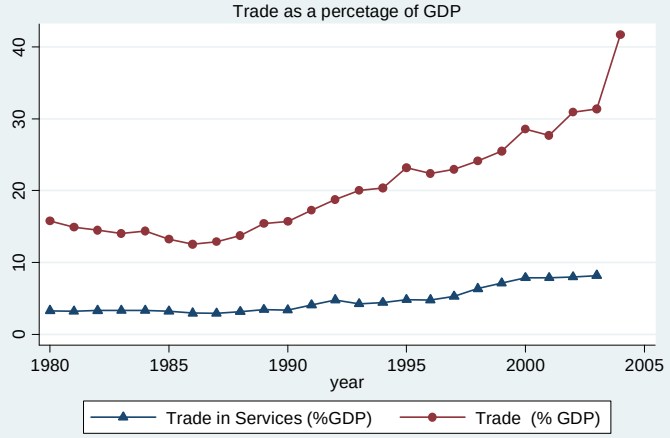

FIGURE 4

Tariffs, Industry Regulations and Development Expenditures

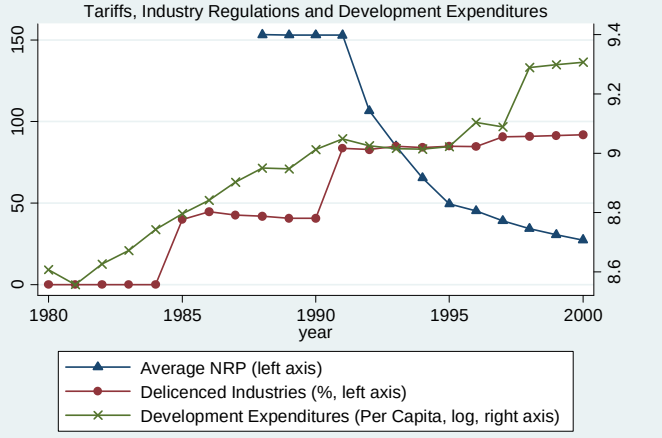

FIGURE 5

Overall Inequality of Output and Net Value Added

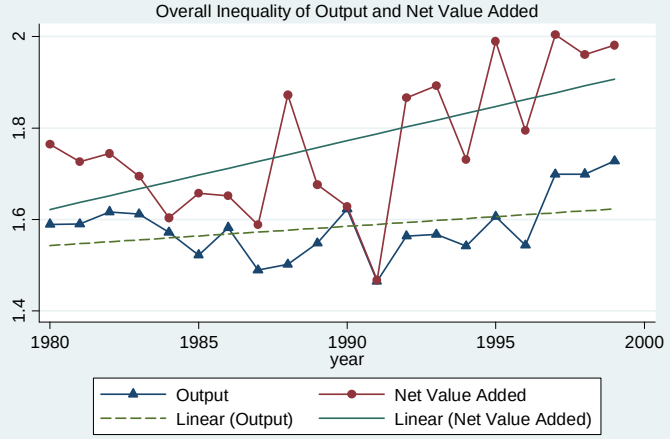

FIGURE 6

Overall Inequality of Output Per Worker and Net Value Added Per Worker

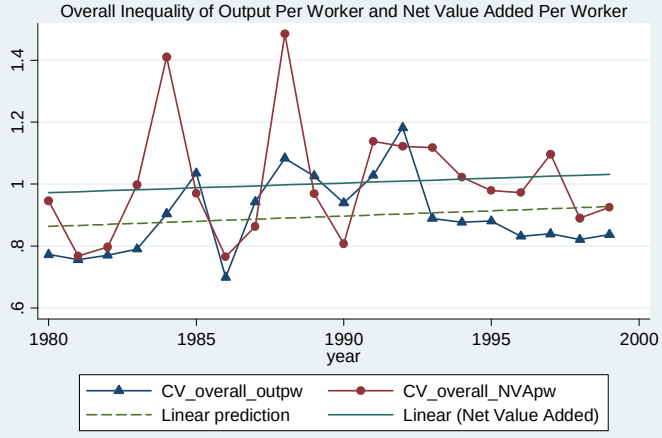

Table 1: Descriptive Statistics

	Time Span	Mean	Std. Dev.
Output	1980-1999	45468.2	85061.27
	Before (1980-1991)	36702.7	59938.76
	After (1992-1999)	59224.5	112460.1
Net Value Added	1980-1999	8456.9	18110
	Before (1980-1991)	36702.7	59938.8
	After (1992-1999)	59224.5	112460.1
Output per Worker	1980-1999	2.12	2.63
	Before (1980-1991)	1.85	1.89
	After (1992-1999)	2.54	3.45
Net Value Added Per Worker	1980-1999	0.38	0.49
	Before (1980-1991)	0.33	0.36
	After (1992-1999)	0.47	0.64
Per Capita Development Expenditures	1980-1999	7818.02	2694.42
	Before (1980-1991)	7056.57	2370.95
	After (1992-1999)	9159.21	2707.24
Real Invested Capital	1980-1999	24692.09	52235.25
	Before (1980-1991)	19417.88	36434.77
	After (1992-1999)	32969.34	69403.99
Number of Workers	1980-1999	23281.59	45793.66
	Before (1980-1991)	20960.75	32370.9
	After (1992-1999)	26923.86	61019.07
Investment	1980-1999	0.50	26462.34
	Before (1980-1991)	1265.90	11323.9
	After (1992-1999)	-1830.70	39024.2
Average Tariffs	1980-1999	100.27	50.11
	Before (1980-1991)	153.13	25.04
	After (1992-1999)	65.09	25.83
Average Non-Tariff Barriers	1980-1999	66..88	21.99
	Before (1980-1991)	85.35	14.52
	After (1992-1999)	56.44	19.44
Output Share of Delicensed Industries	1980-1999	53.50	45.20
	Before (1980-1991)	28.01	38.55
	After (1992-1999)	87.35	27.83
Share of Export>Import Industries	1991	0.55	0.48

Notes:
1) Output and Net Value Added are deflated by WPI obtained from Reserve Bank of India Database on Indian Economy at http://www.rbi.org.in/. Base year for WPI is 1981.
2) Development expenditures are deflated by the GDP deflator.
3) Number of workers includes direct and contracted employment.

Table 2: Labor Market Flexibility

State	Composite Measure*
Andrha Pradesh	Flexible
Assam	Inflexible
Bihar	Inflexible
Gujarat	Flexible
Haryana	Inflexible
Karnataka	Flexible
Kerala	Inflexible
Madhya Pradesh	Flexible
Maharashtra	Inflexible
Orissa	Flexible
Punjab	Flexible
Rajasthan	Inflexible
Tamil Nadu	Inflexible
Uttar Pradesh	Flexible
West Bengal	Flexible

* Source: Hasan, Mitra and Ramaswamy (2007)

Table 3: Labor Productivity - Determinants of Real Net Value Added per Worker

Dependent Variable: log (Real Net Value Added / Number of Workers)

	(1)	(2)	(3)	(4)
NRP	-0.00468 (-4.77)***	-0.00193 (-1.92)*		
NTB			-0.00414 (-1.74)*	0.00156 (0.62)
Development Expenditures (real, per capita, log)*	0.27529 (4.93)***	0.35029 (6.16)***	0.28191 (5.12)***	0.35757 (6.32)***
FLEX	0.19286 (2.99)***	0.054 (0.84)	0.13993 (1.65)	0.01175 (0.14)
NRP * FLEX	-0.00176 (-3.36)***	-0.0009 (-1.75)*		
NTB * FLEX			-0.00193 (-1.61)*	-0.00078 (-0.65)
NRP * Development Expenditures	0.000004 (6.25)***	0.00000 (2.10)**		
NTB * Development Expenditures			0.00000 (6.67)***	0.00000 (1.43)
Gross State Domestic Product (constant 93 prices, log)		0.38903 (6.52)***		0.34896 (6.11)***
Constant	-3.63143 (-6.96)***	-10.16066 (-9.11)***	-3.76063 (-7.10)***	-9.74428 (-8.69)***
Time Effects	Yes	Yes	Yes	Yes
Industry Effects	Yes	Yes	Yes	Yes
Number of Observations:	2970	2970	2970	2970
R-squared	0.52	0.53	0.52	0.52

Robust t statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

* Estimated coefficients of NRP * Development Expenditures are zero up to five digits.

Table 4: Production Function - Determinants of TFP and Real Net Value Added

Dependent Variables: log (Real Net Value Added)

	(1)	(2)	(3)	(4)
Factors of Production:				
Log Labor	0.5057	0.50255	0.5024	0.49859
	(21.90)***	(22.00)***	(21.80)***	(21.80)***
Log Real Invested Capital	0.5587	0.55355	0.56086	0.55674
	(29.10)***	(28.40)***	(29.00)***	(28.50)***
Policy:				
NRP	-0.00278	-0.00201		
	(-3.40)***	(-2.42)**		
NTB			-0.00187	-0.00043
			(-0.96)	(-0.21)
Development Expenditures (real, per capita, log)	0.139	0.16811	0.14906	0.17524
	(3.15)***	(3.74)***	(3.50)***	(3.89)***
FLEX	0.07071	0.03115	-0.01614	-0.04965
	(1.27)	(0.57)	(-0.22)	(-0.66)
NRP * FLEX	-0.00094	-0.00069		
	(-2.07)**	(-1.56)		
NRP * Development Expenditures	0.00000	0.00000		
	(0.49)	(1.41)*		
NTB * FLEX			-0.00021	0.0001
			(-0.21)	(-0.09)
NTB * Development Expenditures			0.00000	0.00000
			(0.98)	(1.09)
Gross State Domestic Product (constant 93 prices, log)		0.12148		0.09814
		(2.27)**		(2.02)**
Constant	-3.04707	-5.05252	-3.13712	-4.78256
	(-7.45)***	(-5.27)***	(-7.70)***	(-5.07)***
Time Effects	Yes	Yes	Yes	Yes
Industry Effects	Yes	Yes	Yes	Yes
Number of Observations	2970	2970	2970	2970
R-squared	0.92	0.92	0.92	0.92

Robust t statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 5: Effect of Trade Protection on Employment

Dependent variable: log (Number of Workers)

	(1)	(2)	(3)	(4)
NRP	-0.0088 (-5.80)***	0.00143 (0.89)		
NTB			-0.02000 (-6.37)***	0.00546 (1.66)
Development Expenditures (real, per capita, log)	0.57181 (7.18)***	0.85077 (10.04)***	0.52373 (6.50)***	0.85956 (10.60)***
FLEX	0.36303 (4.09)***	-0.16011 (-1.84)	0.18965 (1.56)	-0.38845 (-3.47)***
NRP * FLEX	-0.00207 (-2.47)**	0.00117 (1.62)		
NRP * Development Expenditures	0.00000 (26.60)***	0.00000 (1.46)		
NTB * FLEX			0.00001 (0.01)	0.00521 (3.07)***
NTB * Development Expenditures			0.00000 (23.04)***	0.00000 (2.79)***
Gross State Domestic Product (constant 93 prices, log)		1.45888 (14.30)***		1.55652 (16.30)***
Constant	5.81963 (7.86)***	-18.98739 (-9.87)***	6.916 (7.30)***	-20.81352 (-11.50)***
Time Effects	Yes	Yes	Yes	Yes
Industry Effects	Yes	Yes	Yes	Yes
Number of Observations	2970	2970	2970	2970
R-squared	0.47	0.53	0.46	0.53

Robust t statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 6: Effect of Protection on Invested Capital

Dependent variable: log (Real Invested Capital)

	(1)	(2)	(3)	(4)
NRP	-0.01079	0.00172		
	(-5.75)***	(0.85)		
NTB			-0.02109	0.00905
			(-5.97)***	(2.36)**
Development Expenditures (real, per capita, log)	0.76063	1.1016	0.71088	1.10839
	(7.73)***	(10.90)***	(7.09)***	(11.00)***
FLEX	0.53894	-0.10049	0.4725	-0.21179
	(5.08)***	(-0.99)	(3.18)***	(-1.59)
NRP * FLEX	-0.0033	0.00065		
	(-3.99)***	(0.77)		
NRP * Development Expenditures	0.00000	0.00000		
	(26.20)***	(2.06)**		
NTB * FLEX			-0.00345	0.00269
			(-1.66)	(1.42)
NTB * Development Expenditures			0.00000	0.00000
			(24.00)***	(2.80)***
Gross State Domestic Product (constant 93 prices, log)		1.78317		1.84243
		(14.60)***		(15.70)***
Constant	3.94009	-26.38114	4.86705	-27.95589
	(4.37)***	(-11.30)***	(3.93)***	(-12.30)***
Time Effects	Yes	Yes	Yes	Yes
Industry Effects	Yes	Yes	Yes	Yes
Number of Observations	2970	2970	2970	2970
R-squared	0.57	0.61	0.56	0.61

Robust t statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 7: Determinants of Investment

Dependent variable: log (Real Investment)

	(1)	(2)	(3)	(4)
NRP	-0.00573 (-1.75)**	0.0042 (1.14)		
NTB			-0.01367 (-2.03)**	0.01126 (1.56)
Development Expenditures (real, per capita, log)	0.37231 (2.33)**	0.63936 (3.89)***	0.34014 (2.10)**	0.64352 (3.92)***
FLEX	0.89585 (4.81)***	0.44488 (2.35)**	0.98585 (3.73)***	0.52848 (2.09)**
NRP * FLEX	-0.0046 (-2.84)***	-0.00199 (-1.24)		
NRP * Development Expenditures	0.00000 (11.30)***	0.00000 (0.70)		
NTB * FLEX			-0.00796 (-2.21)**	-0.00412 (-1.20)
NTB * Development Expenditures			0.00000 (11.40)***	0.00000 (1.54)
Gross State Domestic Product (constant 93 prices, log)		1.38968 (6.68)***		1.50701 (7.99)***
Constant	4.0057 (2.67)***	-19.61333 (-5.11)***	4.81431 (3.11)***	-21.41209 (-5.84)***
Time Effects	Yes	Yes	Yes	Yes
Industry Effects	Yes	Yes	Yes	Yes
Number of Observations	2970	2970	2970	2970
R-squared	0.39	0.42	0.39	0.42

Robust t statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 8: Determinants of Labor Productivity (Real Net Value Added per Worker)
Extending to the Impact of Industrial Delicencing

Dependent variable: log (Real Net Value Added / Number of Workers)

	(1)	(2)	(3)	(4)
NRP	-0.00492 (-5.01)***	-0.0023 (-2.29)**		
NTB			-0.00534 (-2.18)**	0.00001 (0.00)
Development Expenditures (real, per capita, log)	0.29387 (5.22)***	0.36631 (6.43)***	0.30691 (5.53)***	0.37661 (6.65)***
FLEX	-0.01692 (-0.15)	-0.17326 (-1.59)*	-0.26668 (-1.92)*	-0.42862 (-3.07)***
Delicenced	-0.0009 (-1.35)	-0.00104 (-1.58)	-0.0015 (-2.22)**	-0.00142 (-2.11)**
Delicenced*FLEX	0.00206 (2.53)***	0.0023 (2.87)***	0.00293 (3.45)***	0.00324 (3.82)***
NRP * FLEX	-0.00114 (-1.92)**	-0.00025 (-0.44)		
NRP * Development Expenditures	0.00000 (5.99)***	0.00000 (2.02)**		
NTB * FLEX			0.00096 (0.69)	0.00235 (1.69)*
NTB * Development Expenditures			0.00000 (6.63)***	0.00000 (1.32)
Gross State Domestic Product (constant 93 prices, log)		0.37422 (6.28)***		0.33228 (5.89)***
Constant	-3.42527 (-6.46)***	-9.80187 (-8.89)***	-3.77734 (-6.98)***	-9.68009 (-8.53)***
Time Effects	Yes	Yes	Yes	Yes
Industry Effects	Yes	Yes	Yes	Yes
Observations	2970	2970	2970	2970
R-squared	0.52	0.53	0.52	0.53

Robust t statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 9: Determinants of Labor Productivity (Real Net Value Added per Worker)
Extending to the Impact of Export Promotion

Dependent Variable: log (Real Net Value Added / Number of Workers)

	(1)	(2)	(3)	(4)
NRP	-0.00511	-0.00246		
	(-5.17)***	(-2.41)**		
NTB			-0.00617	-0.0008
			(-2.50)***	(-0.31)
Development Expenditures (real, per capita, log)*	0.29174	0.36439	0.30973	0.37782
	(5.18)***	(6.39)***	(5.59)***	(6.68)***
FLEX	0.04817	-0.11912	-0.30207	-0.45517
	(0.42)	(-1.04)	(-2.16)**	(-3.24)***
Export Dummy * NRP * FLEX	-0.00074	-0.0006		
	(-1.72)*	(-1.39)		
Export Dummy * NTB * FLEX			-0.00184	-0.00154
			(-2.61)**	(-2.19)**
Delicenced	-0.00086	-0.001	-0.00158	-0.00148
	(-1.28)	(-1.52)	(-2.31)**	(-2.19)**
Delicenced*FLEX	0.00156	0.0019	0.00272	0.00305
	(1.82)*	(2.23)**	(3.19)***	(3.59)***
NRP * FLEX	-0.00102	-0.00017		
	(-1.70)*	(-0.29)		
NTB * FLEX			0.00284	0.00389
			(1.83)*	(2.51)**
NRP * Development Expenditures	0.00000	0.00000		
	(5.96)***	(1.97)**		
NTB * Development Expenditures			0.00000	0.00000
			(6.74)***	(1.18)
Gross State Domestic Product (constant 93 prices, log)		0.37205		0.32579
		(6.16)***		(5.77)***
Constant	-3.38429	-9.74019	-3.75017	-9.54586
	(-6.37)***	(-8.71)***	(-6.93)***	(-8.40)***
Time Effects	Yes	Yes	Yes	Yes
Industry Effects	Yes	Yes	Yes	Yes
Number of Observations:	2970	2970	2970	2970
R-squared	0.52	0.53	0.52	0.53

Robust t statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

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Notes:

[1] In many cases, the dividing line between policies and institutions is very thin.

[2] In this paper, we mainly focus on the gains to producers.

[3] See Bhattacharjea (2006) for an exhaustive and critical survey of the empirical evidence on the relationship between industrial performance and labor-market regulation in India. In this survey, Bhattacharjea takes issue with the measures of labor regulation used in existing studies, and argues in favor of outcome-based measures, especially to take into account the enforcement of labor laws. While Bhattacharjea is extremely critical of the Besley and Burgess (2004) measure, he is less critical of the measure we are using in this paper. While this measure, also used in Hasan, Mitra and Ramaswamy (2007), is derived from Besley and Burgess (2004), the modifications (explained later) are important and make the cross-state variation in labor regulation look more plausible.

[4] See Dutt (2003) and Krishna and Mitra (1998).

[5] See Dutt (2003) for a more detailed discussion of India's labor-market regulations.

[6] Until 1976, the provisions of the IDA were fairly uncontroversial. The IDA allowed firms to layoff or retrench workers as per economic circumstances as long as certain requirements such as the provision of sufficient notice, severance payments, and the order of retrenchment among workers (last in first out) were met. An amendment in 1976 (the introduction of Chapter VB), however, made it compulsory for employers with more than 300 workers to seek the prior approval of the appropriate government before workers could be dismissed. A further amendment in 1982 widened the scope of this regulation by making it applicable to employers with 100 workers or more.

[7] The term layoff refers to a temporary or seasonal dismissal of a group of workers due to slackness of current demand. Retrenchments, on the other hand, denote permanent dismissals of a group of workers. Both terms may be distinguished from "termination" which refers to separation of an individual from his or her job.

[8] See Hasan, Mitra and Ramaswamy (2003) and Hasan, Mitra and Ramaswamy (2007) for details.

[9] ASI data covers establishments registered under the Factory Act and employing ten or more workers (with power and 20 or more workers without power). It provides information on 18 manufacturing industries disaggregated by their location across India's states.

[10] The term “workers” refers to production workers (permanent, contract, and temporary). The ASI also reports the number of “total employees”, i.e., production and non-production workers. Unfortunately, the ASI uses different definitions for reporting payments to “workers” (called "wages") and “total employees” (called "total emoluments"). Total emoluments include not only “wages” paid to production and nonproduction workers (not reported separately), but also the imputed value of benefits in kind provided to production and nonproduction workers (once again, not reported separately). This prevents us from computing a meaningful wage rate for non-production workers. Nevertheless, if we ignore this and compute a wage rate for nonproduction workers (["total emoluments"- workers’ "wages"]/[“total employees”- “workers”]) and include it in our labor demand regressions, the key results of our paper regarding the relationship between trade liberalization and labor demand elasticity go through. Additionally, the results are also unchanged if we estimate "total" labor demand equations (i.e., for total employees with the wage rate now being computed as total emoluments divided by total employees).

[11] Details of mapping from their product groups to the two-digit classification are provided in Hasan, Mitra and Ramaswamy (2003). We thank Pushpa Trivedi for providing us with the data.

[12] In order to be able to use all our data from 1988 onwards, we use linear interpolation/extrapolation to fill in the years for which the data are missing.

[13] The following two-step process was carried out to use the Aghion et al definition for delicensed industries. First, since the manufacturing industries listed by them are expressed in terms of the Indian National Industrial Classification (NIC) 1987 industrial codes, we map the listed industries in terms of their NIC 1970 classification. This step is essential given that state level information on three digit manufacturing industries between 1986 and 1988 is available from the Annual Survey of Industry (ASI) in terms of NIC 1970 only. Second, we follow Aghion et al in dropping all three digit industries which are either included in any given state for less than 10 years or are active in less than five states. This step was carried out in order to maximize the comparability of states’ experience with delicensing. We thank Rana Hasan and Jewel Cain of the Asian Development Bank for helping us sort out this important data issue.

[14] We have 270 cross-sectional units (18 industries and 15 states), and thus the number of cross-sectional units far exceeds the number of years, which is only 10. This allows us to ignore cointegration-related issues in our estimation.

[15] We also included the export dummy by itself, as well as its interaction with trade protection in our analysis as an alternative specification. However, these variables did not turn out significant and the effect of their exclusion on other coefficients was very small. For this reason, they are not presented in the paper.

[16] The logarithm of per capita development expenditure increased by 0.49 points, which can be seen on the right axis in Figure 4.