Endogenous Economic Policy and the Structure of Production: Theory and Evidence*

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Abstract

This paper develops and tests a model that predicts a positive relationship between absolute levels of capital stock and how favourable are policies toward capital. The theoretical model we use is a model of campaign contributions and electoral competition, extended to consider the implications for factor mobility and hence the structure of production. There are two main predictions. First, countries with more capital stock tend to implement more pro-capital policies. Second, in a two country model, the country that initially has more capital will be able to attract capital inflows from the other country. Given additional assumptions on the production side, this yields the prediction that the more different are countries' policies, the more different will be the set of goods which they produce. These predictions of the model are confirmed using panel data on cross-state differences in policies and economic outcomes in India.

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1 Introduction

Absolute advantage, broadly defined as absolute superiority in technology or factor endowments, has rarely played a major role in theories of international trade. Traditional trade theory, from Ricardo to Heckscher and Ohlin, has stressed the role of comparative rather than absolute advantage as the reason for trade. New trade theories in the Helpman-Krugman (1985) mould show the impact of increasing returns in determining the pattern of trade. This paper seeks to address a simple question: can absolute advantage, through its impact on policy, play a role in international trade and the structure of production?

We propose a model that makes the following two predictions. First, in a two-location world\(^1\), the location with a greater absolute stock of capital will have policies which are more favourable to capital. Once we allow for capital to move across locations, the location with greater absolute capital stock will attract inflows of capital from the other location, changing relative capital-labour endowments, so that the location with an initial absolute advantage in capital stock, will end up having a comparative advantage in the capital intensive good. Therefore, the second theoretical prediction is that locations with more different policies will also have more different industrial structures. Both of these predictions are then tested empirically.

The way the model works is as follows. We start with a standard model of trade with identical technologies but different relative endowments of capital and labour across locations. Then, comparative advantage implies that each location will export the good which uses intensively its relatively abundant factor. However, capital owners are able to lobby the government for policies that favour them, at the expense of labour. The location with greater absolute levels of capital will therefore implement policies that are more favourable to capital, because the cost of policy is spread over more units of capital.\(^2\)

Once we allow for capital mobility, lobbies in each location play a two stage game in which they first simultaneously choose whether to lobby their respective governments or not, and then whether to stay in their original location or move to the other location. In general there are two (pure strategy) Nash equilibria, in which all the capital in the world locates in either location. However, if initial absolute capital endowments are different across locations, the two equilibria are not symmetric, and we can obtain conditions for which one of the equilibria disappears leaving us with a unique Nash equilibrium, that all the capital in the world will locate in the location that has the larger initial stock of capital. Therefore, while comparative advantage matters for current patterns of trade,

\(^1\)A note on terminology: we use "locations" to distinguish between two geographical areas. We prefer this term to alternatives such as "countries" or "states" as the mechanism in the model would operate irrespective of the geographical area involved, as long as different locations have different policies.

\(^2\)If the government-provided good is a public good that is nonrival in consumption, e.g. national defence, then the benefits of government policy do not decline with the units of capital.
initial absolute endowments of capital determine policies and hence the future location of capital, future comparative advantage, and future patterns of production. This can lead either to the reinforcement or reversal of initial comparative advantage.

The key contribution of this paper is to combine the microfoundation of policy with comparative advantage and trade patterns. Following the lead of Grossman and Helpman (1996), we endogenise the relative weights which the government places on campaign contributions versus voter welfare, and show that the share of tax revenue derived from capital depends on how effective is lobbying activity, how dispersed are voter preferences for different parties in an election, and how well-informed are voters. We build on Grossman and Helpman (1996) by modifying and extending the framework to incorporate a Heckscher-Ohlin production structure, and then allowing for capital mobility across locations.

There have of course been previous models on the impact of endogenous policy formation on capital mobility; examples include Persson and Tabellini (1992) and Hauger (1997). At least two key features distinguish our model from previous models. First, it is based on a two-good, two-factor model of international trade; this allows us to derive some results on the impact of factor mobility on the structure of production. Second, and fairly crucially for our results, the government in our model maximises the probability that it will win an election. In the process of doing so, it has to compete with a rival party using a combination of campaign contributions and policies, but this results in the capital lobby being able to exploit this rivalry to maximise its own welfare at the expense of the political parties.

The model of absolute advantage which we present also differs from previous models in which absolute advantage is an explanation for trade, for example Copeland and Kotwal (1996) or Neary (2003). In Copeland and Kotwal (1996), absolute (technological) advantage combined with non-homothetic preferences may lead to no gains from trade, so that absolute advantage reduces trade flows. In Neary (2003), a fall in production costs in one country in a many-sector oligopolistic general equilibrium model may lead both countries to specialise less in accordance with comparative advantage through changes in factor prices. In our model, absolute advantage in terms of absolute capital stock has an indirect effect on patterns of trade, by influencing the location of capital through its impact on policy. Trade in goods, taking factor endowments as given, is still governed by comparative advantage.

This paper is also related to the literature on tax competition. The evidence from this literature has been that corporate tax revenue as a share of total tax revenue has been falling in OECD countries over the last 30 years (see e.g. Devereux, Griffith and Klemm (2002)). The traditional tax competition literature has emphasised a race-to-the-bottom as countries compete with one another to capture internationally mobile capital. However, Baldwin and Krugman (2002) show that, empirically, there is no clear evidence of a race to the bottom, and they develop a theoretical model of economic geography which predicts that closer integration between countries may lead first to a
race-to-the-top and then a race-to-the-bottom. The model in the present paper predicts no race of either kind, as governments are compelled to implement policies subject to the special interest groups’ interests.

In the theoretical model, we model the government’s policy variable as the tax rate on capital and labour. In our empirical analysis, we take a broader interpretation of policy. We test for the impact of capital endowments on economic policy using state-level data on India between 1959 and 1997, using Besley and Burgess’ (2004) labour regulation indicator as a measure of how favourable is the policy stance of a state to capital. Since capital stock is endogenous in our model, our empirical strategy uses instrumental-variables methods to overcome this problem. We instrument capital stock using electricity generating capacity and bank credit. These are intuitively appealing instruments as they are highly correlated with capital stock, but at the same time, are not correlated with the error term, as they are primarily determined by the central government, and also pass the Hansen (1982) test of overidentification. As a robustness check, we use ordered logit as an alternative estimation method, due to the discrete nature of the labour regulation variable.

Both predictions of our theoretical model are confirmed in the data. First, even after controlling for numerous other factors, absolute capital endowments have a strong impact on policy. More precisely, the greater the endowment of capital in a state, the more pro-capital will be its policy stance. We see this as evidence in support of the mechanism proposed in our theory. Second, states which are more similar in their labour regulations, tend to have more similar industrial structure, which again is in accord with the theoretical prediction.

Our empirics differ from previous work such as Besley and Burgess (2000, 2004), Aghion, Burgess, Redding and Zilibotti (2003) and Dollar, Iarossi and Mengistae (2002), who focus on the impact of policy on economic performance. Here, in our first main econometric specification, we use a measure of policy as our dependent variable, and investigate the impact of capital endowments on policy. In our second main estimated equation, we also investigate how differences in policy across states impact on industrial structure.

The rest of the paper is structured as follows. The next section lays out the theoretical model, starting with a closed economy and then allowing for capital mobility across locations. Section 3 performs the empirical tests. The final section concludes.

2 The Model

The model combines elements of both a model of political economy and a model of trade based on factor endowments. First, we describe the production side of the economy, which is a standard $2 \times 2 \times 2$ Heckscher-Ohlin model. Assume two locations, Home and
Foreign, two goods, 1 and 2, and two factors of production, capital and labour, both inelastically supplied. The two goods are produced under perfect competition using the following technologies which are assumed to be identical across locations:

\[
X_1 = x_1(K, L) \quad X_2 = x_2(K, L)
\]

\[
\frac{\partial X_i}{\partial K} > 0 \quad \frac{\partial X_i}{\partial L} > 0 \quad \frac{\partial^2 X_i}{\partial K^2} < 0 \quad \frac{\partial^2 X_i}{\partial L^2} < 0 \quad i = 1, 2
\]

Assume that good 1 is capital-intensive relative to good 2 at any given factor price (no factor intensity reversals): \((\frac{K}{L})_1 > (\frac{K}{L})_2\). Equilibrium in production is given by the set of equilibrium conditions familiar from standard trade theory (see Helpman and Krugman (1985)):

\[
p_i = MC_i(w, r)
\]

\[
l_1(w, r)X_1 + l_2(w, r)X_2 = L
\]

\[
k_1(w, r)X_1 + k_2(w, r)X_2 = K
\]

\[
\kappa_1(p_1, p_2) = \frac{p_1X_1}{p_1X_1 + p_2X_2}
\]

\[
\kappa_2(p_1, p_2) = \frac{p_2X_2}{p_1X_1 + p_2X_2}
\]

where the first condition is simply the zero profit condition, the second condition is the factor market clearing condition, where \(l_i\) and \(k_i\) are the unit factor input requirements, and the third condition is the goods market clearing condition, where \(\kappa_1(p)\) and \(\kappa_2(p)\) are the shares of goods 1 and 2 respectively in total expenditure.

The political model is based on a heavily modified version of Grossman and Helpman’s (1996) model of electoral competition and special interest politics; our exposition actually follows Chapter 10 in Grossman and Helpman (2001) more closely. The main difference between our model and theirs is that we extend their framework to consider the role of factor endowments on policy, and the impact of policy on the industrial structure. Therefore, the special interests are defined differently, as capital owners and labour owners, respectively. Instead of their policy vector, we consider a simpler setup with only a single policy instrument, which may favour either capital or labour. We adopt a different (more specific) functional form for the impact of campaign spending on voters’ decisions.

We divide consumers into those who own labour, whose net labour income is \(WL\), and those who own capital, whose net capital income is \(RK\). This is a simple way of capturing the reality that the main source of income is labour wage for some agents in society, and capital rents for other agents, while avoiding issues related to the distribution of wage versus rental income. The model is set up so that capital and labour have
opposing interests. This is in line with recent evidence which suggests that individual preferences are split along factor endowment lines (see for example Mayda and Rodrik (2004), O’Rourke (2003), O’Rourke and Sinnott (2001), Scheve and Slaughter (2001)).

Also, suppose that capital owners do not vote, while all labour owners vote. All capital owners form a single special interest group (SIG) which can lobby the government, while labour is unorganised. The assumption that capital owners do not vote means that the only channel through which they can influence policy is through their lobbying activity. The single SIG can be justified based on the free-rider argument: if capital ownership is highly concentrated, then it is easier for them to organise, as behaviour can be more easily monitored, whereas the much larger number of workers/voters is much harder to monitor, and hence a SIG is harder to organise.

2.1 Modelling the policy instrument

The data we use for the empirical section uses Besley and Burgess’ (2004) indicator of labour regulation as pro-worker or pro-capital. Therefore, we would like to model the policy instrument in the same way. First, we give a brief description of the labour regulations as used in Besley and Burgess (2004), then we explain our modelling procedure.

The legislation which Besley and Burgess use is the Industrial Disputes Act of 1947. This is a Federal Act, enacted in 1947, and falls under the Concurrent List, for which both central and state governments are allowed to make law. Besley and Burgess consider state-level amendments to the Act, as listed in Malik (1997). Therefore, while because of the Federal Act all states started out with the same level of policy, these state-level amendments mean that they have diverged over time.

Besley and Burgess code 113 amendments to the Act, as either pro-employer, pro-worker, or neutral. An amendment is coded as +1 if it is pro-worker, -1 if it is pro-employer, and 0 if it is neutral, with multiple amendments in the same direction in the same year given the same coding as if it is a single amendment (for further details, see Besley and Burgess (2004)). Figure 1 shows the trends in the policy measure across states. Six states which have made no amendments to the Industrial Disputes Act can be classified neutral or control states: Assam, Bihar, Haryana, Jammu & Kashmir, Punjab and Uttar Pradesh. The treatment states are either pro-employer (six states: Andhra Pradesh, Karnataka, Kerala, Madhya Pradesh, Rajasthan and Tamil Nadu) or pro-worker (four states: Gujarat, Maharashtra, Orissa and West Bengal).

What exactly are these changes in labour regulation? The Appendix Table in Besley and Burgess (2004) lists all the changes. Examples of pro-worker regulation include requiring workers to be paid before closing down firms, giving preference to prior workers when rehiring, allowing individual workers to apply to the labour court for adjudication, widening judicial powers to recover money owed to workers by employers, and lengthening the notice employers must give workers about changes in the condition of service.
Examples of pro-employer regulation include prohibiting strikes and lockouts when in the public interest, facilitating the settlement of industrial disputes in labour courts, and allowing firms to continue layoffs due to natural disasters for more than 30 days without requiring permission from the government.

Our simple model is of course unable to capture all the richness of the policy environment in India. Nevertheless, the message that comes through very clearly in the policy changes noted above is that any given policy change generates a benefit to capital or labour, and a policy that favours capital tends to hurt labour. To keep the model simple, we model the policies as tax rates on labour and capital, although we want to keep in mind that this is a simplification of the much more complex policies involved. Let the policies toward labour and capital be related in the following manner:

\[ t^L L + t^K K = G \]  

(5)

That is, there is a government revenue requirement that is satisfied by taxes on capital and labour. Assume that \( t^K, t^L \geq 0 \); the government cannot subsidise factors. Then, the net return to labour is \( W = w - t^L \), while the net return to capital is \( R = r - t^K \). \(^3\) Interpreted in this way, policy is more favourable to capital the lower is the tax rate on capital. We believe that other formulations of policy that involve a transfer of resources between factor owners should yield similar results. Since it is factor owners rather than firms who pay the taxes, these taxes do not influence the firms’ decisions: firms will maximise their profits taking pre-tax wage and rental rates as given. This allows us to retain the Factor Price Equalisation result, which simplifies the model considerably.

We now establish a link between the way we have modelled the policy, with the actual policies we use in our empirical work. The tax rates in the model may be thought of as the monetary equivalent of the cost of the labour regulations imposed on labour or capital owners in the data. Our interpretation of events is as follows. All states started out at the same level of tax rates (policy) on capital in 1947. But after that, lobbying activity in individual states changes the policy to reflect the political equilibrium in each state, with the result (to be shown below) that the more capital there is in a state, the more favourable to capital will be the policy.

2.2 The political environment and equilibrium without capital mobility

First, consider the case without capital mobility. We seek a subgame-perfect Nash equilibrium of a two-stage political game. The timing of the game is as follows:

(1) In Stage 1, interest groups announce their contribution schedules to each party.

\(^3\) Modelling policy as multiplicative rather than additive as we do here does not change the basic insight of the model.
Then in Stage 2, parties choose their policy platforms. Contributions are paid and campaigns are waged. The election takes place and the legislature meets to implement the winning party’s platform. Finally, output is produced and factors are paid.\footnote{Since contributions are paid before factors are paid, we implicitly assume that there is a perfect capital market on which factors can borrow/lend costlessly.}

Let $W^A$ and $W^B$ be the return to labour net of the policy implemented by parties A and B. Substituting from the government budget constraint (5), we get the welfare of voters given the policy platform of each party:

\begin{align*}
W^A &= w - t^A \text{LA} \\
&= w + t^A \left( \frac{K}{L} \right) - G \frac{L}{L} \\
W^B &= w - t^B \text{LB} \\
&= w + t^B \left( \frac{K}{L} \right) - G \frac{L}{L}
\end{align*}  

where $t^A, t^B$ are policy platforms of parties A and B. This implies that voter welfare is linear in income.

First, we discuss the behaviour of voters. There are two classes of voters: informed and uninformed, and two political parties, A and B. A two-party system is a good representation of the politics of many countries, for example the Republicans and the Democrats in the United States, the Labour party and the Conservative party in the United Kingdom, or Congress and the BJP (Bharatiya Janata Party) in India.

Informed voters are those who are aware of each party’s platforms, and vote based on the policy platforms and other characteristics of each party. Let $(1 - \alpha)$ denote the fraction of informed voters in the total voting population. Voters differ in their preferences for each party’s exogenous characteristics; let $\beta^i$ measure voter $i$’s assessment of the superiority of party B’s exogenous characteristics relative to party A, drawn from a uniform distribution on $(-\frac{1}{2}f, \frac{1}{2}f - \frac{b}{f})$, where $f > 0$ is a parameter measuring the diversity of ex ante views about the parties. The parameter $b$ can be interpreted as the ex ante voter bias in favour of party A. We might expect $b > 0$ if party A is the incumbent party, and $b < 0$ if party B is the incumbent party. An informed voter $i$ votes for party A only if $W^A - W^B \geq \beta^i$, or if the net return to labour under party A’s policy is greater.

Then the total number of informed votes cast for party A equals

\begin{align*}
s^I &= \left[ \frac{1}{2} + b + f (W^A - W^B) \right] (1 - \alpha) L \\
&= (1 - \alpha) \left[ \left( \frac{1}{2} + b \right) L + f (t^A - t^B) K \right]
\end{align*}
Uninformed voters (making up the remaining fraction $\alpha$ of the voting population) vote based on campaign spending by the two parties, and party characteristics. A party would be able to attract more uninformed voters to vote for it if it spends more than its rival in its campaign. Hence, denote by $s^U$ the number of uninformed voters who vote for party A, and assume that it depends on the difference in the parties’ total campaign budgets:

$$s^U = \left(\frac{1}{2} + b\right)\alpha L + h \left[(C^A)^{\frac{1}{2}} - (C^B)^{\frac{1}{2}}\right]$$

(9)

where $h > 0$ is a parameter reflecting the productivity of campaign spending, and $C^P$ is total campaign spending by party $P$, $P = A, B$. This specification shows that there are diminishing returns to campaign spending. This is a natural assumption to make, as more effective campaigning methods are used first, followed by less effective methods. Assume that the voter bias $b$ is the same for both groups of voters.

The total number of votes won by party A (denoted $s$; this implies that party B wins $1 - s$) is:

$$s = s^I + s^U$$

$$= \left(b + \frac{1}{2}\right)L + (1 - \alpha) f(W^A - W^B) L + h \left[(C^A)^{\frac{1}{2}} - (C^B)^{\frac{1}{2}}\right]$$

(10)

Now we discuss the behaviour of political parties. Each party is committed to implementing its policy platform if it wins the election. If the two parties happen to endorse the same policies, and spend the same amounts on their campaigns, then party A will capture a total of $\left(\frac{1}{2} + b\right) L$ of the votes. To inject some uncertainty into the outcome of the election, suppose that when $t^A$ and $t^B$ are chosen, each party regards $b$ as the future realisation of a random variable $\tilde{b}$. Ex ante, $b$ can be positive or negative, so that even if the platforms converge, each party has a chance to win a majority. Denote by $\varphi(\cdot)$ the distribution of $b$ as perceived by the parties at the time they announce their policies.

Each party sets its policy to maximise its chance of winning a majority, in light of its prior beliefs about the distribution of $\tilde{b}$. Since each party cannot influence what the other party does, the best it can do is to choose its own policy and campaign spending $W^P$ and $C^P$ to maximise this probability. Therefore, each party’s platform does not depend on what the other party does; this feature makes solving the model very simple. Nevertheless, in equilibrium party platforms cannot be very different from one another, because they are both constrained by the platform-contingent contributions of the SIG. This is consistent with the observation that the platforms of rival parties tend not to be very dissimilar from one another.

From the number of votes won (10), we can obtain the objective function of each political party. For party A, the probability that $s > \frac{1}{2}L$ is maximised when the party
adopts the tax platform \( t^K \) that maximises
\[
G^A = \max_{t^K} \left\{ (1 - \alpha) f \left( W^A \right) L + h \left( C^A \right)^{\frac{1}{2}} \right\}
\] (11)

while for party B, the probability that \( (1 - s) > \frac{1}{2} L \) is maximised when the party maximises
\[
G^B = \max_{t^K} \left\{ (1 - \alpha) f \left( W^B \right) L + h \left( C^B \right)^{\frac{1}{2}} \right\}
\] (12)

Each party maximises a weighted sum of campaign contributions and the welfare of the informed voters. The weight on welfare is greater, the greater is the fraction of informed voters (the larger is \( 1 - \alpha \)), and the narrower is the range of their ideological view (the larger is \( f \)).

We now consider the behaviour of the special interest group. Denote by \((r - t^K) K\) the aggregate utility that members of the interest group derive from the policy \( t \); the utility of capital owners is again linear in their income. The SIG knows that party A will win a majority only if the realisation of \( b \) is such that \( s > \frac{1}{2} L \). This happens with probability \( \varphi (\Delta) \), where
\[
\Delta = G^A - G^B = (1 - \alpha) f \left( W^A - W^B \right) L + h \left[ \left( C^A \right)^{\frac{1}{2}} - \left( C^B \right)^{\frac{1}{2}} \right]
\] (13)

The SIG attaches a probability \( \varphi (\Delta) \) to the event \( t = t^A \), and a probability \( 1 - \varphi (\Delta) \) to the event \( t = t^B \). Hence the objective function of the SIG is:
\[
V_L = \varphi (\Delta) \left[ (r - t^K)^A K \right] + [1 - \varphi (\Delta)] \left[ (r - t^K)^B K \right] - C^A - C^B
\] (14)

The key feature of the political model is that it is effectively the lobby that decides government policy through its campaign contributions. The lobby chooses contributions and hence policy to maximise its welfare \( V_L \), taking as given the two parties’ responses to its contributions, while the two parties each choose policy platforms to maximise its vote share, given the platform of the other party and the contribution schedule of the lobby. The lobby is able to exploit the competition for votes between the two parties to set its own agenda. The solution is a Nash equilibrium in contributions and policies.

If the lobby offers nothing to a party, then the party would support the policy that best served the average informed voter. From the government’s budget constraint (5), the equilibrium policy would then be:
\[
t^L = 0 \quad t^K = \frac{G}{K}
\] (15)
That is, in the absence of lobbying activity, policy favours labour and hurts capital. A party will deviate from this policy only if it can get at least as many votes by deviating as it would by implementing this policy. Deviating from this policy in favour of the SIG costs the party some votes from informed voters. Therefore, to induce the party to implement a more favourable policy to itself, the lobby must compensate the party for the loss of votes from informed voters, with a gain in votes from uninformed voters. Hence from equation (13), the SIG must offer to party A a contribution of at least

\[ C^A \geq \left[ \frac{(1 - \alpha)f}{h} \right]^2 L^2 \left( W^* - W^A \right)^2 \]  

Notice that this does not depend on the policy position adopted by party B. Similarly, to induce it to adopt the platform \( t^B \), the lobby must offer party B a contribution of at least

\[ C^B \geq \left[ \frac{(1 - \alpha)f}{h} \right]^2 L^2 \left( W^* - W^B \right)^2 \]  

The lobby’s problem is then to choose \( t^A, t^B \) to maximise its objective function (14), subject to the constraints (16) and (17). We assume that the lobby offers each party a contribution that leaves it with exactly the same chance of winning the election as it would be endorsing \( t^* \), so that both constraints hold with equality. This is what Grossman and Helpman (1996) refer to as influence-seeking behaviour by the lobby: the lobby contributes in order to influence policy platforms but not the outcome of the election.\(^5\)

If both parties do not receive any contributions, then party A would win the election with probability \( \varphi(0) \). But since the contribution leaves each party with the same chance of winning the election as without the contribution, then the probability that A wins the election is \( \varphi(0) \) regardless of the pair of policies chosen by the SIG. The SIG finds it beneficial to offer contributions to both groups because of the uncertainty over which party will win the election, at the time when contributions are offered.\(^6\) Appendix A shows the conditions for which the SIG will maximise its objective function by lobbying.

Substituting the contributions into the lobby’s objective function using the constraints gives:

\[ V_L = \varphi(0) \left[ (r - t^{KA}) K \right] + (1 - \varphi(0)) \left[ (r - t^{KB}) K \right] - \left[ \frac{(1 - \alpha)f}{h} \right]^2 L^2 \left( (W^* - W^A)^2 + (W^* - W^B)^2 \right) \]  

\(^5\)Grossman and Helpman (1996) also consider the possibility that the SIG offers more contributions than are required to satisfy the constraints (16) and (17). They refer to this as an electoral motive for campaign contributions, as this would change the outcome of the election. For simplicity we do not consider this possibility here.

\(^6\)However, the SIG does not necessarily contribute equally to both parties. The party which is more likely to win will get the larger contribution, as it receives a larger weight in the SIG’s objective function; see Grossman and Helpman (2001) p. 330 for a discussion of this outcome.
Therefore the equilibrium policy platforms satisfy

\[ t^KA = \arg \max_{t^K} \left\{ \frac{\varphi(0) \left( (r - t^K) K \right)}{L^2 \left( W^* - W^A \right)^2} \right\} \]  

(19)

\[ t^KB = \arg \max_{t^K} \left\{ \left[ 1 - \frac{\varphi(0)}{\varphi} \right] \left( (r - t^K) K \right) \right\} \]  

(20)

The influence-seeking lobby induces both parties to behave as if they were maximising weighted sums of the collective welfare of interest group members, and the welfare of informed workers. Define \( \varphi^A = \varphi(0) \) and \( \varphi^B = [1 - \varphi(0)] \). Then the first order condition implies:

\[ t^KP = t^{K*} - \frac{\varphi^P}{2} \left( \frac{1}{K} \right) \left[ \frac{h}{(1-\alpha) f} \right]^2 \]  

(21)

\[ \text{where } P = A, B \]

Therefore, \( t^KP < t^{K*} \). Proposition 1 summarises the role of the absolute capital stock on policy:

\textbf{Proposition 1} All else equal, policies are more favourable to capital the more capital there is in the economy: \( \frac{dt^KP}{dK} < 0 \) for \( t^KP > 0 \).

Lobbying activity by the SIG changes the tax regime from one in which all tax revenue is obtained from capital alone, to one in which tax revenue is obtained from both capital and labour. From the government revenue requirement, if a given fraction of government revenue is obtained from capital taxation, then clearly tax rates have to be lower if there is more capital. In the presence of lobbying activity, the tax rate on capital is lower than in the absence of lobbying activity; political parties offer lower tax rates to the capital SIG in return for campaign contributions.

The tax rate on labour is:

\[ t^LP = \frac{G}{L} - t^KP \left( \frac{K}{L} \right) \]  

(22)

\[ = \frac{\varphi^P}{2} \left( \frac{1}{L} \right) \left[ \frac{h}{(1-\alpha) f} \right]^2 > 0 \]

With labour as with capital, the more labour there is in the economy, the lower is the tax rate on labour in equilibrium. With lobbying, the tax rate on labour is positive.
as opposed to zero without lobbying, as parties sacrifice votes from informed voters by reducing their welfare, for votes from uninformed voters by spending more on their election campaigns. Notice that total tax revenue from labour and capital, \( t^{LP}L \) and \( t^{KP}K \), are constants that depend on how effective are campaign contributions. The more effective are campaign contributions (i.e. the larger are \( \alpha \) and \( h \)), the larger the total tax revenue from labour, and the lower the total tax revenue from capital, as parties put more weight on the welfare of the SIG.

### 2.3 Capital mobility

Now suppose that we have capital mobility across locations (while labour remains immobile across locations). Let there be a linear cost of capital mobility, \( c(K_M) = \gamma K_M \), where \( K_M \) is the amount of capital that moves from one location to the other. Suppose that the cost of capital mobility is small, but nonzero. This is a simple way of formalising the idea that capital is not perfectly free to move between locations. From a technical standpoint, a cost of capital movement is necessary to obtain a unique subgame-perfect Nash equilibrium when absolute capital stocks differ between locations.

To simplify the analysis, we also specialise the production functions to \( X_1 = K_1 \), and \( X_2 = L_2 \), for both Home and Foreign. This implies that, with free trade, every point within the Edgeworth Box has factor prices completely equalised across locations, thus allowing us to ignore the impact of changing factor prices on the analysis.

Given the linear specification for mobility costs and the linear technology, if one unit of capital gains by moving, then all units of capital in that location must gain by moving, so that the movement decision can be simplified to whether or not all the capital in a location moves to the other location. More generally, if the FPE set is a subset of the Edgeworth Box, then we can get an interior equilibrium whereby some capital remains in each location. We conjecture that allowing for factor prices to change would preserve the basic idea described below, but dampen the results and complicate the analysis. In terms of notation, in this subsection we work exclusively with tax rates on capital, so we suppress the superscripts indicating capital or labour tax rates.

The game in the previous section may be rewritten to allow for the possibility of capital mobility. Then, the outcome of the previous subsection may be interpreted as a special case of the game where capital is not allowed to move between locations. When we allow capital to move, it moves after policies are announced, but before production takes place, and taxes are paid to the government in the location where capital finally locates. We assume that capital that moves from one location to the other cannot be excluded by the incumbent capital from the benefits of lower tax rates. Lobbies can only lobby the government of the location in which they are initially located. The timing of the game is now as follows:

1. In Stage 1, the SIG in each location simultaneously decide whether or not to offer...
campaign contributions.

(2) In Stage 2, campaigns are waged, elections take place, and policies are implemented. Policies are observed by all agents prior to the start of Stage 3.

(3) In Stage 3, capital in each location simultaneously decides whether or not to move, production takes place and factors are paid.

Figure 2 is the extensive form representation of this game. All the action takes place in Stages 1 and 3. The choices faced by the SIGs \(H\) and \(F\) in Stage 1 are whether to contribute \((C)\) or to not contribute \((NC)\). The dashed line linking the two nodes of \(H\) indicates that the two nodes form a single information set; that is, \(H\) does not know which node in the information set has been reached, since the SIGs move simultaneously.

In Stage 3, each SIG decides whether to locate in Home or in Foreign. \(F_H\) denotes the decision of all capital in Foreign to move to Home, while \(F_F\) denotes the decision of the capital in Foreign to stay in Foreign. Once again the dashed lines linking the nodes of Home indicate that both SIGs move simultaneously.

The payoffs are written first for the Home SIG, then for the Foreign SIG, and represent the impact on the per unit return on capital. Take for example the case when both SIGs contribute, and both locate in Home (the lower left branch of the game tree). Then the payoff to Home’s SIG is \((-\frac{TC}{KW} - \frac{CU}{KH})\), while the payoff to Foreign’s SIG is \((-\frac{TC}{KW} - \frac{CF}{KF} - \gamma_F)\), where \(TC\) is the total tax revenue from capital when the capital SIG offers contributions to the government, \(KW = KH +KF\) is the total endowment of capital in the world. Therefore, if this is the outcome of the game, then since Home has contributed and all the capital in the world is in Home, the tax rate on capital is \(\frac{TC}{KW}\), while the cost of contribution per unit of capital is \(\frac{CU}{KH}\). For Foreign, it gets the same tax rate as Home since it has moved to Home, it has paid the cost of contributing to its own government, and it has incurred the cost of moving, \(\gamma_F\).

2.4 Equilibrium with capital mobility

The Nash equilibria for each Stage 3 subgame can be seen most clearly if there are no capital mobility costs \((\gamma = 0)\). Then, in the subgame where both SIGs have contributed, if Home chooses to stay in Home, then Foreign’s best response is to move to Home since the tax on capital is spread over a larger number of units of capital \((-\frac{TC}{KW} > -\frac{TC}{KF})\), while if Foreign decides to move to Home, then Home’s best response is to stay at Home for the same reason \((-\frac{TC}{KW} > -\frac{TC}{KH})\). Therefore, for this subgame, the outcome that both SIGs locate in Home \((F_H, H_H)\) is a Nash equilibrium\(^7\). But there is another Nash

\(^7\) In this case, since all the capital in Foreign has located in Home, to satisfy the government budget constraint, the entire tax burden must fall to labour, so that the tax rate on labour is \(tL = \frac{T}{KF}\).
equilibrium, since if Home decides to move to Foreign, then Foreign is better off staying in Foreign \( -\frac{T_C}{K_W} > -\frac{T_C}{K_F} \), while if Foreign stays in Foreign, then Home’s best response is to move to Foreign \( -\frac{T_C}{K_W} > -\frac{T_C}{K_F} \). Hence for this subgame, both SIGs locating in Foreign \((F_F, H_F)\) is another Nash equilibrium.

Performing the same exercise for all the remaining Stage 3 subgames yields the following Nash equilibria\(^8\) (note that these equilibria also hold for positive but small mobility costs):

<table>
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<tr>
<td>((F_C, H_{NC}, F_F, H_F))</td>
<td>((F_{NC}, H_C, F_H, H_H))</td>
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<tr>
<td>((F_{NC}, H_{NC}, F_F, H_F))</td>
<td>((F_{NC}, H_{NC}, F_H, H_H))</td>
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where \(F\) and \(H\) refer to the Foreign and Home lobbies, the subscripts \(C\) and \(NC\) indicate the lobby’s decision to Contribute or Not Contribute, and the subscripts \(H\) and \(F\) indicate the lobby’s decision to locate either in Home or in Foreign. The first two Nash equilibria \((F_C, H_C, F_H, H_H)\) and \((F_C, H_C, F_F, H_F)\) are those described above. The remaining equilibria are those in which the Foreign SIG contributes, the Home SIG does not, and both SIGs choose to locate in Foreign \((F_C, H_{NC}, F_F, H_F)\); and the mirror-image equilibria, where the Foreign SIG does not contribute, the Home SIG does, and both SIGs locate in Home \((F_{NC}, H_C, F_H, H_H)\), and the case where both SIGs do not contribute, but both either locate in Foreign \((F_{NC}, H_{NC}, F_F, H_F)\) or in Home \((F_{NC}, H_{NC}, F_H, H_H)\).

Next, we show which of the above Nash equilibria are subgame perfect. Now it is useful to re-introduce the cost of capital mobility. If Foreign contributes, then Home’s best response would be to not contribute, since this response leads to the outcome \((F_C, H_{NC}, F_F, H_F)\), which yields the payoff to Home of \(-\frac{T_C}{K_W} - \frac{C_H}{K_H}\), which is greater than the possible payoffs if Home contributes, \(-\frac{T_C}{K_W} - \frac{C_H}{K_H}\) for outcome \((F_C, H_C, F_H, H_H)\) or \(-\frac{T_C}{K_W} - \frac{C_H}{K_H} - \gamma_H\) for outcome \((F_C, H_C, F_F, H_F)\), as long as \(\gamma_H < \frac{C_H}{K_H}\). Therefore, provided this condition holds, one subgame perfect equilibrium is \((F_C, H_{NC}, F_F, H_F)\); that is, the Foreign SIG contributes while the Home SIG does not, and the Home SIG moves to Foreign. Intuitively, by not contributing and moving to Foreign, the Home SIG gets the benefit of the Foreign SIG’s lobbying for lower taxes on capital, and avoids paying contributions to the Home government.

Doing the same on the other side of the game tree, we find that, provided \(\gamma_F < \frac{C_F}{K_F}\), the other subgame perfect outcome is \((F_{NC}, H_C, F_H, H_H)\); that is, the Foreign SIG does not contribute but instead moves to Home, while the Home SIG stays at home and lobbies the Home government for pro-capital policies.

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\(^8\)Provided the following two conditions hold: \(\gamma_H < \frac{T_{NC}}{K_W} - \frac{T_C}{K_H}\), and \(\gamma_F < \frac{T_{NC}}{K_W} - \frac{T_C}{K_F}\). These inequalities hold if lobbying is sufficiently effective in switching the tax burden away from capital to labour.
This multiple equilibria outcome of the game appears at first sight to hamper our attempt to draw a prediction from initial endowments of capital to final endowments. However, we can eliminate one of the two equilibria if initial capital stocks are sufficiently different between locations. To make things concrete, suppose that $K_H > K_F$; Home has more capital stock than Foreign. Suppose that $C_H = C_F$ (this will be true if the share of informed voters, the distribution of their preferences for the two parties, and the effectiveness of lobbying are the same across locations), and that the cost of moving is identical for capital in each location ($\gamma_H = \gamma_F$). Then for some values of $K_H$, the condition $\gamma_H < \frac{C_H}{K_H}$ is violated, while the other condition $\gamma_F < \frac{C_F}{K_F}$ remains valid.\(^9\)

Then, provided the cost of capital mobility takes on some intermediate value,\(^10\) if Foreign contributes, Home will choose to contribute as well, but Home will still contribute if Foreign does not; contributing becomes Home’s dominant strategy. In this case, Foreign would prefer not to contribute, so that the unique subgame perfect outcome is $(F_{NC}, H_C, F_H, H_H)$. In words, the SIG in the location with more capital will remain in that location and lobby its government, while the SIG in the other location will not lobby, but instead move to the first location.

That the cost of capital movement is neither too small nor too large is crucial for this result. If it is too expensive for capital to move between locations, it will never be optimal for capital to move. On the other hand, if capital mobility is costless, then both SIGs would be indifferent between the two subgame-perfect Nash equilibria.

Intuitively, it is simple to see why we get this outcome. The SIGs face a choice of paying the contribution and getting lower tax rates, and incurring a mobility cost to move to the other location to free ride on the other SIG’s contribution (provided of course that the other SIG does in fact contribute). But the cost of contribution per unit of capital decreases the more capital there is in the economy, while the per unit mobility cost is constant. Therefore, the larger is the capital stock in a location relative to the other location, the less willing is the SIG in the first location to move. Given this unwillingness to move, the SIG in the other location would then find it always beneficial to move.

To see how this mechanism can lead to a reversal of initial comparative advantage, suppose that initially Home has absolutely more capital than Foreign, $K_H > K_F$, but that Home is relatively capital-scarce compared to Foreign, $\left(\frac{K}{T}\right)_H < \left(\frac{K}{T}\right)_F$. Then, initially, Home would have had a comparative advantage in the labour-intensive good. But since capital moves from Foreign to Home, Home will become capital-abundant relative to Foreign, and so will have a comparative advantage in the capital-intensive good.

\(^9\)To be precise, the level of capital for which this statement is true is $K_H > \frac{C_H}{\gamma_H}$, and $K_F < \frac{C_F}{\gamma_F}$.

\(^10\)These conditions are that $-\frac{C_F}{K_F} > -\frac{C_H}{K_H} - \gamma_H$ and $-\frac{C_F}{K_F} - \gamma_F > -\frac{C_H}{K_H}$. These two conditions ensure that if both Home and Foreign lobby in Stage 1, then in Stage 3, the only Nash equilibrium is when both Home and Foreign are located in Home. This ensures that Home will lobby provided that $\gamma_H > \frac{C_H}{K_H}$. These conditions together are consistent with our assumption that $K_H > K_F$. 

16
As noted in the introduction, in this model, absolute factor endowments influence comparative advantage indirectly. Absolute factor endowments influence tax rates on capital, which provides capital with an incentive to relocate to the location which gives the higher (post-policy) rate of return. This changes the locations’ relative factor endowments, causing a change in its comparative advantage. What the model does not consider is that it is possible for policies to influence locations’ comparative advantage directly, through factor prices. The reason this is the case, is that we focus on the case where factor prices are equalised, and that government policy does not affect firms’ profit-maximising decisions (see the brief discussion in subsection 2.1 above). If we relax these assumptions, the model would yield a direct impact on locations’ comparative advantage. Davis (1998) is an example of how a minimum wage might play such a role.

Therefore, a second result of the model is that, in a two location world, the greater the difference in absolute capital stocks between the two locations, the greater will be the difference in policies on capital. With capital mobility, this leads to a divergence in both absolute and relative factor endowments between the two locations, and hence a divergence in industrial structure, following standard Heckscher-Ohlin results.

To conclude this section on theory, we briefly summarise the two main theoretical predictions. The first main theoretical prediction, from Proposition 1, is that larger absolute capital stock is related to more favourable policy towards capital. This is the case whether or not we allow for the possibility of capital mobility across locations. The second main theoretical prediction, from the extension of the model to allow for capital mobility, is that differences in policy stance across locations, by providing capital with an incentive to move between locations, will lead to different industrial structures across locations. We test both these predictions in the next section.

3 Empirical evidence

In this section, we consider evidence from a state-time panel dataset from India on the two predictions of our theoretical model: the relationship between factor endowments and policies, and the impact of policy on industrial structure. The advantages of using within-country data are: first, that other sources of cross-location heterogeneity in government policies would be smaller within a country than across countries, and second, that capital mobility, crucial for the second theoretical prediction, is higher within than across countries. However, the model could in principle also be tested using cross-country data.
3.1 Campaign contributions in India

Our theoretical model is based on the role of campaign contributions in influencing the policy stance of governments. One of our tasks must therefore be to show that campaign contributions do in fact play a significant role in elections in India. Here, we present a brief history of the laws and reality of campaign contributions in India in the last 50 years\(^\text{11}\).

Political parties in India do not receive direct state subsidies. They do receive some subsidised television time and other indirect benefits, such as office space in the capital, but Indian parties raise most of their funds from corporate contributions. There is also evidence that corruption is high (see e.g. Das (2002); in 2002 Transparency International’s Corruption Perceptions Index ranked India joint 71st out of 102 countries in terms of the level of corruption).

From 1951 to 1969, most private donations to political parties were legal, but public-sector firms were not allowed to make political contributions. Contributions were not subject to limits, but campaign spending itself was limited. In 1969, corporate contributions were banned. Then, in 1975, the Indian Supreme Court ruled that political expenditures not authorised by a candidate do not count towards that candidate’s spending limits. As a result of these events, political finance moved underground. When corporate contributions became legal again in 1985, most parties and their corporate benefactors had become used to the underground system of unreported cash or in-kind contributions.

Since 1990, campaign contributions have continued to increase, while expenditure limits remain unrealistically low. But since unauthorised expenditures do not count toward candidate limits, such expenditures technically do not violate the law. In effect, there are no limits either on contributions or expenditures. Not only do researchers not have reliable data on campaign expenditures; the parties themselves may not fully know what was expended in the campaigns.\(^\text{12}\) Fortunately, this has no impact on our empirical analysis, as our theoretical model draws a direct link between capital stock and policy.

3.2 Data and methods

The test of our first theoretical prediction on the determinants of government policy is performed for the period 1959-1997, using data on the 16 largest states in India, which

\(^{11}\)The following exposition is based on the report on The Democracy Forum for East Asia’s working conference "Political Finance and Democracy in East Asia: The Use and Abuse of Money in Campaigns and Elections", 28-30 June 2001. The report is available online at http://www.ned.org/asia/june01/introduction.html.

\(^{12}\)Kochanek (1974) is an interesting discussion on the relationship between business and politics in India.
account for about 97% of the total population, while the test of our second theoretical prediction on industrial structure is based on a subset of this period, from 1980 to 1997. The data appendix lists the data sources. Real fixed capital stocks across Indian states are shown in Figure 3, which shows the disparity in capital accumulation, with no indication that states with initially less capital are catching up with those that have more capital. We use three alternative estimation methods. First, using OLS, we estimate regressions of the form:

$$LR_{st} = \alpha_s + \beta_1 + \phi_1 \ln(K_{st}) + \phi_3 \ln(L_{st}) + \delta x_{st} + \varepsilon_{st}$$ (23)

where $LR_{st}$ is the measure of labour regulation in state $s$ in year $t$, as discussed above in section 2.1. As discussed there, pro-worker amendments to the Industrial Disputes Act are coded as +1, while pro-capital amendments are coded as -1. This fits in nicely with the theoretical model, as a lower tax rate on capital is a pro-capital policy. $\ln(K_{st})$ and $\ln(L_{st})$ are the log of capital stock and population in state $s$ in year $t$.

$\alpha_s$ are the state dummies, which pick up all inter-state differences which are constant over time, and $\beta_1$ are year dummies, which control for common shocks. The inclusion of state and year dummies in all our regressions means that identification of the coefficients comes from the within-state relationship between changes in absolute capital endowments and changes in labour regulation.

The $x_{st}$ are other exogenous variables. One problem which we face in adding additional controls on the RHS of the equation is that most potential controls are themselves endogenous. Therefore we constrain ourselves to two control variables: the political history of states and the per capita state domestic product. Equation (23) seeks to uncover the impact of capital endowments on the policy stance of the state government.

According to our model, the capital stock may be an endogenous variable. Therefore, we follow up the OLS regression with an instrumental-variables regression. We want the number of instruments to be greater than the number of instrumented variables, so that we can perform a test for overidentification. On the other hand, we do not want too many instruments either, as the IV estimator becomes increasingly biased as the number of instruments increases (Davidson and MacKinnon (1993) p. 222).

We use two instruments: the log of total bank credit and the log of installed electricity generating capacity. These variables capture the impact of financial services and electrical power on the location of capital. Bank credit and electricity generating capacity were effectively determined by the central government, through the Banking Companies (Acquisitions and Transfer of Undertakings) Act of 1969, and the Industries (Development and Regulation) Act of 1951, while labour regulation was determined by state governments. This supports our interpretation, that variables that are determined by central government policies (bank credit and electricity generating capacity), can have a causal impact on a variable (labour regulation) which is determined by state governments.
For a set of instruments to be valid, the error term must be uncorrelated with the errors. Because we have more instruments than instrumented variables, the model is overidentified. The overidentifying restrictions require that the extra instruments should also be uncorrelated with the errors. We can use a Hansen-Sargan test to test for the validity of these restrictions. The test statistic is the criterion function of the IV model\textsuperscript{13}, divided by the estimate of the error variance of the model, which, under the null hypothesis that the instruments are uncorrelated with the errors, is distributed as a $\chi^2$ with $l - k$ degrees of freedom (where $l$ is the number of instruments, $k$ is the number of regressors).

Because the LHS variable in our regression, labour regulation, has characteristics of a discrete dependent variable, as a separate robustness check, we also perform the regression using ordered logit. The estimation method is maximum likelihood, which raises the issue of the appropriate functional form for the probability function of the discrete dependent variable, as the desirable properties of maximum likelihood are dependent on the distributional assumptions of the likelihood function. The two main alternative functional forms are the standard normal (in which case we get a probit model), and a logistic distribution (from which we get a logit model). If the true model is a probit and we maximise the likelihood function associated with a logit, the estimates will be inconsistent. However, we do not have any priors about the preferred functional form of the probability function, and using either ordered logit or ordered probit gives qualitatively similar results.\textsuperscript{14}

### 3.3 The impact of factor endowments on policy in India

Table 1 presents the results of our regressions. For each specification we report IV results next to the OLS results, all with heteroskedastic-robust standard errors.

Columns (1) and (2) are the baseline specifications, simply regressing labour regulation on capital endowment, population, and state and year dummies. We find that, using either estimation method, controlling for population, larger capital stocks are associated with lower values of the policy variable; that is, larger capital stocks imply more pro-capital policies. Greater population is associated with less pro-capital policy. Taken together, these results support the prediction of our theoretical model, which is that larger absolute capital stocks are associated with more favourable policies toward

\textsuperscript{13}The criterion function is defined as

$$Q(\beta, y) = (y - X\beta)^\top P_W (y - X\beta)$$

where $P_W$ is the orthogonal projection matrix of the instruments $W$: $P_W = W (W^\top W)^{-1} W^\top$. See Davidson and MacKinnon (2004) p. 321.

\textsuperscript{14}The results are so similar between the ordered logit and ordered probit models that we are unable to discriminate between the two models using the test that twice the difference between the two log-likelihood functions is distributed $\chi^2 (1)$ (see Johnston and DiNardo (1997) p. 430).
capital, while a larger population implies more favourable policies toward labour. The remaining columns in Table 1 control for other possible factors that might influence policy. However, the results on capital and population are robust to our alternative specifications.

Columns (3) and (4) control for state domestic product (SGDP) per capita. This has no significant impact under OLS, but is significant at the 5 percent level under IV. The sign of the coefficient indicates that the greater the state domestic product per capita, the less pro-capital is policy. The coefficients on capital and population are only marginally affected and remain highly significant. While SGDP may be endogenously determined by labour regulation, evidence from Besley and Burgess (2004) suggest that labour regulation has no significant impact on SGDP. However, SGDP is highly correlated with capital stock (correlation in excess of 0.83), which may account for the non-significance of SGDP under OLS, due to multicollinearity.

Columns (5) and (6) control for the political history of the states. The identity of the ruling party in a state clearly has great influence on the policy stance. We do indeed find that states which have had more years under a hard left (Communist) party or under the Congress party, have significantly less pro-capital policies than states under the rule of other parties, while states under a Hindu party tend to have pro-capital policies. This reduces the size and the significance of the coefficients on capital and population, however both remain significant at at least the 1 percent level. Finally, columns (7) and (8) include all the controls, which does not change any of the previous results.

Because of the possible endogeneity of the capital stock, we may prefer the instrumental variables approach to estimation. However, instrumental variables need to be used carefully. Do instrumental variables yield significantly different results from OLS, and are the instruments we have chosen the appropriate ones?

To test for whether it is necessary to use instrumental variables, we have to ask whether the estimates obtained from OLS are consistent or not. One test that can be used is the Hausman (1978) test. The idea is that OLS is inconsistent if some RHS variables are indeed endogenous, while instrumental variables is consistent whether or not these variables are endogenous. The null hypothesis then is that there are no systematic differences in parameter estimates between the two methods. If the null is rejected, we can conclude that OLS is inconsistent, and that IV should be preferred.

The results are in Table 1. The null hypothesis is rejected for the first specification but not the remaining ones. Therefore, we may prefer the IV results in column (1) to the OLS results in column (2), but there is no evidence to support this hypothesis in the other columns. Our interpretation of this result is that in columns (3) to (8), we are controlling for previously omitted variables which were in the error term in columns (1) and (2), and hence correlated with the RHS variables of interest. Including these additional controls reduces the differences in parameter estimates between OLS and IV, and hence leads to non-rejection of the null hypothesis that there are no systematic
differences in parameter estimates between IV and OLS.

If we persist in using IV estimation, then we need to ask whether we are using the appropriate instruments. An appropriate instrument is one which is both uncorrelated with the error term (for consistency), and highly correlated with the instrumented variable (for efficiency). If we have more instruments than instrumented variables, we can use a Sargan (1958) or Hansen (1978) test of overidentifying restrictions. The results are in Table 1. We find that the Hansen test passes comfortably in all specifications.16

How can we interpret the fact that the coefficient on capital stock is always more negative using IV than OLS? This indicates the direction of OLS bias, and is suggestive of the two-way relationship between capital and labour regulation. If labour regulation does have an impact on capital stock, then this impact could be positive17. That is, the more pro-labour is policy, the more capital stock there is. This may be explained as firms switching towards more capital-intensive methods as labour regulations move against them.

3.4 First stage and reduced form results

Table 2 presents the first stage results for the IV estimation, and the reduced form for the main specification (23), both with heteroskedastic-robust standard errors. These are OLS regressions of the log of fixed capital and labour regulation, on the full set of exogenous variables.

First, consider column (1), the first stage regression for fixed capital. Controlling for all other exogenous variables in the main regression, total bank credit and installed electricity generating capacity have highly significant effects. The more bank credit or electricity generating capacity there is in a state, the greater the amount of fixed capital, which agrees with our intuition. The availability of bank credit makes it easier to exploit profitable opportunities by lowering the cost of installing new capital, while electrical power is essential for the productive use of modern industrial machinery, but is difficult to transmit across long distances.

In column (2), in the reduced form regression, both the instruments have strong direct impacts on labour regulation. Greater bank credit and installed electricity generating capacity are associated with more pro-capital policy. Also, as in Table 1, states under a Hindu party tend to have more pro-capital policy, while states with larger populations or under a hard left party or the Congress party tend to have less pro-capital policy.

Table 2 also reports the F-test of the joint significance of the excluded exogenous

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15The Hansen (1978) test is used in the case of heteroskedastic-robust standard errors.
16Further evidence on whether the instruments are reasonable, including an excluded variables F-test, are in the following subsection.
17This depends on the correlation between the RHS variables.
variables in the first-stage regression. We find that the instruments are always highly jointly significant, and therefore play an important role in determining the stock of fixed capital. In summary, the results of Table 2 show that the instruments we have chosen do in fact have important influences on the instrumented variable, thus providing further evidence that the instruments are reasonable ones.

3.5 Robustness

One possible concern of our results is that the capital stock variable in Table 1 may be capturing the impact of capital-labour ratio rather than absolute capital stock. If instead of running equation (23), we replace capital stock and population by the capital-labour ratio, this is equivalent to running equation (23) with the constraint that the coefficients on capital and labour sum to zero:

\[
LR_{st} = \alpha_s + \beta_t + \phi_3 \ln \left( \frac{K_{st}}{L_{st}} \right) + \delta x_{st} + \varepsilon_{st}
\]

Therefore, testing if the coefficients on capital and labour in equation (23) sum to zero is a test of this constraint. A significant test statistic would indicate that the coefficients do not sum to zero, and therefore that there is additional information from separating the effects of capital and labour. Table 1 reports the test statistic, which is always highly significant in every specification, thus supporting our claim that the impact of capital stock on policy is at least partly due to absolute capital rather than relative capital-labour ratios.

While the coefficients of interest are statistically significant, there is the question of how important they are. To explore this, we report standardised or beta coefficients in square brackets in Table 1. These are the coefficients that would have been obtained if all the variables were standardised to have mean 0 and a standard deviation of 1. The variables that have the largest beta coefficients are fixed capital and population. Under OLS, the beta coefficient for fixed capital is moderately large, ranging from 0.3 to 0.5 depending on specification; that is, a 1 standard deviation increase in capital stock reduces the measure of labour regulation by 0.3 to 0.5 standard deviations. Using IV, the beta coefficient is much larger, taking values from 1.7 to 2.4. A one standard deviation increase in capital stock reduces labour regulation by a massive 2.6 to 3.7 standard deviations. We can therefore conclude that capital stock has a significant and large effect on labour regulation.

Table 3 presents the results of the ordered logit regressions. Column (1) is the baseline regression, with fixed capital and population on the RHS, heteroskedastic-robust standard errors, and state and time dummies. Both capital and population are significant at the 1 percent level, and are signed as in the OLS regression: more fixed capital is
associated with pro-capital policies, while more population is associated with anti-capital policies.

Column (2) adds state domestic product per capita, which has no significant impact on policy. Political histories (column (3)) have the same impact as they do under OLS and IV: states ruled by a hard left party or the Congress Party tend to have anti-capital policies, while states ruled by a Hindu party tend to have pro-capital policies. The coefficients on absolute capital stock and population remain significant at the 1 percent level.

Finally, column (4) includes all the controls, which does not change the results. Overall, the results of the ordered logit regression serve to confirm the results of OLS and IV, which is that absolute stocks of fixed capital are related to more favourable policies toward capital.

3.6 Industrial specialisation in India, 1980-1997

To test the second main prediction of the model, we make use of more detailed data at the 3-digit-industry-state level, for which data is available between 1980 and 1997. The prediction of the model which we want to test is the following: the greater is the difference in policies across states, the greater will be the difference in their industrial structure. We can test this proposition using a simple formulation adapted from Bernard and Schott (2002) (see also Bernard, Redding, Schott and Simpson (2003)). We run the following regression:

\[ I_{rs} = \lambda_0 + \lambda_1 |\eta_{rs}| + \lambda_2 I_r + \lambda_3 I_s + \lambda_4 |x_{rs}| + u_{rs} \]  

(25)

The dependent variable \( I_{rs} \) is the number of industries common to both state \( r \) and \( s \), and \( |\eta_{rs}| \) are the absolute differences in the measure of labour regulation between states \( r \) and \( s \). \( I_r \) and \( I_s \) are the number of industries in states \( r \) and \( s \); states with more industries are, other things equal, likely to have more industries in common.

\(|x_{rs}|\) represents other variables which take the form of absolute differences across states. The controls we include are absolute differences in the land-labour ratio (which controls for exogenous, geographically immobile factor endowments which may have an impact on industrial structure), and per capita state domestic product (SGDP). Per capita SGDP captures possible differences in demand across states based on income levels; if preferences are non-homothetic, states with higher per capita SGDP may demand different goods than states with lower per capita SGDP. If it is costly to ship goods between states, then we may expect states to specialise in industries with greater local demand.

The basic idea is that the larger is the value of \(|\eta_{rs}|\), the more different are policies and hence factor endowments across states, and therefore the fewer industries the two
states should have in common. Therefore we expect $\lambda_1$ to be negative. We include state and year dummies in each regression.

Table 4 which presents the results with heteroskedastic-robust standard errors, shows that our expectations are confirmed. Column (1) is the basic specification following equation (25). All coefficients are highly significant and their signs are consistent with our priors. The absolute difference in labour regulation has a strong negative impact on the number of common industries in the two states, while the total number of industries in each state have very strong positive effects.

In column (2), we control for the absolute difference in the relatively immobile land-labour ratio across states, and the absolute difference in per capita net state domestic product between states. The difference in the land-labour ratio has no significant impact on the number of industries in common, but larger differences in per capita incomes are associated with more different industrial structures. The coefficient on our variable of interest, differences in labour regulation, remains almost unchanged and highly significant; the greater the difference in labour regulation across states, the fewer the industries they have in common.

4 Conclusions

The main contribution of this paper is to develop and test empirically a model of electoral competition and campaign contributions that has implications for the structure of economic activity. The model makes two main theoretical predictions. First, locations that have large absolute levels of capital stock tend to implement policies which are more favourable to capital. This prediction is found to hold true across states in India in the period 1959-1997, even after controlling for various other factors that could influence the policy stance. To overcome possible endogeneity issues, in addition to OLS, we use two-stage-least-squares as an alternative method of estimation. A second prediction of the model is that capital tends to flow into locations that already have more absolute levels of capital than their trading partners\textsuperscript{18}. Locations with less similar policies toward capital (due to differences in absolute capital endowments) therefore tend to have more different relative factor endowments and hence tend to specialise in different bundles of goods. This is also confirmed in the data.

While the predictions of the theoretical model are in accord with the empirical evidence, there are several extensions that can be pursued to enhance our understanding of the key issues. One possible starting point would be to take the tax interpretation of the model, and consider further the role of informed and uninformed voters, the effectiveness of campaign spending and the range of voters’ ideological views (corresponding to the parameters $1 - \alpha$, $\alpha$, $h$ and $f$ in the model). For example, one additional prediction of

\textsuperscript{18}We do not test this prediction directly, but it is possible to do so.
the model which we do not test here but which could be investigated, is that the more effective is campaign spending, the lower is the share of government revenue raised from taxes on capital. As noted in the introduction, evidence across OECD countries has been that capital tax rates have declined over the last 30 years, at the same time as the role of the media has been observed to play an increasingly important role in everyday life.

Our results have broader implications for the process of policy formation. Most importantly, states which are initially disadvantaged in the sense of having less capital stock (or small states), face difficulties in catching up with states that are better endowed initially. The political structure leads states with less capital to implement policies that are less favourable to capital. Therefore, our findings call for a reconsideration of the role of campaign contributions in elections, and also for a reevaluation of the costs and benefits of regional integration, especially for smaller countries. If increasing integration leads to increased tax competition, then countries with less capital stock may be worse off as capital leaves the country.
References


5 Appendix A: Conditions for which lobbying enhances the welfare of the SIG

In this appendix, we show the conditions for which the SIG prefers to lobby than not lobby.

If the SIG does not give any contribution to either political party, then its welfare is obtained by substituting equation the equilibrium policy without lobbying (15) into the SIG’s objective function (14):

\[ V_0^L = \left( r - tK^* \right) K = rK - G \]

Welfare of the SIG if it lobbies a single party (assume without loss of generality that it lobbies party A) is obtained by substituting equations (15), (16), (21) and (6) into (14):

\[ V_1^L = \left( \frac{1}{2} + b \right) \left[ rK - G + \frac{1}{2} \varphi(0) \left( \frac{h}{(1 - \alpha)f} \right)^2 \right] + \left( \frac{1}{2} - b \right) (rK - G) - \left[ \frac{(1 - \alpha)f}{h} \right]^2 L^2 (W^* - W^A)^2 \]

\[ = rK - G + \left( \frac{1}{2} + b \right) \frac{1}{2} \varphi(0) \left( \frac{h}{(1 - \alpha)f} \right)^2 - \left[ \frac{(1 - \alpha)f}{h} \right]^2 (t^{LA}L)^2 \]

Welfare of the SIG if it lobbies both parties is similarly obtained as:

\[ V_2^L = rK - G + \frac{1}{2} \left( \frac{h}{(1 - \alpha)f} \right)^2 \left[ \frac{1}{2} - b + 2b \varphi(0) \right] - \frac{(1 - \alpha)f}{h} \left[ (t^{LA}L)^2 + (t^{LB}L)^2 \right] \]

Now, lobbying a single party is preferred to not lobbying at all \((V_1^L > V_0^L)\) if (substituting from (22)):

\[ \left( \frac{1}{2} + b \right) \frac{1}{2} \varphi(0) \left( \frac{h}{(1 - \alpha)f} \right)^2 > \left[ \frac{(1 - \alpha)f}{h} \right]^2 (t^{LA}L)^2 \]

\[ b > \frac{1}{2} \varphi(0) - \frac{1}{2} \]

Similarly, we can show that lobbying both parties is preferred to lobbying a single party \((V_2^L > V_1^L)\) if:

\[ \frac{1}{2} \left( \frac{h}{(1 - \alpha)f} \right)^2 \left[ \frac{1}{2} - b + 2b \varphi(0) \right] - \left[ \frac{(1 - \alpha)f}{h} \right]^2 \left[ (t^{LA}L)^2 + (t^{LB}L)^2 \right] > \left( \frac{1}{2} + b \right) \frac{1}{2} \varphi(0) \left( \frac{h}{(1 - \alpha)f} \right)^2 - \left[ \frac{(1 - \alpha)f}{h} \right]^2 (t^{LA}L)^2 \]
which simplifies to
\[
[\varphi(0) - 1]\left[b - \frac{1}{2}\varphi(0)\right] > 0
\]
Finally, we can show that lobbying both parties is always preferred to not lobbying at all \((V_L^2 > V_L^0)\) if:
\[
\frac{1}{2} \left(\frac{h}{(1-\alpha)f}\right)^2 \left[\frac{1}{2} - b + 2b\varphi(0)\right] > 2 \left[\frac{(1-\alpha)f}{h}\right]^2 (\mu^{L^A_L})^2
\]
\[-b + (1 + 2b)\varphi(0) - |\varphi(0)|^2 > 0\]
What do these expressions imply? Suppose that \(\varphi(0) = \frac{1}{2}\); that is, the probability of each party winning the election is one-half. Then, the above three conditions simplify to:
\[
V_L^1 > V_L^0 \quad \text{if} \quad b > -\frac{1}{4}
\]
\[
V_L^2 > V_L^1 \quad \text{if} \quad b < \frac{1}{4}
\]
\[
V_L^2 > V_L^0 \quad \text{since} \quad \frac{1}{4} > 0
\]
Therefore in this case, lobbying both parties is always superior to not lobbying at all, and is also superior to lobbying only one party if neither party is too popular \((b \text{ sufficiently small; } b \in (-\frac{1}{4}, \frac{1}{4})).\)

6 Appendix B: Data Appendix

The data comes from many sources. Our dataset builds on Ozler, Datt and Ravallion (1996) and Besley and Burgess (2004).

The labor regulation variable comes from state specific text amendments to the Industrial Disputes Act 1947 as reported in Malik (1997). Besley and Burgess (2004) code each change in the following way: a 1 denotes a change that is pro-worker or anti-employer, a 0 denotes a change that was judged not to affect the bargaining power of either workers or employers and a -1 denotes a change which they regard to be anti-worker or pro-employer. There were 113 state specific amendments coded in this manner. Where there was more than one amendment in a year they collapsed this information into a single directional measure. Thus reforms in the regulatory climate are restricted to taking a value of 1, 0, -1 in any given state and year. To use these data, they then construct cumulated variables which map the entire history of each state beginning from 1947 — the date of enactment of the Industrial Disputes Act.

State population data used to express magnitudes in per capita terms and as a control comes from the 1951, 1961, 1971, 1981, 1991 and 2001 censuses (Census of
India, Registrar General and Census Commissioner, Government of India) and has been interpolated between census years.

State domestic product comes from Estimates of State Domestic Product published by Department of Statistics, Ministry of Planning, Government of India, and is expressed in log per capita terms.

Fixed capital comes from the Indian Annual Survey of Industries, Central Statistical Office, Department of Statistics, Ministry of Planning, Government of India. It represents the depreciated value of fixed assets owned by the factory on the closing date of the accounting year. Fixed assets are those which have a normal productive life of more than one year. Fixed capital covers all types of assets new or used or own constructed, deployed for production, transportation, living or recreational activities, hospitals, schools etc. for factory personnel.

Variables expressed in real terms are deflated using the Consumer Price Index for Industrial Workers, obtained from several publications including the Indian Labour Handbook, the Indian Labour Journal, the Indian Labour Gazette, the Reserve Bank of India Report on Currency and Finance, and the Monthly Abstract of Statistics of India.

Total installed electrical capacity of electrical generation plants is measured in thousand kilowatts and come from various issues of the Statistical Abstracts of India, Central Statistical Office, Department of Statistics, Ministry of Planning, Government of India. It is expressed in log per capita terms.

The data on political histories comes from Butler, Lahiri and Roy (1991), updated from the website of the Election Commission of India (http://www.eci.gov.in/). Political history is measured by the number if years during our data period that particular political groupings have held a majority of the seats in the legislature. State political configurations are held constant between elections. In our data period, the relevant groupings are: the Congress party, the Janata parties, hard left parties, the Hindu parties, and regional parties. These groupings contain the following parties (i) Congress Party (Indian National Congress + Indian Congress Socialist + Indian National Congress Urs + Indian National Congress Organization), (ii) Janata parties (Lok Dal+Janata+Janata Dal), (iii) a hard left grouping (Communist Party of India + Communist Party of India Marxist), (iv) Hindu parties (Bharatiya Janata Party (BJP)), and (v) a grouping made up of regional parties.

Banking data refers to scheduled commercial banks: State Bank of India and its associates, Nationalized banks, Regional rural banks, Private sector banks, and Foreign banks. Data on bank credit is from the Reserve Bank of India publication Statistical Tables Relating to Banks in India.

Industry data is from the Indian Annual Survey of Industries. Data is available at the 3-digit level, following the National Industrial Classification (NIC). There is a change in industrial classification in 1987 and, in order to match the 1970 and 1987 NICs, we
aggregate a small number of 3-digit industries. We exclude miscellaneous manufacturing industries, as these are likely to be heterogeneous across states. The industries ‘Minting of Currency Coins’ and ‘Processing of Nuclear Fuels’ are also excluded, as outcomes in these industries are likely to be determined by special considerations. This leaves a total of 138 industries.
Figure 1: Labour regulation in India, 1958-1997.
Figure 2: Game tree, extensive form.
Figure 3: Log of real fixed capital

Graphs by State Name
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<td>IV OLS</td>
<td>IV OLS</td>
<td>IV OLS</td>
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<td>(5.76)**</td>
<td>(4.73)**</td>
<td>(4.50)**</td>
<td>(4.76)**</td>
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<td>(4.55)**</td>
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<td>0.013</td>
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<td>-0.019</td>
<td>0.017</td>
<td>-0.022</td>
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<td>(0.49)</td>
<td>(0.84)</td>
<td>(0.010)</td>
<td>(0.019)</td>
<td>(0.017)</td>
<td>(0.022)</td>
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<td>(0.71)</td>
<td>(0.49)</td>
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<td>(0.010)</td>
<td>(0.019)</td>
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<td>[0.014]</td>
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<td>(4.52)**</td>
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<td>(1.06)</td>
<td>(2.13)*</td>
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<td>(0.103)</td>
<td>(0.038)</td>
<td>(0.103)</td>
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<td>Yes</td>
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<td>Year dummies</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>0</td>
<td>0</td>
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Notes: Heteroskedastic-robust z statistics in parentheses, and standardised beta coefficients in square brackets. The dependent variable is a cumulative measure of amendments to the Industrial Disputes Act, coded as -1 if it is pro-capital, 0 if it is neutral, and +1 if it is pro-labour. + significant at 10%; * significant at 5%; ** significant at 1%. In the IV regression, fixed capital is assumed to be endogenous, and is instrumented using total bank credit and installed electricity generating capacity. The number of observations varies across specifications because not all variables are available for all observations. Using the same number of observations for all specifications does not change the results. Congress, hard left, Janata, Hindu and regional majority are counts of the number of years for which these political groupings held a majority of the seats in the state legislatures. The Hansen test is the test for overidentification. The Hausman test is the test for systematic differences in parameter estimates between IV and OLS. The test that capital+population=0 is the test that the coefficients on capital and labour are the same, i.e. only the capital-labour ratio matters. A rejection of the null hypothesis implies that absolute capital and labour stocks play a role beyond the capital-labour ratio. See the Data Appendix for details on the sources and construction of the variables.

Table 1: IV and OLS results for the measure of labour regulation.
Table 2: First stage and reduced-form regressions.

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<th>Dependent variable</th>
<th>(1) Log of real fixed capital</th>
<th>(2) Labour regulation</th>
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<tr>
<td>Log of bank credit</td>
<td>0.327</td>
<td>0.0509</td>
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<td>(4.54)**</td>
<td>(4.01)**</td>
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<td>Log of installed electricity generating capacity</td>
<td>0.232</td>
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<td>(4.32)**</td>
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<td>Log of population</td>
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<td></td>
<td>-0.14</td>
<td>(8.30)**</td>
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<td>Log of real net state domestic product p/c</td>
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<td></td>
<td>(3.41)**</td>
<td>(4.43)**</td>
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<td></td>
<td>-1.61</td>
<td>(4.61)**</td>
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<td>-0.007</td>
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<td></td>
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<td>0.031</td>
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<td>(2.07)*</td>
<td>(3.86)**</td>
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State dummies: Yes
Year dummies: Yes
Observations: 592
R-squared: 0.95
F-test of excluded variables: 21.2
Prob>F: 0

Notes: Heteroskedastic-robust t statistics in parentheses. * significant at 5%; ** significant at 1%. Column (1) is the first stage regression of the IV regression in table 4.1, where the instrumented variable, log of real fixed capital, is regressed on the full set of instruments. Column (2) is the reduced form regression, where the dependent variable in the second stage regression is regressed directly on the instruments. The F-test of excluded variables is a test of the joint significance of the instruments included in the first stage regression but excluded in the second stage regression (log of installed electricity generating capacity, and log of bank credit). See the Data Appendix for details on the sources and construction of the variables.
Table 3: Ordered logit results for labour regulation.
## Table 4: Industry overlap and labour regulation.

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<td></td>
<td>(3.08)**</td>
<td>(2.84)**</td>
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<tr>
<td>Total number of industries, reporting state</td>
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<td>0.514</td>
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<tr>
<td></td>
<td>(10.66)**</td>
<td>(10.73)**</td>
</tr>
<tr>
<td>Total number of industries, partner state</td>
<td>0.661</td>
<td>0.661</td>
</tr>
<tr>
<td></td>
<td>(19.93)**</td>
<td>(19.73)**</td>
</tr>
<tr>
<td>Absolute difference in land labour ratio</td>
<td>0.37</td>
<td>0.25</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Absolute difference in real per capita net state domestic product</td>
<td>-0.217</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(5.42)**</td>
</tr>
<tr>
<td>Constant</td>
<td>-39.991</td>
<td>-63.227</td>
</tr>
<tr>
<td></td>
<td>(5.24)**</td>
<td>(32.65)**</td>
</tr>
<tr>
<td>State dummies</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Year dummies</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Observations</td>
<td>2160</td>
<td>2145</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.95</td>
<td>0.95</td>
</tr>
</tbody>
</table>

Notes: Heteroskedastic-robust t statistics in parentheses. * significant at 5%; ** significant at 1%.

The number of observations is smaller in column (2) as data for state domestic product is missing for Jammu and Kashmir in 1997. Using the same number of observations for all specifications does not change the results. The dependent variable is the number of 3-digit industries common to any two states r and s. See the Data Appendix for details on the sources and construction of the variables.