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

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We study whether the effects on registered manufacturing output of dismantling the License Raj—a system of central controls regulating entry and production activity in this sector—vary across Indian states with different labor market regulations. The effects are found to be unequal across Indian states with different labor market regulations. In particular, following delicensing, industries located in states with pro-employer labor market institutions grew more quickly than those in pro-worker environments. (JEL J50, L52,L60, O14, O15, O25)

In the postwar period, planned industrialization became a widespread development strategy for tackling economic backwardness. In the 1980s, however, amidst growing dissatisfaction about its results, many developing countries progressively liberalized their economies by dismantling government controls over industry and opening up to trade. Despite the pervasiveness of these reforms, there is little sound empirical evidence on whether and how they interact with local institutions. The same nationwide reform could lead to quite different outcomes, depending on the local institutional environment.

The aim of this paper is to examine the interaction between product market deregulation and the organization of labor markets in India. We focus on a little-studied internal liberalization episode, the dismantling during the 1980s and 1990s of the License Raj—a system of central controls introduced in 1951 regulating entry and production activity in the registered manufacturing sector. Delicensing reforms were staggered over a decade, but were nationwide in scope: when an industry was delicensed, the policy change affected all Indian firms in that industry, irrespective of location. The focus of our analysis is on whether institutional differences across Indian states, particularly in labor market regulations, led to a differential response in industrial performance to the reform across states.

Our main finding is that, after delicensing, industries located in states with pro-employer labor market institutions grew more quickly than those in pro-worker environments. This result stands up to a wide variety of robustness checks. Since pro-worker regulations are, on average, associated with weaker industrial performance, our study shows that dropping barriers to investment and entry via delicensing magnified the disadvantage of states with pro-worker labor market institutions.

Our work relates to several strands of literature. First, a number of recent papers argue that the impact of pro-competitive reforms on economic performance will vary significantly depending on the technological and institutional environment in which they take place (Aghion et al. 2005; Daron Acemoglu, Aghion, and Zilibotti 2006).[1] Second, there is a literature that studies the effect of labor or entry regulation on economic performance (Thomas Holmes 1998; Marianne Bertrand and Francis Kramarz 2002; Simeon Djankov et al. 2002; Timothy Besley and Burgess 2004; Ricardo J. Caballero et al. 2004; Chang-Tai Hsieh and Peter Klenow 2007). Finally, a recent literature analyzes the interaction between product market and labor market regulations (Olivier Blanchard and Francesco Giavazzi 2003; Alejandro Cunat and Melitz 2007).

The paper is structured as follows. Section I provides the relevant historical background and describes how the different data series are constructed. Section II contains the empirical analysis of the links between delicensing, labor regulation environment, and industrial performance. Section III concludes.

I. Background and Data

The centerpiece of centrally planned industrialization in India was the Industries (Development and Regulation) Act of 1951 which brought all key industries in the registered manufacturing sector under central government control via industrial licensing. Under the act, an industrial license was required to establish a new factory, significantly expand capacity, start a new product line, or change location (see Rabindra K. Hazari 1966; Jagdish Bhagwati and Padma Desai 1970; P. L. Malik 1997). This allowed the government to allocate plan production targets to firms. We use statements on industrial policy, press notes, and notifications issued by the federal government to code when different three-digit industries were exempted from industrial licensing.[2]

During the 1980s and the 1990s, there were two main waves of reforms. The first occurred in 1985 after Rajiv Gandhi's unexpected rise to power following the assassination of his mother Indira in 1984. He was an airline pilot with no political experience whose reformist attitude was largely unexpected (Dani Rodrik and Arvind Subramanian 2004). It was under his government, in 1985, that around one-third of all three-digit industries were delicensed. The second wave of reform was launched in 1991 under the regime of Narasimha Rao, who came to power following Rajiv Gandhi's assassination in an election campaign that subsequently returned the Congress Party to government. The 1991 liberalization was prompted by a balance-of-payment crisis and by the external pressure of the IMF that imposed a structural adjustment program. Industrial licensing was effectively abolished in 1991, except for a small number of industries where it was retained "for reasons related to security and strategic concerns, social reasons, problems related

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[1] In a similar spirit, the recent trade literature has studied how heterogeneous firms and industries react differently to trade liberalization (James Tybout, Jaime de Melo, and Vittorio Corbo 1991; Nina Pavcnik 2002; Marc Melitz 2003; Daniel Trefler 2004; Andrew Bernard, Stephen Redding, and Peter Schott 2007; Eric Verhoogen 2008).

[2] See Table 1 for summary statistics of the main variables and the Data Appendix for further information on variable definitions and data sources. Figure A1 of the online Appendix, available at the *American Economic Review's* Web site (http://www.aeaweb.org/articles.php?doi=10.1257/aer.98.4.1398), displays when each three-digit industry was delicensed. Table A1 provides the detail on how each three-digit industry was coded and Table A2 provides the concordance between the 1970 and 1987 industrial classification systems.

to safety and overriding environmental issues, manufacture of products of hazardous nature and articles of elitist consumption" (Government of India 1991). As with the case of Gandhi, the depth of the reformist tendencies of the Rao government was largely unanticipated. There are few instances of delicensing in years other than the leadership transitions in 1985 and 1991.[3]

From 1991 onward, tariff barriers were also progressively reduced and restrictions on foreign direct investment (FDI) relaxed (Pravin Krishna and Devashish Mitra 1998; Petia Topalova 2005). It is therefore important for us to separate the effects of delicensing from those of trade and FDI liberalization. To capture trade liberalization, we construct a measure of the actual tariff rate applied by customs officials at the Indian border by combining basic, auxiliary, and countervailing rates of duty for each three-digit industry between 1980 and 1997. These provide us with a direct measure of the evolving Indian trade policy regime and enable us to control for the effects of trade liberalization in our regressions. To capture FDI liberalization, we record, from 1991 onward, how many six-digit products within a three-digit industry were opened to automatic approval of FDI (up to 51 percent equity). Our measure takes a value of zero before 1991 when FDI was strictly controlled. In Table 1 we see that our applied tariff is high and relatively flat across the 1980–1990 period and then falls dramatically after 1990. The FDI reform measure increases after 1990 following the relaxation of controls on foreign investment.

We match our delicense, tariff, and FDI reform measures with state-industry panel data on the registered manufacturing sector for the period 1980–1997 drawn from the Annual Survey of Industries.[4] This is the most disaggregated level at which one can obtain representative data on industrial performance across the pre- and post-delicensing periods. The sampling unit is a state and three-digit industry pair, so that the data are representative at the state-three-digit industry level. To minimize the role played by industry entry and exit in explaining our results, we restrict our attention to a balanced panel of state-industries on which data exist for all 18 years of our dataset. Moreover, since we are interested in comparing cross-state, within-industry performance, we restrict attention to industries that exist in at least five states in each year of the sample. This gives us 18,324 observations on an average of 64 three-digit industries in each of the 16 main Indian states over an 18-year time period.[5] These 16 states account for over 95 percent of the Indian population.

As India is a federal democracy and industrial relations fall under the joint jurisdiction of central and state governments in the Indian constitution, labor market regulations differ across states. The key piece of central legislation is the Industrial Disputes Act of 1947, which sets out the conciliation, arbitration, and adjudication procedures to be followed in the case of an industrial dispute. This act has been extensively amended by state governments during the post-Independence period. Thus, although all states have the same starting point, they have diverged from one another over time. Following Besley and Burgess (2004), we code each state amendment as neutral (0), pro-worker (+1), or pro-employer (−1). Having obtained the net direction of amendments in any given year, we cumulate the scores over time to give a quantitative picture of how the regulatory environment evolved over the 1947–1997 period.

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[3] The 1985 and 1991 reforms covered, respectively, around one-third and one-half of three-digit industries. About one-tenth of three-digit industries had not been delicensed by 1997 (see Figure A1 of the online Appendix).

[4] Under the Factories Act of 1948, enterprises are required to register if either they have more than 10 employees and electric power or have more than 20 employees and no electric power. Smaller enterprises below these size thresholds are classified as part of unregistered manufacturing and are not covered by the Annual Survey of Industries. In our sample period, registered manufacturing makes up about 9 percent of total state output and unregistered manufacturing around 5 percent.

[5] We check that all our results are robust to running regressions on an unbalanced panel where industries are in the data for at least ten years and are active in at least five states. This raises our sample size to 24,374 observations.

TABLE 1—SAMPLE DESCRIPTIVE STATISTICS

	1980	1985	1990	1997	1980–1997
Delicensing					
Percentage of three-digit industries delicensed	0	36.61	39.29	91.07	73.48
Percentage of real output delicensed	0	47.68	56.94	92.57	74.53
Percentage of employment delicensed	0	43.05	47.81	88.15	68.31
Labor regulation					
Labor regulation	−0.16	−0.05	0.13	0.13	0.04
	(1.04)	(1.42)	(1.65)	(1.65)	(1.52)
Trade liberalization					
Tariff rate	119.19	142.31	132.53	47.58	117.62
	(44.74)	(47.69)	(38.94)	(21.34)	(49.22)
FDI reform					
FDI reform	0	0	0	0.35	0.14
				(0.39)	(0.30)
Industrial performance					
Mean log real output	11.47	11.88	12.31	12.68	12.13
	(1.96)	(1.93)	(1.96)	(2.20)	(2.02)
Mean log number of factories	3.30	3.42	3.50	3.58	3.46
	(1.34)	(1.29)	(1.30)	(1.36)	(1.32)
Mean log employment	7.22	7.37	7.46	7.55	7.43
	(1.70)	(1.57)	(1.58)	(1.69)	(1.61)
Mean log real fixed capital	9.78	10.39	10.74	11.27	10.61
	(2.12)	(2.03)	(2.12)	(2.46)	(2.20)
Observations	1,018	1,018	1,018	1,018	18,324

Notes: The dataset is a balanced panel of three-digit state industries that are present in the data in all 18 years and includes an average of 64 three-digit industries in the 16 states over the period 1980 to 1997. Numbers in parentheses are standard deviations across state industries. State amendments to the Industrial Disputes Act are coded (1 = pro-worker, 0 = neutral, −1 = pro-employer) and then cumulated over the 1947−1997 period to generate the labor regulation measure. Tariff rate is the tariff rate applied to a three-digit registered manufacturing industry. FDI reform is a variable, which before 1991 is equal to zero and after 1991 is equal to the fraction of Harmonized System six-digit products within a three-digit industry opened to automatic approval of FDI for up to 51 percent equity. Real output is real registered manufacturing output in thousands of rupees (1981 prices). Number of factories is number of registered manufacturing factories. Employment is number of registered manufacturing employees. Real fixed capital is real registered manufacturing fixed capital stock in thousands of rupees (1981 prices). See the Data Appendix for further information on variable definitions and the data sources.

There is heterogeneity in both the level and change of labor regulation across our 1980–1997 sample period. The most extreme pro-worker state, West Bengal, has labor regulation values that rise from +2 to +4 over the 1980–1997 period. Three other states (Gujarat, Maharashtra, and Orissa) are also recorded as beginning the period as pro-worker or amending in this direction. The most extreme pro-employer state, Andhra Pradesh, has a score that varies from −2 to −3 across our period. Four other states (Kerala, Rajasthan, Tamil Nadu, and Karnataka) begin the period as pro-employer or amend in that direction. There are six neutral states (Assam, Bihar, Haryana, Jammu and Kashmir, Punjab, and Uttar Pradesh) that begin the period at zero and do not amend in either direction. Finally, Madhya Pradesh is neutral in all years except for a pro-employer change in 1982, which is reversed by a 1983 pro-worker amendment.[6]

Labor regulations, industrial licensing, and the Annual Survey of Industries apply only to registered manufacturing. Our data are therefore well suited to examine how product market

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[6] Figure A2 in the online Appendix displays the variation in state labor regulation across the 1980–1997 sample period.

deregulation, in the form of delicensing, interacts with heterogeneous state-level labor institutions in shaping the pattern of industrial development across Indian states.

II. Empirical Analysis

A. *Method*

Our interest centers on the delicense–labor regulation interaction coefficient which captures the role of state-specific labor regulation in mediating the impact of the delicensing reform on industrial performance. To examine this interaction, we estimate a regression of the form:

$$(1) \qquad y_{i,s,t} = \alpha_{i,s} + \eta_{i,t} + \beta_{s,t} + \theta(d_{i,t})(r_{s,t}) + \varepsilon_{i,s,t},$$

where $y_{i,s,t}$ is the logarithm of three-digit state-industry real output, $d_{i,t}$ is a dummy variable which takes the value of unity in the year a three-digit industry is delicensed and then stays equal to one thereafter, $r_{s,t}$ is the labor regulation measure for state s at time t, $\alpha_{i,s}$ are state-industry interactions that control for any unobserved time-invariant determinants of state-industry performance (e.g., natural endowments, location), $\eta_{i,t}$ are industry-year interactions that control for differential industry-specific time effects (e.g., technological innovation), $\beta_{s,t}$ are state-year interactions that control for differential state-specific time effects (e.g., macro shocks), and $\varepsilon_{i,s,t}$ is a stochastic error. The coefficient of interest (θ) is identified by the mix of industry-year variation in delicensing interacted with state-year variation in labor regulation.

We cluster the standard errors by state and year of delicensing. This is not only to address serial correlation concerns (and to allow for heteroskedasticity), but also to take account of the fact that delicensing is highly clustered in time. Delicensing happened overwhelmingly in 1985 and 1991, implying that different industries within a state in these years cannot be treated as independent observations.

B. *Results*

If the licensing system was acting as a barrier to entry, we would expect its removal to be associated with an increase in entry in delicensed relative to still-licensed industries. The inclusion of industry-year and state-year interactions in equation (1) precludes estimating the average effects of delicense and labor regulation, as these vary at the industry-year and state-year level, respectively. We therefore begin our analysis by presenting, in Table 2, results for a specification where the industry-year and state-year interactions in equation (1) have been replaced with year fixed effects and where the delicense–labor regulation interaction term has also been omitted. In column 1, we find that delicensing leads to a statistically significant increase in the number of factories within an industry of around 6 percent.[7] The delicensing reform therefore does appear to have encouraged entry. In column 2, we include labor regulation as an additional regressor. The coefficient on labor regulation is negative and significant, indicating that states that have moved in a pro-worker direction experience less net entry relative to pro-employer states. The coefficient on delicense remains positive and significant, and of a similar magnitude. Delicensing and pro-worker labor regulation are thus pulling in opposite directions in determining the number of factories operating in state industries.

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[7] Unfortunately, we do not observe separate entry and exit flows, but changes in the number of factories operating in a state-industry provide us with a measure of net entry.

TABLE 2—AVERAGE EFFECTS OF DELICENSING ON INDUSTRIAL PERFORMANCE IN INDIA: 1980–1997

	(1) Log no. factories	(2) Log no. factories	(3) Log real output	(4) Log real output
Delicense	0.064*** (0.024)	0.064** (0.024)	0.032 (0.042)	0.031 (0.043)
Labor regulation		−0.062** (0.027)		−0.137*** (0.044)
Observations	18,324	18,324	18,324	18,324
R-squared	0.92	0.92	0.89	0.89
State-industry interactions	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes

Notes: The dataset is a balanced panel of three-digit state industries that are present in the data in all 18 years and includes an average of 64 three-digit industries in the 16 states over the period 1980 to 1997. Robust standard errors adjusted for clustering on state × year delicensed are reported in parentheses. Log no. factories is log number of registered manufacturing factories. Log real output is log real registered manufacturing output. Delicense is a dummy variable which is one if all or part of a three-digit industry is delicensed in a particular year, and zero otherwise. State amendments to the Industrial Disputes Act are coded (1 = pro-worker, 0 = neutral, −1 = pro-employer) and then cumulated over the 1947–1997 period to generate the labor regulation measure. See the Data Appendix for further information on variable definitions and the data sources. * denotes statistical significance at the 10 percent level; ** denotes statistical significance at the 5 percent level; *** denotes statistical significance at the 1 percent level.

Columns 3 and 4 use the same specification to examine the average effects of delicensing and labor regulation on output. In column 3, we find a positive, but not statistically significant, effect of delicensing. The small average effect on output, however, may be masking substantial heterogeneity of delicensing effects, depending on the institutional conditions in Indian states. Output may have risen in some states and fallen in other states in response to the same nationwide delicensing reform. To examine this possibility, we added interactions between state fixed effects and delicense to the specification in column 3 of Table 2. We find that the coefficient on this interaction is positive in nine states and negative in seven states: delicensing led to a rise in output in some states and a fall in output in other states (relative to industries where licensing was retained).[8] We also find a similar pattern of effects for employment and fixed capital: the average effect of delicensing is small and insignificant but hides considerable heterogeneity across states.

A key question concerns which characteristics of states affect how industries located within their borders respond to delicensing. Of particular interest are policies and institutions over which state governments exercise some control. In column 4 of Table 2, we find that regulation in a pro-worker direction is associated with lowered output relative to regulating in a pro-employer direction. This lines up with a growing body of evidence that suggests that labor regulation affects industrial performance across Indian states.[9]

In this paper we examine whether state-specific labor institutions mediated the impact of the nationwide delicensing reform on industrial performance across Indian states. Column 1 of Table 3 presents results from estimating a regression of the form described in equation (1). The delicense–labor regulation interaction coefficient is negative and significant, indicating that,

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[8] Eleven of the sixteen delicense-state interactions are statistically significantly different from zero at the 5 percent level. We can reject the null hypothesis that the coefficient on delicense is the same across states at the 1 percent level. In the interest of brevity we do not report the individual coefficients on the delicense-state interactions.

[9] Besley and Burgess (2004) show that states that amended in a pro-worker direction in the pre-1992 period experienced lowered output, employment, investment, and productivity in registered manufacturing. In contrast, output in unregistered manufacturing increased. Labor regulation therefore seems to be capturing something specific to the institutional environment facing firms in registered manufacturing. Unfortunately, data on unregistered manufacturing are not available at the state-industry level across our sample period.

TABLE 3—DELICENSING, LABOR REGULATION, AND INDUSTRIAL PERFORMANCE IN INDIA: 1980–1997

	(1) Log real output	(2) Log real output	(3) Log real output	(4) Log real output
Delicense × labor regulation	−0.054** (0.024)			−0.202** (0.078)
Delicense × 1980 labor regulation		−0.062* (0.035)		
Delicense × instrumented labor regulation			−0.068** (0.030)	
Observations	18,324	18,324	18,054	18,324
R-squared	0.92	0.92	0.92	0.92
State-industry interactions	Yes	Yes	Yes	Yes
State-year interactions	Yes	Yes	Yes	Yes
Industry-year interactions	Yes	Yes	Yes	Yes
Delicense-state interactions				Yes

Notes: The dataset is a balanced panel of three-digit state industries that are present in the data in all 18 years and includes an average of 64 three-digit industries in the 16 states over the period 1980 to 1997. The difference in the number of observations between column 3 and the other columns of the table is due to the absence of unionization data for Jammu and Kashmir, which implies that instrumented labor regulation is missing for Jammu and Kashmir. Robust standard errors adjusted for clustering by state × year delicensed are reported in parentheses. Log real output is log real registered manufacturing output. Delicense is a dummy variable which is one if all or part of a three-digit industry is delicensed in a particular year, and zero otherwise. State amendments to the Industrial Disputes Act are coded (1 = pro-worker, 0 = neutral, −1 = pro-employer) and then cumulated over the 1947−1997 period to generate the labor regulation measure. 1980 labor regulation is the labor regulation measure of states as of 1980. Instrumented labor regulation is predicted from a state-year regression for 1958−1997 in which the instruments are interactions between a post-1977 dummy variable and pre-1977 mean unionization in a state and between the post-1977 dummy and patterns of land tenure in British India (from Abhijit Banerjee and Lakshmi Iyer 2005). The *F*-statistic for the significance of the excluded instruments in the first-stage state-year regression is 7.27. The Hansen-Sargan overidentification test regresses the residuals from the second-stage state-industry time regression on interactions between the instruments and delicense. The instruments pass the overidentification test with a *p*-value of 0.255. Standard errors in column 3 are corrected for instrumented labor regulation being generated in a first-stage regression. See the Data Appendix for further information on variable definitions and the data sources. * denotes statistical significance at the 10 percent level; ** denotes statistical significance at the 5 percent level; *** denotes statistical significance at the 1 percent level.

when delicensing occurred, industries in states with pro-employer regulation experienced larger increases in output relative to those located in pro-worker states.[10] This is the key result in the paper. Given the demanding nature of the specification, this is compelling evidence that labor regulations passed over time at the state level affected how industries responded to a nationwide delicensing experiment.[11]

We checked that our findings are not driven by individual states by sequentially excluding each state from the sample and reestimating the column 1 specification of Table 3. In each case, the estimated coefficient on the interaction term between delicense and labor regulation remains significant at the 5 percent level and is not statistically significantly different from the estimate for the full sample. This suggests that our results capture a general relationship between industrial performance, delicensing, and labor market institutions, rather than the influence of individual states.

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[10] We find a similar result for a specification that includes state-industry interactions and year fixed effects (see column 1 of Table A3 in the online Appendix). The delicense–labor regulation coefficient (standard error) is −0.070 (0.018).

[11] A model developed in the working paper version of the paper helps us to understand this key result. Delicensing encourages firm entry and expansion, but more so in pro-employer states. The falls in price that ensue lead to exit and contraction of less productive firms, particularly in pro-worker states. The net effect is a reallocation of economic activity toward pro-employer states (see Aghion et al. 2006).

A potential concern is that state labor regulations are responding to changes in industrial development following delicensing. Therefore, column 2 considers a specification where we interact delicense with state labor regulations in 1980 before delicensing occurred. State-level amendments to the Industrial Disputes Act are coded and cumulated from 1947, so column 2 examines whether pre-delicensing cross-state variation in labor regulation affected how industries responded to delicensing in subsequent years. The interaction coefficient continues to be negative and significant, and of similar magnitude to the column 1 result, indicating that industries located in states classified as pro-employer in 1980 tended to grow more quickly, relative to their counterparts in pro-worker states, after they were delicensed.

To provide further evidence against feedback from industrial development to labor regulation, we exploit the instrumental variables estimation strategy of Besley and Burgess (2004). Following a Supreme Court ruling, which found Indira Gandhi's Congress Party guilty of election fraud, she imposed martial law and suspended elections between 1975 and 1977. When state elections resumed, she and her party were heavily punished—10 of the 16 states in our data switched from Congress to non-Congress majorities. The new governments brought new ideas, and we observe an increase in labor regulation activity following this political shock. We use interactions between a post-1977 dummy variable and pre-1977 mean unionization in a state and between the post-1977 dummy and patterns of land tenure in British India (from Banerjee and Iyer 2005) as our two instruments for state labor regulation. Unionization and historical land tenure both affected how politics had evolved in each state, and hence the direction of labor regulation when political competition intensified post-1977.

Our IV strategy is to predict labor regulation using a first-stage regression, which includes our two instruments, state fixed effects, and year fixed effects for the period 1958–1997.[12] We then interact the predicted value of labor regulation with delicense and include it in our second-stage regression. The result is in column 3 of Table 3.[13] The estimated coefficient on the delicense–labor regulation interaction is of a similar magnitude to that in column 1 and statistically significant at the 5 percent level, supporting our interpretation of the interaction term as capturing the role of state-specific labor regulation in determining the heterogeneous impact of delicensing.

In column 4 we include a set of interactions between each state fixed effect and delicense. These interactions control for all fixed state characteristics that affect how industries respond to delicensing, including cross-state differences in labor regulation at the beginning of our sample period. The identification of the delicense–labor regulation interaction coefficient now solely comes from changes in labor regulation during the sample period. Even with this limited variation (see Figure A2 in the online Appendix), the coefficient remains negative and significant, indicating that, after being delicensed, industries located in states that moved in a pro-employer direction experienced greater output growth relative to those located in states that moved in a pro-worker direction.

When we reestimate the specification from column 1 of Table 3 for two alternative measures of industrial performance—total employment and fixed capital—we find similar magnitudes of interaction effects. The estimated delicense–labor regulation coefficients (standard errors) are -0.050 (0.019) and -0.054 (0.020), respectively. Therefore, pro-worker states experience less employment growth and investment relative to pro-employer states following delicensing.

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[12] The F-statistic on the excluded instruments in the first-stage regression is 7.27 (this is a state-year regression, with standard errors clustered on state), indicating that the instruments have some power in explaining the direction of labor regulation.

[13] Standard errors in column 3 have been corrected to take account of the fact that predicted labor regulation is generated in a first-stage regression.

Our results demonstrate that liberalization had unequal effects across Indian states, and accentuated the importance of labor regulation in determining the trajectory of industrial activity in India. To gauge the economic significance of our findings we construct a counterfactual of what would have happened to the distribution of output across Indian states had delicensing had no heterogenous effects in states with different labor regulations. To do this, we first construct fitted values for log output using the specification in column 1 of Table 3. We next construct a counterfactual series for log output without heterogeneous effects of delicensing (by falsely assuming that $\theta = 0$ in column 1 of Table 3).[14] Taking exponents and summing across industries within each state allows us to compare the evolution of state output with and without heterogeneous effects of delicensing (see Figure A3 in the online Appendix).

The largest relative increases in output following delicensing are found in Andhra Pradesh and Tamil Nadu, the states with the most pro-employer labor regulations. Output in Andhra Pradesh and Tamil Nadu is around 10 percent higher in 1997 relative to the counterfactual. In contrast, output in West Bengal and Maharashtra, the states with the most pro-worker regulations, is 18 percent and 9 percent lower, respectively. Similar results are found for employment and fixed capital.[15]

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

C. *Robustness*

Liberalization in 1991 in India came as a package. Trade tariffs were reduced and restrictions on foreign direct investment were relaxed at the same time that the second wave of delicensing was taking place. These reforms were enacted centrally and vary across industries and time (see Krishna and Mitra 1998; Topalova 2005). Table 4 checks whether our delicense–labor regulation result is robust to controlling for interactions between these other industry-year varying elements of the liberalization package and labor regulation.

We begin by examining the interaction between our tariff measure and labor regulation. In a specification with state-industry interactions and year dummies, this interaction is positive and significant, suggesting that tariff reductions led to output expansion in pro-employer states relative to pro-worker states.[16] This result, however, is not robust to controlling for industry-year and state-year interactions, as is shown in column 1 of Table 4. In column 2, we include the interaction of labor regulation with both tariff and delicense alongside one another. The delicense–labor regulation interaction remains negative and significant (and of the same magnitude as in column 1 of Table 3), indicating robustness to controlling for the interaction of trade liberalization with labor regulation. When we include both FDI reform-labor regulation and tariff-labor regulation interactions in column 3, we find that neither is significant. In column 4, we include our FDI reform measure interacted with labor regulation alongside the delicense–labor regulation and tariff–labor regulation interactions. We find that the delicense–labor regulation

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[14] Since industry-year and state-year interaction effects absorb, respectively, the level effects of delicensing and labor regulation, the difference between the fitted and counterfactual series can identify only the heterogeneous effects of delicensing.

[15] Our estimates imply that, relative to the counterfactual, employment in 1997 is 5 and 10 percent higher in Andhra Pradesh and Tamil Nadu, respectively, and 18 percent lower in West Bengal. Similarly, fixed capital is around 10 percent higher in Andhra Pradesh and Tamil Nadu and 19 percent lower in West Bengal.

[16] See column 3 of Table A3 in the online Appendix. We also find a negative but statistically insignificant average effect of tariffs on output, which lines up with the weak direct effects of delicensing on output that we observe in Table 2 (see column 2 of Table A3).

TABLE 4—TRADE LIBERALIZATION, FDI REFORM, LABOR REGULATION, AND INDUSTRIAL PERFORMANCE IN INDIA: 1980–1997

	(1) Log real output	(2) Log real output	(3) Log real output	(4) Log real output
Delicense × labor regulation		−0.059** (0.024)		−0.059** (0.024)
Log tariff rate × labor regulation	0.009 (0.019)	0.008 (0.020)	0.009 (0.019)	0.008 (0.020)
FDI reform × labor regulation			−0.007 (0.038)	−0.010 (0.036)
Observations	17,783	17,783	17,783	17,783
R-squared	0.92	0.92	0.92	0.92
State-industry interactions	Yes	Yes	Yes	Yes
State-year interactions	Yes	Yes	Yes	Yes
Industry-year interactions	Yes	Yes	Yes	Yes

Notes: The dataset is a balanced panel of three-digit state industries that are present in the data in all 18 years and includes an average of 64 three-digit industries in the 16 states over the period 1980 to 1997. The difference in the number of observations between Table 4 and Table 3 is due to the fact that there are a small number of three-digit industries for which tariff data are unavailable. Robust standard errors adjusted for clustering on state × year delicensed are reported in parentheses. Log real output is log real registered manufacturing output. 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 1947–1997 period to generate the labor regulation measure. Log tariff rate is the log tariff rate applied to a three-digit industry. FDI reform is a variable which before 1991 is equal to zero and after 1991 is equal to the fraction of Harmonized System six-digit products within a three-digit industry opened to automatic approval of FDI for up to 51 percent equity. See the Data Appendix for further information on variable definitions and the data sources. * denotes statistical significance at the 10 percent level; ** denotes statistical significance at the 5 percent level; *** denotes statistical significance at the 1 percent level.

interaction remains significant (and of similar magnitude to our earlier result from column 1 in Table 3). Our central finding is therefore robust to controlling for the interaction of both trade liberalization and FDI reform with labor regulation.

Table 5 checks whether our delicense–labor regulation result is robust to controlling for interactions between delicensing and other time-varying state policies and characteristics. In column 1, we include the interaction of delicense with state development expenditure and with a measure of state financial development. Development expenditure includes state spending on health, education, and infrastructure and helps crudely to measure differences in state government investment in these activities across time. For financial development, we use the instrumented state-level bank branch expansion measure from Burgess and Rohini Pande (2005). This captures the expansion of bank branch networks into locations with no banks across Indian states driven by the introduction (in 1977) and removal (in 1990) of a branch licensing rule.[17] This mitigates concerns that financial development is endogenous to industrial development while controlling for this potentially important determinant of industrial performance (see Acemoglu and Zilibotti 1997; Aghion, Peter Howitt, and David Mayer-Foulkes 2005; Kalina Manova 2006).

The coefficient on the delicense–development expenditure interaction in column 1 of Table 5 is positive and significant, suggesting that within each industry, states with larger development expenditures tend to gain more from the delicensing reform relative to those that spend less. The

[17] Between 1977 and 1990, the Indian Central Bank imposed a licensing rule which required that for each branch opened in a location already served by a bank, four had to be opened in locations without a bank. Burgess and Pande (2005) use the number of bank branches per capita in 1961 interacted with (a) a post-1976 time trend and (b) a post-1989 time trend as instruments for state-level bank branch expansion. Standard errors in columns 1 to 3 of Table 5 have been adjusted to take account of the fact that predicted financial development is generated in a first-stage regression.

TABLE 5—ROBUSTNESS TO INTERACTIONS WITH STATE AND STATE-INDUSTRY CHARACTERISTICS

	(1) Log real output	(2) Log real output	(3) Log real output
Delicense × labor regulation	−0.051** (0.024)	−0.064** (0.028)	−0.064*** (0.022)
Delicense × log development exp	0.188* (0.105)	−0.113 (0.101)	−0.118 (0.126)
Delicense × financial development	0.030** (0.014)	0.029* (0.017)	0.047** (0.023)
Delicense × top industry productivity tercile		0.472*** (0.032)	0.474*** (0.032)
Delicense × bottom industry productivity tercile		−0.521*** (0.033)	−0.523*** (0.033)
Delicense × Congress majority			−0.006 (0.005)
Delicense × hard-left majority			0.005 (0.020)
Delicense × regional majority			0.003 (0.006)
Delicense × janata majority			0.006 (0.019)
Delicense × hindu majority			0.072 (0.081)
Observations	18,324	18,324	18,324
R-squared	0.92	0.93	0.93
State-industry interactions	Yes	Yes	Yes
State-year interactions	Yes	Yes	Yes
Industry-year interactions	Yes	Yes	Yes

Notes: The dataset is a balanced panel of three-digit state industries that are present in the data in all 18 years and includes an average of 64 three-digit industries in the 16 states over the period 1980 to 1997. Robust standard errors adjusted for clustering on state × year delicensed are reported in parentheses. Log real output is log real registered manufacturing output. 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 1947–1997 period to generate the labor regulation measure. Log development expenditure is real per capita state spending on social and economic services. Financial development is from Burgess and Pande (2005) who use the number of bank branches per capita in 1961 interacted with (a) a post-1976 time trend and (b) a post-1989 time trend as instruments for state-level bank branch expansion for the 1961–2000 period. We use predicted financial development from this state-year regression interacted with delicense above. The *F*-statistic for the significance of the excluded instruments in the first-stage state-year regression is 16.87. Standard errors in columns 1 to 3 of Table 5 have been adjusted to take account of the fact that predicted financial development is generated in a first-stage regression. Top industry productivity tercile is a dummy which is one if a state-industry lies in the top third of the cross-state within-industry labor productivity distribution in a given year, and zero otherwise. Bottom industry productivity tercile is a dummy which is one if a state-industry lies in the bottom third of the cross-state within-industry labor productivity distribution in a given year, and zero otherwise. Congress, hard left, regional, Janata, and Hindu majority are counts of the number of years for which these political groupings held a majority of the seats in the state legislatures since 1957. See the Data Appendix for further information on variable definitions and the data sources. * denotes statistical significance at the 10 percent level; ** denotes statistical significance at the 5 percent level; *** denotes statistical significance at the 1 percent level.

delicense–financial development coefficient is also positive and significant, suggesting that states that expanded access to finance benefited from delicensing relative to those where bank branch expansion was less marked. The coefficient on the delicense–labor regulation interaction, however, remains negative and significant, and similar in magnitude to column 1 of Table 3, when we include these controls.

Labor market regulations may also be correlated with the technological level of industries in a given state. To address this concern, we construct a dummy for whether a state industry is in the top, middle, or bottom tercile of the cross-state distribution of labor productivity within the

industry in a given year. We then interact the top and bottom tercile dummies with our delicense measure, omitting the middle tercile interaction which serves as a reference. In column 2 of Table 5 (which also contains the development expenditure and financial development controls from column 1), we see that being in the top tercile is associated with a larger increase in output after delicensing relative to being in the middle tercile.[18] Being in the bottom tercile is associated with smaller increases. Both effects are large in magnitude and highly statistically significant. Technological level clearly has a bearing on which state-industries in a three-digit sector benefit from delicensing. Controlling for technology, however, has little effect on the delicense–labor regulation interaction term, which remains negative and significant and of similar magnitude to column 1 of Table 3. The direction of labor regulation in a state does not appear to be just proxying for how technologically advanced industries in a state are.

Many aspects of the policy environment are difficult to measure. In column 4 of Table 3, we have shown that our results are robust to including delicense-state interactions which control for the role that unobserved time-invariant state characteristics play in mediating the impact of delicensing. Omitted interactions between delicense and unobserved time-varying state policies, however, remain a concern. As a further robustness check, we therefore add in controls for the political complexion of states on the grounds that policy stances affecting the registered manufacturing sector are likely to be correlated with political outcomes. We expect past political outcomes to matter, as they determine the attitude toward business that prevails in the bureaucracy and polity. This attitude will affect a range of policy actions that we cannot observe in our data. We therefore assemble a picture of each state's "political history" as measured by the number of years since 1957 that particular political groupings have held a majority of the seats in the state legislature. The relevant groupings for this exercise are: the Congress Party, hard-left parties, regional parties, Janata parties, and Hindu parties. The results are in column 3, which also contains the full set of controls for development expenditure, financial development, and technology from columns 1 and 2. The coefficient on the interaction between delicense and labor regulation remains negative and significant, and of similar magnitude to column 1 of Table 3 when we control for the interaction between delicense and state political histories. The same result holds if we use the contemporaneous share of seats held in state assemblies in these five groupings interacted with delicense.[19]

The timing of delicensing varies across industries. A natural question to ask is whether the actual year in which industries are delicensed matters. To investigate this, we run a Monte Carlo simulation in which we draw a random year when an industry is delicensed from the empirical distribution of delicensing years. We do this for each three-digit industry, thus creating a random or "placebo" delicense measure. We repeat this process to generate 100 placebo delicense measures. For each of the placebo measures, the probability of an industry being delicensed in a given year matches that in the actual data, but we randomize over the identities of industries.

In a first falsification exercise, we then estimate our regression specification (1) using the placebo delicense measures in the place of our actual delicense measure. In 93 of the 100 regressions, we find that the placebo delicense–labor regulation interaction has a lower absolute

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[18] This finding is consistent with the theory of Acemoglu, Aghion, and Zilibotti (2006), who argue that the removal of entry barriers favors the performance of firms and industries that are closer to the technological frontier, while it may harm less advanced ones. See also Aghion and Rachel Griffith (2005) for corresponding UK evidence.

[19] As part of a wider sensitivity analysis, not reported in the paper, we included all of the following additional variables interacted with delicense in columns 1 to 3 of Table 5: (a) the constituent health, education, and other expenditure elements of development expenditure (to more finely control for state-government spending behavior), (b) the proportion of people below the poverty line in a state (to capture overall backwardness), (c) state-specific differences between industrial and agricultural electricity tariffs (to capture cross-subsidization of agriculture), and (d) cumulative state land reform acts from Besley and Burgess (2000) (to capture how pro-rural a state was). In all these regressions, the delicense–labor regulation interaction remains negative and highly significant.

t statistic than the actual delicense–labor regulation interaction (from column 1 of Table 3). In a second falsification exercise, we include both the actual and placebo delicense measures interacted with labor regulation in our regression specification (1). The actual delicense–labor regulation interaction is significant at the 5 percent level in 98 of the 100 regressions, whereas the placebo delicense–labor regulation interaction is significant at the 5 percent level in only 7 of the regressions. The results of both falsification exercises serve as compelling evidence that the actual timing of when industries are delicensed is central to our main empirical result.

A final concern is that the sequencing of delicensing may be driven by the underlying performance of industries. The fact that delicensing was a centrally managed technocratic reform which was, in part, triggered by largely unexpected shocks (Rajiv Gandhi's sudden rise to power and the IMF-imposed structural adjustment program under Narasimha Rao) helps to allay the concern that industries may have acted in anticipation of economic reforms. However, the industries that were delicensed in different waves may have been selected according to some characteristics related to performance potential. In particular, reformers in 1985 may have not chosen industries randomly. The concern is less severe for the 1991 wave, as this covered most of the remaining industries, and the criterion for the exclusion of a few industries was their strategic, environmental, and social importance. Endogenous sequencing would be a problem for analyzing the impact of delicensing if the selection criterion were correlated with the expected future performance of state-industries at the time of the reform.[20] As a crude check on this, we ran a cross-section regression of the year in which a three-digit industry was delicensed on output growth in that industry during the 1980–1984 period (prior to the first wave of delicensing). This is intended to detect whether politicians selected industries in 1985 according to their degree of economic success. We find no evidence of a relationship between when an industry is delicensed and pre-reform output growth (the estimated coefficient of interest is -0.383, and the standard error is 1.436). Similar results are found using other measures of pre-reform industrial performance, such as employment or labor productivity growth during 1980–1984.[21] The absence of systematic differences in pre-reform economic performance between industries that are delicensed in each of the two waves is reassuring.

III. Conclusions

This paper has investigated the extent to which the effects on registered manufacturing output of dismantling the License Raj—a system of central controls governing entry and expansion in this sector—vary across Indian states with different labor market regulations. To do this we employ a difference-in-difference econometric specification that includes state-industry, industry-year, and state-year interactions to control for a variety of unobserved effects. The main finding is that output rose more in pro-employer states than it did in pro-worker states in response to the same delicensing reform. This central result stands up to a wide variety of robustness checks and the delicense–labor regulation interaction coefficient is similar in size and significance across a range of specifications. Delicensing resulted in a sizeable reallocation of industrial production from states with pro-worker labor institutions to states with pro-employer labor institutions. A policy implication of our analysis is that liberalization tends to make the creation of a more favorable investment climate a more pressing concern. This may require complementary

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[20] The fact that our interest centers on the delicense–labor regulation interaction helps somewhat in this regard. To explain our main result from column 1 of Table 3, endogenous selection would have to be based upon an industry's expected strong performance in pro-employer states and/or expected weak performance in pro-worker states.

[21] The regression coefficients (standard errors) are, respectively, 0.23 (1.25) and -0.74 (1.57).

institutional reforms as well as redistributive policies that ease the costs of adjustment associated with liberalization.

Data Appendix

Our dataset on output, number of factories, employment, and fixed capital covers an average of 64 three-digit industries in the 16 main Indian states over an 18-year time period from 1980 to 1997 and comes from the Annual Survey of Industries (ASI).[22] To this dataset we add the following variables.

Delicense.—Appendix II of the Industries Development and Regulation Act of 1951 reports a comprehensive list of the "Scheduled Industries" subject to industrial licensing (Malik 1997). All key manufacturing sectors are covered by the 1951 act. We assigned three-digit codes to the scheduled industries listed in the act and used Press Notices and Notifications issued by the Ministry of Commerce and Industry to track when three-digit industries were delicensed during the 1980s (see Shri Chaudhary 1987; Government of India's Economic Surveys, and the *Handbook of Industrial Policy and Statistics* 1987). The Statement of Industrial Policy of 1991 disbanded industrial licensing except for a small number of specified industries. Subsequent revisions to the list of licensed industries from 1991 onward were tracked from Press Notices and Notifications published in various issues of the *Handbook of Industrial Policy and Statistics*.

Labor Regulation.—This measure is based on state-specific text amendments to the Industrial Disputes Act 1947 reported in Malik (1997). Our coding of amendments follows Besley and Burgess (2004): 0 denotes a change judged not to affect the bargaining power of either workers or employers, 1 is a pro-worker change, and −1 denotes a pro-employer change. Where there was more than one amendment in a year, we code the net direction of change, thus restricting our measure to take a value of 0, 1, −1 in any given state and year. These measures are then cumulated over the 1947–1997 period.

Tariffs and FDI Reform.—Data on actual rates of duty are from the Customs Tariff of India manuals published through the Central Board of Excise and Customs. Prior to 1988, the basic, auxiliary, and countervailing duties are reported for approximately 1,100 products of the Brussels Tariff Nomenclature (BTN). From 1988 onward, even more finely detailed data are available for approximately 5,000 six-digit products of the Harmonized System (HS). We combine the three rates of duty according to the official formula[23] and then aggregate product rates to the three-digit industry average using the mapping of Bibek Debroy and A. T. Santhanam (1993). Data on when different HS six-digit products are opened to automatic FDI approval for up to 51 percent of equity are from the *Handbook of Industrial Policy and Statistics*.

Control Variables.—State development expenditure is from the Public Finance Statistics published by the Ministry of Finance. Our measure of state financial development is from Burgess and Pande (2005). The data on political histories come from state election data published by the Election Commission of India. State poverty head counts are from the National Sample Survey. State cumulative land reforms are from Besley and Burgess (2000). Agricultural and industry

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[22] The Indian industrial classification changes in 1987. We establish a concordance from the 1970 classification to the 1987 classification to create a consistent state-industry panel across the 1980–1997 period (see Table A2 in the online Appendix).

[23] Applied tariff = basic + auxiliary + (100 + basic + auxiliary) × (countervailing)/100.

electricity tariff data come from *Annual Reports on the Working of State Electricity Boards and Electricity Departments.*

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