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Are Labor Regulations Driving Computer Usage in India's Retail Stores?

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Abstract A recent survey of 1,948 retail stores in India conducted by the World Bank's Enterprise Surveys shows that 19 percent of the stores use computers for their business. In some states like Kerala, computer usage is as high as 40 percent. Using this data we find labor regulation as an important determinant of computer usage. The estimates suggest that when faced with burdensome labor regulations, the probability of using a computer rises by over 36 percentage points for an average store. These findings formally confirm a commonly held but untested view that labor regulation may be responsible for the spread of labor saving modern technology.

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1. Introduction

A new survey of 1,948 retail stores in India compiled by the World Bank's Enterprise Surveys shows that 19% of the stores use computers for their business. Computer usage is higher among stores that find labor regulations to be more burdensome. Specifically, 16% of the stores who report labor regulations as "no obstacle" for their business use computers. Corresponding figures for stores reporting labor regulations as "minor", "moderate", "major or very severe" obstacles are 24%, 30% and 34%, respectively. We test if computer usage in India's retail sector is driven by the severity of labor regulations.

Existing empirical work has paid little attention to the technology-labor regulations nexus.[1] Few studies which do exist treat the choice of technology as exogenous to labor regulations. For example, Card et al (1999) take computer usage in the Canada, France and the US as an exogenous technological shock. They find that the effect of this shock on wages and employment depends on labor regulations in the three countries. In recent theoretical contributions, Alesina and Zeira (2006) and Blanchard and Philippon (2006) have argued that the choice of technology should be treated as endogenous to labor regulations. Our findings confirm this argument.

2. Data and Main Variables

We use store level data collected by the World Bank in 2006.[2] The data are a pure cross section of 1,948 stores spread over 16 states and 41 cities of India. Our dependent variable, *Computers*, is a dummy which equals 1 if a store uses a computer for running its

[1] See, for example, Botero, Djankov, La Porta, Silanes and Shleifer (2004).
[2] The survey and methodology for data collection are available at www.enterprisesurveys.org.

business and 0 otherwise.[3] The mean value of *Computers* is .19 and standard deviation is .39. Our main explanatory variable is an index of labor regulation defined at the state level.[4] In one survey question, stores were asked if labor regulations were an obstacle for their business. Responses were recorded on a 0-4 scale defined as no obstacle (0), minor obstacle (1), moderate obstacle (2), major obstacle (3), and very severe obstacle (4). Our main index of labor regulation, *Perception* index, equals the proportion of stores in a state who report labor regulations as a problem (minor obstacle or higher).[5] Being a group (state) average, the *Perception* index suffers less from measurement errors and endogeneity problems associated with firm perceptions (Kreuger and Angrist, 2001). As a robustness check, we also use an index of labor regulation for the manufacturing sectors in India (*Law Book* index) due to Besley and Burgess (2004). For the *Law Book* index, we use the latest year (2000) values for which the index is available. The motivation is that pro-labor governments are likely to implement labor-friendly laws in both manufacturing and services. Correlation between *Perception* and *Law Book* index is .564.

One concern could be that labor regulation is likely to be correlated with other regulations such as tax rates, land laws, corruption, etc. However, this is not a problem for us because we expect these (other) regulations to be positively correlated with labor regulation but have a negative effect on computer usage. Thus, failure to control for tax rates, etc., will only weaken the positive association we intend to show between computer usage and labor regulations (downward bias in the estimated coefficient of labor regulation). To confirm this, we use store response (on the same 0-4 scale as above) to

[3] Data on the number of workers using computers or hours of computer usage is not available.
[4] In India, labor regulations are made and implemented by the state governments.
[5] Our results are virtually unchanged if we use state level averages of the actual scores here. The *Perception* index varies between .09 (Gujarat) and .528 (West Bengal) with a mean of .249.

questions on tax rates, tax administration, land laws (access to land), business licensing and permits, corruption and restrictions on store hour operations as obstacles to growth. Indices similar to the *Perception* index were first computed for each of these (non-labor) regulations and then a simple average was taken over them to arrive at *Regulation* – an overall index of non-labor regulations. The sub indices of *Regulation* are all highly (positively) correlated and our results are unaffected whether we use *Regulation* or its sub indices. We expect a negative effect of *Regulation* and a positive effect of the labor regulation index on computer usage. We single out the sub-index on land laws (*Land* index) for special treatment because it shows little correlation with the *Perception* index. The correlation coefficient between the *Perception* index and the *Land* index is .39 and it drops to .06 if we exclude the states of West Bengal and Gujarat (16% of the sample) which are outliers (Figure 1). What this suggests is that at least in the bulk (84%) of the sample we can easily contrast the effects of labor and land regulations on computer use.

A second concern is that labor regulations could be correlated with overall development, biasing our results. The most plausible scenario is that labor regulations are stricter in less developed states. This negative relationship between labor regulation and overall development again implies a downward bias in the estimated labor regulation-computer usage relationship because the direct effect of less development is likely to be less computer usage. For example, the index of overall development due to Banerjee and Iyer (2005), *BI* index, shows a negative correlation with the *Perception* index (correlation of -.290) but is positively correlated with the percentage of stores in a state who use computers (correlation of .320). Below we control for a number of proxy measures of overall development and the results confirm our claim of the downward bias.

The last concern relates to a possible correlation between labor regulation and store characteristics. We looked at a number of store characteristics and found these to be only weakly correlated with the *Perception* index. For example, averaged at the state level, current employment, current sales and floor area of the shop show a correlation of -.125, .088 and -.109, respectively, with the *Perception* index. Our results for labor regulation hardly change due to store level controls (discussed below).

3. Estimation

We use a probit specification clustering the standard errors on the state. Estimated marginal effects (at the mean value of the explanatory variables) are reported in Table 1. Our main control is the *Land* index for reasons discussed above. Using the *Perception* index, we find no significant effect of labor regulation on computer usage without any controls. In column 1 of Table 1 we control for the *Land* index. Labor regulation now shows a significant effect (at less than 5%). Specifically, a 1 percentage point increase in the number of stores who find labor regulation to be a problem raises computer usage by .179 percentage points. In contrast, stricter land laws have a negative effect on computer usage (significant at less than 1% level). For overall development we use ratio of females to males (*Sex ratio*) at the city level.[6] Other proxy measures like literacy rates, etc. are used in the robustness checks below. Column 2 of Table 1 shows that controlling for *Sex ratio* increases the estimated coefficient of labor regulations from .179 to .189 (p-value of .004) confirming the downward bias discussed above. *Sex ratio* has a positive effect on

[6] The correlation between *Sex ratio* and *Perception* index is -.237 in the full sample and -.077 in the restricted sample (excluding West Bengal and Gujarat). We use (lagged) 1991 values of *Sex ratio* taken from Census of India (1991). Our results do not change if we use 2001 values of sex ratio.

computer usage (significant at less than 1% level). Estimation results for the restricted sample (West Bengal and Gujarat dropped) are almost similar to the ones above.

4. Robustness

In column 3 we add the control for *Regulation*. As expected, *Regulation* has a negative effect on computer usage (significant at less than 1% level) and controlling for it increases the coefficient of the labor regulation index from .189 to .346. In column 4 we add controls for overall development: *BI* index, literacy rate, labor force participation rate, total adult population (size of the city) and share of services in total employment.[7] Population and participation rates also control for differences in labor supply across cities in which our stores are located.[8] The impact of these controls is an increase in the estimated coefficient of labor regulation (column 3 vs. column 4) which supports our claim of the downward bias. In column 5 we control for a host of store level characteristics: floor area of the shop (thousand square feet), age of the store, duration of power outages per day (*Outage*) and five dummy variables capturing (equal to 1) if a store owns a generator (*Generator*), has a checking/savings account (*Checking*), a line of credit, overdraft facility (*Overdraft*) and felt no need to borrow from external sources in the last fiscal year (*Liquid*). With these controls added the coefficient of the labor regulation index remains positive and significant at less than 5% level.[9] It drops in magnitude from .412 to .369 which is partly due to the difference in sample size between

[7] Apart from the *BI* index, all other development proxies mentioned here are at the city level, for the year 1991 (lagged) and taken from Census of India (1991). Our results are same if we use 2001 values instead.
[8] Population of the city is expressed in thousands.
[9] This result holds with a host of other controls too. Examples include: a dummy for the metropolitan cities of Mumbai, Kolkatta, New Delhi, Chennai, Bangalore and Hyderabad, per capita income of the state (2001, 1991 values), number of telephone lines per capita at the state level (city level data is not available) and store level variables for: current sales, days of inventory, store is audited or not.

the two columns (due to missing observations) and partly due to the control for age of the store. Our main result of a positive and significant effect of labor regulation on computer usage holds for the *Law Book* index.[10]

5. Conclusion

The paper shows that rising computer usage in India's retail sector is in part driven by burdensome labor regulations. The findings suggest a labor saving motive which we confirm in a companion paper. We have also shown that existing work on the labor regulation-technology-employment/wages nexus may suffer from specification problems in that it treats the choice of technology by firms as exogenous to labor regulations. Our results contradict the exogeneity assumption.

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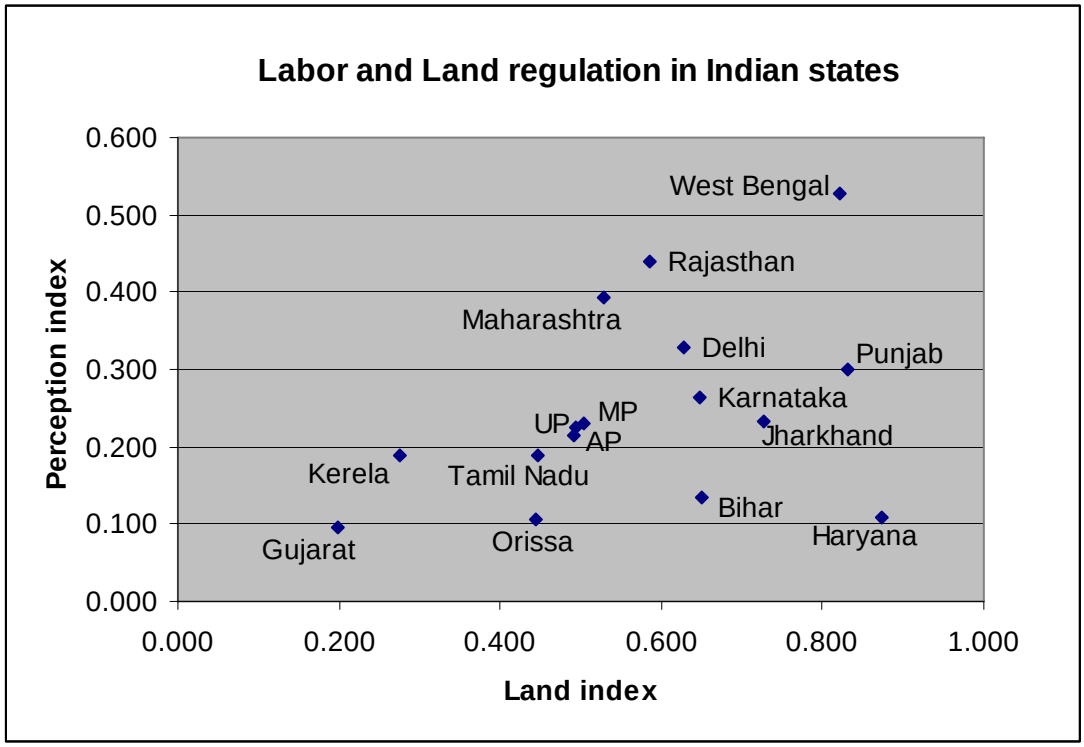
[10] For the specification in column 5 of Table 1, the coefficient of the *Law Book* index equals .020 which is significant at less than 5% level. The coefficient remains significant at less than 5% level with just a few basic controls such as *Sex ratio* and *Regulation*, irrespective of the remaining controls in column 5.

Figure 1



AP: Andhra Pradesh
UP: Uttar Pradesh
MP: Madhya Pradesh

Table 1: Marginal effects from Probit regressions

Dependent variable: *Computers*

	(1)	(2)	(3)	(4)	(5)
Perception index	.179**	.189***	.346***	.412***	.369**
	(.021)	(.004)	(.001)	(.000)	(.045)
Land index	-.304***	-.208***			
	(.000)	(.000)			
Sex ratio		.709***	.487***	.272**	.217
		(.000)	(.001)	(.031)	(.128)
Regulation			-.408***	-.411***	-.335***
			(.000)	(.000)	(.008)
BI index				.042**	.037
				(.035)	(.267)
Literacy				.002	.0001
				(.106)	(.997)
Labor force				-.001	.0004
Participation rate				(.556)	(.887)
Population of the				-.005	-.004
city				(.223)	(.552)
Services share in				.001	.001
total employment				(.589)	(.400)
Floor area of the					.062*
shop					(.087)
Age of the store					-.002***
					(.001)
Outage					-.003
					(.212)
Generator					.199***
					(.000)
Checking					.097***
					(.000)
Liquid					.015
					(.426)
Overdraft					.133***
					(.000)
Line of Credit					.040
					(.137)
Pseudo R^2	.015	.029	.030	.032	.323
Sample Size	1948	1948	1948	1948	1893

p-values in brackets; significance level is denoted by ***(1% or less), ** (5% or less) and * (10% or less). All standard errors are clustered on the state. Sample size smaller in column 5 due to missing observations and one outlier dropped.