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EVIDENCE FROM DISMANTLING THE LICENSE RAJ IN INDIA

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**ABSTRACT**

We study the effects of the progressive elimination of the system of industrial regulations on entry and production, known as the "license raj," on registered manufacturing output, employment, entry and investment across Indian states with different labor market regulations. The effects are found to be unequal depending on the institutional environment in which industries are embedded. In particular, following delicensing, industries located in states with pro-employer labor market institutions grew more quickly than those in pro-worker environments.

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## 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 industrial policy and reforms need to be “appropriate” to other elements of the economic environment, such as the state of technology and the organization of credit and labor markets. The interaction between competition-enhancing policies and other institutions is, in their view, a key element to design economic reforms and assess their effects.

In this paper we take a step in this direction. 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 political and policy autonomy, resulting in a large variation of institutional environments with which the nationwide industrial policy reform interacts. In particular, we focus on differences in labor market institutions.

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 March 1985 (with few extensions in 1986 and 1987), whereas most of the remaining

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<sup>1</sup> Among the critical views, see Hausman and Rodrik (2002), Rodrik and Rodriguez (2000), Stiglitz (2002), and Rodrik *et al.*, (2004). The effects on income inequality are stressed by Banerjee and Newman (2003), and Attanasio *et al.* (2005). Goldberg and Pavcnik (2004) provide a summary of the empirical evidence on the effects of liberalization on inequality.

industries were delicensed in 1991. Trade barriers (tariffs) were also slashed in the 1990's. Labor market institutions also started from a common nationwide framework, the Industrial Disputes Act, approved in 1947, which regulated industrial relations in the organized manufacturing sector. However, under the Indian constitution states were entitled to amend the Act, and amendments were in fact extensively introduced. As a result, labor market institutions gradually evolved, and there was a large extent of heterogeneity across Indian states at the time of the industrial policy reforms of the 1980's and 1990's.

To guide the analysis, 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 regulations on firms' production activity would benefit states where labor market institutions are more business-friendly, and possibly harm states there are biased in favor of workers.

Then, we move to the empirical analysis. We track manufacturing industries using a three-digit state-industry panel for the sixteen main states of India (covering over 95% of the Indian population). We use panel data from the Annual Survey of Industries covering the period 1980-1997 which spans the main period of delicensing in India. For each of these years we have state-specific industrial outcomes for an average of 85 three-digit industries in each year yielding about twenty-four thousand observations. We have also 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 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. Within each industry, pro-employer states benefitted from the reform relative to pro-worker states in terms of output, employment, capital accumulation and the number of factories. In pro-worker states we find that delicensing actually depressed industrial performance relative to what would have happened had the license raj remained in place. Our results stand up to a wide variety of robustness checks. We find a similar interaction effect between labor market institutions and a measure of the extent of the trade liberalization that was mainly carried out in the early 1990's.

In previous work we have documented descriptively that the process of reform in the 1980's and 1990's was associated with increasing cross-state inequality in industrial performance (Aghion *et al.* 2005b). There, we showed that the timing and the variation across industries of the inequality trends is associated with the process of delicensing. In

particular, inequality started growing earlier for industries that delicensed in 1985, while it only grew later for industries that delicensed in 1991, and does not grow for industries that never delicensed. The results of this paper emphasize that institutional differences across states are an important factor in the unequal response of state-industries, and illustrate the importance of the interaction between fast-moving product market deregulation (delicensing, trade liberalization) and slow-moving labor market regulation in explaining the evolution of cross-state industrial performance.<sup>2</sup>

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; Caballero and Hammour, 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, Aghion *et al.* (2004 and 2005a and 2005b) and Aghion and Griffith (2005). Aghion et al (2005a), in particular, 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, Trefler, 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, and Rama and Tabellini, 1999; Blanchard and Giavazzi, 2002, Cunat and Melitz, 2005; Harrison, 2005, Topalova, 2005).

The paper is structured as follows. Section 2 reports on 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 main econometric 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>3</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

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<sup>2</sup>The distinction between fast moving and slowmoving institutions is discussed in Roland (1994), who, however, refers to social norms and values as slow-moving institutions.

<sup>3</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).

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>4</sup>

The development of the organized manufacturing sector became tightly regulated. 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 (iv) 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>5</sup> There was also considerable uncertainty as to whether license applications would be approved and within what time frame. For example, 35% of license 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>6</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, raise exemption and expansion limits and to exempt specific product lines from the provisions of the 1951 Industries Act. 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 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

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<sup>4</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 (Industrial Policy Resolution, 1956).

<sup>5</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.

<sup>6</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.

son Rajiv Gandhi unexpectedly came to power following his mother'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 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 delicensing on industrial performance was affected by the state of labor institutions in the Indian states.

### 3 A SIMPLE MODEL OF INDUSTRY EQUILIBRIUM

To guide the empirical analysis of the following sections, we construct a stylized model of industry equilibrium where the reduction of barriers to entry and of regulation to productive activity 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>7</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>8</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,  $\theta \in [0, 1]$ .

### 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 endogenous 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  $[0, \bar{b}]$ , and is assumed to be independent of productivity. In particular,  $\phi(\omega) = \phi_0 \equiv \bar{b}^{-1}$ , for all  $\omega \in [0, \bar{b}]$ . 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 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  $\pi_{is} > 0$ , i.e., 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

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

Total supply equals then  $S_A(p, b, w_A) + S_B(p, b, w_B)$ . The industry equilibrium re-

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<sup>7</sup>Higher labor costs is a catch-all for a variety of regulations to the use of labor that can include flexibility, minimum wages dismissal law, working time conditions etc.. Modelling explicitly labor market institutions is beyond the scope of the stylized model presented in this section.

<sup>8</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).



quires then:

$$D(p) = \left(1 - \frac{b}{\bar{b}}\right) \left(2 - \frac{w_A + w_B}{p - b}\right)$$

where  $D(p)$  is the aggregate industry demand. We assume throughout that  $D'(p) \leq 0$ .

We now analyze the effect of delicensing, i.e., 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.

**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 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  $\Delta S_A < 0$ .*

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

$$\Delta S_B - \Delta S_A = (w_A - w_B) \left[ \frac{1}{p - b} \left(1 + \frac{b}{\bar{b}}\right) - \frac{1}{p'} \right]. \quad (3)$$

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:

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

Now, substituting for  $p' = p'_L$  into (3) gives:

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

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

The liberalization reform causes high-productivity firms which were previously credit-constrained to enter in both states, but 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 costs and barriers to the expansion of productive capacity in existing firms. In order for the theory to generate predictions on the effects of this aspect, we shall 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 (e.g., 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. If unconstrained, firms would set their optimal production level such that the marginal product of labor equals the unit labor cost, i.e.,  $\alpha x^{\alpha-1} = w/(p\theta)$ , or, identically,

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

However, prior to delicensing, prohibitive barriers prevent firms from expanding production above the level  $\bar{y}$ . Since, absent constraints, more productive firms would produce more output, this ceiling is binding for high-productivity firms but not for low-productivity ones. As before, we assume that  $w_A > w_B$ . Prior to delicensing, production in State  $s \in \{A, B\}$  equals:

$$S_s(p, \bar{y}, w) = \int_0^{\tilde{\theta}_s} \left( \frac{\alpha p \theta}{w_s} \right)^{\frac{\alpha}{1-\alpha}} d\theta + (1 - \tilde{\theta}_s) \bar{y} = (1 - \alpha \tilde{\theta}_s) \bar{y}, \quad (4)$$

where<sup>9</sup>

$$\tilde{\theta}_s = \min \left[ \frac{w_s}{\alpha p} \bar{y}^{\frac{1-\alpha}{\alpha}}, 1 \right] \quad (5)$$

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 (4)-(5). Standard algebra (using the definition of  $\tilde{\theta}_s$ ) shows that

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

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

$$\begin{aligned} & \int_0^{\tilde{\theta}_c} \left( \frac{\alpha p \theta}{w_c} \right)^{\frac{\alpha}{1-\alpha}} d\theta + (1 - \tilde{\theta}_c) \bar{y} = \left( \frac{\alpha p}{w_c} \right)^{\frac{\alpha}{1-\alpha}} (1 - \alpha) \tilde{\theta}_c^{\frac{1}{1-\alpha}} + (1 - \tilde{\theta}_c) \bar{y} \\ & = (1 - \alpha) \frac{w_c}{\alpha p} \bar{y}^{\frac{1}{\alpha}} + (1 - \tilde{\theta}_c) \bar{y} = (1 - \alpha \tilde{\theta}_c) \bar{y} \end{aligned}$$

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.

**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  $\Delta S_A < 0$ .*

**Proof of Proposition 2** First, 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 (5), 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

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, the number of factories 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 Melitz (2003). In his theory, firms with heterogeneous 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> Melitz's model differs from ours in two respects. First, it has only one factor market and firm-level productivity is the only source of heterogeneity, whereas our focus is on the interplay between liberalization and the heterogeneity in labor markets. Second, his 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

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<sup>10</sup>In his model, the reduction in trade costs induces entry by more productive firms which can afford the fixed exporting cost. This increases domestic labor demand and therefore the real domestic wage rate, which in turn forces more low productivity firms to exit, as their profit margins become too small for them to cover their fixed production costs.

<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.

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 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 1985-1990 wave about one third of all three-digit industries are delicensed and in the 1991-1997 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. To take account of this variation we construct a second measure of delicensing where we have separate dummies for whether a three-digit industry is delicensed in the 1985-1990 wave or the 1991-1997 wave. Table 1 documents that the number of industries, share of output and share of employment delicensed 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 Debroy 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

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<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.

<sup>13</sup>We take arithmetic averages rather than weighting by import shares to avoid the bias introduced

the attractive feature that they capture the actual tariff rate applied by customs officials at the Indian border, taking into account auxiliary and countervailing duty. 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, 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 state-industries on which data exist for at least ten years and to industries where at least five states are active within the same three-digit industry in any year. This leaves us with an unbalanced panel of approximately 24,000 observations on an average of 85 three-digit industries in the 16 states over the 18-year time period from 1980 to 1997. We also use a balanced panel data set which contains approximately 18,000 observations on state-industries that exist in all 18 years of the data. The balanced panel comprises an average of 64 three-digit industries in the 16 states over the period 1980 to 1997. 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 unbalanced 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

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by endogenous import shares. With elastic demand, higher tariffs reduce the share of a product in industry imports.

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>14</sup> It has been extensively amended by state governments during the post-Independence period. It is these amendments that we use to study the impact of labor market regulation on manufacturing performance and poverty.

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 from 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 “treatment” or “control” states. 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, 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 that suggest that our labor regulation measure is capturing salient elements of the investment climate 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 such as work-days lost through strikes and lock-outs for the pre-1992 period. Sanyal and Menon (2005) demonstrate that new industrial plants in India tend to open more in pro-employer states which suffer less from industrial disputes.

As Figure 2 makes it clear there is some variation in the direction of amendments across states during our 1980-1997 period. We can therefore examine whether this variation affects industrial performance at the state-industry level. Our main focus of interest, however, is on the interaction between nationwide delicensing and state labor regulation. We look at this interaction using both the time varying labor regulation

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<sup>14</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).

measure and a simpler measure which classifies states into pro-employer, neutral and pro-worker categories which are time invariant.

## 5 EMPIRICAL ANALYSIS

### 5.1 METHOD

We run panel data difference-in-difference regressions of the form:

$$y_{ist} = \alpha_{is} + \beta_t + \gamma d_{it} + \mu r_{st} + \theta(r_{st})(d_{it}) + \theta z + \varepsilon_{ist} \quad (11)$$

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),  $z$  are control variables such as industry and state time trends,  $\alpha_{is}$  are state-industry fixed effects which control for any unobserved time invariant determinants of net entry in a particular three-digit industry in a specific state (e.g. natural endowments, location), and  $\beta_t$  are year dummies which control for common macroeconomic shocks. The variable  $u_{ist}$  is a stochastic error. To address serial correlation concerns and to allow for heteroskedasticity, the standard errors are clustered on state-three-digit industry (see Bertrand, Mullainathan and Duflo 2004).

In the specification shown the level effect of delicensing ( $\gamma$ ) captures the impact of delicensing for a control state that has not amended labor regulation in either a pro-worker or pro-employer direction ( $r_{st} = 0$ ). We are interested in assessing how the impact on industrial performance of a common delicensing reform varies according to the state institutional environment. The impact of delicensing for pro-worker or pro-employer states is found from the sum of the main effect and the interaction effect evaluated at the value of state labor regulation ( $\gamma + \theta r_{st}$ ). The theory presented in section 3 predicts that  $\theta$  should be negative, and the test of this prediction constitutes the core of the empirical analysis.

### 5.2 AVERAGE EFFECTS OF DELICENSING ON ENTRY AND OUTPUT

Before turning to the main analysis we examine a specification without the interaction term to see whether delicensing affects entry. This is an important check as it allows us to test whether the licensing system really acted as a barrier to entry. Columns (1) and (2) of Table 2 confirms that this is the case for our unbalanced and balanced panels. Delicensing is associated with an increase in the number of factories operating in a three-digit industry. 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 5-6 percent.

In column (3), we split out the two waves of reforms by including separate delicensing dummies according to whether an industry was delicensed between 1985 and 1990 or between 1991 and 1997. Both delicensing variables are significant and of similar magnitude indicating that the reform waves that begun in 1985 and 1991 respectively were both effective in encouraging entry. We find a similar pattern when we run the same regression on the balanced panel in column (4). Our results are robust to the inclusion



of state time trends which helps to control for unobserved time-varying state characteristics (column (5)). Including time trends for individual three-digit industries to control for differential patterns of technological change and weighting by employment share in 1980 to control for sampling errors also leaves our results unaffected (column (6)). We continue to find that delicensed industries experience significantly more rapid growth in the number of factories relative to industries that remain subject to licensing.

Table 3 carries out the same analysis for output. The evidence turns out to be mixed. We find no significant effect on output in the unbalanced (column (1)) nor in the balanced sample (column (2)). However, when we separate out the 1985-1990 and 1991-1997 delicensing waves (columns (3) and (4)) we see evidence that the 1985-1990 delicensing wave was associated with an increase in industrial output while the 1991-1997 wave was not. We find an identical pattern of results for employment. In the specifications with state (column (5) and industry (column (6)) time trends we continue to find no significant association between delicensing and industrial output. This suggests that additions to output and employment from entry and expansion in some state-industries is counterbalanced by contraction (and, to some degree, exit) in others.<sup>15</sup> The average effect of delicensing on output and employment is, at best, small.

We now turn our attention to the heterogeneous response of states and industries to delicensing, which is the main focus of our analysis.

### 5.3 BASIC RESULTS

In column (1) of Table 4 we include both our labor regulation and delicensing measures separately. As before the effect of delicensing remains insignificant. The coefficient on the labor regulation measure, however, is negative and significant. Pro-worker regulations have a negative effect on registered manufacturing output. This result lines up with the state level results in Besley and Burgess (2004) for the longer 1958-1992 period.

In column (2) we include the interaction term between our labor regulation and delicensing measures. The coefficient is negative and significant. This tells us that when delicensing occurred, state-industries in more pro-worker states experienced smaller (possibly negative) increases in output than those located in pro-employer states. We find a similar result when we run the regression on the balanced panel (column (3)). The coefficients of the level effect of delicense capture the effect of the reform for states which did not amend the 1947 Industrial Disputes Act. For such states, as well as for those states which amended the Act in a pro-employer direction the reform had, on average, a positive effect. However, the effect was negative for all states which amended the Act in a pro-worker direction.

Column (4) breaks out our delicensing measure into the 1985-1990 and 1991-1997 waves and interacts this with the our labor regulation measure in the year prior to an industry being delicensed.<sup>16</sup> We find that the coefficients on both interactions are negative and significant (and, actually, very similar). The institutional environment

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<sup>15</sup>Labor regulations and bankruptcy laws limit the exit in India which helps explain why we observe positive effects of delicensing on number of factories.

<sup>16</sup>Results are similar if we use the time varying labor regulation measure interacted with dummies for delicensing in the 1985-1990 and 1991-1997 periods.

prevailing in a state in the pre-delicensing year affected the impact of delicensing in both the 1985 and 1991 waves. This is an important result as it shows that both delicensing waves are important in explaining our interaction result in column (2).

In column (5) of Table 4 we use the average of our labor regulation measure in each state across the 1980-1997 period (see Figure 2) to divide the states into three groups – pro-worker states (Gujarat, Maharashtra, West Bengal) where average labor regulation score is above zero, control states (Assam, Bihar, Haryana, Jammu and Kashmir, Madhya Pradesh, Punjab, Uttar Pradesh) where there has been no amendments in either direction since 1947 and hence the labor regulation score is zero and pro-worker states (Andhra Pradesh, Karnataka, Kerala, Rajasthan and Tamil Nadu) where the labor regulation score is below zero. We interact dummies for pro-worker and pro-employer status with our delicensing measure leaving control states as the omitted reference category. Column (5) shows that when delicensing occurs it is the state-industries in pro-employer states that expand output relative to those in control states. The coefficient on the interaction between pro-worker status and delicensing is of the opposite sign but is not significant.

In column (6) we break our labor regulation even further dividing state into strong pro-employer (Andhra Pradesh, Rajasthan and Tamil Nadu) defined as having an average score over the period less than  $-1$ , moderate pro-employer (Karnataka, Kerala, Madhya Pradesh) defined as having a score between 0 and 1, moderate pro-worker (Gujarat, Orissa) defined as having a score between 0 and 1 and strong pro-worker (Maharashtra, West Bengal) defined as having a score greater than 1. The omitted category, as before, is the neutral states. We see in column (6) that strong pro-employer and strong pro-worker states move in opposite directions relative to neutral states. Both these interaction effects are highly significant but of opposite signs. The effects of nationwide delicensing are, indeed, unequal depending on the state of labor market institutions in Indian states.

In column (7) we take the labor regulation score in the year prior to delicensing. This helps to guard against our interaction effect being driven by changes in labor regulation across time. The interaction terms remains negative and significant and of similar magnitude relative to the baseline result in column (2). This complements the analysis where we interacted the labor regulation score prior to delicensing for three-digit industries delicensed in the 1985-1990 and 1991-1997 waves (column (4)). In column (8) we include political controls to control for unobserved government policies which may affect output. These controls are the share of seats in the state legislature held by the five main political groupings in India: the congress parties, the hard left parties, the Janata parties, the Hindu nationalist parties and regional parties. The composition of the political groupings is discussed in further detail in the data appendix and the excluded group is other parties. The interaction between labor regulation and delicensing continues to be negative and significant.

Column (9) includes state-time trends to take account of the unobserved time varying effects of state characteristics on output. This is important as there is a whole host of unobserved state characteristics which may affect the evolution of industrial output in a state. Column (10) includes three-digit industry-time trends to control for time varying

effects of industry characteristics on output and weights by employment share in 1980 to control for sampling errors. Industries, for example, may experience different rates of technological change. In both specifications the interaction between labor regulation and delicensing remains significant indicating that our basic result in column (2) is robust to the inclusion of such controls.<sup>17</sup> Taken together the results in Table 4 confirm the main prediction of our theory that delicensing has an expansionary effect in pro-employer states relative to pro-worker states.

In Table 5 we widen our set of left hand-side variables to include employment, number of factories and fixed capital. In columns (1)-(3) we see a pattern of results for employment which mirrors that for output. Moving in a pro-worker direction is associated with falls in employment (column (1)). When delicensing occurs being in a pro-worker state is associated with a contraction of employment relative to being in a pro-employer state (columns (2) and (3)). The fact that the output and employment effects line up increases our confidence that state labor institutions are important in determining the impact of delicensing on output.

Delicensing allows firms to enter new state-industries or expand production in existing establishments beyond what was permitted under pre-existing licenses. Firms may also decide to invest in new production processes and technologies to increase their productivity as a means of capturing a greater share of the market. The extent to which they respond through these mechanisms should depend upon the quality of the institutional environment in which firms are embedded. *Ceteris paribus* we might expect the entry and investment response of state-industries to the same delicensing shock to be different depending on whether they are in pro-worker or pro-employer state.

Columns (4)-(9) of Table 5 investigate this possibility using number of factories and fixed capital as proxies of investment. In Column (4) we see that moving in a pro-worker direction is associated with a reduction in entry into a state-industry whereas delicensing is associated with an increase in entry. Delicensing and labor regulation thus pull in opposite directions. In column (5) we see that the interaction between delicensing and labor regulation is negative and significant. This tells us that when delicensing occurred, state-industries in more pro-employer states experienced larger increases in net entry than those located in pro-worker states. In column (6) we divide states into pro-worker and pro-employer categories and interact these with our delicensing measure leaving control states as the comparison group. In line with our results for output we find that, relative to the situation in control states, it is pro-employer states that are attracting the bulk of new entry after delicensing occurs. This helps to explain why we see an expansion in output in state-industries located in these states following delicensing.

In columns (7)-(9) we see a similar pattern for fixed capital. Pro-worker regulation is associated with lower state-industry investment (column (7)). When a state-industry

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<sup>17</sup>The results are similar if we include three-digit industry time trends but do not weight observations by employment shares. The estimated coefficient on the interaction between delicensing and labor regulation in this case is -0.067 (s.e. 0.013). We also run a specification where we include both state trends and three digit industry-time trends. The coefficient on the interaction between delicensing and labor regulation continues to be negative and statistically significant -0.033 (s.e. 0.016). In this case, however, the coefficient becomes marginally insignificant (-0.020, s.e 0.013) when we also weight by employment shares in 1980.

is delicensed we see that labor institutions have the usual impact: industries in pro-employer states attract more investments than their counterparts in pro-worker states within the same three-digit sector (column (8)). Relative to control states it is pro-employer states that have benefited from delicensing (column (9)). The fact that entry, fixed capital and output results line up points to investment incentives differing across pro-worker and pro-employer states when delicensing occurs. The investment results are important as they help uncover the mechanism as to why output (and employment) expands more in pro-employer states relative to neutral and pro-worker states when and three-digit industry is delicensed.

#### 5.4 MAGNITUDES AND COUNTERFACTUALS

The estimates in Table 4 can be used to quantify the impact of the dismantling of the license raj on industrial development across Indian states with different labor market institutions. From equation (11), the percentage change in an industrial outcome due to delicensing varies with state labor market institutions as follows:

$$\% \text{ impact delicensing} = \gamma + \theta r_{st} \tag{12}$$

We can use this formula to evaluate the impact of delicensing on aggregate measures of industrial development. To this aim, we first run the specification from column (2) of Table 4 and calculate, using the formula (12), a counterfactual for what the log-production level would have been in a state-industry had delicensing not occurred. We then take exponents and sum across industries to evaluate the predicted impact of delicensing on total manufacturing output in each state. Figure 3 graphs the difference between predicted real output and this counterfactual for all Indian states. This exercise takes into account not only the estimated impact of delicensing but also industrial structure in each Indian states.

The largest positive effects of delicensing on state output are found in Andhra Pradesh and Tamil Nadu (and to a lower extent Karnataka, Kerala and Rajasthan), i.e., the states with the most pro-employer labor regulations. The largest negative effects are found in West Bengal and Maharashtra, i.e., the state with most pro-worker labor regulations. For instance, in Andhra Pradesh and Tamil Nadu output in the manufacturing sector was 15% higher in 1997 than if there had been no reform. In West Bengal, to the opposite, output was 20% lower in 1997 than if there had been no reform. In many Indian states (for example, those with neutral labor market institutions), the effects of the reforms are of negligible size, reflecting the small magnitude of the average effects. The results are similar for employment, number of factories and fixed capital.<sup>18</sup> The consequences for delicensing impact of having different types of labor market regulations in an Indian state are thus sizeable.

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<sup>18</sup>Due to the reforms, employment was 13% larger in Andhra Pradesh and Tamil Nadu, and 13% lower in West Bengal. Fixed capital was 9% larger in Andhra Pradesh and Tamil Nadu, and 9% lower in West Bengal.

## 5.5 TRADE LIBERALIZATION

While the main focus of our analysis is on delicensing, trade liberalization via reductions in tariffs was another important form of product market deregulation which took place in India during the 1990's. We have constructed a measure of tariff barriers for each three-digit industry in India for the period 1980-1997. Tariffs were relatively flat and in some cases increasing for the period 1980-90. Tariff reductions were concentrated from 1991 onwards and were therefore somewhat contemporaneous with the second delicensing wave.

In column (1) of Table 6 we find a positive but statistically insignificant average effect of tariffs on output. This lines up with the weak effects of delicensing on output that we observe in Table 3. In column (2) of Table 6 we interact tariffs with labor regulation: the estimated interaction coefficient is positive and significant. This implies that, within each industry, tariff reductions led to output expansion in pro-employer states relative to pro-worker states. This fact is confirmed in column (3) where we interact pro-worker and pro-employer status with our tariff measure leaving control states as the omitted reference group. The pro-employer interaction is negative and significant indicating that tariff reductions had a more positive effect on pro-employer states relative to neutral and pro-worker states. This lines up with the result on delicensing in Table 4.

In column (4) we include the interaction of labor regulation both with tariff and with delicensing. The delicensing interaction remains negative and significant indicating robustness to controlling for trade liberalization. The magnitude of the coefficient is almost unaffected by the inclusion of the tariff interaction. The same is true when we include the time invariant measure of labor regulation in the year prior to delicensing (column (5)). The tariff interaction itself is positively signed although no longer statistically significant at conventional levels.

In column (6) we break out delicensing into the 1985-1990 and 1991-1997 waves and interact with labor regulation. Both interaction terms remain negative and significant and of similar magnitude to the specification in column (4) of Table 4 where tariffs and their interactions with labor regulation were not included. This is a useful robustness check, as the first delicensing wave precedes the period of tariff reduction, while the second is contemporaneous to it. The size of the coefficient on the tariff interaction falls but remains significant in column (5) at the 10 percent level. In summary, our delicensing results are robust to including tariffs and of their interaction with labor regulation.

## 5.6 ADDITIONAL ROBUSTNESS CHECKS

We now consider a variety of robustness checks to address two further important issues. First, we check that it is the variation over industries and time embedded in our delicense measure that is responsible for our results. Second, we discuss issues related to the endogeneity of the timing and sequencing of reforms.

### 5.6.1 *Spurious Correlation*

In Table 7 we undertake two falsification exercises that compare the results of our baseline specification in column (2) of Table 4 with findings from a sequence of randomly

generated (“placebo”) delicensing measures. The random delicensing measures were constructed as follows. For each industry, we randomly chose a year from our time period and imposed that random year as a hypothetical time when the industry was delicensed. Each random delicensing measure is zero before the hypothetical year of delicensing and one afterwards. Each falsification exercise involved a Monte Carlo simulation that constructed one thousand of these random delicensing measures.

The first falsification exercise re-estimated the baseline specification from column (2) of Table 4 using each of the randomly generated delicensing measures in the place of our baseline measure. We included both the level of the random delicensing variable and its interaction with labor regulation. We compared the statistical significance of the interaction term between random delicensing and labor regulation in each of the one hundred regressions with the statistical significance of the interaction term using our actual delicensing measure. We also compared the overall goodness of fit of specifications with random and actual delicensing as measured by the regression  $R^2$ . As shown in Column (1) of Table 7, the absolute value of the  $t$ -statistic on our actual delicensing interaction exceeded the absolute value of the  $t$ -statistic on the random delicensing interaction in more than 99% of the 1000 simulations. The regression  $R^2$  using our actual delicensing measure exceeded that using the random delicensing measure in more than 96% of the 1000 simulations. Both findings suggest that there is important information in our actual measure of the timing and identity of industries delicensed based on the official policy announcements of the Ministry of Industry.

The second falsification exercise re-estimated the baseline specification from column (2) of Table 4 including each of the randomly generated delicensing measures alongside our baseline measure. We included both a level and interaction term with labor regulation for random and actual delicensing measures. As shown in column (2) of Table 7, the interaction term between actual delicensing and labor regulation was statistically significant in all 1000 simulations, while the interaction term between random delicensing and labor regulation was statistically significant in 11% of the simulations. The actual delicensing measure dominates random measures, though the interaction term between random delicensing and labor regulation is sometimes statistically significant, which is not surprising given the necessary positive correlation between actual and random delicensing. Again these results again provide clear evidence that the timing and identity of the industries delicensed matters for our results. Taken together, the results tighten the link between delicensing in a particular industry and a specific time period and the post-delicensing impact of labor market institutions.

Column (1) of Table 8 continues in this vein. We construct a hypothetical measure of delicensing, where we falsely assume that industries delicensed during our sample were delicensed three years prior to their true year of delicensing. We include the hypothetical measure and the interaction between the hypothetical measure and labor regulation alongside our baseline measures in the specification of column (2) of Table 4. The estimated coefficient on the interaction between our baseline measure and labor regulation remains of a similar size and statistically significant. The coefficient on the interaction term between the hypothetical measure and labor regulation is insignificant. Again this is evidence that our delicensing measure is capturing salient elements of the competitive

environment facing industries in Indian states.

Columns (1) and (2) of Table 7 include interaction terms between labor regulation and a post-1985 dummy and a post-1991 dummy, respectively.<sup>19</sup> This is to control for the possibility that our delicensing variable captures “across the board” effects of the 1985 and 1991 reforms (rather than those limited to the industries that were delicensed). We continue to find a negative and highly significant coefficient on the interaction term between delicensing and labor regulation, suggesting that it is indeed the cross-industry variation in our delicensing measure that is responsible for our results.

Finally, we checked that our findings are not driven by individual states. We sequentially excluded each state from the sample and re-estimated our baseline 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.

### 5.6.2 *Endogeneity of Reforms*

Delicensing was a centrally managed technocratic reform that seems to have been triggered by largely unexpected shocks. 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. Similarly, large-scale trade liberalization did not occur until 1991 and was again driven by the sudden rise to power of Narasimha Rao, the macroeconomic crisis, and the adoption of the IMF structural adjustment programme. The concern that firms 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.<sup>20</sup> The endogenous 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. We could also worry that industries were selected according to political criteria that would be correlated with the distribution of political power across states with different labor market institutions. These concerns could be properly addressed if it were possible to identify valid instruments, namely, variables which are correlated with the delicense indicator, but not directly with state-industry economic performance trends. Unfortunately, this strategy did not appear feasible to us.

We performed instead some imperfect experiments, which we report in Table 9, aimed to show that endogeneity is unlikely to be a first-order issue. In column (1), we run a cross-section regression of the year in which an industry was delicensed on

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<sup>19</sup>We cannot control simultaneously for the two dummy variables, as a combination of them would be almost perfectly collinear to our delicense measure (since almost all industries were delicensed in either 1985 or 1991).

<sup>20</sup>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.

output growth during the 1980-84 period prior to the first wave of delicensing. We find no evidence of a relationship between when an industry is delicensed and pre-reform output growth. In column (2), we run a similar experiment for trade liberalization. We run a cross-section regression of the percentage point reduction in tariffs between 1988 and 1997 on rates of growth of output respectively during 1980-84. We find no correlation between the size of future tariff reductions and output growth prior to trade liberalization. Therefore, neither of the experiments detect any evidence of systematic differences in economic performance across industries that are correlated with future delicensing or trade liberalization.<sup>21</sup>

In Columns (3) and (4) of Table 9, we examine whether delicensing and trade liberalization were influenced by politico-economic factors (e.g., protection for sale, as emphasized by Grossman and Helpman, 1994). Political parties have different attitudes towards economic liberalization, partly for ideological reasons and partly because of the nature of their constituency. The distribution of stakes political parties hold across states (which, if politics are persistent, is likely to be correlated with labor market institutions) may therefore have shaped the intensity of the support parties offered to the delicensing of particular industries. For instance, political parties which were opposed to liberalization (e.g., because it represents the interests of either unionized workers or insider firms) would tend to oppose particularly strongly delicensing industries that represent a large share of employment in states where they have large stakes.

To test whether such politico-economic factors influenced the timing of reforms, we exploit variation across states and over time in the political power of parties and in the employment structure within the manufacturing sector. In particular, we construct industry-employment weighted averages of the share of seats in state legislatures held by each of the main political groupings in India. We then run an industry-time regression of delicensing on these measures. This will give us a sense of the extent to which the central delicensing process is affected by state politics. Since elections are held approximately every four years, we lag the political measures four years. We find no evidence of a correlation between an industry being delicensed and industry-employment weighted state political representation (column (3)). Column (4) shows a similar lack of correlation between the level of tariff barriers and state political representation. While these results cannot rule out the influence of other politico-economic factors, they provide no evidence of a relationship between reform and patterns of political power across states.

## 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 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.

In this paper, we study the effects of the progressive elimination of the system of

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<sup>21</sup>Similar results were found using other measures of pre-reform industrial performance such as employment or labor productivity growth during 1980-84.



industrial regulations on entry and production, known as the “license raj”, on registered manufacturing output, employment, entry and investment across Indian states with different labor market regulations. The punchline of the paper is contained in Figure 3 – registered manufacturing fell in some states and rose in others in response to the same delicensing reform depending on the state of labor institutions in an Indian state. 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.

Our results emphasize how local institutions and policies matter for whether a region benefits or is harmed by nationwide liberalization reforms. 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 reforms. Understanding which elements of this environment are important is critical to designing public policy to encourage industrialization and growth in a changing world.

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## 7 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. **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. **Real output** is output deflated by industry-specific output

price deflators from the *Handbook of Industrial Policy and Statistics*. **Real fixed capital** is fixed capital deflated by 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).

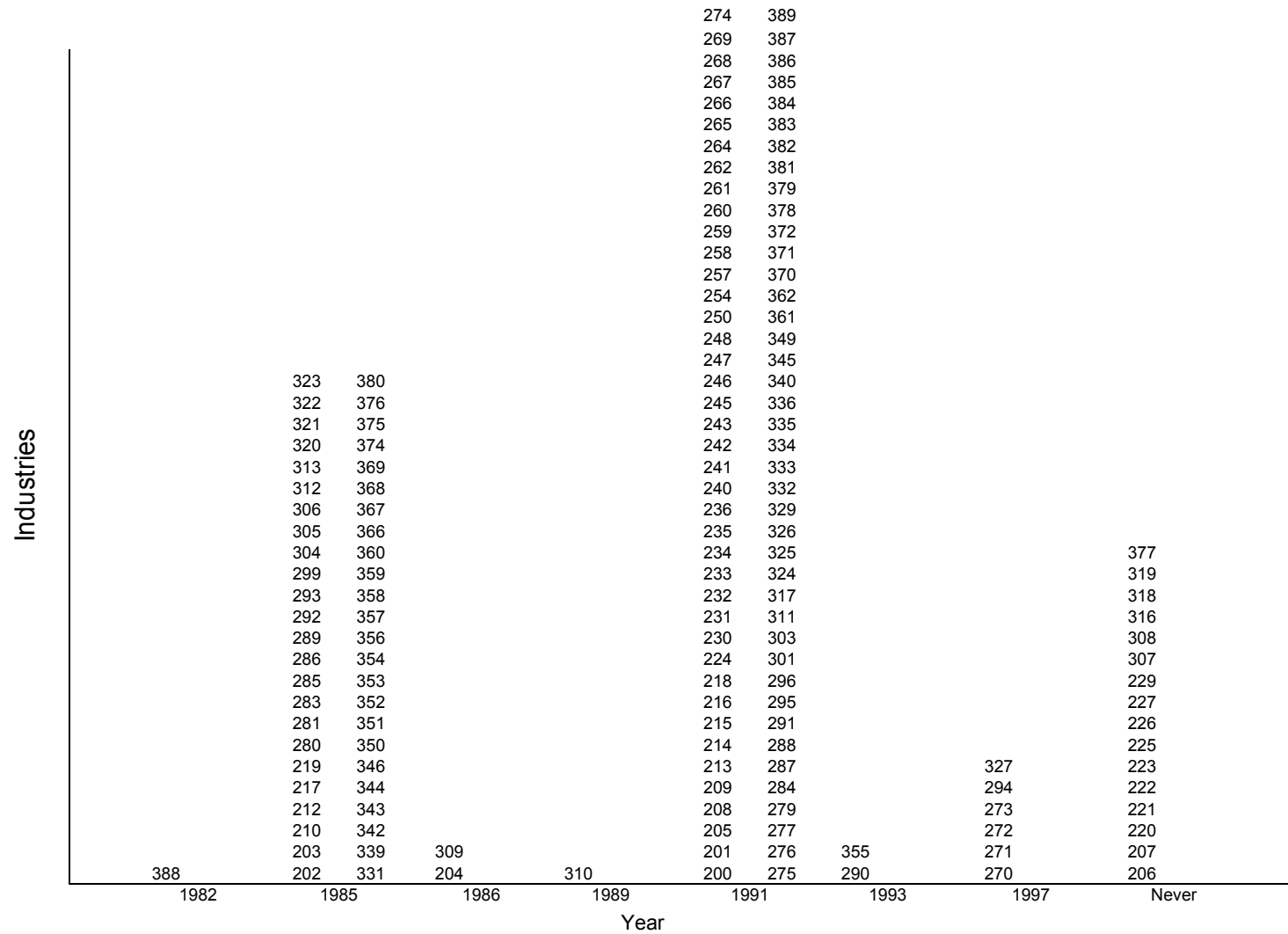
The applied tariff for each three-digit industry was calculated as the arithmetic average of the applied tariffs on all products mapped to the three-digit industry. Three-digit industry tariffs for 1980 were assumed to equal their values in 1981. Three-digit industry tariffs for the years in between 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). This primary data is aggregated into four political groupings which are defined below and expressed as shares of the total number of seats in state legislatures. State political configurations are held constant between elections. 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), and a (iv) grouping made up of regional parties.



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



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

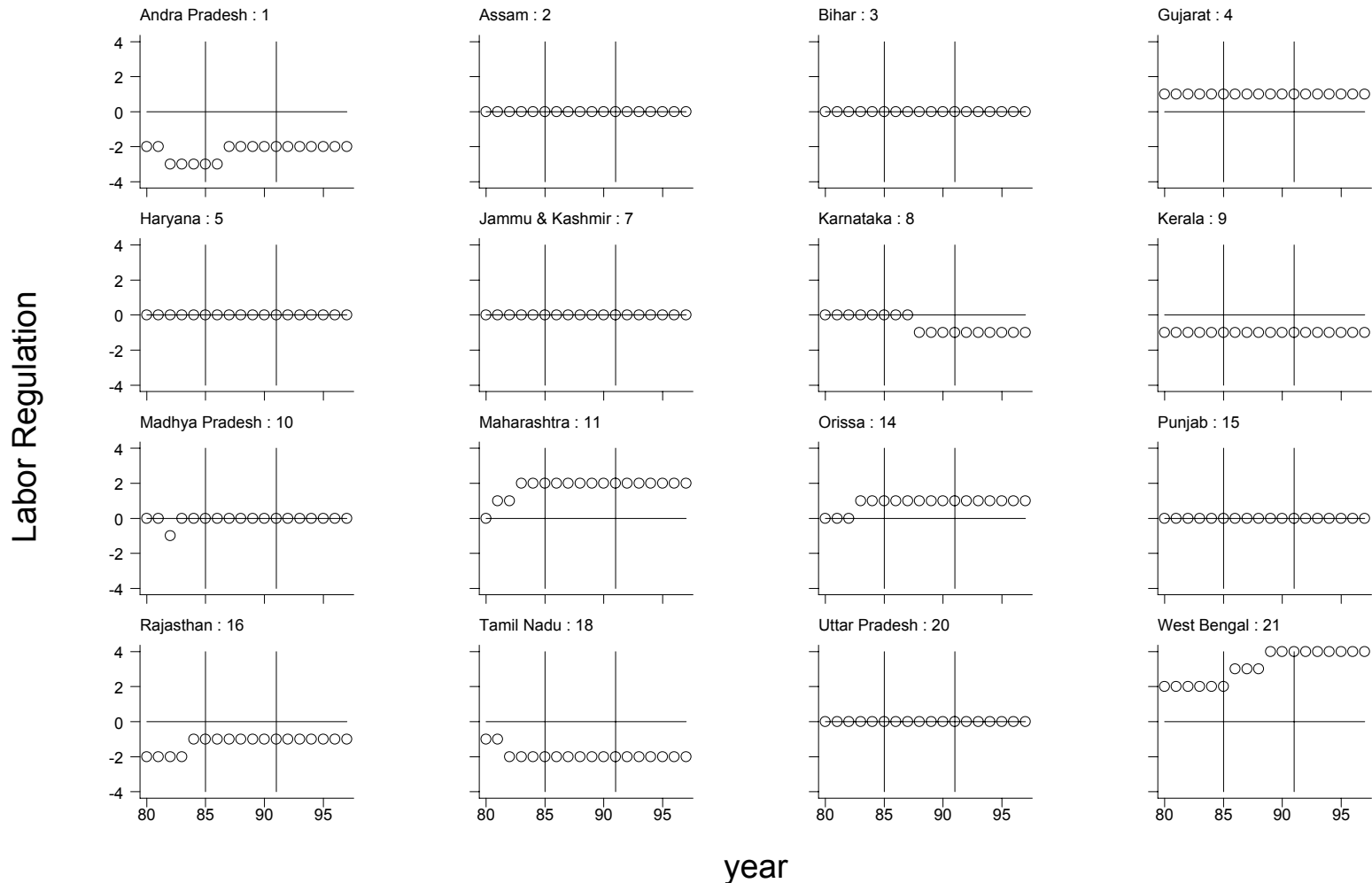


Figure 2: Labor Regulation by State

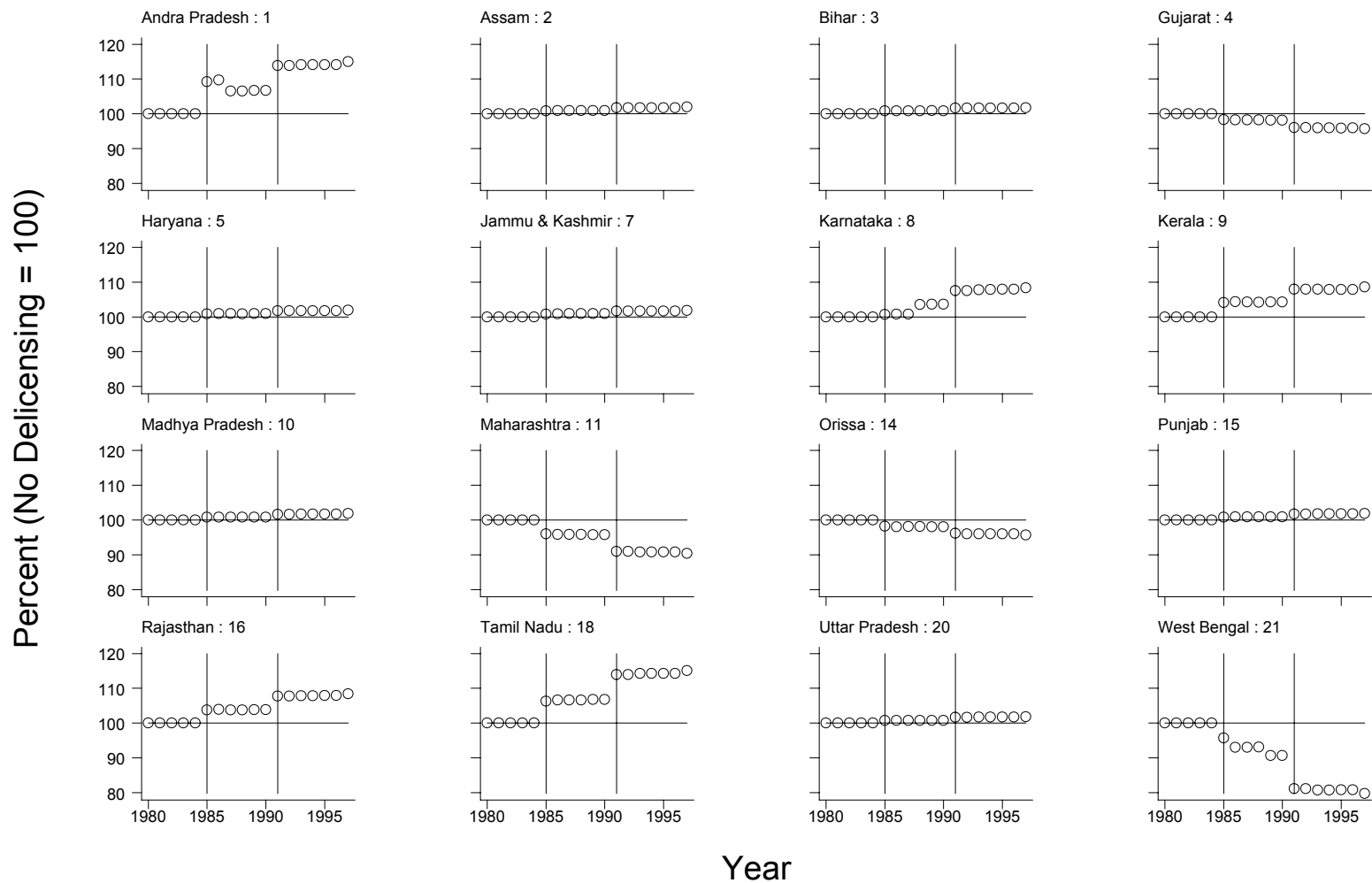


Figure 3: Log Output Relative to Counterfactual Without Delicensing

**Table 1: Descriptive Statistics**

	Year			
	1980	1985	1990	1997
<b>Delicensing</b>				
Number of industries delicensed	0	41	44	102
Percentage of real output delicensed	0	45.08	53.29	90.58
Percentage of employment delicensed	0	41.93	46.41	87.52
<b>Trade liberalization</b>				
Mean applied tariff	120.51 (45.87)	144.12 (47.57)	134.57 (38.67)	48.10 (21.61)
<b>Industrial performance</b>				
Mean real output	437613.25 (1173759.75)	572032.50 (1621077.00)	867908.75 (2515327.50)	1624003.50 (4536439.50)
Mean employment	5033.58 (15435.40)	4207.14 (11712.77)	4395.67 (12378.34)	5801.44 (15879.36)
Mean number of factories	67.51 (175.00)	61.72 (166.61)	64.46 (186.23)	83.63 (230.88)
Mean real fixed capital	128921.71 (714071.81)	191542.34 (900062.56)	297122.13 (1553109.50)	694986.44 (2898016.50)
Observations	1164	1370	1417	1207

**Notes:** Based on an unbalanced panel including an average of 85 three-digit industries in the 16 states over the 18-year time period from 1980 to 1997. The number of observations reported in the table is the number of state-industries in a particular year. 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: Delicensing and Net Entry in India: 1980-1997**

	(1)	(2)	(3)	(4)	(5)	(6)
	Log Number of Factories	Log Number of Factories	Log Number of Factories	Log Number of Factories	Log Number of Factories	Log Number of Factories
Delicense	0.049*** (0.018)	0.064*** (0.020)			0.048*** (0.018)	0.048*** (0.018)
Delicense85			0.055** (0.026)	0.066** (0.029)		
Delicense91			0.045* (0.025)	0.063** (0.029)		
Observations	24374	18324	24374	18324	24374	24374
R-squared	0.92	0.92	0.92	0.92	0.92	0.97
State-industry fixed effects	YES	YES	YES	YES	YES	YES
Year effects	YES	YES	YES	YES	YES	YES
Industry-time trends	NO	NO	NO	NO	NO	YES
State-time trends	NO	NO	NO	NO	YES	NO
Balanced panel	NO	YES	NO	YES	NO	NO
Weighting	NO	NO	NO	NO	NO	YES

**Notes:** The unbalanced panel includes an average of 85 three-digit industries in the 16 states over the 18-year time period from 1980 to 1997. The balanced panel concentrates on 3-digit industry-states 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. Robust standard errors in parentheses adjusted for clustering on 3-digit industry-state. 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. Delicense85 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 for those industries that were delicensed between 1985 and 1990. Delicense91 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 for those industries that were delicensed between 1991 and 1997. The weights in Column (6) are 1980 employment shares in a state-three-digit industry. \*\*\* denotes statistical significance at the 1% level; \*\* denotes statistical significance at the 5% level; \* denotes statistical significance at the 10% level.

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

	(1) Log Real Output	(2) Log Real Output	(3) Log Real Output	(4) Log Real Output	(5) Log Real Output	(6) Log Real Output
Delicense	0.017 (0.031)	0.032 (0.033)			0.016 (0.032)	-0.014 (0.020)
Delicense85			0.069 (0.043)	0.090** (0.046)		
Delicense91			-0.022 (0.044)	-0.016 (0.048)		
Observations	24374	18324	24374	18324	24374	24374
R-squared	0.88	0.89	0.88	0.89	0.89	0.94
State-industry fixed effects	YES	YES	YES	YES	YES	YES
Year effects	YES	YES	YES	YES	YES	YES
Industry-time trends	NO	NO	NO	NO	NO	YES
State-time trends	NO	NO	NO	NO	YES	NO
Balanced panel	NO	YES	NO	YES	NO	NO
Weighting	NO	NO	NO	NO	NO	YES

**Notes:** The unbalanced panel includes an average of 85 three-digit industries in the 16 states over the 18-year time period from 1980 to 1997. The balanced panel concentrates on 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. Robust standard errors in parentheses adjusted for clustering on 3-digit industry-state. 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. Delicense85 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 for those industries that were delicensed between 1985 and 1990. Delicense91 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 for those industries that were delicensed between 1991 and 1997. The weights in Column (6) are 1980 employment shares in a state-three-digit industry. \*\*\* denotes statistical significance at the 1% level; \*\* denotes statistical significance at the 5% level; \* denotes statistical significance at the 10% level.

**Table 4: Delicensing, Labor Regulation and Industrial Performance in India: 1980-1997**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Log Real Output	Log Real Output	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	-0.134*** (0.027)	-0.077*** (0.030)	-0.074** (0.031)	-0.101*** (0.028)	-0.109*** (0.028)	-0.082*** (0.027)	-0.100** (0.028)	-0.044 (0.029)	-0.022 (0.022)	-0.085*** (0.026)
Delicense	0.017 (0.032)	0.020 (0.032)	0.038 (0.033)		-0.027 (0.050)	-0.023 (0.050)	0.018 (0.032)	0.018 (0.032)	0.017 (0.032)	0.011 (0.023)
Delicense85				0.064 (0.043)						
Delicense91				-0.016 (0.044)						
Labor Regulation × Delicense		-0.066*** (0.016)	-0.070*** (0.017)					-0.076** (0.015)	-0.034* (0.018)	-0.072*** (0.017)
Pre-Labor Regulation × Delicense							-0.058** (0.016)			
Labor Regulation × Delicense85				-0.057** (0.025)						
Labor Regulation × Delicense91				-0.057*** (0.021)						
Pro-worker × Delicense					-0.052 (0.065)					
Pro-employer × Delicense					0.142** (0.061)					
Strong Pro-worker × Delicense						-0.214*** (0.068)				
Moderate Pro-worker × Delicense						0.115 (0.088)				
Moderate Pro-employer × Delicense						0.107 (0.076)				
Strong Pro-employer × Delicense						0.173*** (0.070)				
Observations	24374	24374	18324	24374	24374	24374	24374	24374	24374	24374
R-squared	0.88	0.88	0.89	0.88	0.88	0.88	0.88	0.88	0.89	0.94
State-industry fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry-time trends	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES
State-time trends	NO	NO	NO	NO	NO	NO	NO	NO	YES	NO
Balanced panel	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO
Weighting	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES
Political controls	NO	NO	NO	NO	NO	NO	NO	YES	NO	NO

**Notes:** The unbalanced panel includes an average of 85 three-digit industries in the 16 states over the 18-year time period from 1980 to 1997. The balanced panel concentrates on 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. Robust standard errors in parentheses adjusted for clustering on 3-digit industry-state. 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. Delicense85 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 for those industries that were delicensed between 1985 and 1990. Delicense91 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 for those industries that were delicensed between 1991 and 1997. 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. Pre-labor regulation is labor regulation in the year before delicensing. Pro-worker is a dummy which is one for pro-worker states. Pro-employer is a dummy which is one for pro-employer states. Strong pro-worker is a dummy which is one for pro-worker states with an average labor regulation score of greater than one. Moderate pro-worker is a dummy which is one for pro-worker states with an average labor regulation score greater than zero and less than or equal to one. Strong and moderate pro-employer are defined analogously. The political controls included in Column (8) are the shares of the major Indian political groupings in state legislatures. See the data appendix for further information concerning variables and data sources. The weights in Column (10) are 1980 employment shares in a state-three-digit industry. \*\*\* denotes statistical significance at the 1% level; \*\* denotes statistical significance at the 5% level; \* denotes statistical significance at the 10% level.

**Table 5: Delicensing, Labor Regulation, Employment and Investment in India: 1980-1997**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Log Employ- ment	Log Employ- ment	Log Employ- ment	Log Number of Factories	Log Number of Factories	Log Number of Factories	Log Real Fixed Capital	Log Real Fixed Capital	Log Real Fixed Capital
Labor Regulation	-0.089*** (0.022)	-0.038 (0.024)	-0.063*** (0.023)	-0.051*** (0.016)	-0.007 (0.017)	-0.033** (0.017)	-0.066** (0.031)	-0.039 (0.035)	-0.061* (0.032)
Delicense	0.014 (0.025)	0.017 (0.025)	0.012 (0.039)	0.049*** (0.018)	0.051*** (0.018)	0.009 (0.030)	0.030 (0.041)	0.031 (0.041)	-0.070 (0.064)
Labor Regulation × Delicense		-0.060*** (0.013)			-0.051*** (0.009)			-0.032* (0.019)	
Pro-worker × Delicense			-0.101** (0.051)			-0.028 (0.039)			0.080 (0.078)
Pro-employer × Delicense			0.072 (0.047)			0.117*** (0.036)			0.189** (0.076)
Observations	24374	24374	24374	24374	24374	24374	24374	24374	24374
R-squared	0.89	0.90	0.89	0.92	0.92	0.92	0.84	0.84	0.84
State-industry fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year effects	YES	YES	YES	YES	YES	YES	YES	YES	YES

**Notes:** The unbalanced panel includes an average of 85 three-digit industries in the 16 states over the 18-year time period from 1980 to 1997. Robust standard errors in parentheses adjusted for clustering on 3-digit industry-state. 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. Pro-worker is a dummy which is one for pro-worker states. Pro-employer is a dummy which is one for pro-employer states. \*\*\* denotes statistical significance at the 1% level; \*\* denotes statistical significance at the 5% level; \* denotes statistical significance at the 10% level.



**Table 6: Trade Liberalization, Labor Regulation and Industrial Performance in India, 1980-97**

	(1)	(2)	(3)	(4)	(5)	(6)
	Log Real Output	Log Real Output	Log Real Output	Log Real Output	Log Real Output	Log Real Output
Labor Regulation		-0.334*** (0.074)	-0.127*** (0.027)	-0.158** (0.079)	-0.098*** (0.029)	-0.215*** (0.077)
Delicense				0.033 (0.033)	0.032 (0.033)	
Delicense85						0.068 (0.044)
Delicense91						0.004 (0.046)
Tariff Rate	0.074 (0.058)	0.076 (0.058)	0.180** (0.079)	0.075 (0.058)	0.076 (0.058)	0.076 (0.058)
Labor Regulation × Tariff Rate		0.045*** (0.014)		0.018 (0.014)		0.025* (0.014)
Pre-labor Regulation × Tariff Rate					0.019 (0.016)	
Pro-worker x Tariff Rate			-0.061 (0.071)			
Pro-employer x Tariff Rate			-0.198*** (0.072)			
Labor Regulation × Delicense				-0.061*** (0.017)		
Pre-labor Regulation × Delicense					-0.052*** (0.018)	
Labor Regulation × Delicense85						-0.053** (0.025)
Labor Regulation × Delicense91						-0.047** (0.023)
Observations	23729	23729	23729	23729	23729	23729
R-squared	0.88	0.88	0.88	0.88	0.88	0.88
State-industry Fixed Effects	YES	YES	YES	YES	YES	YES
Year Effects	YES	YES	YES	YES	YES	YES

**Notes:** The unbalanced panel includes an average of 85 three-digit industries in the 16 states over the 18-year time period from 1980 to 1997. Robust standard errors in parentheses adjusted for clustering on 3-digit industry-state. 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. Delicense85 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 for those industries that were delicensed between 1985 and 1990. Delicense91 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 for those industries that were delicensed between 1991 and 1997. 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. Pre-labor regulation is state labor regulation in the year prior to delicensing. Tariff Rate is the log applied tariff rate. \*\*\* denotes statistical significance at the 1% level; \*\* denotes statistical significance at the 5% level; \* denotes statistical significance at the 10% level.

**Table 7: Effects of Actual and Random Delicensing**

	(1)	(2)
Percentage of times that the t-statistic on the actual delicensing and labor regulation interaction exceeds the t-statistic on the random delicensing and labor regulation interaction	99.1%	
Percentage of times that the R2 of the model with actual delicensing exceeds the R2 of the model with random delicensing	96.3%	
Percentage of times that the actual delicensing and labor regulation interaction is significant at the 5% level in a specification that includes both actual and random licensing		100.0%
Percentage of times that the random delicensing and labor regulation interaction is significant at the 5% level in a specification that includes both actual and random delicensing		11.2%

**Notes:** The table reports the results of one thousand Monte Carlo simulations. In each simulation, every industry is allocated a random year of delicensing between 1980 and 1997, and a random delicensing measure is created that equals one from the random year of delicensing onwards and zero otherwise. One thousand regressions were then run using the random delicensing measures generated in the simulations. Column (1) compares the results from our baseline specification in Column (2) of Table 4 using the actual delicensing measure with the results of one thousand regressions using the same specification but replacing the level and interaction terms of actual delicensing with the level and interaction terms of random delicensing. Column (2) reports the results of one thousand regressions using the baseline specification from Column (2) of Table 4 but including level and interaction terms for both actual and random delicensing.

**Table 8: Robustness of the Delicensing Measure**

	(1)	(2)	(3)
	Log Real Output	Log Real Output	Log Real Output
Delicense	0.040 (0.031)	0.019 (0.032)	0.020 (0.032)
Labor Regulation	-0.065* (0.033)	-0.066** (0.033)	-0.075** (0.029)
Labor Regulation × Delicense	-0.055*** (0.014)	-0.057*** (0.016)	-0.056*** (0.018)
Labor Regulation × Dummy 85		-0.017 (0.017)	
Labor Regulation × Dummy 91			-0.013 (0.015)
Early Delicense	-0.066* (0.036)		
Labor Regulation × Early Delicense	-0.021 (0.018)		
Observations	24374	24374	24374
R-squared	0.88	0.88	0.88
State-industry Fixed Effects	YES	YES	YES
Year Effects	YES	YES	YES

**Notes:** The unbalanced panel includes an average of 85 three-digit industries in the 16 states over the 18-year time period from 1980 to 1997. The balanced panel concentrates on 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. Robust standard errors in parentheses adjusted for clustering on 3-digit industry-state. 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. Dummy 85 is a dummy which is one from 1985 onwards and zero otherwise. Dummy 91 is a dummy which is one from 1991 onwards and zero otherwise. Early delicense is a hypothetical delicensing measure which assumes that each industry is delicensed three years before it was actually delicensed. \*\*\* denotes statistical significance at the 1% level; \*\* denotes statistical significance at the 5% level; \* denotes statistical significance at the 10% level.

**Table 9: Selection of Industries for Delicensing and Trade Liberalization**

	(1) First Year Delicensed	(2) Tariff Reduction 1988-97	(3) Delicense	(4) Tariff
Output Growth 1980-84	-0.383 (1.436)	3.379 (6.134)		
Average Proportion Congress [t-4]			0.069 (0.108)	-6.342 (4.893)
Average Proportion Hard Left [t-4]			0.215 (0.558)	-16.764 (30.170)
Average Proportion Janata [t-4]			-0.194 (0.181)	1.409 (11.715)
Average Proportion Hindu [t-4]			-0.311 (0.329)	-17.603 (27.880)
Average Proportion Regional [t-4]			-0.249 (0.184)	10.661 (11.929)
State-industry fixed effects	NO	NO	YES	YES
Year effects	NO	NO	YES	YES
Observations	102	102	1568	1554
R-squared	0.001	0.002	0.72	0.93

**Notes:** Columns (1) and (2) are based on cross-section regressions of the first year in which an industry is delicensed on real output growth over the 1980-84 period as a whole. Industries that are never delicensed are excluded from the regression. In columns (1) and (2) standard errors are heteroscedasticity robust. Columns (3) and (4) are based on an industry-time panel and standard errors are heteroscedasticity robust and adjusted for clustering on industry. Average Proportion Congress is the industry-employment weighted average share of seats held in state legislatures by the Congress parties. Average Proportion Hard Left is the industry-employment weighted average share of seats held in state legislatures by hard left parties. Average Proportion Janata is the industry-employment weighted average share of seats held in state legislatures by the Janata parties. Average Proportion Hindu is the industry-employment weighted average share of seats held in state legislatures by the hindu nationalist parties. Average Proportion Regional is the industry-employment weighted average share of seats held in state legislatures by regional parties. See the data appendix for further details concerning the political groupings. \*\*\* denotes statistical significance at the 1% level; \*\* denotes statistical significance at the 5% level; \* denotes statistical significance at the 10% level.