

# The Unequal Effects of Liberalization: Evidence from Dismantling the License Raj in India\*

Philippe Aghion<sup>†</sup>      Robin Burgess<sup>‡</sup>      Stephen Redding<sup>§</sup>  
Fabrizio Zilibotti<sup>¶</sup>

June 19, 2006

## Abstract

We study whether the effects on registered manufacturing output of dismantling the ‘license raj’ – a system of central controls regulating entry and production activity in this sector – vary across Indian states with different labor market regulations. The effects are found to be unequal across Indian states with different labor market regulations. In particular, following delicensing, industries located in states with pro-employer labor market institutions grew more quickly than those in pro-worker environments.

---

\*We are grateful to Timothy Besley, David Donaldson, Rachel Griffith, Elhanan Helpman, Ethan Kaplan, Larry Katz, and seminar participants at Berkeley, Canadian Institute for Advanced Research, East Anglia, European Bank for Reconstruction and Development, IIES Stockholm, the LSE, the NBER Summer Institute, Princeton University, the MacArthur Inequality Workshop, the Society for Economic Dynamics 2004 Florence Meeting, Stanford, Tokyo BREAD-CEPR Conference on Institutional Development, Market Integration and Growth, UCL, Yale and the University of Zurich for useful comments and suggestions. Arunish Chawla, Ashwini Natraj, Juan Pablo Rud and Kwok Tong Soo provided excellent research assistance. We thank the CEPR, Leverhulme Trust, the Bank of Sweden Tercentenary Foundation STICERD-LSE, Princeton University Department of Economics and UC Berkeley Department of Economics for financial support.

<sup>†</sup>Department of Economics, Harvard University and CEPR

<sup>‡</sup>Department of Economics, LSE, CEPR and NBER

<sup>§</sup>Department of Economics, LSE and CEPR

<sup>¶</sup>IIES-Stockholm University and CEPR

## 1 INTRODUCTION

In the post-war period, planned industrialization became a major doctrine for tackling economic backwardness in developing countries. The theoretical argument was that massive state investment would help kick start development and state coordination of economic activities would ensure the rapid and sustained growth of domestic industries (Rosenstein-Rodan, 1943 and 1961; Rostow, 1952). Policy-makers translated these principles into a variety of policies. In countries where private initiative was not altogether suppressed, a cornerstone of the development strategy was the requirement for firms to obtain a license to begin or expand production. The goal of this policy was to place industrial development under the control of central governments, allowing them to allocate plan targets to firms and to address inequities across regions. Trade restrictions were also part of the same package. Tariffs would shelter nascent domestic industries from foreign competition, and help promote the industrialization process according to the objectives of the plan.

These views remained influential among policy-makers until the 1970's. However, amidst growing dissatisfaction about its results, the consensus shifted in the 1980s from planned industrialization to liberalization and *laissez-faire*. Many developing countries progressively abandoned central planning, dismantled government controls over industry, and liberalized trade. This paradigm change has been the source of a passionate debate. Most mainstream economists have welcomed it as a key step to achieve growth and poverty eradication, while skeptics have warned, among other things, that liberalization might exacerbate income inequality within countries.<sup>1</sup> In recent research, Acemoglu, Aghion and Zilibotti (2006) argue that understanding how competition-enhancing policies and other institutions interact is key to designing growth enhancing reforms.

In this paper we examine the interaction between product market deregulation and the organization of labor markets. We focus on India, and look at the effects of a particular internal liberalization episode – the dismantling of industrial licensing during the 1980's and 1990's. We exploit the fact that Indian states have a considerable degree of autonomy, resulting in a large variation of institutional environments with which the nationwide industrial policy reform interacts. In particular, we focus on cross-state differences in labor market regulations.

After independence, India's industrial policy had been shaped by the 1951 Industries (Development and Regulation) Act which introduced a system of industrial licensing that regulated and restricted entry of new firms and expansion of existing ones and became known as the 'license raj'. The persistent stagnation of the Indian economy prompted the government to undertake a set of liberalization reforms as of the 1980's. About a third of three-digit industries were exempted from industrial licensing, or delicensed, in 1985 (with few extensions in 1986 and 1987), whereas most of the remaining industries were delicensed in 1991. Trade barriers (tariffs) were also slashed in the 1990's.

Labor market institutions started from a common nationwide framework, the In-

---

<sup>1</sup>Among the critical views, see Hausman and Rodrik (2002), Rodrik and Rodriguez (2001), and Stiglitz (2002). The effects on income inequality are stressed by Banerjee and Newman (2003), and Attanasio et al. (2005). Goldberg and Pavcnik (2004) provide an excellent review of the empirical evidence on the effects of liberalization on inequality.

dustrial Disputes Act, approved in 1947, which regulated industrial relations in the registered or organized manufacturing sector. However, under the Indian constitution individual states were entitled to amend the Act independently, and local amendments were in fact extensively introduced. As a result, labor market institutions gradually diverged from one state to another, thereby generating a high degree of heterogeneity across Indian states at the time of the industrial policy reforms of the 1980's and 1990's.

To guide our analysis of the interacted effects of delicensing and local labor market regulations, we construct a simple model of an economy where firms are heterogenous in productivity (as in Melitz, 2003), but with subregions (or states) which differ in terms of their labor market institutions. We analyze how the removal of entry or size restrictions induces entry, exit, and production reallocations between states with different labor market institutions. The theory predicts that a reform slashing barriers to entry and expansion would benefit states where labor market institutions are more business-friendly relative to states which are biased in favor of workers.

To examine this idea empirically we track manufacturing industries using a three-digit state-industry panel from the Annual Survey of Industries for the sixteen main states of India (covering over 95% of the Indian population). Our data span 1980-1997 and thus cover the main period of delicensing in India. For each of these years we have state-specific industrial outcomes for a balanced panel of 64 three-digit industries in each year yielding about eighteen thousand observations. We also have information on the year in which the delicensing reform was introduced in each industry. To measure state-specific labor market regulations, we extend the data of Besley and Burgess (2004) who coded state amendments to the 1947 Industrial Disputes Act as “pro-employer”, “pro-worker” and “neutral”. State-industries within a three-digit sector are heterogeneous in terms of the state regulatory environments in which they are embedded. Both state labor regulations and the nationwide delicensing reforms apply to the organized manufacturing sector surveyed by the Annual Survey of Industries allowing us to make inferences about the interaction between product market and labor market regulation.

Our main finding is that, consistent with the prediction of the theory, the response to delicensing varies significantly depending on the labor markets conditions prevailing in different Indian states. Pro-employer states benefit from the reform relative to pro-worker states in terms of output growth. Our results stand up to a wide variety of robustness checks.

Our work on the interaction between product and labor market regulation relates to several strands of literature. First, a number of recent papers have focused on the role of labor and entry regulation as a determinant of economic performance (Holmes, 1998; Bertrand and Kramarz, 2002; Djankov et al, 2002; Besley and Burgess, 2004; Caballero et al, 2004). Another set of papers argue that the effectiveness and desirability of pro-competitive reforms depends on the state of technology. These include Acemoglu *et al.* (2006) and Aghion *et al.* (2004 and 2005a and 2005b). Aghion et al (2005a), for example, show using a UK firm-level panel data, that innovation incentives respond more positively to increased market competition in industries that are closer to the technology frontier than in industries that are far below it. In a similar spirit the recent trade literature has studied how heterogeneous firms and industries react differently to trade

liberalization (Tybout et al., 1991; Hay, 2001, Krishna and Mitra, 1998, Levinsohn, 1999, Pavcnik, 2002; Melitz, 2003, Muendler, 2004, Treffer, 2004, Hsieh and Woo, 2005 and Verhoogen 2005). Finally the paper relates to a small but growing recent literature that analyzes the interaction between product market and labor market regulations (Rama, 1997, Rama and Tabellini, 1999; Blanchard and Giavazzi, 2002, Cunat and Melitz, 2005; Harrison, 2005, Topalova, 2005).

The paper is structured as follows. Section 2 documents the history of the license raj in India. Section 3 presents a simple model of industry equilibrium. Section 4 provides a description of the data. Section 5 contains the empirical analysis. Finally, section 6 concludes.

## 2 THE RISE AND FALL OF THE LICENSE RAJ

After independence in 1947 India embarked on a period of centrally planned industrialization. The centerpiece of the planning regime was the Industries (Development and Regulation) Act of 1951 which states that “it is expedient in the public interest that the Union should take under its control the industries in First Schedule”.<sup>2</sup> This Act introduced a system of industrial licensing to control the pace and pattern of industrial development across the country which became known as the ‘license raj’. Licensing became the key means of allocating production targets set out in the five-year plans to firms. Both state and private firms in the registered manufacturing sector were covered under the licensing regime (Hazari, 1966). State control over industrial development via licensing was intended to accelerate industrialization and economic growth and to reduce regional disparities in income and wealth.<sup>3</sup>

The development of the organized manufacturing sector became tightly regulated (see Bhagwati and Desai, 1970). Under the 1951 Industries Act an industrial license was required to (i) establish a new factory, (ii) carry on business in an existing unlicensed factory (iii) significantly expand an existing factory’s capacity, (iv) start a new product line and (v) change location. Applications for industrial licenses were made to the Ministry of Industrial Development and then reviewed by an inter-ministerial Licensing Committee.

The bureaucratic nature of the licensing process imposed a substantial administrative burden on firms.<sup>4</sup> There was also considerable uncertainty as to whether license applications would be approved and within what time frame. For example, 35% of license

---

<sup>2</sup>Union refers to central government. The First Schedule lists all key manufacturing industries in 1951 and is subsequently revised to encompass new products. This central planning act effectively brings all key industries in the organised manufacturing sector under central government control via licensing (Malik, 1997).

<sup>3</sup>Other objectives included the development of small-scale and cottage industries and preventing concentration of economic power in the hands of small numbers of individuals (Government of India, 1956).

<sup>4</sup>Successful license applicants were required to submit a G-return to the Ministry of Industrial Development every six months outlining progress in implementing licensed capacity. Even once a license had been granted, further expansion of capacity, changes in the article produced or changes in the location of manufacture would require an additional license application under the terms of the 1951 Industries Act.

applications in 1959 and 1960 were rejected, with the rejected applicants accounting for around 50% of the investment value of all applications (Hazari, 1966).<sup>5</sup> Delays in the approval process were common and of indeterminate length. No explicit criteria for the award of industrial licenses were provided to applicants. Since the Licensing Committee reviewed applications on a sequential, first-come, first-served basis, and since the five-year plans laid down targets or ceilings for industrial capacity, this provided an incentive for preemptive license applications. This system tended to favor the larger industrial houses (e.g. Birla, J.K. and Tata) which were better informed and organized and submitted multiple early applications as a means of foreclosing on plan capacity.

Recognition of these problems led to various reforms in the 1970s which attempted to streamline the application process and to raise exemption and expansion limits. By this time it had become apparent that industrial licensing had failed to bring about the rapid industrial development that had been anticipated in the 1950s. Wholesale reform of the licensing system, however, was delayed until the 1980s. The Congress Party which had been the dominant political force in the country suffered a severe defeat in both, state and central elections in the late 1970s. The heightened political competition which followed led to pressure for the dismantling of government controls including the industrial licensing system. The Congress leader Indira Gandhi responded via the 1980 Statement on Industrial Policy which signalled a renewed emphasis on economic growth (see Government of India, 1980). Large scale delicensing, however did not occur until her son Rajiv Gandhi unexpectedly came to power following Indira's assassination in 1984. He was an unknown quantity – an airline pilot with no political experience – who turned out to be a fervent reformer and was responsible for moving India in a pro-business direction (Rodrik and Subramaniam, 2004). Twenty five broad categories of industries were entirely exempted from industrial licensing, or delicensed, in March 1985. In late 1985 and 1986, there followed further relaxations of the industrial licensing system.

In May 1991, Rajiv Gandhi was assassinated in the midst of an election campaign that subsequently carried his Congress Party to victory. Narasimha Rao was appointed as his successor in the post of Prime Minister, and he in turn appointed Manmohan Singh as Finance Minister. Rising external debt, exacerbated by the increase in oil prices due to the Gulf War, resulted in macroeconomic crisis and India was obliged to request a stand-by arrangement with the International Monetary Fund (IMF). The financial assistance was made conditional upon the implementation of a structural adjustment programme.

In response to this external pressure the Rao administration implemented a large scale liberalization of the Indian economy. As with Rajiv Gandhi the depth of reformist tendencies of the Rao/Singh team were largely unanticipated (Rodrik and Subramaniam, 2004; Topalova, 2005). In 1991 industrial licensing was abolished except for a small number of industries where licensing was retained “for reasons related to security and strategic concerns, social reasons, problems related to safety and over-riding environmental issues, manufacture of products of hazardous nature and articles of elitist

---

<sup>5</sup>License applications are themselves a selected sample of potential undertakings. Some investments that would have incurred in the absence of industrial licensing may not have even reached the license application stage.

consumption.”(Government of India, 1991). Additional industries were removed from the provisions of the 1951 Industries in the post-1991 period. From 1991 onwards, tariff and non-tariff barriers were also slashed as India opened its economy to the outside world (Topalova 2004, 2005). The stated rationale for the liberalization of industrial policy was “to actively encourage and assist Indian entrepreneurs to exploit and meet the emerging domestic and global opportunities and challenges. The bedrock of any package of measures must be to let the entrepreneurs make investment decisions on the basis of their own commercial judgment”(Government of India, 1991).

The two waves of delicensing in 1985 and 1991 brought central government control over industrial development to a close. The license raj which had been in place for forty years had collapsed. Both waves of reform followed leadership transitions resulting from assassinations. In this paper we exploit this variation to examine whether the impact of nationwide delicensing on industrial performance was affected by labor institutions in the various Indian states.

### 3 A SIMPLE MODEL OF INDUSTRY EQUILIBRIUM

To guide the empirical analysis which follows, we construct a stylized model of industry equilibrium where the reduction of barriers to entry and expansion generates entry, exit and resource reallocation between regions (“states”) characterized by different labor market institutions. Its building blocks are the following. First, firms are heterogenous in productivity and geographical locations. Productivity differences may stem from entrepreneurial skills, availability of local infrastructure, or knowledge embodied in the local labor force. Second, firms face common labor market institutions within each state but institutions vary across states. We capture such differences in a reduced-form fashion by cross-state variation in average unit labor costs: in states with pro-worker (pro-employer) labor markets institutions firms have to pay a higher (lower) wage to otherwise identical workers.<sup>6</sup> Third, firms are subject to entry costs (licence fees) or to regulations constraining their productive capacity. These, combined with the existence of credit constraints, limit the number and size of firms in equilibrium. Delicensing is modeled as slashing license fees and removing regulations on firm size.

More formally, we assume that firms are located in two different states, A and B, assumed to be of equal economic size. Neither firms nor workers are mobile across states, while there is a unique nationwide product market.<sup>7</sup> Firms use homogenous labor as their only input, but they differ in their unit labor costs: “good” firms have low unit cost. Labor productivities are drawn from a uniform density function with support,  $\theta \in [0, 1]$ . For the sake of keeping the theoretical analysis very simple, we treat labor costs as exogenous, ignoring general equilibrium effects of the reform on industrial wages.

---

<sup>6</sup>Higher labor costs is a catch-all for a variety of regulations to the use of labor that can include rules on hiring and firing, employment protection, flexibility and procedures for handling industrial disputes. Modelling explicitly labor market institutions is beyond the scope of the stylized model presented in this section.

<sup>7</sup>Measured factor mobility across Indian states are low (see, for example, Topalova, 2005). As discussed in the trade literature, factor mobility is important in determining the incidence of policy reforms (see for example Neary 1978 and Banerjee and Newman 2003).

This can be motivated by the presence of a “reserve labor force army” outside of the formal manufacturing sector that would be willing to work at the going wage (which is a reasonable description of the Indian labor market in the formal manufacturing sector). Endogenizing the response of industrial wages to the reforms would enrich the theoretical analysis, but not change any of the main predictions that we aim to test.

### 3.1 REMOVING ENTRY BARRIERS

In the first part of the analysis, we assume that each active firm produces one unit of output, while in the second part we allow for variable production levels. Firms face a barrier represented by a licence fee  $b$  to be paid up front before starting production. Because of credit market imperfections, firms cannot borrow to pay for the licence, nor can they use future profits as collateral. Thus, entrepreneurs (firms) must cover its cost out of their wealth. Wealth, denoted by  $\omega$  is uniformly distributed across firms in the interval  $[0, \bar{b}]$ , with density  $\phi(\omega) = \phi_0 \equiv \bar{b}^{-1}$ , for all  $\omega \in [0, \bar{b}]$ , and it is assumed to be independent of productivity. In particular, Given these assumptions, a proportion  $b/\bar{b}$  of firms at any productivity level is credit constrained and cannot enter irrespective of their potential profitability.

Consider firms which are unconstrained ( $\omega > \bar{b}$ ). The profit of an unconstrained firm  $i$  located in state  $s \in \{A, B\}$  is given by

$$\pi_{is} = p - \frac{w_s}{\theta_{is}} - b \quad (1)$$

where  $w_s$  denotes unit labor costs. A firm enters if  $\pi_{is} > 0$ , that is, if  $\theta_{is} \geq \theta_0 \equiv w_s/(p - b)$ . We assume that  $\theta_0 < 1$ , implying that in both states some but not all firms want to enter. Production in state  $s \in \{A, B\}$  is

$$S_s(p, b, w_s) = \left(1 - \frac{w_s}{p - b}\right) \left(1 - \frac{b}{\bar{b}}\right). \quad (2)$$

The industry equilibrium requires that  $D(p) = S_A(p, b, w_A) + S_B(p, b, w_B)$ , where  $S_A + S_B$  is the total supply and  $D(p)$  is the aggregate industry demand. We assume throughout that  $D'(p) \leq 0$ .

We now analyze the effect of delicensing, that is, of moving from  $b > 0$  to  $b = 0$ . We assume labor market institutions to be more pro-worker in state A than in state B, implying that  $w_A > w_B$ . We denote by  $\Delta S_s$  the post-reform output change in state  $s \in \{A, B\}$ , and by  $p'$  the post-reform equilibrium price. The following Proposition summarizes results in the case with barriers to entry and fixed production at the firm level (proof in the Mathematical Appendix).<sup>8</sup>

**Proposition 1** *Assume  $w_A > w_B$  and  $b < \bar{b}$  (barriers to entry are binding for some firms in both states before the reform). Then, delicensing induces production reallocation*

---

<sup>8</sup>The Proposition states the result in terms of level differences. However, it is easy to show delicensing also (weakly) increases the ratio  $S_B/S_A$ . In particular,  $S_B/S_A$  remains constant if  $p$  does not change, and increases otherwise.

from state  $A$  to state  $B$ , namely,  $\Delta S_B > \Delta S_A$ . Moreover, if the demand is sufficiently inelastic, then  $\Delta S_B > 0$  and  $\Delta S_A < 0$ .

The liberalization reform causes high-productivity firms which were previously credit-constrained to enter in both states, but the more so in  $B$  where labor costs are lower. The entry of these firms works as an aggregate supply shock causing a movement along the downward-sloped demand curve. Thus, the equilibrium price falls, and this, in turn, triggers the exit of less productive incumbents. Although there is exit in both states, the entry flow of high-productivity firms is larger in  $B$ . This results in the number of firms and output rising in  $B$  relative to  $A$ , and possibly falling in  $A$  if the demand is sufficiently inelastic.

### 3.2 ALLOWING FIRMS TO EXPAND CAPACITY

An important aspect of the Indian delicensing reform is the elimination of barriers to the expansion of productive capacity in existing firms. In order to generate predictions on how delicensing affects the expansion or contraction of existing firms' activities, we now expand the model to allow for variable production at the firm level. In particular, let firms face the following production function:

$$y = x^\alpha,$$

where  $x$  denotes the effective units of labor hired, and  $\alpha < 1$ . Decreasing returns to  $x$  reflect the presence of fixed factors of production (for example, managerial ability). For simplicity, we abstract here from barriers to entry ( $b = 0$ ). As before, "good" firms have lower unit labor costs, namely, they need fewer workers to attain a given number of effective units of labor. In the absence of constraining regulations, firms would set their optimal production level such that the marginal product of labor equals the unit labor cost, namely,  $\alpha x^{\alpha-1} = w / (p\theta)$ , or equivalently,

$$y = \left( \frac{\alpha p \theta}{w} \right)^{\frac{\alpha}{1-\alpha}}.$$

However, prior to delicensing, prohibitive barriers prevent firms from expanding production above some upper bound  $\bar{y}$ . Since, according to the above equation, in the absence of regulation more productive firms would produce more output, this ceiling  $\bar{y}$  is more binding for high-productivity firms than for low-productivity ones. As before, we assume that  $w_A > w_B$ . Prior to delicensing, production in state  $s \in \{A, B\}$  equals:

$$S_s(p, \bar{y}, w) = \int_0^{\tilde{\theta}_s} \left( \frac{\alpha p \theta}{w_s} \right)^{\frac{\alpha}{1-\alpha}} d\theta + (1 - \tilde{\theta}_s) \bar{y} = (1 - \alpha \tilde{\theta}_s) \bar{y}, \quad (3)$$

where<sup>9</sup>

$$\tilde{\theta}_s = \min \left[ \frac{w_s}{\alpha p} \bar{y}^{\frac{1-\alpha}{\alpha}}, 1 \right] \quad (4)$$

is the threshold productivity level such that the production ceiling is binding for all firms with  $\theta > \tilde{\theta}_s$ . We assume that prior to reform the ceiling  $\bar{y}$  is binding for a positive measure of firms in both states, namely,  $\tilde{\theta}_B < \tilde{\theta}_A < 1$ .

Delicensing eliminates the ceiling  $\bar{y}$ , causing an expansion of output in more productive firms. After-reform production is captured in the model by letting  $\bar{y} \rightarrow \infty$  and, consequently,  $\tilde{\theta}_s = 1$  in (3)-(4). As above, let  $\Delta S_s$  denote the output change, namely,  $\Delta S_s \equiv S_s(p', \infty, w) - S_s(p', \bar{y}, w)$

The following Proposition can be established (proof in the Mathematical Appendix).

**Proposition 2** *Assume  $w_A > w_B$  and  $\tilde{\theta}_A < 1$  (production ceilings are binding for some firms in both states before the reform). Then, the elimination of barriers to production induces production reallocation from state A to state B, namely,  $\Delta S_B > \Delta S_A$ . Moreover, if the demand is sufficiently inelastic, then  $\Delta S_B > 0$  and  $\Delta S_A < 0$ .*

Slashing production ceilings causes an expansion in the production of high-productivity firms which were previously constrained, and a fall in the equilibrium price. Low-productivity firms react by reducing their output (if production were subject to fixed costs, some would actually exit). On average, production expands more in state B (due to lower labor costs), and possibly falls in state A.

In reality, the Indian reforms entailed both the reduction of barriers to entry and the elimination of controls on the production decisions of firms. Thus, our theory predicts that the delicensing triggers both the entry of new firms accompanied by the exit of less productive incumbents (as in Proposition 1) and the expansion of more productive firms accompanied by the contraction of less productive ones (as in Proposition 2). Both effects give rise to a reallocation of economic activity. Within each industry, output, employment and fixed capital expand more in regions where labor costs are lower, and possibly fall in regions where labor costs are higher. It is these predictions that we shall test in the next sections using Indian state-industry panel data.

The idea that market liberalization favors the more productive firms at the expense of the less productive ones is reminiscent of the influential paper of Melitz (2003). In his theory, firms with heterogenous productivities can either produce for the domestic market or export. Trade liberalization is modelled as either a reduction in the per-unit iceberg cost of export, or a reduction in the fixed cost of exporting. A reform reducing either of these costs causes more productive firms to expand production whereas it forces the less productive firms to exit or shut down.<sup>10</sup> However, Melitz has only one factor

<sup>9</sup>The second equality is obtained by noting that, using repeatedly the definition of  $\tilde{\theta}_s$ :

$$\int_0^{\tilde{\theta}_s} \left( \frac{\alpha p \theta}{w_s} \right)^{\frac{\alpha}{1-\alpha}} d\theta + (1 - \tilde{\theta}_s) \bar{y} = \left( \frac{\alpha p}{w_s} \right)^{\frac{\alpha}{1-\alpha}} (1 - \alpha) \tilde{\theta}_s^{\frac{1}{1-\alpha}} + (1 - \tilde{\theta}_s) \bar{y} = (1 - \alpha \tilde{\theta}_s) \bar{y}$$

<sup>10</sup>In his model, the expansion of output by exporters increases domestic labor demand and therefore the real domestic wage rate, which in turn forces lower productivity firms to exit, as their profit margins become too small for them to cover their fixed production costs.

market and firm-level productivity is the only source of heterogeneity, whereas our model focuses on the interplay between liberalization and the heterogeneity in labor markets. In addition, Melitz’s emphasis is on trade liberalization, while ours is on delicensing.

## 4 DATA

Table 1 contains the descriptive statistics for the main variables that we use in our analysis. Manufacturing in India is composed of two sub-sectors – an unregistered (unorganized) sector of small firms and a registered (organized) sector of larger firms.<sup>11</sup> In our sample period, the former makes up about 5 percent of state output and the latter 9 percent. Both industrial licensing (via the 1951 Industries Act) and labor market regulations (via the 1947 Industrial Disputes Act) only apply to firms in the registered sector. For these reasons our analysis focuses on the registered manufacturing sector.

We have data at the three-digit industry level for the period 1980-1997 (which covers delicensing) for the sixteen main states of India. For each three-digit industry we can track what happened to entry, output, employment and investment in each of the main Indian states across this period. We then use codings of the state level amendments to this 1947 Industrial Disputes Act to capture whether labor regulation in a state is moving in a pro-worker or pro-employer direction. The state-industry panel data set that we construct in this way allows us to study the links between nationwide delicensing, labor market regulations at the state level, and manufacturing performance at the state-industry level.

### 4.1 DELICENSING AND TRADE PROTECTION

To construct our delicensing measure we first assigned three-digit codes to all the industries licensed under the 1951 Industries Act (and subsequent amendments to that Act). We then used statements on industrial policy, press notes and notifications issued by the federal government to construct a delicensing dummy variable which is equal to one if all or part of a three-digit manufacturing industry is delicensed in a particular year and to zero otherwise. Separate, independent codings were carried out to ensure consistency. This policy measure tells us when each three-digit industry was delicensed within the 1980-1997 period.<sup>12</sup> Figure 1 plots when different three-digit industries were delicensed. The 1985 delicensing wave associated with Rajiv Gandhi’s rise to power in 1984 and the 1991 wave associated with Narasimha Rao’s take over following Rajiv Gandhi’s assassination in 1991, are both clearly visible. There is little delicensing action away from these leadership transitions. In the 1985 wave about one third of all three-digit industries are delicensed and in the 1991 wave a further half of all three-digit industries are delicensed. About one tenth of three-digit industries remain licensed at the end of our data period in 1997. Table 1 documents that the share of output and employment in delicensed

---

<sup>11</sup>Under the Factories Act of 1948 enterprises are required to register if either (i) they have more than ten employees and use electric power or (ii) they have more than twenty employees and do not use electric power.

<sup>12</sup>A full account of how the delicensing variable was coded for each three-digit industry in India is available in a web-based data appendix.

industries rises first in 1985 and then again post-1990.

We also construct measures of tariff barriers over time for each three-digit industry for the period 1980-1997. We exploit information on official rates of duty applied to highly disaggregated products in the Customs Tariff of India manuals issued through the Central Board of Excise and Custom. Indian tariffs comprise a basic rate of duty, an auxiliary rate of duty, and a countervailing duty. We combine the three rates of duty according to the official formula for the applied tariff rate, as discussed in further detail in the data appendix. Prior to 1988, the tariff data are reported for approximately one thousand one hundred products of the Brussels Tariff Nomenclature (BTN). From 1988 onwards, even more finely-detailed data are available for approximately five thousand six-digit products of the Harmonised System (HS).

We use standard mappings between each of the trade classifications and the three-digit industry classification used in the delicensing measure and in our data on industrial performance. The mappings in Debroj and Santhanam (1993) allocate each product to an individual three-digit manufacturing industry. Industry tariffs were calculated as the arithmetic average of all products allocated to an industry.<sup>13</sup> Our tariff measures have the attractive feature that they capture the actual tariff rate applied by customs officials at the Indian border. The tariff data provide a direct measure of the evolving Indian trade policy regime and enable us to control for the effects of trade liberalization in our regressions. In Table 1 we see how our applied tariff measure is high and relatively flat across the 1980-1990 period and then falls dramatically post-1990 (starting in 1991).

## 4.2 INDUSTRIAL PERFORMANCE

We match our delicensing measure with state-industry panel data for the period 1980-1997 drawn from the Annual Survey of Industries. This is the most disaggregated level at which one can obtain representative industrial data across the pre- and post-licensing periods. The Annual Survey of Industries is in part a census and in part a survey of registered manufacturing activity. Data on industry, location, inputs and outputs are collected at the factory level. Factories, as defined by the 1948 Factories Act, are manufacturing establishments or plants which employ more than ten employees with electricity or more than twenty employees without electricity. A firm may therefore comprise several factories. All factories with more than 100 employees are included in the census sector. Factories with less than 100 employees form the sample sector. The sampling unit is a state and three-digit industry pair, so that the data are representative at the state-three-digit industry level. In the data made available to us, the factory-level data has been aggregated to the state-three-digit industry level, weighting by the inverse of the sampling probabilities (typically one third in the sample sector and one in the census sector) to ensure the representativeness of the data.

We focus on the 16 main Indian states, which account for around 95 per cent of the Indian population. Since we are interested in examining the relative performance of different states within the same three-digit industry, we restrict our attention to a

---

<sup>13</sup>We take arithmetic averages rather than weighting by import shares to avoid the bias introduced by endogenous import shares. With elastic demand, higher tariffs reduce the share of a product in industry imports.

balanced panel of state-industries on which data exist for all eighteen years of our data set. This strategy also helps to minimize the role played by industry entry and exit in explaining our results. This leaves us with an balanced panel of 18324 observations on an average of 64 three-digit industries in the 16 states over the 18-year time period from 1980 to 1997.<sup>14</sup> Table 1 reports the mean and standard deviation of real output, employment, number of factories, real fixed capital across industries and states over time for the balanced panel.

### 4.3 LABOR MARKET REGULATION

India is a federal democracy and under the Indian Constitution of 1950 industrial relations is a concurrent subject. This implies that central and state governments have joint jurisdiction over labor regulation legislation. The key piece of central legislation is the Industrial Disputes Act of 1947 which sets out the conciliation, arbitration and adjudication procedures to be followed in the case of an industrial dispute. The Act was designed to offer workers in the organized sector some protection against exploitation by employers. The Act is comprised of seven chapters and forty sections, specifying the powers of government, courts and tribunals, unions and workers and the exact procedures that have to be followed in resolving industrial disputes.<sup>15</sup> It has been extensively amended by state governments during the post-Independence period. It is these amendments that we use to study whether state labor market regulation mediate the impact of delicensing on manufacturing performance.

We extend the coding of amendments carried out by Besley and Burgess (2004) for the 1958 and 1992 period. The coding is based on reading all state level amendments to the Industrial Disputes Act of 1947 (see Malik (1997)). Thus although all states have the same starting point, they diverged from one another over time. Each amendment is coded as being either neutral, pro-worker or pro-employer. For the purposes of quantitative analysis, we coded each pro-worker amendment as a one, each neutral amendment as a zero, and each pro-employer amendment as a minus one. If there were multiple amendments in a state in a year we add together the different amendments to give the net direction of change. Figure 2 graphs the history of regulatory change across states obtained using this coding procedure over the 1980-1997 period. Labor regulations exhibit significant variation across states and time.

This method classifies states as either “pro-worker”, “pro-employer” or “neutral”. The latter are states that do not experience any amendment activity in a pro-worker or pro-employer direction over the 1958-1997 period. In Figure 2 these are the flat line states which lie on the zero line. There are six of these: Assam, Bihar, Haryana, Jammu and Kashmir, Punjab and Uttar Pradesh. Among those that have passed amendments,

---

<sup>14</sup>We check our results are robust to running regressions on an unbalanced panel where industries are in the data for at least ten years and are active in at least five states. This raises our sample size to 24374 observations.

<sup>15</sup>The seven chapters cover: (I) definitions; (II) authorities under this Act; (III) reference of disputes to Boards, Courts or Tribunals; (IV) procedures, powers and duties of authorities; (V) strikes and lockouts, lay-off and retrenchment, unfair labour practices; (VI) penalties and (VII) miscellaneous (see Malik, 1997).

our method classifies six states Andhra Pradesh, Karnataka, Kerala, Madhya Pradesh, Rajasthan and Tamil Nadu as “pro-employer”. In Figure 2 these states lie below the zero line. This leaves four “pro-worker” states: Gujarat, Maharashtra, Orissa and West Bengal which lie above the zero line.

There is a growing body of evidence suggesting that our labor regulation measure is capturing salient elements of the investment climate facing registered manufacturing firms in Indian states. Besley and Burgess (2004), for example, present evidence that more pro-worker labor regulation is strongly positively correlated with measures of industrial disputes in the registered sector such as work-days lost through strikes and lock-outs for the pre-1992 period. They find that states which moved in a pro-worker direction experienced lowered output in the registered manufacturing sector. In contrast, output in unregistered manufacturing increased. This suggests that labor regulation is picking up something about the policy environment facing registered firms as opposed to the overall investment climate facing all firms. In a similar vein Sanyal and Menon (2005) demonstrate that new industrial plants in the registered sector in India tend to open more in pro-employer states which suffer less from industrial disputes.

## 5 EMPIRICAL ANALYSIS

### 5.1 METHOD

We begin with a baseline specification:

$$y_{ist} = \alpha_{is} + \beta_t + \gamma d_{it} + \mu r_{st} + \theta(r_{st})(d_{it}) + \varepsilon_{ist} \quad (\text{BS})$$

where  $y_{ist}$  is a (logged) three-digit state-industry outcome variable,  $d_{it}$  is a dummy variable which switches on (i.e., takes the value of unity) in the year a three-digit industry is delicensed and then stays on thereafter (see Figure 1),  $r_{st}$  is the labor regulation measure measured in state  $s$  at time  $t$  (see Figure 2),  $\alpha_{is}$  are state-industry fixed effects which control for any unobserved time invariant determinants of state industry performance (e.g. natural endowments, location), and  $\beta_t$  are year dummies which control for common macroeconomic shocks.  $\varepsilon_{ist}$  is a stochastic error. The main industry outcome variable we examine is output though we also look at fixed capital, employment and number of factories.

Our interest centers on the labor regulation-delicensing interaction coefficient ( $\theta$ ) that the theory presented in section 3 predicts to be negative. A concern with the baseline specification (BS) is that the interaction term might be picking up time varying industry or state effects that are due to factors other than the delicensing reform or labor regulations in the Indian states. To address this concern, we augment the baseline specification with state-year and industry-year fixed effects. Our preferred augmented specification takes the form:

$$y_{ist} = \alpha_{is} + \beta_{st} + \eta_{it} + \theta(r_{st})(d_{it}) + \varepsilon_{ist} \quad (\text{AS})$$

where  $\beta_{st}$  is a state-year interaction effect and  $\eta_{it}$  is a industry-year interaction effect. Including these controls precludes estimating the level effects of labor regulation

and delicensing, respectively. The coefficient of interest is now identified by the mix of industry-year variation in delicensing interacted with state-year variation in labor regulation.

We run the regressions on a balanced panel covering an average of 64 industries in sixteen states over the 1980-1997 period. Standard errors are clustered by state and year of delicensing. This is to address serial correlation concerns (and to allow for heteroskedasticity) but also to take account of the fact that delicensing is highly clustered in time. This happened overwhelmingly in 1985 and 1991, implying that different industries within a state in these years cannot be treated as independent observations.<sup>16</sup>

## 5.2 RESULTS

As a warm-up exercise, we examine in Table 2 a specification without the interaction term to see whether delicensing increased entry. This is an interesting preliminary test of whether the licensing system really acted as a barrier to entry. Unfortunately, we do not observe separate entry and exit flows. Rather, we have a measure of the total number of factories operating in a state industry in a given year. This is akin to a measure of net entry. Column (1) of Table 2 contains state-industry and year fixed effects as in the baseline specification (BS). The estimated coefficient on the delicensing variable is positive and highly statistically significant, implying an increase in the number of factories within an industry of around 6 percent. This is a signal that liberalization via delicensing encouraged entry of factories thus raising competitive pressure within an industry.<sup>17</sup> In column (2) we include state-year interactions to control for time-varying effects of state characteristics. The coefficient remains positive and significant, and of a similar magnitude. In column (3) we include labor regulation as an additional regressor in the baseline specification with state-industry and year fixed effects. The coefficient on labor regulation is negative and significant indicating that states that have moved in a pro-worker direction experience less net entry relative to pro-employer states. The coefficient on delicense remains positive and significant, and of a similar magnitude. Delicensing and pro-worker labor regulation are thus pulling in opposite directions in determining the number of factories operating in state-industries.

We then turn to the main test of the paper focusing on the interaction between delicensing and labor regulation. Table 3 presents the results using real output as the performance measure. In column (1) carry over the specification from column (3) of Table 2 and include as regressors both our delicensing and labor regulation measures separately, but with no interaction. The estimated coefficient on the delicense measure is positive, but small and statistically insignificant.<sup>18</sup> This suggests that additions to

---

<sup>16</sup>An alternative less demanding strategy, which does not deal with the bunching in liberalization issue, is to cluster by state and industry (see Bertrand, Mullainathan and Duflo (2004)). Standard errors are typically slightly smaller under this alternative.

<sup>17</sup>The average effect on the number of factories is even larger (0.112 with a standard error of 0.036, not reported in the table) if we run the same specification as in the column (1) but weight observations by time-averaged employment to take account of differences in industry size across states.

<sup>18</sup>This is true across a range of specifications. The coefficient in a baseline specification which only includes the delicense measure (as in column (1) of Table 2) is 0.032 (s.e. 0.042). If we add state-year

output from entry and expansion in some state-industries is offset by contraction (and, to some degree, exit) in others.<sup>19</sup> The coefficient on the labor regulation measure is, as before, negative and significant. Pro-worker regulation direction at the state level is associated with a negative impact on registered manufacturing output at the three-digit industry level relative to pro-employer regulation. These results line up with the state-level results of Besley and Burgess (2004) for the pre-liberalization 1958-1992 period.

In column (2) we include the interaction between our labor regulation and delicensing measures in the baseline specification which also includes state-industry and year fixed effects. The coefficient is negative and significant. This tells us that when delicensing occurred, industries in states with pro-employer regulation experienced larger increases in output relative to those located in pro-worker states. Column (3) shows that the same pattern of results holds when we run the regression on an unbalanced as opposed to balanced panel of state industries.<sup>20</sup>

Column (4) presents results from our preferred augmented specification (AS) which includes state-industry, state-year and industry-year interactions so that identification is coming from the interaction of industry-year variation in delicensing and state-year variation in labor regulation. In column (4) we see that the interaction coefficient remains negative and significant indicating that liberalization leads to bigger economic improvements where labor regulations are more pro-employer. This is the key result in the paper. Given the demanding nature of this specification we regard this result as compelling evidence that labor regulations passed over time at the state level affected how industries responded to a nationwide delicensing experiment. In column (5) we cluster standard errors at the state-industry level (see Bertrand, Mullainathan and Duflo (2004)). This reduces the standard errors slightly rendering the coefficient significant at the 1% level.<sup>21</sup>

We checked that our findings are not driven by individual states by sequentially excluding each state from the sample and re-estimating the column (4) specification. In each case, we were unable to reject the null hypothesis that the estimated coefficient on the interaction term between delicensing and labor regulation equalled the value estimated for the full sample at the 5% level. This suggests that our results are capturing a general relationship between industrial performance, delicensing and labor market institutions rather than the influence of individual states.

In column (6) we run the regression including state-industry, state-year and industry-year interactions with the unbalanced panel and find that the interaction coefficient remains negative and significant. One potential concern is that state labor regulations are responding to changes in economic performance following delicensing. Therefore,

---

interactions (as in column (2) of Table 2) the coefficient is 0.021 (s.e. 0.036).

<sup>19</sup>Bankruptcy laws and national labor regulations may have constrained exit in India resulting in new entrants crowding out the market share of less productive incumbents without actually forcing them to exit (see Fallon, 1987 and Fallon and Lucas, 1993).

<sup>20</sup>In the unbalanced panel we keep industries that exist in at least five states and which stay in the data for at least ten years. This drives the number of observations up to 24374.

<sup>21</sup>We have checked all our results using both strategies and find an almost identical pattern of effects. We adopt the more demanding strategy in the paper as this takes account of the fact that delicensing occurs predominately in 1985 and 1991.

in column (7) we interact delicense with state labor regulations in 1980. State level amendments to the Industrial Disputes Act are coded and cumulated from 1947 so column (7) is asking whether pre-delicensing cross-state variation in labor regulation affected how industries responded to delicensing in subsequent years. The interaction coefficient continues to be negative and significant indicating that industries located in more pro-employer states in 1980 tended to grow more quickly relative to those in pro-worker states after they were delicensed.

In column (8) we include a set of interactions between each state dummy and delicense. These interactions control for all fixed state characteristics which affect how industries respond to delicensing. We can think of a host of time invariant factors which differ across states that might affect how industries respond to the nationwide delicensing shock. This would include cross-state differences in labor regulation at the beginning of our sample period. Identification of the interaction coefficient now solely comes from changes in labor regulation during the 1980-1997 sample period. Even with this limited variation (see Figure 2) the coefficient remains negative and significant indicating that, after being delicensed, industries located in states which moved in a pro-employer direction experienced greater output growth relative to those located in states which moved in a pro-worker direction.

We now turn to two alternative measures of industrial performance, fixed capital and employment. The theory presented in section 3 predicts that, by removing regulations on productive capacity, delicensing induces reallocation and favors, within each industry, states with pro-employer labor regulations, where constraints on investments and productive capacity (and, hence, employment) were more binding before the reform. Table 4 presents the results. In columns (1)-(3) the dependent variable is fixed capital defined as the depreciated real value of machinery, equipment and structures in state-industries across the 1980-1997 period. Changes in fixed capital capture investment. In column (1) we estimate a specification without the interaction term. As with output, within each industry, we find that states which moved in a pro-worker direction tended to experience less investment relative to states moving in a pro-employer direction. Delicensing, however, exerts no significant direct impact on investment. In column (2) we interact the labor regulation and delicense variables in the baseline specification which includes state-industry and year fixed effects (BS). The interaction coefficient is negative and significant. The coefficient remains negative and significant in column (3) where we add industry-year and state-year interactions in our preferred augmented specification (AS). When delicensing occurred, industries in more pro-employer states experienced larger increases in investment relative to industries in pro-worker states.

Columns (4)-(6) focus on employment. The results are similar. The level effect of delicensing is positive but statistically insignificant. The interaction coefficients are negative and significant in both the baseline and augmented specification. Noticeably, in the augmented specification (AS), the point estimates of the interaction coefficient are very similar for the three outcome variables (see column (4) of Table 3, and columns (3) and (6) of Table 4). Liberalization had unequal effects across Indian states, and accentuated the importance of labor regulation in determining the trajectory of industrial activity in India.

To gauge the economic significance of our findings we construct a counterfactual of what would have happened to the distribution of output across Indian States had no reform occurred, or, more precisely, had delicensing had no heterogeneous effects in states with different labor regulations (i.e. we falsely assume that  $\theta(r_{st})(d_{it}) = 0$ ). We then compare this counterfactual series with fitted values from our preferred specification in column (4) of Table 3. This series shows us how output actually evolved as predicted by state-year dummies, industry-year dummies and labor regulation-delicense interactions. The difference between the two series is thus attributable to the heterogeneous effects of delicensing in states with different labor regulations.<sup>22</sup>

Taking exponents and summing across industries yields fitted and counterfactual values for the evolution of aggregate output in each state. Figure 3 displays the percentage difference between these two series. For neutral states there is no difference in the two series. For states that amended in a pro-worker or pro-employer direction the percentage difference is zero before the first wave of delicensing in 1985, when fitted and counterfactual output are equal to one another, and then diverges following delicensing. As Figure 3 demonstrates the differential effects of the reform on industrial performance are sizeable. The largest relative increases in output following delicensing are found in Andhra Pradesh and Tamil Nadu, the states with the most pro-employer labor regulations. Output in Andhra Pradesh and Tamil Nadu, is around 11% higher in 1997 relative to the counterfactual. In contrast, output in West Bengal and Maharashtra, the states with the most pro-worker regulations, is 19% and 10% lower. Similar results are found for employment and fixed capital.<sup>23</sup>

The results paint a consistent picture. State labor regulations affected in a sizeable fashion the relative development of manufacturing industry across Indian states following the delicensing episodes of the 1980's and the 1990's.

### 5.3 OMITTED VARIABLES

A potential concern with our results is that the delicensing and labor regulation variables may be picking up the effects of omitted variables which vary by industry-year and state-year and are correlated with state-industry output.

Trade tariffs which are set centrally but the extent to which vary across industries and years is a particular area of concern. Trade liberalization via reductions in tariffs was an important element of the liberalization package that India adopted from 1991 (see Topalova, 2004, 2005). We would therefore like to control for this other form of product market deregulation. To do this we combined auxiliary and countervailing duty rates and aggregated up to get a measure of average tariffs applied to each three-digit

---

<sup>22</sup>To construct our counterfactual we are, in effect, taking out the effect of the delicense-labor regulation interaction from the fitted series. The coefficients on both state-year and industry-year interactions terms are therefore assumed to be the same for the counterfactual as for our preferred fitted specification. Since industry-year and state-year effects will absorb, respectively, the level effects of delicensing and labor regulation the difference between the counterfactual and fitted series can only identify the heterogeneous effects of delicensing across states due to their labor market regulations.

<sup>23</sup>Our estimates imply that, relative to the counterfactual, employment in 1997 is 10% higher in Andhra Pradesh and Tamil Nadu, and 18% lower in West Bengal. Similarly fixed capital is 11% higher in Andhra Pradesh and Tamil Nadu and 20% lower in West Bengal.

industry over the 1980-1997 period. Tariffs were relatively flat in the 1980-1990 period and then fell sharply from 1991 onwards (see Table 1).

In column (1) of Table 5 we find a negative but statistically insignificant average effect of tariffs on output.<sup>24</sup> This lines up with the weak direct effects of delicensing on output that we observe in Table 3. As before the coefficient on labor regulation is negative and significant. In column (2) of Table 5 we interact tariffs with labor regulation in the baseline specification (BS). The estimated interaction coefficient is positive and significant. This would suggest that, within each industry, tariff reductions led to output expansion in pro-employer states relative to pro-worker states. This result, however, is not robust to the augmented specification (AS) which includes state-year and industry-year interactions (column (3)).

In columns (4)-(5) we include the interaction of labor regulation with both tariff and with delicensing alongside one another, using the baseline and augmented specification, respectively. In both specifications the labor regulation-delicensing interaction remains negative and significant indicating robustness to controlling for trade liberalization.

Another concern is that labor regulation may be a proxy for other state level policies and state-characteristics that may have influenced the effect of the delicensing reform within each state. Table 6 attempts to deal with such concerns. For simplicity, we restrict attention to the augmented specification (AS). In column (1) we include the interaction of log of real state development expenditure with delicense. Development expenditure includes state spending on health, education, infrastructure and administration and helps crudely to measure differences in human capital and infrastructure due to state government activities across time. The coefficient on the interaction is positive and significant suggesting that within each industry, states with larger development expenditure tend to gain more from the delicensing reform relative to those that spend less. The coefficient on labor regulation and delicensing, however, remains negative and significant when we include these controls. The labor regulation measure does not appear to be just picking up the propensity of state governments to promote education and develop infrastructure.

Labor market regulations may also be correlated with the technological level of industries in given states. To address this concern we construct a dummy for whether a state-industry is in the top, middle or bottom tercile of the cross-state distribution of labor productivity for a given year. We then interact the top and bottom tercile dummies with our delicense measure omitting the middle tercile interaction which serves as a reference. In column (2) we see that being in the top tercile is associated with a larger increases in output after delicensing relative to being in the middle tercile. Being in the bottom tercile is associated with smaller increases. Both effects are large in magnitude and highly statistically significant. Technological level clearly has a bearing on which state industries in a three-digit sector benefit from delicensing. Controlling for this, however, has little effect on the labor regulation-delicense interaction term which remains negative and significant. The direction of labor regulation in a state does not appear to be just proxying for how technologically advanced industries in a state are.

---

<sup>24</sup>The slight difference in the number of observations between Table 5 and Table 3 is due to the fact that there are a small number of three digit industries for whom tariff data is unavailable.

Many aspects of the policy environment are difficult to measure. In column (8) of Table 3 we have shown that our results are robust to including state-delicense interactions which controls for the role that unobserved time-invariant state characteristics may have played in mediating the impact of delicensing. Unobserved time varying state policies, however, remain a concern. As a further robustness check, we therefore add in controls for the political complexion of states on the grounds that policies towards the registered manufacturing sector are likely to be correlated with political outcomes. We expect past outcomes to matter as they determine the attitude towards business that prevails in the bureaucracy and polity. This attitude will affect a range of policy actions that we cannot observe in our data. We therefore assemble a picture of each state’s “political history” as measured by the number of years since 1957 that particular political groupings have held a majority of the seats in the state legislature.<sup>25</sup> The relevant groupings for this exercise are: the Congress party, the Janata parties, hard left parties, hindu parties and regional parties. The results are in column (3). The coefficient on interaction between labor regulation and delicense remains negative and significant when we control for the interaction between state political histories and delicense.<sup>26</sup> The same result holds if we use contemporaneous share of seats held in state assemblies in these five groupings interacted with delicensing.

#### 5.4 TIMING OF REFORMS

The timing of delicensing varies across industries. A natural question to ask is whether the identity of the industries delicensed in each wave matters. As a falsification check on our results we randomly pull “placebo” delicensing measures from the empirical distribution of delicensing years in the data.<sup>27</sup> The probability of an industry being delicensed in a given year matches that in the actual data (see Figure 1) but we randomize over the identities of industries. There are three main groups of industries in our data. Industries that delicensed in 1985, those that delicensed in 1991 and those that never delicensed. In effect our exercise amounts to randomly reshuffling industries across these groups. This is a direct test of whether the identity-year designation of industries captured in our delicensing measure industry matters for the results we observe.

Our first falsification exercise is summarized in Panel A of Table 7. We use Monte Carlo simulation to generate one hundred randomly-generated (“placebo”) delicensing measures and reestimate the coefficient on the interaction of this placebo measure with labor regulation. For these one hundred regressions we then report the percentage of times when the coefficient on the interaction term with actual delicensing has a higher absolute  $t$  statistic than that on the placebo measure interaction. We run this exercise with both the baseline specification (column (1)) which controls for state-industry and year effects and the augmented specification (column (2)) which controls for state-industry, state-year and industry-year fixed interactions. For both specifications we find

---

<sup>25</sup>Going earlier is not feasible as state boundaries were reorganised in the early 1950s along linguistic lines.

<sup>26</sup>The finding is the same if we count majority years from 1980 as opposed to 1957.

<sup>27</sup>We have tried a parallel exercise where the distribution is uniform so that there is an equal probability of delicensing in each year and find similar results.

that in 93% of the cases the actual delicensing interaction term is more significant than the random delicensing interaction term.

The second falsification exercise is summarized in Panel B of Table 7. Here we interact both the actual and randomly generated delicensing measures with labor regulation and include both interactions in the same regression. For the baseline specification (column (1)) we find that the actual delicensing-labor regulation interaction is significant in 99 out of the 100 regressions whereas the random delicensing-labor regulation interaction is only significant in 1 out of the 100 regressions. For our preferred augmented specification that includes state-year and industry-year interactions (column (2)) the actual delicensing-labor regulation interaction is significant in 98 out of the 100 regressions whereas the random delicensing-labor regulation interaction in 7 out of the 100 regressions. This is compelling evidence that the timing and identity of the industries delicensed is important for our empirical estimates.

A final concern is that the sequencing of delicensing may be driven by the underlying performance of industries. The fact that delicensing was a centrally managed technocratic reform that was, in part, triggered by largely unexpected shocks helps to deal with this concern. The first wave of delicensing followed Rajiv Gandhi's sudden rise to power in 1985 following the assassination of his mother Indira Gandhi a year before. The second wave of delicensing followed the assassination of Rajiv Gandhi and the sudden rise to power of Narasimha Rao. The concern that industries may have acted in anticipation of economic reforms seems therefore to be of limited importance.

A potentially more severe issue is the selection of industries that were delicensed in different waves. In particular, reformers in 1985 may have not chosen industries randomly. The concern is less severe for the 1991 wave as this covered most of the remaining industries, and the criterion for the exclusion of few industries was their strategic, environmental and social importance. The endogeneous sequencing would be a problem for our analysis if the selection criterion were correlated with the expected future performance of state-industries at the time of the reform. As a crude check on this we ran a cross-section regression of the year in which a three-digit industry was delicensed on output growth in that industry during the 1980-84 period (prior to the first wave of delicensing). This is intended to detect whether politicians selected in 1985 industries according to their degree of economic success. We find no evidence of a relationship between when an industry is delicensed and pre-reform output growth (the estimated coefficient of interest is -0.383, and the standard error is 1.436). Similar results are found using other measures of pre-reform industrial performance such as employment or labor productivity growth during 1980-84.<sup>28</sup> The absence of systematic differences in economic performance between industries that are delicensed in each of the two waves is reassuring.

## 6 CONCLUSIONS

The question of how to encourage industrial development has been one of the holy grails of development work. Intellectual fashions in this area have changed radically in the last

---

<sup>28</sup>The regression coefficients are, respectively, -0.74 (s.e. 1.57) and 0.23 (s.e. 1.25).

fifty years. India is an emblematic case, as it began its post-independence life as the poster child for planned industrialization, and shifted more recently to a market-oriented strategy.

This paper investigates whether the effects, on registered manufacturing output, of dismantling the ‘license raj’ – a system of central controls governing entry and expansion in this sector – vary across Indian states with different labor market regulations. We use the delicensing experiment to shine light on the role of local labor market institutions in determining industrial performance. The punchline is that output rose more in pro-employer states than it did in pro-worker states in response to the same delicensing reform. Therefore, in line with our theoretical predictions we find that delicensing resulted in a reallocation of industrial production from states with pro-worker labor institutions to states with pro-employer labor institutions. Dropping barriers to investment and entry via delicensing magnifies the disadvantage that states with poor institutions face. Reforming institutions and policies to create a more favorable investment climate thus becomes a more important and pressing concern after liberalization occurs.

Our results therefore emphasize how local institutions matter for whether industry in a region benefits or is harmed, in a relative sense, by the nationwide delicensing reform. This is in line with a small but growing trade liberalization literature which points to heterogeneous effects depending on the local institutional setting in which liberalization takes place. The take home message is that the focus should be squarely on the local policy and institutional environment in thinking about how to encourage growth in particular regions during periods of economic reform. Understanding which elements of this environment are important is critical to designing public policy to encourage industrialization and growth in a changing world.

## REFERENCES

- [1] Acemoglu, Daron, Philippe Aghion, and Fabrizio Zilibotti (2006) “Distance to Frontier, Selection, and Economic Growth”, *Journal of the European Economic Association*, 4, 1.
- [2] Aghion, Philippe, Nick Bloom, Richard Blundell, Rachel Griffith and Peter Howitt (2005a) “Competition and Innovation: An Inverted-U Relationship”, *Quarterly Journal of Economics*, 120(2), 701-728.
- [3] Aghion, Philippe, Richard Blundell, Rachel Griffith, Peter Howitt and Susan Prantl (2004) “Entry and Productivity Growth: Evidence from Microlevel Panel Data”, *Journal of the European Economic Association*, 2(2-3), 265-276.
- [4] Aghion, Philippe, Robin Burgess, Stephen Redding and Fabrizio Zilibotti (2005b) ‘Entry Liberalization and Inequality in Industrial Performance’, *Journal of the European Economic Association*, 3(2-3), 291-302.
- [5] Attanasio, Orazio, Pinelopi K. Goldberg and Nina Pavcnik (2005) “Trade Reforms and Income Inequality in Colombia”, *Journal of Development Economics*, forthcoming.
- [6] Banerjee, Abhijit and Andrew Newman (2003) “Inequality, Growth and Trade Policy”, MIT, mimeograph.
- [7] Bertrand, Marianne and Francis Kramarz (2002) “Does Entry Regulation Hinder Job Creation? Evidence from the French Retail Industry”, *Quarterly Journal of Economics*, 117(4), 1369-413.
- [8] Bertrand, Marianne, Sendhil Mullainathan and Esther Duflo (2004) “How Much Should we Trust Difference in Differences Estimates?”, *Quarterly Journal of Economics*, 119(1), 249-75.
- [9] Besley, Timothy and Robin Burgess (2004) “Can Labor Regulation Hinder Economic Performance? Evidence from India”, *Quarterly Journal of Economics*, 19(1), 91-134.
- [10] Bhagwati, Jagdish and Padma Desai (1970) *India Planning for Industrialization: Industrialization and Trade Policies Since 1951*, Oxford University Press: New Dehli.
- [11] Blanchard, Olivier and Francesco Giavazzi (2000) “Macroeconomic Effects of Regulation and Deregulation in Goods and Labor Markets”, *MIT Dept. of Economics Working Paper*, No. 01-02.
- [12] Butler, David, Ashok Lahiri and Prannoy Roy (1991) *India Decides : Elections 1952-1991*. New Delhi : Aroom Purie for Living Media India.

- [13] Caballero, Ricardo J., Kevin N. Cowan, Eduardo M.R.A Engel and Alejandro Micco (2004) "Effective Labor Regulation and Microeconomic Flexibility" mimeo Department of Economics, MIT.
- [14] Chaudhary, Shri (1987) *IDRA and Industrial Licensing with Rules, Forms, Notifications, Press Notes, Guidelines, Policies*, Bharat Law House: New Delhi.
- [15] Cunat, Alejandro and Marc Melitz (2005) "Labor Market Flexibility and Comparative Advantage", Harvard University, mimeograph.
- [16] Debroy, B and A. T. Santhanam (1993) 'Matching Trade Codes with Industrial Codes', *Foreign Trade Bulletin*, 24(1), 5-27.
- [17] Djankov, Simeon, Rafael La Porta, Florencio Lopez-de-Silanes and Andrei Shleifer (2002) "The Regulation of Entry", *Quarterly Journal of Economics*, CXVII, 1-37.
- [18] Fallon, Peter (1987), "The Effects of Labor Regulation upon Industrial Employment in India," World Bank Research Department Discussion Paper No 287.
- [19] Fallon, Peter and Robert E.B. Lucas (1993), "Job Security Regulations and the Dynamic Demand for Labor in India and Zimbabwe" *Journal of Development Economics*, XL, 241-275.
- [20] Goldberg, Penelopi and Nina Pavcnik (2004) "Trade, Inequality, and Poverty: What Do We Know? Evidence from Recent Trade Liberalization Episodes in Developing Countries", Brookings Trade Forum.
- [21] Government of India, *Customs Tariff of India*, New Delhi, various issues.
- [22] Government of India, *Economic Survey*, New Delhi, various issues.
- [23] Government of India, *Handbook of Industrial Policy and Statistics*, New Delhi, various issues.
- [24] Government of India (1948) *Industrial Policy Resolution*, New Delhi.
- [25] Government of India (1956) *Industrial Policy Resolution*, New Delhi.
- [26] Government of India (1980) *Statement on Industrial Policy*, New Delhi.
- [27] Government of India (1991) *Statement of Industrial Policy*, New Delhi.
- [28] Harrison, Ann (2005) "Globalization and Poverty", University of California Berkeley, mimeograph.
- [29] Hausmann, Ricardo and Dani Rodrik (2003) "Economic Development as Self-Discovery", *Journal of Development Economics*, 72, 603-633.

- [30] Hay, Donald (2001) "The Post-1990 Brazilian Trade Liberalization and the Performance of Large Manufacturing Firms: Productivity, Market Shares and Profits" *Economic Journal* 111, 620-41.
- [31] Hazari, Rabindra K. (1966) *Industrial Planning and Licensing Policy*, Interim Report to the Planning Commission, Bombay.
- [32] Holmes, Thomas J. (1998) "The Effect of State Policies on the Location of Manufacturing: Evidence from State Borders," *Journal of Political Economy*, CVI, 667-705.
- [33] Hsieh, Chang-Tai and Keong Woo (2005) "The Impact of Outsourcing to China on Hong Kong's Labor Market" forthcoming *American Economic Review*.
- [34] Krishna, Pravin and Devashish Mitra (1998) 'Trade Liberalization, Market Discipline, and Productivity Growth: New Evidence from India', *Journal of Development Economics*, 56, 447-62.
- [35] Levinsohn, James (1999) "Employment Responses to International Liberalization in Chile," *Journal of International Economics*, 47, 321-344.
- [36] Malik, P. L. (1997) *Industrial Law*, Seventeenth Edition, Eastern Book Company: Lucknow.
- [37] Melitz, Marc J. (2003) "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity", *Econometrica*, 71, 1695-1725.
- [38] Muendler, Marc-Andreas (2004), "Trade, Technology and Productivity: A Study of Brazilian Manufacturers 1986-1998". CESifo Working Paper Series No. 1148
- [39] Neary, Peter (1978) "Short-run Capital Specificity and the Pure Theory of International Trade", *Economic Journal*, 88, 488-510.
- [40] Pavcnik, Nina (2002) "Trade Liberalization, Exit, and Productivity Improvement: Evidence from Chilean Plants", *Review of Economic Studies*, 69(1), 245-76.
- [41] Rama, Martin (1997) "Organized Labor and the Political Economy of Product Market Distortions", *World Bank Economic Review*, 11(2), 327-55.
- [42] Rama, Martin and Guido Tabellini (1999) "Endogenous Distortions in Product and Labor Markets" World Bank Policy Research Working Paper No. 1413.
- [43] Rodrik, Dani and Francisco Rodriguez (2001) "Trade Policy and Economic Growth: A Skeptic's Guide to the Cross-National Evidence", (eds). Ben Bernanke and Kenneth S. Rogoff, *NBER Macroeconomics Annual*, MIT Press for NBER.
- [44] Rodrik, Dani and Arvind Subramanian (2004) "From "Hindu Growth" to Productivity Surge: The Mystery of the Indian Growth Transition", NBER Working Paper 10376.

- [45] Rosenstein-Rodan, Paul (1943) “Problems of industrialization of Eastern and Southeastern Europe.” *Economic Journal*, 53, 202–211.
- [46] Rosenstein-Rodan, Paul (1961). Notes on the Theory of the ‘Big Push’. In: Ellis, H.S., Wallich, H.C. Eds. , *Economic Development for Latin America*. St. Martin’s Press, New York.
- [47] Rostow, Walt W. (1952). *The Process of Economic Growth*. New York: Norton.
- [48] Sanyal, Paroma and Menon, Nidhiya (2005) “Labor Disputes and the Economics of Firm Geography: A Study of Domestic Investment in India” *Economic Development and Cultural Change*, 53, 825–854
- [49] Stiglitz, Joseph (2002) *Globalization and Its Discontents*, WW Norton and Co.
- [50] Topolova, Petia (2004) “Trade Liberalization and Firm Productivity: The Case of India”, *IMF Working Paper*, WP/04/28.
- [51] Topolova, Petia (2005) “Factor Immobility and Regional Impacts of Trade Liberalization: Evidence on Poverty and Inequality from India”, Yale University, mimeograph.
- [52] Treffer, Daniel (2004) “The Long and Short of the Canada-U.S. Free Trade Agreement”, *American Economic Review*, 94, 870-895.
- [53] Tybout, James, Jaime de Melo and Vittorio Corbo (1991) ‘The Effects of Trade Reforms on Scale and Technical Efficiency: New Evidence from Chile’, *Journal of International Economics*, 31(3-4), 231-50.
- [54] Verhoogen, Eric (2005) “Trade, Quality Upgrading and Wage Inequality in the Mexican Manufacturing Sector: Theory and Evidence from an Exchange Rate Shock”, Columbia University, mimeograph.

7 MATHEMATICAL APPENDIX

**Proof of Proposition 1** (a) First, from (2) we immediately get:

$$\Delta S_B - \Delta S_A = (w_A - w_B) \left[ \frac{1}{p-b} \left( 1 + \frac{b}{p} \right) - \frac{1}{p'} \right]. \quad (5)$$

Next, let  $p' = p'_L$  denote the post-equilibrium price in case of a totally inelastic demand,  $D(p) \equiv \bar{D}$ , calculated by setting  $\Delta S_B + \Delta S_A = 0$ . This yields:

$$p'_L = \left[ \frac{1}{p-b} \left( 1 + \frac{b}{p} \right) - \frac{b}{b} \left( \frac{2}{w_A + w_B} \right) \right]^{-1}.$$

Now, substituting for  $p' = p'_L$  into (5) gives:

$$\Delta S_B - \Delta S_A|_{D(p)=\bar{D}} = 2 \frac{w_A - w_B}{w_A + w_B} \frac{b}{\bar{p}} > 0.$$

Clearly, if  $\Delta S_B - \Delta S_A|_{D(p)=\bar{D}} > 0$ , then, *a fortiori*,  $\Delta S_B - \Delta S_A > 0$  holds in general, since (as  $D'(p) < 0$ )  $p' \geq p'_L$ .

(b) In the limit case where demand is totally inelastic, with  $D(p) \equiv \bar{D}$ , we have

$$\Delta S_B + \Delta S_A = 0.$$

This, together with

$$\Delta S_B - \Delta S_A > 0$$

immediately implies that  $\Delta S_B > 0$  and  $\Delta S_A < 0$ , establishing the proposition. **QED**

**Proof of Proposition 2** First, standard algebra (using the definition of  $\tilde{\theta}_s$ ) shows that

$$S_s(p', \infty, w) = \int_0^1 \left( \frac{\alpha p' \theta}{w_s} \right)^{\frac{\alpha}{1-\alpha}} d\theta = (1-\alpha) \left( \frac{p'}{p} \right)^{\frac{\alpha}{1-\alpha}} \tilde{\theta}_s^{-\frac{\alpha}{1-\alpha}} \bar{y}.$$

Then, note that for  $s \in \{A, B\}$ ,

$$\Delta S_s = (1-\alpha) \left( \frac{\alpha p'}{w_s} \right)^{\frac{\alpha}{1-\alpha}} - \left( \bar{y} - \frac{w_s}{p} \bar{y}^{\frac{1}{\alpha}} \right).$$

Let  $\zeta \equiv w_B/w_A$ , so that  $\zeta \in (0, 1)$ . Then:

$$\begin{aligned} \Delta S_B - \Delta S_A &= (1-\alpha) \left( \frac{\alpha p'}{w_A} \right)^{\frac{\alpha}{1-\alpha}} \left( \zeta^{-\frac{\alpha}{1-\alpha}} - 1 \right) \\ &\quad - (1-\zeta) \bar{y}^{\frac{1}{\alpha}} \frac{w_A}{p}. \end{aligned} \quad (6)$$

In the inelastic demand case where  $\Delta S_B + \Delta S_A = 0$ , we have

$$(1-\alpha) \left( \frac{\alpha p'_L}{w_A} \right)^{\frac{\alpha}{1-\alpha}} = \frac{2\bar{y} - (\zeta + 1) \bar{y}^{\frac{1}{\alpha}} \frac{w_A}{p}}{\zeta^{-\frac{\alpha}{1-\alpha}} + 1}. \quad (7)$$

Next, replacing  $p'$  in (6) by the expression of  $p'_L$  implied by (7), and simplifying terms, we obtain:

$$\Delta S_B - \Delta S_A|_{D(p)=\bar{D}} = \frac{2\bar{y}}{\zeta^{-\frac{\alpha}{1-\alpha}} + 1} \left( \zeta^{-\frac{\alpha}{1+\alpha}} - 1 - \bar{y}^{\frac{1-\alpha}{\alpha}} \frac{w_A}{p} \left( \zeta^{-\frac{\alpha}{1-\alpha}} - \zeta \right) \right) \quad (8)$$

$$\geq \frac{2\bar{y}}{\zeta^{-\frac{\alpha}{1-\alpha}} + 1} \left( \zeta^{-\frac{\alpha}{1+\alpha}} - 1 - \frac{\alpha p}{w_A} \frac{w_A}{p} \left( \zeta^{-\frac{\alpha}{1-\alpha}} - \zeta \right) \right) \quad (9)$$

$$= \frac{2\bar{y}}{\zeta^{-\frac{\alpha}{1-\alpha}} + 1} \Phi(\zeta) > 0, \quad (10)$$

where  $\Phi(\zeta) \equiv \left( \zeta^{-\frac{\alpha}{1+\alpha}} - 1 - \alpha \left( \zeta^{-\frac{\alpha}{1-\alpha}} - \zeta \right) \right)$ . The inequality (9) follows from the definition of  $\tilde{\theta}_A$  given in (4), from the assumption that  $\tilde{\theta}_A < 1$ , implying that  $\bar{y}^{\frac{1-\alpha}{\alpha}} \leq \alpha p/w_A$ , and from the fact that, since  $\zeta^{-\frac{\alpha}{1-\alpha}} > \zeta$ , the right hand-side of (8) is decreasing in  $\bar{y}^{\frac{1-\alpha}{\alpha}}$ . The inequality (10) follows from the fact that, in the range  $\zeta \in (0, 1)$ ,  $\Phi'(\zeta) < 0$ , and from the fact that  $\Phi'(1) = 0$  (thus,  $\Phi(\zeta) > 0$  in the relevant range). Finally, since  $p' \geq p'_L$ , by (6),  $\Delta S_B - \Delta S_A|_{D(p)=\bar{D}}$  is a lower bound to  $\Delta S_B - \Delta S_A$ .  $\Delta S_B - \Delta S_A|_{D(p)=\bar{D}} > 0$  implies therefore that  $\Delta S_B > \Delta S_A$  for any demand elasticity, establishing the first part of the proposition. The second part of the proposition follows from the same argument as in the proof of Proposition 1. **QED**

## 8 DATA APPENDIX

The main source of data is the Indian *Annual Survey of Industries (ASI)*. Our dataset covers the 16 main Indian states that account for around 95% of the Indian population. Data on production activity in the ASI are reported at the level of three-digit manufacturing industries by state for the period 1980-97. **Number of factories** is the number of production units employing ten or more workers with electricity, or twenty or more workers without electricity, on any day of the preceding twelve months and therefore registered under sections 2m(i) and 2m(ii) of the Factories Act 1948. **Output** is gross output, which comprises the total ex-factory value of products and by-products manufactured as well as other receipts such as receipts from non-industrial services and additions to the stock of semi-finished goods. It is expressed in real terms by deflating using industry-specific output price deflators from the *Handbook of Industrial Policy and Statistics*. **Employment** is all employees, including production and non-production workers. **Fixed capital** is the depreciated value of fixed assets that have a normal productive life of more than one year, including machinery, equipment and structures. It is expressed in real terms by deflating using the output price deflator for Machinery and Equipment from the *Handbook of Industrial Policy and Statistics*.

The ASI data are reported according to the *National Industrial Classification (NIC)* 1970 from 1980-88 and according to the NIC 1987 from 1989-97. Most three-digit industries can be mapped one-to-one between the 1970 and 1987 classifications. In those cases where a one-to-one mapping did not exist, we aggregated three-digit industries together until a one-to-one mapping could be constructed. A full correspondence between the 1970 and 1987 NIC classifications is available from the authors on request. Miscellaneous manufacturing industries are catch-all categories which are likely to include

heterogeneous activities in different states and therefore they are excluded from the sample. The three-digit industries ‘Minting of Currency Coins’ and ‘Processing of Nuclear Fuels’ are likely to be shaped by non-economic factors and therefore these industries are also excluded from the sample.

The ASI is a census of factories above 100 employees and of factories in certain specified industries. The data on factories below 100 employees is a stratified sample. Some state-industries with low employment levels are observed for a small number of years and repeatedly enter and exit the data. We restrict attention to state-industries on which there are data for at least 10 years. We also report results for the balanced panel of state-industries that are observed in all eighteen years from 1980 to 1997.

Our delicensing measure was constructed as follows. Appendix II of The Industries Development and Regulation Act (IDRA) of 1951 reports a comprehensive list of the “Scheduled Industries” subject to industrial licensing (Malik 1997). We assigned three-digit codes to each of the scheduled industries listed in the Act. From the Press Notices and Notifications issued by the Ministry of Commerce and Industry, we tracked the years in which individual scheduled industries were delicensed during the 1980s (Chaudhary 1987, various issues of the Government of India’s Economic Survey, and the Handbook of Industrial Policy and Statistics 1987). In 1991 industrial licensing was disbanded in all but a small number of industries where licensing was retained “for reasons related to security and strategic concerns, social reasons, problems related to safety and over-riding environmental issues, manufacture of products of hazardous nature and articles of elitist consumption.” (Government of India 1991). The Statement of Industrial Policy in 1991 specifies a list of industries where licensing was retained. Subsequent revisions to the list of licensed industries from 1991 onwards were tracked from the Press Notices and Notifications published in various issues of the Handbook of Industrial Statistics. In this way, we were able to determine the year in which each individual three-digit registered manufacturing industry was delicensed. Two independent codings were carried out to ensure consistency. **Delicense** is a dummy variable which is equal to one from the year in which all or part of a three-digit industry is delicensed and zero otherwise. A full account of how the delicensing variable was coded for each three-digit industry in India is available in a web-based data appendix.

Tariff rates for three-digit manufacturing industries were constructed based on actual rates of duty specified in the *Customs Tariff of India* manuals published through the *Central Board of Excise and Customs*, Department of Revenue, Ministry of Finance. The **applied tariff** is composed of basic duty, auxiliary duty and countervailing duty. The majority of duties are ad valorem. Specific duties were converted into ad valorem rates based on historical price data for products. The applied tariff is calculated according to the following formula:

$$\text{Applied tariff} = \text{basic} + \text{auxiliary} + \frac{(100 + \text{basic} + \text{auxiliary}) * \text{countervailing}}{100}$$

Data were collected on rates of duty for 1981 and 1984 based on the product classification of the Brussels Tariff Nomenclature (BTN). BTN products were mapped to four and five-digit Standard International Trade Classification Revision 2 (SITC Rev. 2)

products using an official concordance from the World Customs Organization (WCO). SITC Rev.2 products were then mapped to three-digit industries using the concordance in Debroy and Santhanam (1993).

Data were collected on rates of duty for 1988, 1992 and 1997 based on the six-digit product classification of the Harmonized System (HS). HS products were mapped to three-digit industries using the concordance in Debroy and Santhanam (1993).

The applied tariff for each three-digit industry was calculated as the arithmetic average of the applied tariffs on all products mapped to the three-digit industry. Three-digit industry tariffs for 1980 were assumed to equal their values in 1981. Three-digit industry tariffs for the years in between 1981, 1984, 1988, 1992 and 1997 were calculated using linear interpolation.

The **labor regulation** variable comes from state specific text amendments to the Industrial Disputes Act 1947 as reported in Malik (1997). Following Besley and Burgess (2004) each amendment was coded in the following way: a 1 denotes a change that is pro-worker or anti-employer, a 0 denotes a change that we judged not to affect the bargaining power of either workers or employers and a -1 denotes a change which we regard to be anti-worker or pro-employer. There were 121 state specific amendments which was coded in this manner. Where there was more than one amendment in a year we collapsed this information into a single directional measure by adding up the codes for the different constituent amendments. Thus reforms to the regulatory climate are restricted to taking a value of 1, 0, -1 in any given state and year. To create the measure we use we then cumulated these scores over time in each state between 1947 and 1997.

The data on **political histories** comes from Butler, Lahiri and Roy [1991] and from data from the Indian Electoral Commission. This primary data is aggregated into five political groupings which are defined in the text and expressed as shares of the total number of seats in state legislatures. State political configurations are held constant between elections. Political history is measured by the number of years since 1957 that a particular political groupings have held a majority of the seats in the legislature. In our data period, the relevant groupings are: the Congress party, the Janata parties, hard left parties and regional parties. These groupings contain the following parties (i) Congress Party (Indian National Congress + Indian Congress Socialist + Indian National Congress Urs + Indian National Congress Organization), (ii) Janata parties (Lok Dal+Janata+Janata Dal), (iii) a hard left grouping (Communist Party of India + Communist Party of India Marxist), (iv) a grouping made up of Hindu parties (Bharatiya Janata Party) and a (v) grouping made up of regional parties. **Development expenditure** refers to state spending on economic services (agriculture, rural development, special area programs, irrigation and flood control, energy, industry and minerals, transport and communications, science, technology and environment) and social services (education, medical and public health, family welfare, water supply and sanitation, housing, urban development, labour and labour welfare, social security and welfare, nutrition and relief). The primary source is an annual publication, *Public Finance Statistics* (Ministry of Finance, Government of India). This information is also collated in the Reserve Bank of India's annual publication Report on *Currency and Finance*.

**Table 1: Descriptive Statistics**

	1980	1985	1990	1997	All Years
<b>Delicensing</b>					
Number of industries delicensed	0	41	44	102	82.29
Percentage of real output delicensed	0	47.68	56.94	92.57	74.53
Percentage of employment delicensed	0	43.05	47.81	88.15	68.31
<b>Labor Regulation</b>					
Pro-worker labor regulation	-0.16 (1.04)	-0.05 (1.42)	0.13 (1.65)	0.13 (1.65)	0.04 (1.52)
<b>Trade liberalization</b>					
Mean applied tariff	119.19 (44.74)	142.31 (47.69)	132.53 (38.94)	47.58 (21.34)	117.62 (49.22)
<b>Industrial performance</b>					
Mean log real output	11.47 (1.96)	11.88 (1.93)	12.31 (1.96)	12.68 (2.20)	12.13 (2.02)
Mean log employment	7.22 (1.70)	7.37 (1.57)	7.46 (1.58)	7.55 (1.69)	7.43 (1.61)
Mean log number of factories	3.30 (1.34)	3.42 (1.29)	3.50 (1.30)	3.58 (1.36)	3.46 (1.32)
Mean log real fixed capital	9.78 (2.12)	10.39 (2.03)	10.74 (2.12)	11.27 (2.46)	10.61 (2.20)
Observations	1018	1018	1018	1018	18324

**Notes:** The data set is a balanced panel of three-digit state-industries that are present in the data in all 18 years and includes an average of 64 three-digit industries in the 16 states over the period 1980 to 1997. Numbers in parentheses are standard deviations across state-industries in a particular year. See the data appendix for further information on variable definitions and data sources.

**Table 2: Average Effects of Delicensing on Net Entry in India: 1980-1997**

	(1)	(2)	(3)
	Log No. Factories	Log No. Factories	Log No. Factories
Delicense	0.064*** (0.024)	0.060*** (0.019)	0.064*** (0.024)
Labor Regulation			-0.062** (0.027)
Observations	18324	18324	18324
R-squared	0.92	0.92	0.92
State-industry fixed effects	YES	YES	YES
Year effects	YES		YES
State-year effects		YES	

**Notes:** Robust standard errors adjusted for clustering on state×year delicensed are reported in parentheses. \*\*\* denotes statistical significance at the 1% level; \*\* denotes statistical significance at the 5% level; \* denotes statistical significance at the 10% level. Delicense is a dummy variable which is one if all or part of a three-digit industry is delicensed in a particular year and zero otherwise. State amendments to the Industrial Disputes Act are coded 1=pro-worker, 0=neutral, -1=pro-employer and then cumulated over the period to generate the labor regulation measure. The data set is a balanced panel of three-digit state-industries that are present in the data in all 18 years and includes an average of 64 three-digit industries in the 16 states over the period 1980 to 1997.

**Table 3: Delicensing, Labor Regulation and Industrial Performance in India: 1980-1997**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Log Real Output	Log Real Output	Log Real Output	Log Real Output	Log Real Output	Log Real Output	Log Real Output	Log Real Output
Labor Regulation	-0.137*** (0.044)	-0.074* (0.040)	-0.077** (0.039)					
Delicense	0.031 (0.043)	0.038 (0.044)	0.020 (0.040)					
Labor Regulation × Delicense		-0.070*** (0.018)	-0.066*** (0.018)	-0.054** (0.024)	-0.054*** (0.018)	-0.043** (0.020)		-0.202*** (0.078)
1980 Labor Regulation × Delicense							-0.062* (0.035)	
Observations	18324	18324	24374	18324	18324	24374	18324	18324
R-squared	0.89	0.89	0.88	0.91	0.92	0.91	0.92	0.92
State-industry fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Year effects	YES	YES	YES					
State-year effects				YES	YES	YES	YES	YES
Industry-year effects				YES	YES	YES	YES	YES
State-delicense effects								YES
Balanced panel	YES	YES		YES	YES		YES	YES
Unbalanced panel			YES			YES		
Clustering	State×ydel	State×ydel	State×ydel	State×ydel	State×ind	State×ydel	State×ydel	State×ydel

**Notes:** Robust standard errors adjusted for clustering by state×year delicensed are reported in parentheses in columns (1)-(4) and (6)-(8). In column (5) standard robust standard errors are reported for clustering by state×industry. \*\*\* denotes statistical significance at the 1% level; \*\* denotes statistical significance at the 5% level; \* denotes statistical significance at the 10% level. Delicense is a dummy variable which is one if all or part of a three-digit industry is delicensed in a particular year and zero otherwise. State amendments to the Industrial Disputes Act are coded 1=pro-worker, 0=neutral, -1=pro-employer and then cumulated over the period to generate the labor regulation measure. 1980 labor regulation is the labor regulation measure of states as of 1980. The data set for columns (1)-(2), (4)-(5) and (7)-(8) is a balanced panel of three-digit state-industries that are present in the data in all 18 years and includes an average of 64 three-digit industries in the 16 states over the period 1980 to 1997. The data set for columns (3) and (6) is an unbalanced panel where industries are in the data for at least ten years and are active in at least five states.

**Table 4: Delicensing, Labor Regulation, Investment and Employment in India: 1980-1997**

	(1)	(2)	(3)	(4)	(5)	(3)
	Log Real Fixed Capital	Log Real Fixed Capital	Log Real Fixed Capital	Log Employment	Log Employment	Log Employment
Labor Regulation	-0.066*	-0.030		-0.092***	-0.037	
	(0.040)	(0.044)		(0.033)	(0.028)	
Delicense	0.011	0.015		0.032	0.038	
	(0.056)	(0.056)		(0.034)	(0.034)	
Labor Regulation × Delicense		-0.039**	-0.054***		-0.060***	-0.050***
		(0.020)	(0.020)		(0.013)	(0.019)
Observations	18324	18324	18324	18324	18324	18324
R-squared	0.85	0.85	0.89	0.90	0.90	0.93
State-industry fixed effects	YES	YES	YES	YES	YES	YES
Year effects	YES	YES		YES	YES	
State-year effects			YES			YES
Industry-year effects			YES			YES

**Notes:** Robust standard errors adjusted for clustering on state×year delicensed are reported in parentheses. \*\*\* denotes statistical significance at the 1% level; \*\* denotes statistical significance at the 5% level; \* denotes statistical significance at the 10% level. Delicense is a dummy variable which is one if all or part of a three-digit industry is delicensed in a particular year and zero otherwise. State amendments to the Industrial Disputes Act are coded 1=pro-worker, 0=neutral and -1=pro-employer and then cumulated over the period to generate the labor regulation measure. The data set is a balanced panel of three-digit state-industries that are present in the data in all 18 years and includes an average of 64 three-digit industries in the 16 states over the period 1980 to 1997.

**Table 5: Trade Liberalization, Labor Regulation and Industrial Performance in India, 1980-97**

	(1)	(2)	(3)	(4)	(5)
	Log Real Output	Log Real Output	Log Real Output	Log Real Output	Log Real Output
Labor Regulation	- 0.132 (0.043)	-0.360*** (0.084)		-0.191* (0.098)	
Delicense				0.049 (0.044)	
Tariff Rate	-0.003 (0.048)	-0.006 (0.051)		-0.008 (0.050)	
Labor Regulation × Tariff Rate		0.051*** (0.015)	0.009 (0.019)	0.026 (0.016)	0.008 (0.020)
Labor Regulation × Delicense				-0.061*** (0.020)	-0.059*** (0.024)
Observations	17783	17783	17783	17783	17783
R-squared	0.89	0.89	0.92	0.89	0.92
State-industry fixed effects	YES	YES	YES	YES	YES
Year effects	YES	YES		YES	
State-year effects			YES		YES
Industry-year effects			YES		YES

**Notes:** Robust standard errors adjusted for clustering on state×year delicensed are reported in parentheses. \*\*\* denotes statistical significance at the 1% level; \*\* denotes statistical significance at the 5% level; \* denotes statistical significance at the 10% level. Delicense is a dummy variable which is one if all or part of a three-digit industry is delicensed in a particular year and zero otherwise. Tariff rate is the log tariff rate applied to a three digit industry. State amendments to the Industrial Disputes Act are coded 1=pro-worker, 0=neutral and -1=pro-employer and then cumulated over the period to generate the labor regulation measure. The data set is a balanced panel of three-digit state-industries that are present in the data in all 18 years and includes an average of 64 three-digit industries in the 16 states over the period 1980 to 1997.

**Table 6: Robustness to Interactions with State and State-Industry Characteristics**

	(1)	(2)	(3)
	Log Real Output	Log Real Output	Log Real Output
Labor Regulation × Delicense	-0.048** (0.023)	-0.061** (0.026)	-0.053** (0.023)
Log Development Exp × Delicense	0.236** (0.101)	-0.065 (0.101)	-0.026 (0.114)
Top Tercile × Delicense		0.472*** (0.032)	0.472*** (0.031)
Bottom Tercile × Delicense		-0.520*** (0.032)	-0.521*** (0.032)
Congress Majority × Delicense			-0.002 (0.005)
Hard-left Majority × Delicense			0.004 (0.018)
Regional Majority × Delicense			0.005 (0.006)
Janata Majority × Delicense			0.019 (0.017)
Hindu Majority × Delicense			0.080 (0.076)
Observations	18324	18324	18324
R-squared	0.92	0.93	0.93
State-industry fixed effects	YES	YES	YES
State-year effects	YES	YES	YES
Industry-year effects	YES	YES	YES

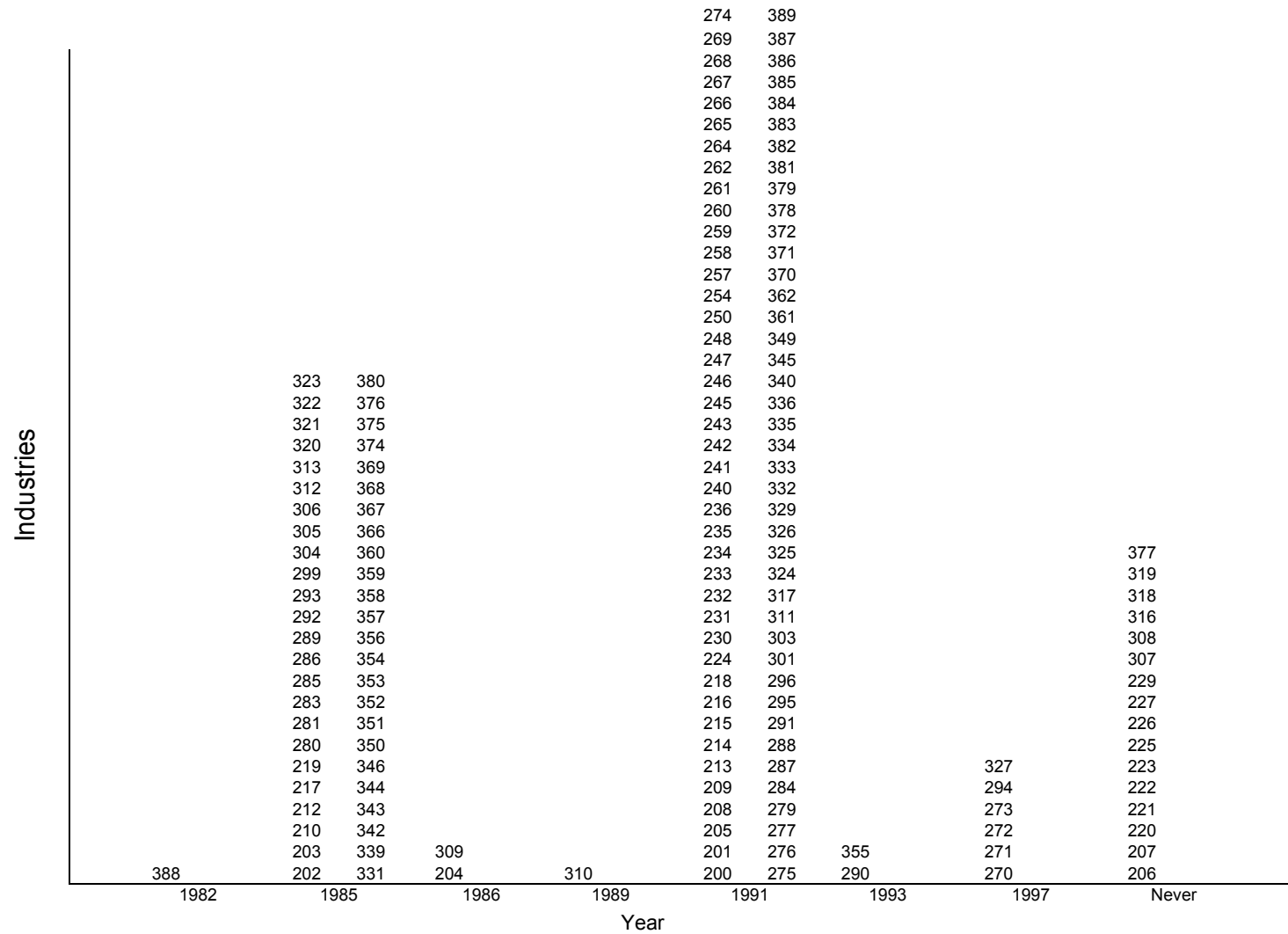
**Notes:** Robust standard errors adjusted for clustering on state×year delicensed are reported in parentheses. \*\*\* denotes statistical significance at the 1% level; \*\* denotes statistical significance at the 5% level; \* denotes statistical significance at the 10% level. Delicense is a dummy variable which is one if all or part of a three-digit industry is delicensed in a particular year and zero otherwise. State amendments to the Industrial Disputes Act are coded 1=pro-worker, 0=neutral and -1=pro-employer and then cumulated over the period to generate the labor regulation measure. Log development expenditure is real per capita state spending on social and economic services. Top tercile is a dummy which is one if a state-industry lies in the top third of the cross-state within-industry productivity distribution and zero otherwise. Bottom tercile is a dummy which is one if a state-industry lies in the bottom third of the cross-state within-industry productivity distribution and zero otherwise. Congress, hard left, Janata and regional majority are counts of the number of years for which these political groupings held a majority of the seats in the state legislatures since 1957. The data set is a balanced panel of three-digit state-industries that are present in the data in all 18 years and includes an average of 64 three-digit industries in the 16 states over the period 1980 to 1997.

**Table 7: Falsification Checks on the Timing of Delicensing**

	(1)	(2)
<b>Panel A: Actual Versus Random Delicensing</b>		
Percentage of times the actual delicensing-labor regulation interaction has a higher t-statistic than the random delicensing-labor regulation interaction	93%	93%
<b>Panel B: Including Both Actual and Random Delicensing</b>		
Percentage of times the actual delicensing-labor regulation interaction is significant at the 5% level	99%	98%
Percentage of times the random delicensing-labor regulation interaction is significant at the 5% level	1%	7%
Distribution of random delicensing years	Empirical	Empirical
State-year dummies	NO	YES
Industry-year dummies	NO	YES
Balanced panel	YES	YES
Clustering	State-year delicensing	State-year delicensing

**Notes:** The table reports the results of Monte Carlo simulations. In each Monte Carlo simulation, one hundred random delicensing measures are created. Industries are allocated a random year of delicensing and a random delicensing measure is created that equals one from the random year of delicensing onwards and zero otherwise. Random years of delicensing are based on the empirical distribution of delicensing years. For each Monte Carlo simulation, the table reports statistical significance across one hundred regressions using the random delicensing measures. Standard errors are adjusted for clustering by state  $\times$  year of delicensing.

**Figure 1 : Industries Delicensed by Year of Delicensing**



**Notes:** numbers refer to three-digit manufacturing industries from the Indian National Industrial Classification (NIC) 1987

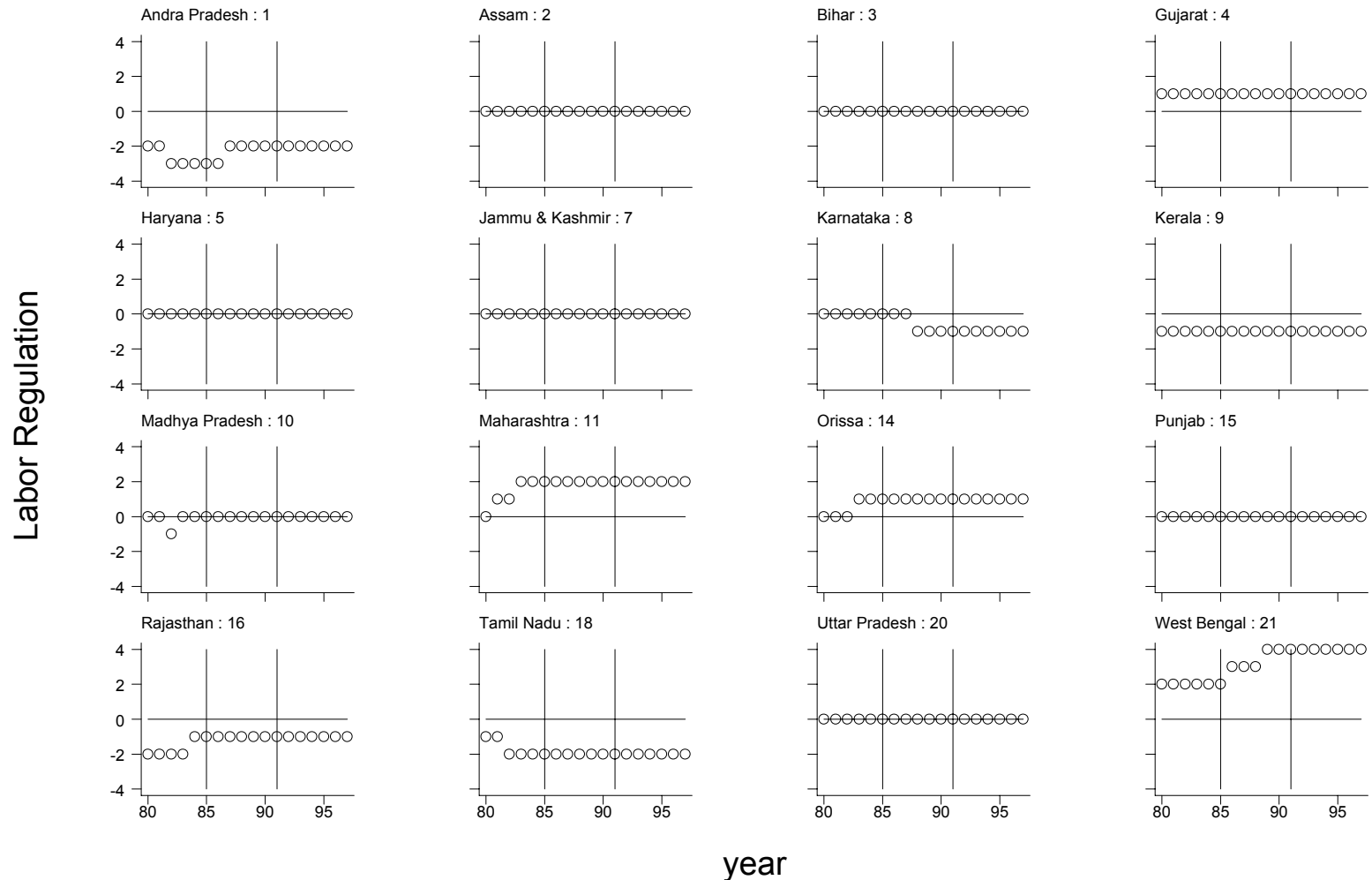
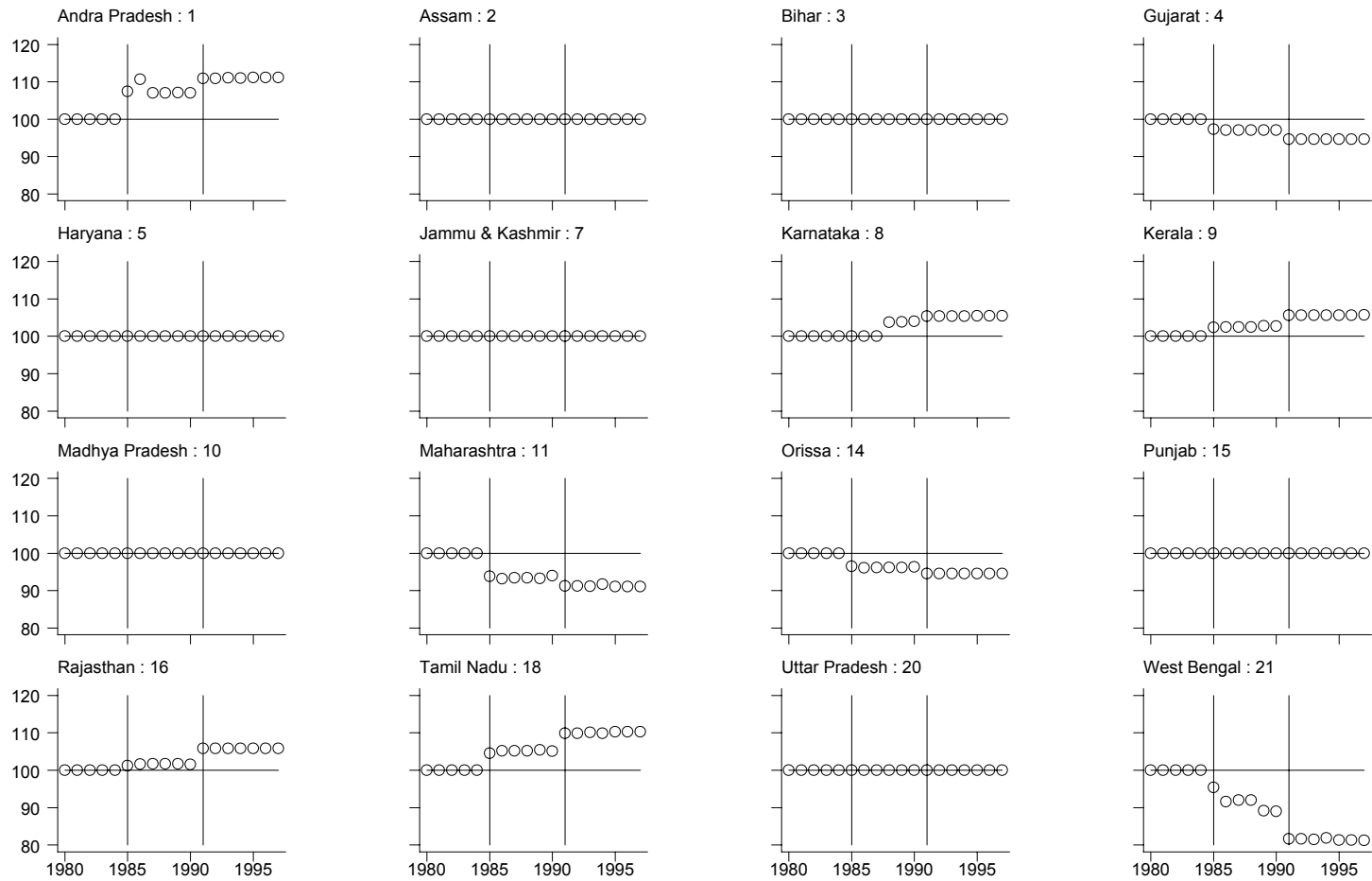


Figure 2: Labor Regulation by State

(No Delicensing = 100)



Predicted Deviations from State-Year and Industry-Year Dummies  
Figure 3: Percentage Change in Relative State Output