Labor Regulations and Plant Location Choice: Evidence From India[**]

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Abstract

Certain regulations in developing countries have often been cited as impediments to progress. This paper considers one facet of these regulations – labor laws – and investigates whether these have detrimental effects on firm location and investment decisions. Conventional wisdom holds that pro-worker labor regulations within a state would hinder firm location in that state. We find strong evidence that this is indeed the case, and our results are robust to alternative specifications. Furthermore, disaggregation by industrial classifications shows that although labor regulations continue to exert negative effects, location choices are also conditioned on other factors such as proximity to raw materials and minerals.

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Introduction

In the interests of increasing the pace of development, countries have begun to re-examine the way they do business. Governments in developing countries talk about reforming laws and removing roadblocks to usher in a golden age of vigorous domestic and foreign investment. Reforms in various spheres including the financial sector, taxation, agriculture, industrial policy, pollution regulation, infrastructure, intellectual property rights (IPR), and labor laws are needed to enhance global competitiveness. But disaggregation of this issue is important in order to get a clear view of the link between regulations and investments at the micro level. This paper serves to do just that. It takes a detailed look at the effect of labor regulations on new investment decisions in the various states of India, and finds that pro-worker legislation has a strong negative effect on location choice.

With the initiation of liberalization policies and economic reforms in India in 1991[1], the role of private investment in economic growth has gained significant importance. States now compete with one another by instituting policies to attract new investment. The consensus is that environmental and labor regulations are the key policy instruments that help or hinder a state's industrial growth. While there is a large theoretical and empirical literature on the effect of environmental and labor regulations on a firm's location and investment decision, especially on a global and US level, insufficient attention has been paid to such relations in developing countries One of the few papers that investigates labor laws in a developing country context is Besley and Burgess (2002). They find that movement towards pro-worker policies is linked to declines in employment and output for Indian manufacturing industries. However, there has been little

[1] India started major economic reforms and nationwide liberalization in 1991 in response to a fiscal and balance of payments crisis. These reforms encompassed all major areas – like industrial policy, trade and exchange rate policy, tax reforms and public sector policies.

research on how these labor reforms affect a firm's incentives at the micro level – that is, how they affect the location of new plants. By analyzing the effect of labor regulations on new investment, we address this gap in the literature.

Labor regulations encompass a wide variety of laws ranging from those formulated to ensure the health and safety of workers to those aimed at resolving industrial disputes. The former category includes policies on minimum wages, work hours, and health and safety standards for factories – all aimed at preventing the worker from being exploited by the employer. The second broad category of labor laws is aimed at ensuring the rights of both workers and employers. These deal mainly with the rights of workers to unionize, collective bargaining processes, layoff policies, mechanisms to resolve disputes, and policies on strikes and lockouts. The focus of this analysis is how these factors affect the input costs of firms and hence their location decisions in the various states of India. We employ both institutional and informal labor regulation variables to analyze how a firm chooses its location, and we study new investments that occurred between 1995-2002 in India.

The paper consists of three main sections. The first gives a brief literature review and also discusses the differing pace of reforms in various Indian states, India's labor laws, and the diversity in labor regulations across Indian states. The second section gives an overview of the data. The third section discusses the methodology and empirical findings. We study several different questions including the effect of labor regulations on firm location decisions, the sensitivity of these results to choice of labor and non-labor variables, whether effects differ with the inclusion of controls for formal labor legislation, and whether differential effects exist by industry.

We find that state-wise number of labor courts, number of unions on register, and number of man-days lost in disputes resulting in work stoppages all have strong negative effects on location choice probabilities. All variables in the estimations are scaled by gross state product, which controls for differences across states in industry size and manufacturing presence. Our results are very robust to the inclusion of other labor regulation (for example, the number of industrial tribunals registered in the state) as well as other non-labor-regulation variables (for example, a Human Development Index value for the state). Our results are also unaffected by taking institutional labor legislation (based on Besley & Burgess, 2002) into account. Lastly, we estimate a more flexible specification that allows us to consider that certain industries are constrained by their need for proximity to sources of raw materials and minerals. We find that in our data, such considerations are particularly important for mining and agricultural projects.

Section 1 - Literature Review

Regulation, Investment, and Firm Location Choice

A long-standing debate among economists and practitioners concerns the effect of various regulations on the economic growth of a country. Conventional wisdom holds that, for example, in the case of environmental regulations, stringent controls and higher compliance standards raise abatement and compliance costs, making the region less attractive to investors. In a similar vein, pro-worker policies like the right to unionize, may retard investment. We consider these issues in greater detail below.

We start by focusing on the body of literature on determinants of firm location decisions. While none considers labor regulations per se, these papers provide useful insights into factors that may retard or encourage new investment. Most employ conditional logit models to study a

firm's location choice decision. The explanatory variables include institutional and regulatory factors, economic parameters, and indicators of existing industrial environment – all of which can affect the operating costs of firms. In particular, environmental regulations, wages, energy costs, property value, and unemployment generally have negative impacts on location probabilities, whereas population and better infrastructure have positive impacts (Wolverton, 2002; List and Co, 2000; Levinson, 1996; McConnell, V. D. and Schwab, R, 1990). Additionally, recent work (Keller and Levinson, 2002) has found that pollution abatement costs have deterring effects on foreign direct investment across states in the U.S.

In terms of labor regulations specifically, results are mixed. For example, the presence of unions increases the collective bargaining power of workers and raises wages – this factor should thus negatively affect location decisions. But evidence for the US ranges from a positive and significant relationship between the percentage of unionized workers and location choice probabilities (List and Co, 2000), to no relationship (McConnell, V. D. and Schwab, R, 1990), to significant negative impacts of unionization (Bartik, 1985). However, differences in right-to-work laws across U.S. states are found to have strong effects, with more "pro-business" states attracting the lion's share of manufacturing activity (Holmes, 1998).

In the case of developing countries, Kuncoro (2000) has found similar effects of wages and infrastructure on the location decisions of firms in Indonesia. For India, Mani, et al. (1997) fail to find evidence that environmental policies affect a polluting firm's location decision. They explain the insignificance of their results by arguing that other factors may be important determinants of plant location choice. One such factor is labor legislation.

State-Level Regulatory Environment in India

Regulations are an important component of the business environment of a country. For India as a whole, economic reforms have moved at a healthy pace since 1991. At the state level, however, the pace of reforms has been slow. Bajpai and Sachs (1999) point to three factors that may have contributed to this. First, the lack of effective decentralization has hampered states' decision-making power. Second, insufficient institutional infrastructure at the state level has made implementation of reforms difficult. Third, political instability has led state governments to focus on short-term goals.

The authors classify states into three categories – the 'reform-oriented states', 'intermediate reformers', and 'lagging reformers'. The first category comprises Andhra Pradesh, Gujarat, Karnataka, Maharashtra, and Tamil Nadu. The reform-oriented states have done much better in attracting both domestic and foreign investment and have consequently grown faster than their neighbors. Andhra Pradesh, for example, has instituted far-reaching industrial reforms that cut through red tape and make the siting of plants easier. It has also reformed worker re-training, reorganized public sector units, implemented tax reforms, and initiated self-certification in certain industries (Government of Andhra Pradesh, 2003). Since 1995, Gujarat has instituted comprehensive policies in areas of privatization, incentives to accelerate investment in backward areas, simplification of rules and procedures, reform of the power sector, infrastructure development, and encouragement of private entrepreneurship (Government of Gujarat, 2003). Karnataka, Maharashtra, and Tamil Nadu have all pursued vigorous industrial reforms aimed at attracting new investments.

The intermediate reformers include Haryana, Orissa, and West Bengal. These states have not undertaken far-reaching reforms like the leaders, but they have started some growth-oriented

policy changes. Power sector reforms have been at the forefront in these states – especially in Orissa and Haryana. Both states have revised tariff rates to decrease the agricultural power subsidy, and they have taken steps towards seeking private investment in the power sector. The laggards consist of Assam, Bihar, Madhya Pradesh, Punjab, Rajasthan, and Uttar Pradesh. These states have taken small steps towards a comprehensive growth policy; however, even among these states, some have made major changes in areas of industrial policy (Bajpai and Sachs, 1999)[2].

India's Labor Laws

Labor laws in India are all-encompassing and have far-reaching impacts upon the industrial climate of the country. Most practitioners agree that in order to attract domestic and foreign investment, these laws need to treat employers and employees in a more balanced manner. Consequently, the various states of India have attempted to institute both formal and informal changes in their bylaws. In this section, we give an overview of the changes that have occurred at both the center and state levels.

The Factories Act of 1948 and the Industrial Disputes Act of 1947 are the two most important acts that govern working conditions in factories and provide a mechanism for the settlement of industrial disputes. The former seeks to set standards for safe working conditions; mandates working hours and vacation and overtime policy; and sets health and safety standards.

[2] Bajpai and Sachs, 1999. This paper contains a very detailed list of state-level reforms in India. The reform categories are broken down into broad categories like investment incentives, power reforms, industrial policy reforms, infrastructure, and tax reforms. Investment incentives include infrastructure and fiscal incentives. Power sector reforms are in the area of tariff revision, restructuring, regulatory commissions, un-bundling, seeking private investment, and licensing issues. Industrial policy reforms encompass private investment promotion, fiscal incentives, infrastructure, and transparency in rules and government decision-making. Infrastructure reforms include policies on roads, ports, and telecommunications. Tax reforms consist of transition to VAT, abolition of OCTROI (entry tax on consumption goods collected at state borders), and policies on agricultural income tax, and simplification of rules.

This Act, along with the Equal Remuneration Act of 1976, the Minimum Wages Act, the Payment of Bonus Act, and the Maternity Benefits Act; constitute the backbone of the labor laws in India today.

The Industrial Disputes Act of 1947 and the Trade Unions Act seek to protect the worker from being exploited by the employer. The former provides guidelines for settling disputes, and also lays out conditions under which a worker may be laid off and the various ways of redressing the situation. The latter grants workers the right to unionize and outlines certain protections and privileges that union members would enjoy. Although these acts apply to all states in India, their efficacy depends on the political will of each state government.

Heterogeneity in labor regulations at the state level arises from two sources. First, depending on the nature of the government in power, states themselves pass amendments to labor laws that are more pro-worker or more pro-employer than the central government law. Our discussion of such formal amendments to state level labor regulations closely follows Besley and Burgess, 2002, who consider all state level amendments to the Industrial Disputes Act of 1947 from 1958-1990 and code each one as neutral, pro-worker, or anti-worker[3]. Second, the implementation of laws may be affected by other considerations. For example, in a state like West Bengal, the Communist party has been in power for the past twenty years. It is common knowledge that the party has a pro-worker bias. This may affect outcomes of collective bargaining, disputes, and strikes, even without any formal changes in labor policies at the state government level.

[3] A complete summary of all the amendments and the coding is available at http://econ.lse.ac.uk/rburgess. A pro-worker amendment is coded as a one, a neutral amendment as a zero, and an anti-worker amendment is coded as a negative one.

Although recent work has shown that stringent pro-worker regulations have negative impacts on the economic performance of states in India (Aghion, et al; 2002; Besley and Burgess, 2002; Bajpai and Sachs, 2000), no study has analyzed how such regulations at the state level affect the location decisions of new plants in India. By undertaking such an analysis and demonstrating that location choice is very sensitive to the nature of labor legislation within the state, this paper contributes to the literature in the area.

Section 2 - Data Background

The data used in this study are from two primary sources - Center for the Monitoring of the Indian Economy (CMIE) and Indiastat. We use data from CMIE, which tracks every new investment made in India from July 1995 to July 2002. The data limitation that we face is that the date of initiation is known for only some of the projects. This prevents us from exploiting any time-series variation. The CMIE data set has information on the location of new projects as well as other plant characteristics such as status, ownership, type, and industrial classification. Table A gives a more detailed breakdown of these characteristics. For purposes of this study, we exclude projects in the service and irrigation sectors. Our sample thus consists of 5065 projects.

Table A

Project Characteristics

Project Characteristics	Description
Project Status	Proposed, Under Implementation, Completed
Project Type	New Unit, Substantial Expansion, Renovation/Modernization, Renovation/Modernization - Substantial Expansion, Rehabilitation
Project Ownership	Private Indian, Private Foreign, State Govt., Central Govt., Joint Sector, Cooperative Sector.

Our independent state-level variables are obtained from the Indiastat[4] database. This is an online data service that contains time-series data on all labor regulation variables, as well as information on all economic, social, demographic, and political variables, both at an all-India level and at the state level.

Location Choice

During the period we consider, the geo-political map of India has undergone dramatic changes. Three new states have been carved out of old ones – Jharkhand was originally a part of Bihar, Chattisgarh was a part of Madhya Pradesh, and Uttaranchal originated from Uttar Pradesh. For our purpose, we classify these new entities under their original states. We also code union territories under the closest (by distance) state. For example, Dadra and Nagar Haveli is indistinguishable in terms of socio-economic characteristics from Gujarat; thus projects here are coded as having located in Gujarat. Similarly Chandigarh is classified under Punjab; Goa,

[4] This data can be found at www.indiastat.com

Daman, and Diu are coded under Maharashtra; and Pondicherry is coded under Tamil Nadu. A detailed list of the coding is reported in Appendix Table 1.

In our estimation, each project has the choice to locate among 16 different states. These include the 14 states in India that have a substantial industrial presence, the union territory of Delhi, and a catchall category that includes other states, as seen from Appendix Table 1. Our choice of these locations is motivated by the Besley & Burgess, 2002, analysis. We assume that for a new plant, the site location address is the most relevant. The registered office address is usually the location of the central office, which is often predetermined in India. When large conglomerates and private business houses like the Tatas and Ambujas started in the early post-independence era, they generally located the central offices in the home states of the entrepreneurs. But for profit-maximizing firms, the location decisions of new projects should be influenced by political, regulatory, and economic considerations in the local siting area. Thus, our location variable is the site address of the project.

Appendix Graph 1 shows the distribution of projects among the various states, where the number has been normalized by gross state product. As is evident from Graph 1, Karnataka is at the forefront of receiving new investments, followed by Gujarat, Andhra Pradesh, Tamil Nadu, and Maharashtra. These are the reform-oriented states as identified in the Bajpai and Sachs, 1999 study.

Labor Regulation Variables

Labor regulation variables can be broadly classified into two main categories – variables that capture labor regulation on-the-ground, and the state-level institutional (formal) amendments to the Industrial Disputes Act of 1947. For the first category, we consider several alternatives,

including the number of labor courts in the state, number of strikes and lockouts, number of unions registered in the state, and number of man-days lost due to strikes and lockouts. Appendix Table 2(a) provides the summary statistics for these variables. Appendix Graph 2 shows the main labor regulation variables used in the estimations (these too have been normalized by gross state product). These figures show an inverse relationship between new investment (Graph 1) and the pro-worker stance of the state (as captured by the number of unions on register and number of man-days lost in disputes resulting in work stoppages in Graph 2).

The second category of labor regulation variables includes formal amendments to labor laws at the state level. These amendment classifications are based on coding developed by Besley and Burgess, 2002, where each amendment is categorized as pro-worker, pro-employer, or neutral. Instead of using the author's categorization, we use counts of the total number of amendments (from 1949 – 1990) per state, and the total number of pro-worker amendments per state over the same time period. Adopting this method allows us to control for the amount of labor-related legislative activity in a state, particularly activity that is anti-employer. We believe that for example, a state that passes 6 pro-worker amendments is not viewed in the same light as a state that passes only 1 such amendment.

Other Variables of Interest

In addition to labor regulations there are other factors that could potentially influence location choice. These are summarized in Appendix Table 2(a). The most important among these are input costs, since wages and power tariffs determine a large part of the daily operating costs of most plants. We use the average daily wage rate of unskilled urban male and female workers in our estimations. In India, power rates vary by the size of the industry and also by

usage - the so-called declining block tariff. We use the average tariff for large industries for estimation purposes. Our results remain unchanged when we alternatively control for tariff rates of medium and heavy industries.

Other economic explanatory variables include growth of net state product per capita from 1994 to 1995, growth of employment from 1983 to 1994, an urban Gini coefficient for 1995, and a Human Development Index (HDI) for 1995. We believe that, for India, the growth of net state product serves more as an indicator of the overall health of the state rather than as a gauge of market size. For most products, firms consider their market to be the all-India market.

The employment growth variable estimates the number of jobs that are being created in the state in a particular year, and is also an indicator that other firms are locating in that state. This may serve two purposes: (1) it tells a potential investor that the business climate of the state is attractive enough for other firms to locate there, and (2) given the presence of other firms, gains may be had from potential agglomeration and positive spillover effects.

The Gini coefficient measures income inequality in the state, and the effect of this variable is unclear. In the US there is a substantial literature on environmental justice (Zimmerman, 1993; Boer et al. 1997) that suggests that environmentally polluting plants may be drawn to lower income minority areas (areas with high inequality). Firms may believe that such areas would be less politically active, and there would thus be less collective action (Hamilton, 1995; Arora and Cason, 1998). On the other hand, investors may choose to move to states with low inequality, since this signals a better overall industrial climate (median voter literature). The HDI variable is an aggregate measure of various social and economic development characteristics. We hypothesize that new firms would want to locate in states at higher stages of social and economic development.

We also control for environmental regulation in a state. Absent other good measures, we use state-wise environmental outlay normalized by gross state product. Depending on how firms perceive such expenditures, that is, as substitutes or complements to their own environmental outlay, the sign on this variable could go either way. If firms view such expenditures as complements, then high environmental expenditures by the state would indicate tighter environmental regulations, and thus higher compliance costs for the firm. In this case, it would be less likely to locate in such a state. On the other hand, if the firm views the two expenditures as substitutes, then a higher state outlay would signal a larger budget for environmental cleanup. Firms may be more likely to locate in such states since they believe that their share of environmental clean-up costs will be small.

Other factors in our study include literacy rates for 1991 and workforce participation rates for urban males (1993-94). Literacy rates are important because they proxy for labor efficiency and productivity. New firms would want to locate in states with higher literacy levels as this may reduce their worker training costs. The workforce participation variable is an indicator of the size of the effective labor force. Thus this variable should affect location choice probabilities positively. We also include (normalized) measures of research and development (R&D) expenditures by the state government in our estimations. We hypothesize that state support for research and development will have a positive effect on location choice decisions. Lastly, dummies for mining and agricultural projects are used to analyze whether labor regulations have differential effects by industrial classifications; the classifications for all projects in our data are as reported in Appendix Table 2 (b).

The next section discusses the econometric methodology and reports the results obtained from our various specifications.

Section 3 - Empirical Model and Results

To obtain a preliminary sense of the relation between aggregate number of new projects and variations in state-level labor regulations, we estimate a simple count model using a negative binomial specification. Our unit of observation is the state, and the dependent variable is the total number of new projects in that state. The labor regulation variables are number of labor courts in the state in 1995, number of unions registered in the state in 1995, and the number of man-days lost due to disputes resulting in work-stoppages in 1995. Given degrees of freedom constraints, we estimate a parsimonious form of the model (our controls include power tariffs, a state level Gini coefficient, and wages for unskilled males). Explanatory variables are normalized by gross state product in 1995 to control for differences in economic activity levels across states. Results indicate that stringent labor regulation has significant negative effects on the total number of new projects in a state. Since our basic hypothesis is validated in this aggregate model, we investigate micro-level firm location decisions next.

We hypothesize that the state-level location decision of projects is a function of labor regulation variables as well as other socio-economic indicators from 1995 or earlier. As noted in previous studies (Wolverton, 2002), an analysis in which the location decision is concurrent with the values of independent variables may suffer from simultaneity bias. We use variables from before the time the project-siting decision is made to control for this, although we acknowledge that in the presence of time-persistent unobservables that influence both labor variables and industrial development, such controls may be insufficient. But controlling for simultaneity bias should only make our results stronger. This is because the likely reverse causation has the opposite (positive) sign. That is, if we believe that development spurs additional labor laws in

order to protect citizen's welfare, then our current coefficients under-estimate the true effect of labor regulations. Controlling for endogeneity caused by the presence of time persistent unobservables should make our coefficients more negative in magnitude (the unobservables cause a conservative bias in our estimates).

Estimation Methodology

Following the literature on location choice theory, a conditional logit model is used. A firm is given the choice of locating its project among sixteen alternative states. Fifteen of these indexes correspond to fifteen states in India, and the last index is an agglomerate "other states" category (See Appendix Table 1 for list of States/Union Territories and corresponding index classifications).

Project location choice is influenced by state-level labor regulation variables, costs of inputs, socio-economic variables such as a state level urban/rural Gini coefficients, and other variables such as state government sponsored research and development expenditures. These variables are believed to affect the net profits of projects and will thus influence location decisions. Our use of the conditional logit model presumes that a project is sited in the state where net profits are the highest. Suppose that for the *i*th project faced with J location choices, net profits from the *j*th location are given by

$$\pi_{ij} = x_{ij}^{'}\beta + \varepsilon_{ij} \qquad (1)$$

where x_{ij} includes various labor regulation variables, socio-economic variables and infrastructure variables, and ε_{ij} is a random project-and location-specific disturbance. If project *i* is located in state *j*, it is assumed that π_{ij} is maximal among the J alternative net profits. Hence, the probability that location *j* is chosen is:

$$\Pr(\pi_{ij} > \pi_{ik}) \forall k \neq j$$

Assuming that the unobservables in the net profit function are independent and identically distributed with a type I extreme value distribution (Greene, 2003),

$$F(\varepsilon_{ij}) = \exp(-e^{-\varepsilon_{ij}})$$

and that Y_i is a random variable that denotes the location chosen by project *i*, the probability that location *j* is chosen is given by:

$$\Pr(Y_i = j) = \frac{e^{x_{ij}'\beta}}{\sum_{k=1}^{J} e^{x_{ik}'\beta}}$$

This leads to the conditional logit model with the following log-likelihood:

$$\log L = \sum_{i=1}^{n} \sum_{j=1}^{J} d_{ij} \log \Pr(Y_i = j)$$

where $d_{ij} = 1$ if $Y_i = j$, and 0 otherwise. The total number of projects (*n*) is 5065, and, as noted above, the total number of location choices (J) is sixteen. We only use generic variables that vary by location and not by project in our model. Thus, we implement the simplest form of the conditional logit that estimates common location-specific coefficients.

The conditional logit is modeled on the assumption of independence of irrelevant alternatives (IIA), which does not allow for correlation across the unobservables of the sixteen net profit equations. This assumption is clearly a strong one to make, since profits may be correlated across states and regions. Following earlier literature (Bartik,1985), we attempt to relax the IIA assumption and allow for correlation in the disturbance terms for states within a region by introducing five regional dummy variables. Four of these capture states that lie in the

four standard geographical regions of India, whereas the fifth dummy represents those states that fall in our "other" category. When estimating the models, Region 4 is the omitted category. Table B below shows the states that are included under each dummy.

Table B

Regional Dummies

Dummies	Regions	States
Region 1	North	Haryana, Punjab, Rajasthan, Uttar Pradesh, Delhi
Region 2	South	Andhra Pradesh, Kerala, Tamil Nadu, Karnataka
Region 3	East	Bihar, Orissa,West Bengal
Region 4	West	Gujarat, Madhya Pradesh, Maharashtra
Region 5	Other	Arunachal Pradesh, Jammu & Kashmir, Mizoram, Nagaland, Sikkim, Himachal Pradesh, Assam, Tripura, Meghalaya

Estimation Results

Basic Model

The first column of Appendix Table 3 shows the results from the basic model. As hypothesized, labor regulation variables, such as the number of labor courts in the state, number of unions registered in the state, and the number of man-days lost in disputes resulting in work stoppages in the state, have strong negative effects on the likelihood of project location. All of these variables are significant at or below the 5% level. As discussed earlier, projects are less likely to locate in states where they perceive a predominantly pro-worker environment.

Variables that capture the cost of inputs such as the power rate for large industries and the average daily wage of unskilled male laborers also have strong negative effects on location choice probabilities. Large input costs imply smaller net profits, and thus smaller location choice

probabilities. Indicators of state infrastructure, like state support to research and development expenditures, positively affect the likelihood of project location, as does the growth of per capita net state product and the workforce participation rate of urban males.

The urban Gini coefficient, which captures income inequalities at the state level, has strong positive effects on the dependent variable. The positive sign suggests that projects are more likely to locate in states with large income inequalities. As discussed before, this supports the environmental justice literature. Given that a large portion of our sample consists of manufacturing and mining plants with potentially significant negative effects on the environment, the positive sign on the Gini variable is not unexpected.

As the basic model in Appendix Table 3 shows, the regional dummies are highly significant. The excluded region is region 4, which includes states such as Maharashtra, Gujarat, and Madhya Pradesh. These states have a substantial manufacturing presence. Therefore, as expected, the included regional dummies are all negative, suggesting lower location choice probabilities in these regions as compared to region 4.

Columns 2 through 5 of Appendix Table 3 test the sensitivity of the basic model to the inclusion of different labor regulation and socio-economic variables. From column (2), it is evident that the state-level number of disputes has a negative effect on project location probabilities, just as the other labor regulation variables had. But from (3) we find that the number of industrial tribunals in a state positively affects choice probabilities. This may be because industrial tribunals and labor courts serve very different functions. Firms may view the existence of industrial tribunals as an indication of a positive business climate in the state, where they could potentially benefit from the due process of law.

Large magnitudes for costs of inputs such as the power rate and the average daily wage for unskilled labor continue to remain disincentives for location choice in all alternative specifications. The negative effect of wages remains strong even if unskilled female labor is considered, and the effect of power rates remain unchanged with controls for rates specific to heavy industries as opposed to rates for large industries. The workforce participation rate for urban males is not significant in most specifications, and the Gini measure remains strongly positive (except in (5)). In (4), when we substitute a state-level human development index (HDI) value for the Gini measure, the variable is estimated imprecisely. In all the specifications considered (columns 2-5), state-wise support to research and development continues to have strong positive effects, and the regional dummies continue to have significant negative effects on location choice probabilities.

Several other variables are included in the sensitivity analysis. When percentage growth in employment is substituted for growth of net state product in (4), it yields a positive and significant coefficient. This is as expected, since states that are viewed to be growing with vibrant economic bases are more likely to attract new units. As expected, a state's literacy rate has a positive effect on a firm's location decision in (5). From specification (5), we also find that the coefficient for environmental outlay is positive and significant, implying that firms are more likely to locate in states with higher environmental outlays.

All alternative specifications show that the results of the basic model are not sensitive to the inclusion of other labor, demographic, and socio-economic variables. A pro-worker state is less likely to attract new business. However, Appendix Table 3 only reports the coefficients and we are unable to judge the magnitude of effects from this. In order to interpret the coefficients,

we calculate own-and cross-elasticities in the next section. These elasticities enable us to judge to what extent and by how much each of these variables affects location choice probabilities.

Elasticities for the Basic Model

The interpretation of own-and cross-elasticities in this case are analogous to the familiar price-elasticity framework. Own-elasticity measures the "responsiveness of an individual's choice probability to a change in the value of some attribute" (Ben-Akiva and Lerman, 1985). Similarly, cross-elasticities show the responsiveness of an individual's probability of choosing location i when the value of some attribute changes in location j. To calculate the own-and cross-elasticities, we proceed in the following manner. We first calculate individual elasticities and then calculate their weighted average using choice probabilities as weights. Suppose there are "i" locations to choose from, "n" projects that are choosing between these locations, and "k" regressors or attributes. Then disaggregate own elasticity is given by:

$$E_{x_{ink}}^{P_n(i)} = [1 - P_n(i)]x_{ink}\beta_k$$

where $P_n(i)$ is the probability of a particular project "n" choosing location "i", x_{ink} is the attribute of interest[5], and β_k is the coefficient on attribute k from the conditional logit model.

Aggregate own-elasticity is given by:

$$E_{x_{jk}}^{\bar{P}(i)} = \frac{\sum_{n=1}^{N} P_n(i) E_{x_{jnk}}^{P_n(i)}}{\sum_{n=1}^{N} P_n(i)}$$

[5] In our particular case, there are no individual-specific attributes. All variables are generic. Thus we write x_{ik} instead of x_{ink}.

Aggregate cross-elasticities may be calculated in an analogous manner. In the interest of brevity, we perform these calculations for the basic model only. The results are reported in Appendix Table 4. The calculations suggest that for a 1% increase in the normalized number of labor courts within the state, the probability that a project will be located in that state decreases by approximately 0.3%. Similarly, for a 1% increase in the normalized number of unions registered and the normalized number of man-days lost in disputes resulting in work stoppages, location choice probabilities at the project level fall by approximately 0.2% and 0.5%, respectively. The signs and magnitudes of the cross-elasticities (also reported in Appendix 4) are also as expected. For example, for a 1% increase in the normalized number of labor courts in other states, the probability that a project will be located in this state increases by approximately 0.4%. These results confirm that states perceived to have a pro-worker tilt attract fewer projects.

Sensitivity to Formal Labor Regulation

The labor regulation variables discussed as of now capture the on-the-ground impact of labor legislations. But formal labor laws and amendments may also be important. We introduce these to test for the robustness of our included labor regulation variables, and to account for an alternative source of disincentives in choice of locations. As noted above, our formulation of the formal labor regulation variable is a modification of the variable used in Besley & Burgess, 2002.

First we use a count of all the labor law amendments passed by a state. A priori, we are agnostic about the sign of this variable, since it is an aggregation of all amendments – pro-worker, pro-employer, and neutral. If firms interpret a large number of amendments in the labor arena as a sign of the state being pro-worker, then this variable will have a negative effect. We

also control for the total number of pro-worker labor amendments passed by each state. We hypothesize a negative coefficient on this variable. Appendix Table 5 shows the results for our basic model with the inclusion of the formal labor law variables discussed above.

Column 1 of this table shows that the coefficient on total labor-related amendments is negative and significant at the 5% level. Hence, firms perceive states with a large number of labor amendments as less employer-friendly, and they are thus less likely to locate in these states. In columns 2, we consider the number of pro-worker amendments passed by each state. We formulate such a disaggregation in order to consider only pure pro-worker legislation effects at the state level, and to exclude the confounding effects of states that pass anti-worker and neutral legislation. The result for the total number of pro-worker amendments shows that it has a strong negative effect on location choice probabilities. Other variables in both specifications have the same effects as before, with on-the-ground labor regulation variables (number of labor courts, number of unions registered, and man-days lost due to work stoppages) continuing to influence location choice probabilities negatively. Thus, both in terms of the political ambience and the actual regulations in effect, states viewed as pro-worker will be less desirable locations to invest in.

Analysis by Industrial Classification

One important consideration so far neglected in our analysis is the effect of resource constraints on project siting decisions. For example, projects related to mining would not have a large degree of freedom in deciding choice of location, since such projects need to be situated close to sources of raw materials. Hence, no matter how strong labor regulations are in a state, if that state happens to be a source of important raw materials and minerals, we would expect to see

positive location choice probabilities for mining projects in that state (relative to the base case). We believe that such constraints primarily affect agricultural projects and projects related to mining, since they are unlikely to be as footloose as manufacturing projects. To account for this, location-specific constants are interacted with two industry dummies specific to mining and agriculture. Appendix Table 6 shows the results for our basic model with the introduction of these dummies.

From the results in this table, it is evident that resource constraints are important factors in determining location choice. Bihar and Orissa are the states of India that have substantial deposits of minerals and ores. As column 1(b) shows, despite the negative effects of labor regulation variables, the interactions of the dummy for mining with alternative specific constants 2 (Bihar) and 9 (Orissa) have strong positive effects, implying that compared to the base case (Location 1, Andhra Pradesh), mining projects have a higher probability of locating in Bihar and Orissa. Such significant positive effects are not evident in these states for agricultural projects (columns 2(b). Uttar Pradesh (choice 13) and West Bengal (choice 14) lie in the Ganjetic plain, and are thus among the most fertile regions in India. Column 3(b) of the table shows that the interactions for these states with an agricultural dummy have significant positive effects on location choice probabilities. In both specifications of Appendix Table 6, labor regulation variables continue to exert strong negative effects.

Conclusion

The results in this paper strongly support our hypothesis that labor regulation variables have significant negative effects on location choice probabilities. As illustrated by the conditional logit estimation of our basic model, the number of labor courts within the state, the

number of unions registered at the state level, and the state-wise number of man-days lost due to labor disputes all act as disincentives on project location choice. The results are very robust to the inclusion of other labor regulation variables, such as the number of industrial tribunals and the state-wise number of workers involved in disputes.

Costs of input variables; such as wages of unskilled labor and the power rate for large industries, also have the hypothesized effects. Socio-economic indicators, such as a state-level Gini measure and a human development index value, have strong positive effects. Additionally, industrial infrastructure variables, such as a measure of state support for research and development and the workforce participation rate of urban males, positively influence location choice probabilities.

We undertake a disaggregation of regulation effects by industrial classifications. Our basic results are robust to these alternative categorizations, and the labor regulation variables continue to exert strong negative effects on project location choice. Furthermore, we allow for a differential effect of formal labor legislation (as opposed to labor regulations on-the-ground) in our estimations. Our results remain robust in all cases.

The results of this analysis have important policy implications. The strong negative effects of labor regulation variables suggest that states perceived as more pro-worker may suffer from a lack of industrial investment. This may have negative repercussions, not just on state output and productivity growth, but could potentially have negative spillover effects in terms of employment generation (such states will attract fewer new projects, and thus generate fewer new jobs). This will further reduce welfare levels, and may lead to increased poverty and deprivation.

We recognize that these results are conditional in nature – the question that we consider is the particular location of a project, given that a project is going to exist. There may be

unconditional effects as well since restrictive laws could deter new projects. We hope to address this question in future work, our use of the conditional logit model and lack of knowledge on the initiation dates of projects prohibits us from analyzing this question here. Moreover, given paucity of data, we could not address industry agglomeration effects, or possible linkages between labor legislations in the long run and regional per capita income, or the link between legislations and the presence of industries that are constrained by their need to locate near sources of raw materials. These are additional questions on our future agenda.

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APPENDIX TABLES

Appendix Table 1

State/Union Territory Classifications

State/Union Territory	Classification Code
Andhra Pradesh	1
Bihar, Jharkhand	2
Gujarat, Dadar & Nagar Haveli	3
Haryana	4
Karnataka	5
Kerala	6
Madhya Pradesh, Chattisgarh	7
Maharashtra, Goa, Daman & Diu	8
Orissa	9
Punjab, Chandigarh	10
Rajasthan	11
Tamil Nadu, Pondicherry	12
Uttar Pradesh, Uttaranchal	13
West Bengal	14
Arunachal Pradesh, Jammu & Kashmir, Mizoram, Nagaland, Sikkim, Himachal Pradesh, Assam, Tripura and Meghalaya	15
Delhi	16

Appendix Table 2(a)
Summary Statistics

State	Projects	Key Labor Regulation Variables			Input Cost Variables		
		Number of Labor Courts	Number of Unions Registered in '95	Man-days lost in disputes resulting in work stoppage '95	Power Tariffs for Industry(1995)		Average Daily Wage for Unskilled Male Laborer in '95
					Medium	Large	
Andhra Pradesh	440	6	4409	4136	351.9	374.2	24.7
Bihar	98	14	1930	628	140.5	212.0	24.9
Gujarat	479	21	1831	819	233.6	281.9	26.2
Haryana	145	0	1036	49	351.0	351.0	54.5
Karnataka	596	12	3810	420	278.4	397.5	22.6
Kerala	104	4	10236	1722	171.6	183.0	64.8
Madhya Pradesh	214	26	903	97	334.4	390.1	22.8
Maharashtra	1040	14	3007	617	299.2	307.5	24.4
Orissa	126	3	1531	133	285.0	334.6	24.4
Punjab	113	6	1272	151	240.5	274.5	59.6
Rajasthan	169	1	3054	446	309.0	330.0	38.4
Tamil Nadu	526	7	3219	758	244.4	259.1	34.3
Uttar Pradesh	260	19	1994	517	398.6	428.8	32.0
West Bengal	326	2	8965	3799	354.1	333.3	27.1
Other	179	1	114	122	172.5	166.0	40.2
Delhi	256	10	1557	47	345.2	384.3	46.1

State	Economic Variables				Demographic Variables		R&D and Infrastructure		
	% Growth Rate Per Capita Net State Dom. Product in '95	HDI Score (1991)	HDI Rank (1991)	Urban Gini-coeff. in 1995	Workforce Part. Rate for Urban Males '93-'94	State Literacy Rate in 1991	State support for R&D (1995) – (lakhs of Rs)	Environmental Outlay, 1995 (lakhs of rupees)	Gross State Domestic Product, 1995 (billions of Rs, 93-94 prices)
Andhra Pradesh	3.90	0.38	23	0.3210	54.4	44.1	182.0	420	611.14
Bihar	6.80	0.31	32	0.3090	43.9	38.5	55.0	120	421.15
Gujarat	19.40	0.40	21	0.3035	57.7	51.0	38.0	360	597.34
Haryana	5.00	0.44	16	0.2800	51.9	55.8	13.0	1569	231.99
Karnataka	3.30	0.41	19	0.3150	54.2	56.0	193.0	200	462.09
Kerala	8.10	0.59	3	0.3400	55.9	89.8	71.0	440	288.41
Madhya Pradesh	-0.30	0.33	30	0.3260	47.1	44.2	59.0	1684	542.91
Maharashtra	0.20	0.52	9	0.2767	50.8	70.5	86.5	245	1503.67
Orissa	2.40	0.35	28	0.3040	51.0	49.1	24.0	184	198.22
Punjab	0.25	0.57	7	0.3375	59.5	68.2	37.0	100	470.50
Rajasthan	17.00	0.35	27	0.2900	49.0	38.5	50.0	496	391.23
Tamil Nadu	4.45	0.52	10	0.3215	54.9	68.7	98.5	434	743.14
Uttar Pradesh	2.90	0.31	31	0.3240	48.2	41.6	231.0	500	926.47
West Bengal	5.00	0.40	20	0.3350	55.0	57.7	196.0	340	570.41
Other	1.18	0.45	16	0.2692	49.4	62.3	6.9	122	292.80
Delhi	7.30	0.62	2	0.3760	53.8	75.3	170.0	53	2192.42

Appendix Table 2(b)

Industrial Classification

Classification	Industry Sub-Categories
Manufacturing	Base Metals, Chemicals, Electric Machinery, Electronics, Fats and Oils, Leather, Misc. Manufacturing, Non-electrical Machinery, Plastics, Pulp and Paper, Textiles, Transport Machinery, Wood
Mining and Quarrying	Minerals, Non-metal Minerals
Agriculture, Forestry and Fishing	Agriculture, Animals, Foods
Electricity, Gas and Water	Electricity

Appendix Table 3
Basic Model and Sensitivity of Results to Other Variables

Variable	Basic Model	Sensitivity to Other Variables			
	(1)	(2)	(3)	(4)	(5)
State-wise Number of Labor Courts	-45.96 **	-37.84 **	-51.99 **	-36.42 **	-23.84 **
	(2.465)	(2.334)	(2.713)	(2.301)	(2.541)
Number of Unions Registered in '95	-0.047 **	-0.042 **	-0.080 **	-0.033 **	-0.049 **
	(0.012)	(0.012)	(0.013)	(0.008)	(0.009)
Man-days lost in disputes resulting in work stoppage '95	-0.096 **		-0.076 **	-0.054 **	
	(0.011)		(0.011)	(0.012)	
Number of Disputes in 1994		-1.403 **			
		(0.173)			
Number of Industrial Tribunals			111.21 **		
			(17.87)		
State-wise support to R&D Projects	5.192 **	2.631 **	1.568 **	4.998 **	4.602 **
	(0.627)	(0.710)	(0.854)	(0.421)	(0.503)
% Growth Rate of Per Capita Net State Dom. Product in '95	0.011 *	0.007	-0.010		0.043 **
	(0.007)	(0.007)	(0.007)		(0.005)
% Growth in Employment				0.250 **	
				(0.048)	
State Environmental Outlay					0.119 **
					(0.036)
Power Tariffs for Large Industry	-0.003 **	-0.002 **	-0.002 *		-0.002 *
	(0.001)	(0.001)	(0.001)		(0.001)
Power Tariffs for Heavy Industry				-0.004 **	
				(0.001)	
Literacy Rate in 1991					0.030 **
					(0.003)
State-wise urban Gini-coeff. in 1995	5.620 **	2.378 **	1.844 *		-0.837
	(0.994)	(0.964)	(1.146)		(1.221)
State-wise Human Dev. Index (1991)				0.437	
				(0.309)	
Average Daily Wage for Unskilled Male Laborer in '95	-0.016 *	-0.028 **	-0.020 **		
	(0.010)	(0.010)	(0.009)		
Average Daily Wage for Unskilled Female Laborer in '95				-0.030 **	-0.058 **
				(0.007)	(0.012)
Workforce Part. Rate for Urban Males '93-'94	0.007	0.028 **	-0.005	-0.005	-0.002
	(0.012)	(0.012)	(0.012)	(0.009)	(0.009)
Region 1 Dummy	-1.869 **	-1.294 **	-0.861 **	-1.523 **	-0.620 **
	(0.257)	(0.263)	(0.294)	(0.136)	(0.233)
Region 2 Dummy	-1.302 **	-0.628 **	0.083	-1.211 **	-0.913 **
	(0.107)	(0.136)	(0.245)	(0.067)	(0.101)
Region 3 Dummy	-1.964 **	-1.620 **	-1.312 **	-1.811 **	-1.174 **
	(0.093)	(0.104)	(0.140)	(0.093)	(0.126)
Region 5 Dummy	-2.136 **	-1.858 **	-1.695 **	-3.078 **	-1.172 **
	(0.182)	(0.189)	(0.196)	(0.266)	(0.213)
Pseudo R2	0.088	0.088	0.090	0.088	0.089

Sample size is 5,065 projects. Table reports coefficients and not odds ratios. Standard Errors in Parenthesis.
** Significant at the 5% level. * Significant at the 10% level.

Appendix Table 4

Basic Model and Elasticities

Variable	Basic Model	Elasticities	
		Own	Cross
	(1)	(2)	(3)
State-wise Number of Labor Courts	-45.96 **	-0.003	0.004
	(2.465)		
Number of Unions Registered in '95	-0.047 **	-0.002	0.002
	(0.012)		
Man-days lost in disputes resulting in work stoppage '95	-0.096 **	-0.005	0.001
	(0.011)		
State-wise support to R&D Projects	5.192 **	0.011	-0.004
	(0.627)		
Power Tariff for Large Industry	0.011 *	-0.009	0.005
	(0.007)		
State-wise urban Gini-coeff. in 1995	5.620 **	0.013	-0.010
	(0.994)		
Average Daily Wage for Unskilled Male Laborer in '95	-0.016 *	0.003	0.003
	(0.010)		
Workforce Part. Rate for Urban Males '93-'94	0.07	0.003	-0.002
	(0.012)		

Appendix Table 5

Formal Labor Regulations

Variable	(1)	(2)
Counts of All Labor Related Amendments	-8.215 **	
	(1.673)	
Counts of Pro-Worker Amendments		-16.921 **
		(4.079)
State-wise Number of Labor Courts	-47.77 **	-50.713 **
	(2.496)	(2.725)
Number of Unions Registered in '95	-0.033 **	-0.039 **
	(0.012)	(0.011)
Man-days lost in disputes resulting in work stoppage '95	-0.089 **	-0.081 **
	(0.011)	(0.011)
State-wise support to R&D Projects	5.017 **	5.473 **
	(0.613)	(0.616)
% Growth Rate of Per Capita Net State Dom. Product in '95	0.019 **	0.016 **
	(0.007)	(0.007)
Power Tariffs for Large Industry	-0.003 **	-0.003 **
	(0.001)	(0.001)
Urban Gini-coefficient in 1995	4.751 **	5.788 **
	(0.996)	(0.983)
Average Daily Wage for Unskilled Male Laborer in '95	-0.024 **	-0.023 **
	(0.010)	(0.010)
Workforce Part. Rate for Urban Males '93-'94	0.009	0.011
	(0.011)	(0.011)
Region 1 Dummy	-1.663 **	-1.806 **
	(0.255)	(0.254)
Region 2 Dummy	-1.257 **	-1.408 **
	(0.106)	(0.109)
Region 3 Dummy	-1.855 **	-1.850 **
	(0.093)	(0.095)
Region 5 Dummy	-1.983 **	-2.097 **
	(0.179)	(0.177)
Pseudo R2	0.089	0.089
Log Likelihood	-12791.77	-12795.33

Table reports coefficients and not odds ratios. Standard Errors in Parenthesis.
** Significant at the 5% level. * Significant at the 10% level.

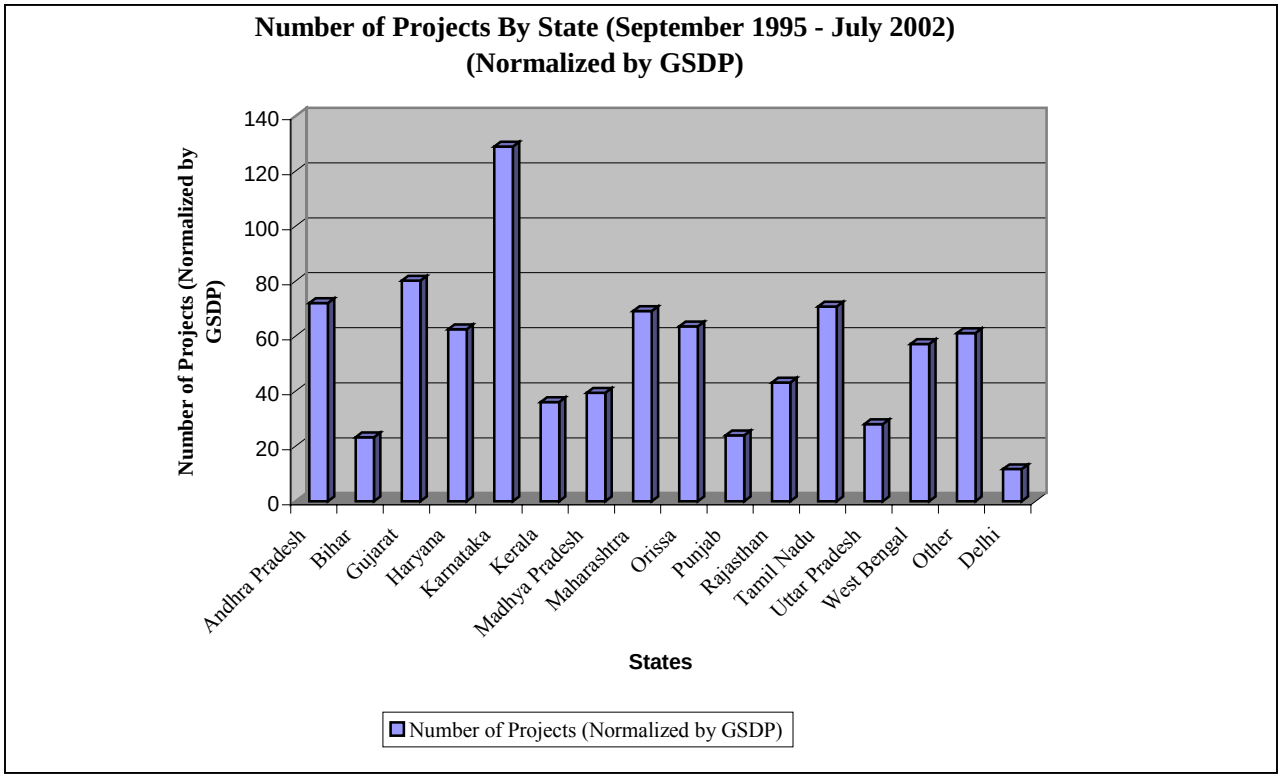
Appendix Table 6
Analysis by Industrial Classification

Variable	Mining (1a)	Agriculture (2a)		Variable	Mining (1b)	Agriculture (2b)
State-wise Number of Labor Courts	-46.62 ** (2.695)	-44.06 ** (2.606)		Choice2* Ind. Dum.	0.730 ** (0.254)	-0.140 (0.401)
Number of Unions Regd. '95	-0.052 ** (0.013)	-0.042 ** (0.012)		Choice3* Ind. Dum.	-0.061 (0.182)	-0.928 ** (0.283)
Man-days lost in disp. result. in work stop. '95	-0.098 * (0.011)	-0.097 ** (0.011)		Choice4* Ind. Dum.	-0.901 ** (0.367)	0.302 (0.302)
State-wise support to R&D Projects	6.283 ** (0.714)	4.501 ** (0.654)		Choice5* Ind. Dum.	-1.070 ** (0.210)	0.248 (0.201)
% Growth Rate of Per Capita GSP (1995)	0.010 (0.007)	0.015 ** (0.007)		Choice6* Ind. Dum.	-0.620 * (0.372)	0.172 (0.357)
Power Tariff for Large Industry	-0.004 ** (0.001)	-0.003 ** (0.001)		Choice7* Ind. Dum.	0.067 (0.213)	-1.138 ** (0.391)
State-wise urban Gini-coeff. in 1995	4.450 ** (1.082)	5.674 ** (1.044)		Choice8* Ind. Dum.	-0.316 ** (0.159)	0.317 * (0.184)
Ave. Daily Wage for Unskill. Male Lab. in '95	-0.011 (0.010)	-0.017 * (0.010)		Choice9* Ind. Dum.	0.845 ** (0.228)	-0.971 ** (0.483)
Workforce Part. Rate for Urban Males '93-'94	0.010 (0.013)	0.008 (0.012)		Choice10* Ind. Dum.	-1.644 ** (0.472)	0.279 (0.303)
Region 1 Dummy	-1.938 ** (0.280)	-1.848 ** (0.272)		Choice11* Ind. Dum.	-0.342 (0.245)	-0.660 * (0.346)
Region 2 Dummy	-1.473 ** (0.122)	-1.188 ** (0.112)		Choice12* Ind. Dum.	-0.057 (0.176)	0.061 (0.212)
Region 3 Dummy	-2.162 ** (0.107)	-1.891 ** (0.096)		Choice13* Ind. Dum.	-0.702 ** (0.279)	0.721 ** (0.231)
Region 5 Dummy	-2.275 ** (0.204)	-1.191 ** (0.189)		Choice14* Ind. Dum.	-0.354 * (0.214)	0.683 ** (0.212)
Log Likelihood	-12738.10	-12752.27		Choice15* Ind. Dum.	-0.468 * (0.274)	-0.510 (0.349)
Pseudo_R2	0.093	0.092		Choice16* Ind. Dum	0.426 ** (0.194)	-0.70 (0.291)

Sample size is 5,065 projects. Table reports coefficients and not odds ratios. Standard Errors in Parenthesis.
** Significant at the 5% level. * Significant at the 10% level.

APPENDIX GRAPHS

Appendix Graph 1



Appendix Graph 2